



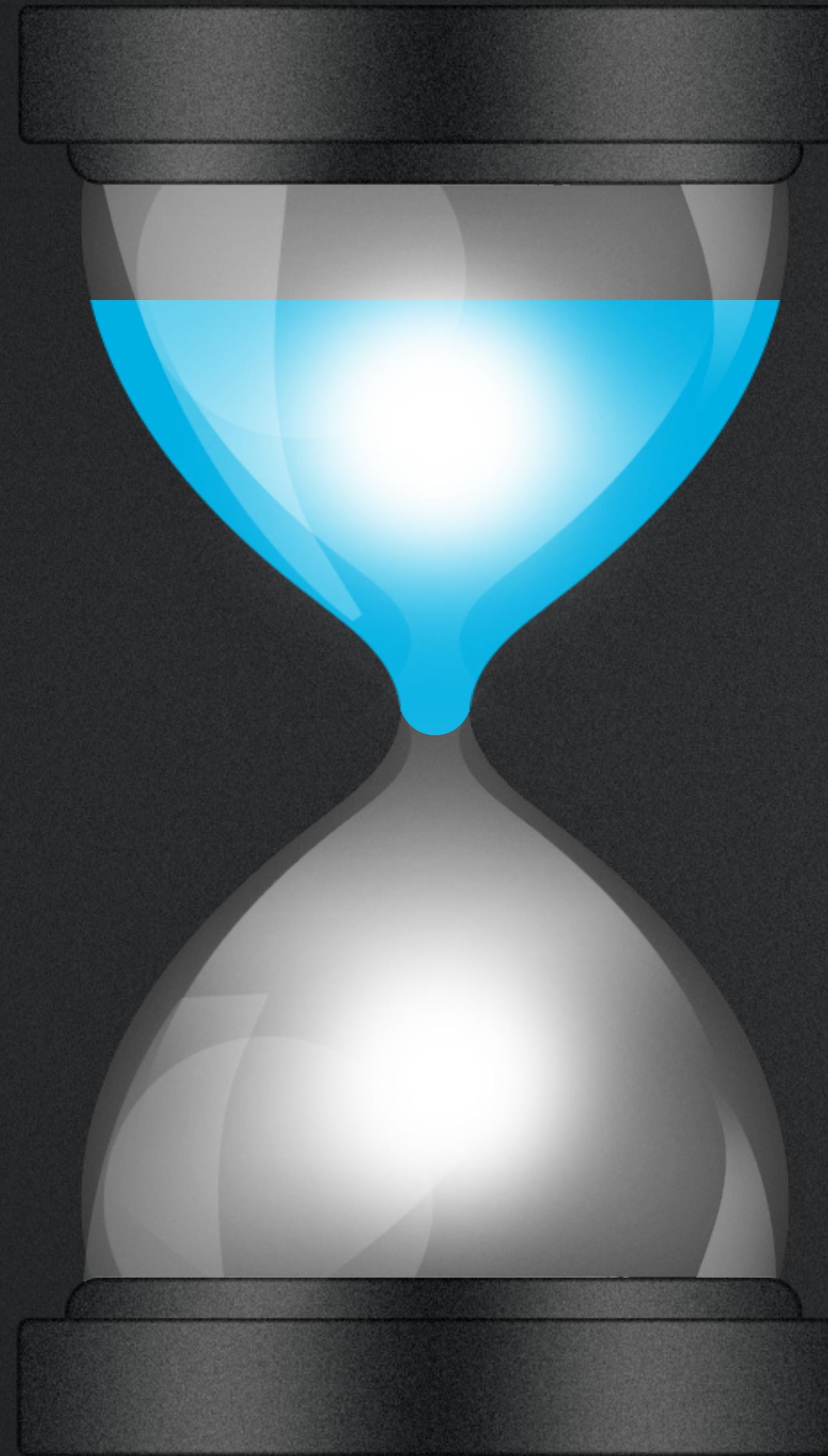
LinkedIn's Active/Active Evolution

Erran Berger

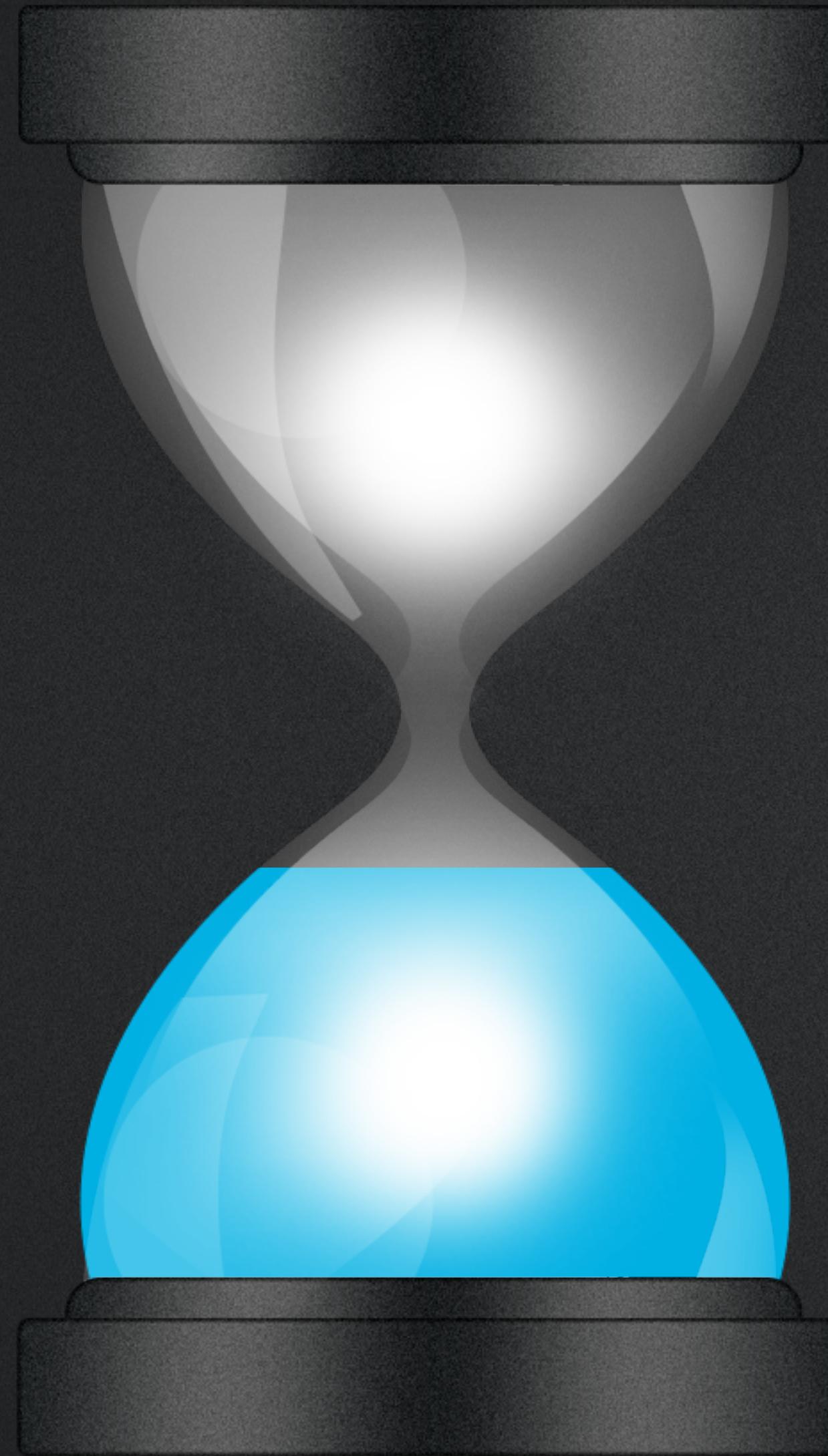
Head of Engineering, Content Products, LinkedIn

www.linkedin.com/in/erranberger

@eberger45



Time was
running out



Time was
running out

Multicolo from the get-go

Who is this Erran Berger
guy anyway?

What were the circumstances
of our decision?

Why should you care
about any of this
stuff?

Multicol From the Get-Go

1

2

3

Multicolo From the Get-Go

1

Stream
Processing

2

Personal Data

3

Cache Invalidation
& Replication
Conflicts



1

Stream
processing

8 billion

kafka messages

175 TB

of data

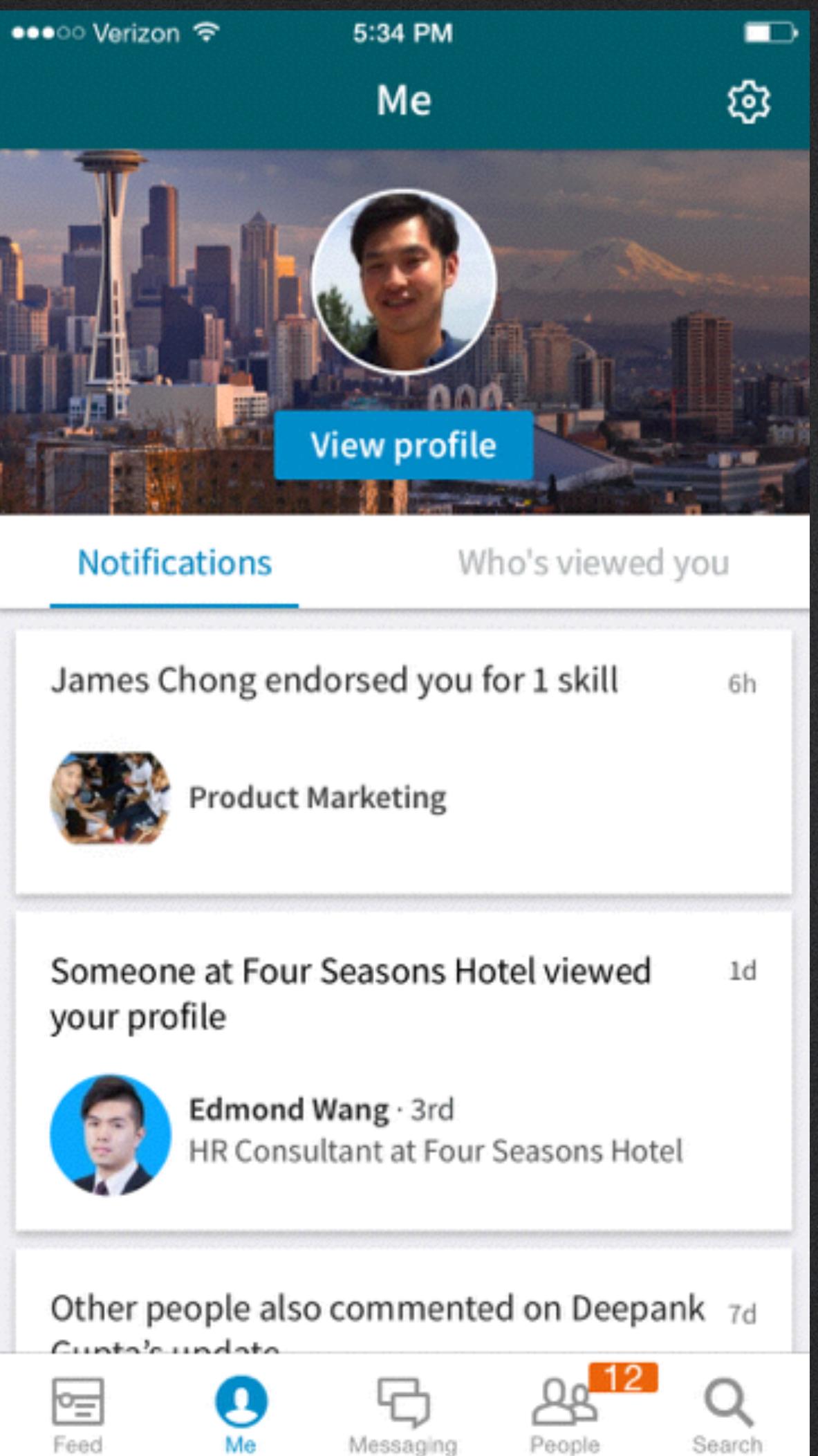
The great thing about kafka is
that its data is replicated like
everything else

WORST

The ~~great~~ thing about kafka is
that its data is replicated like
everything else

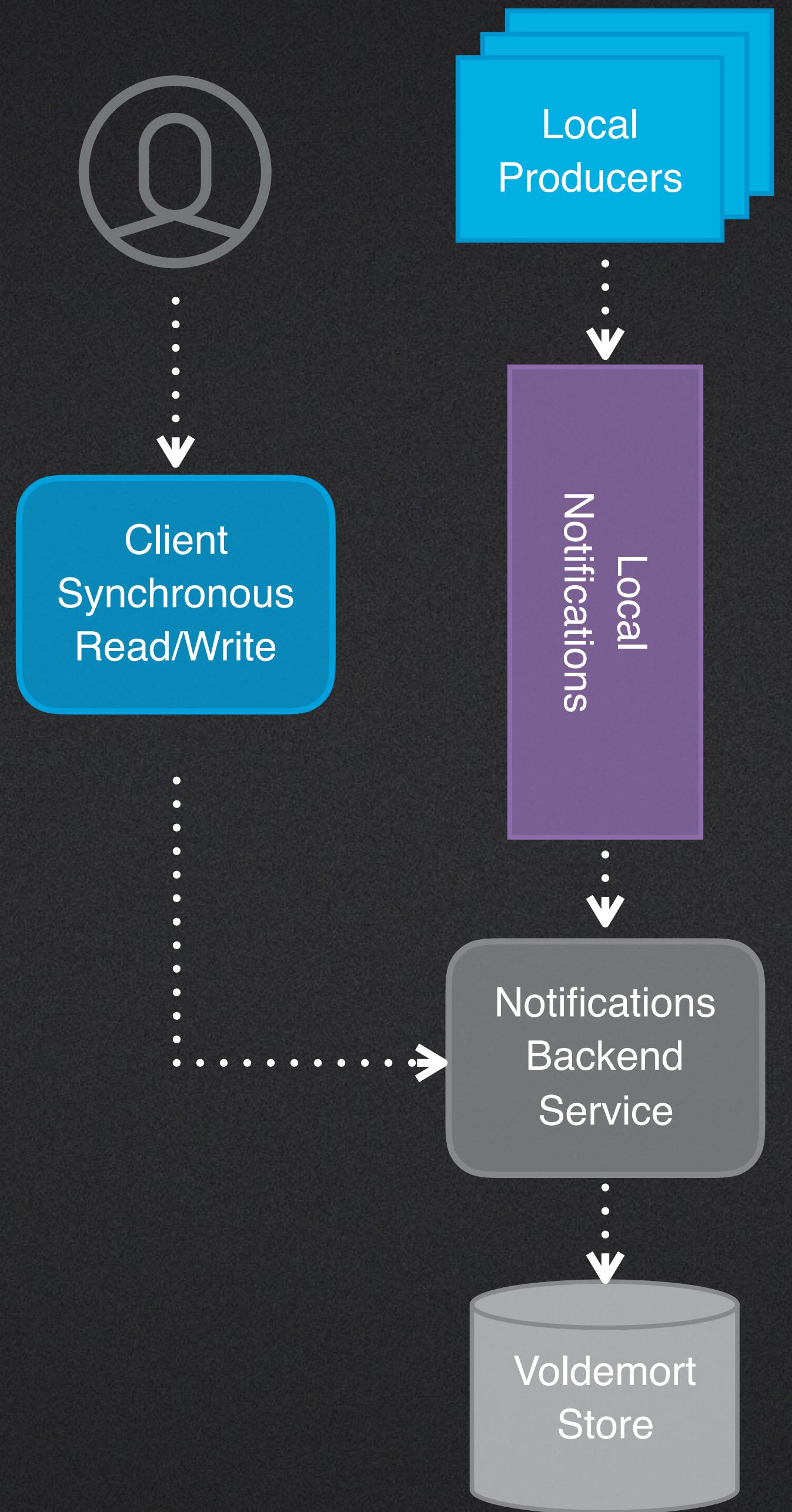
Only Process Once

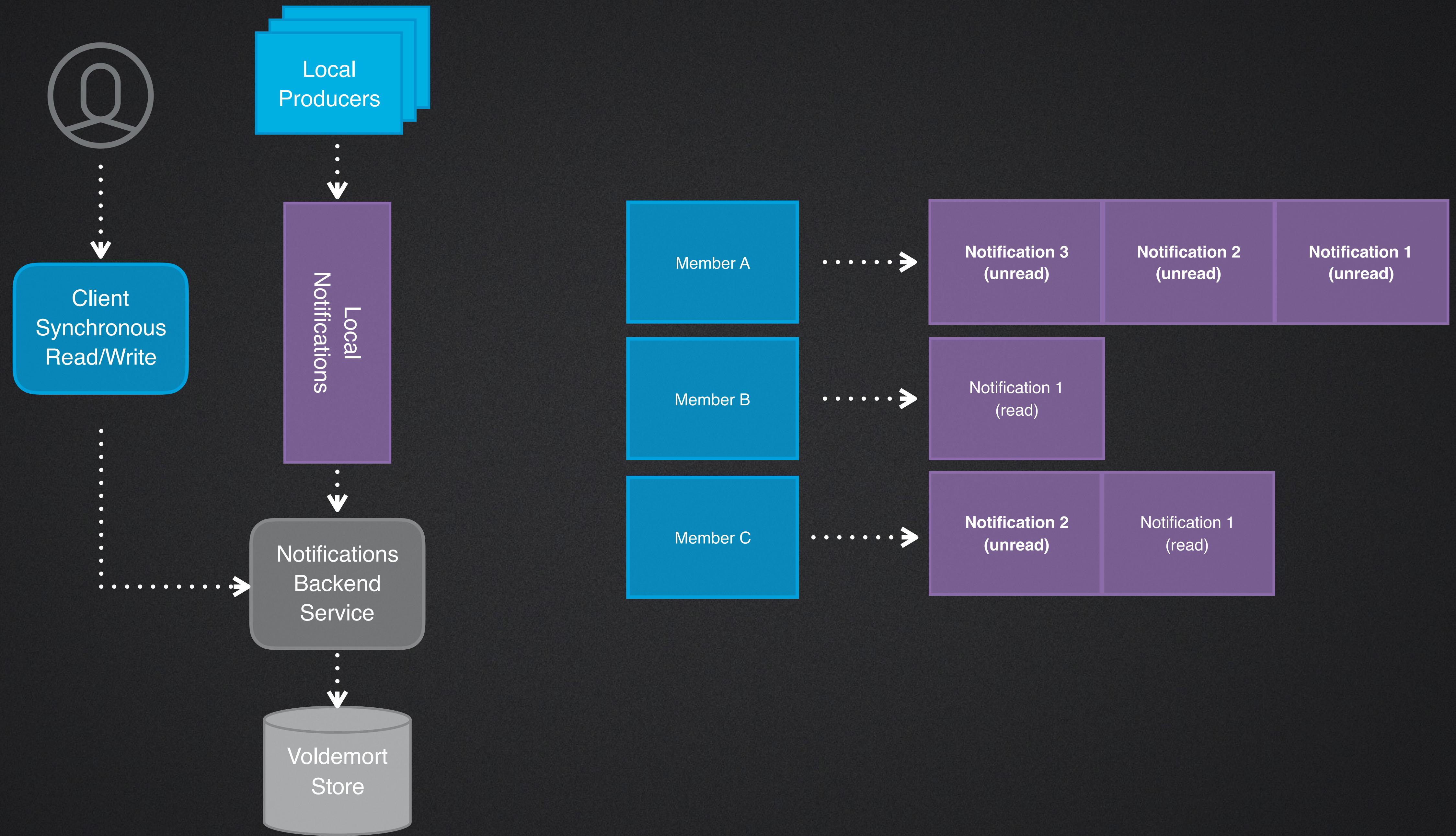




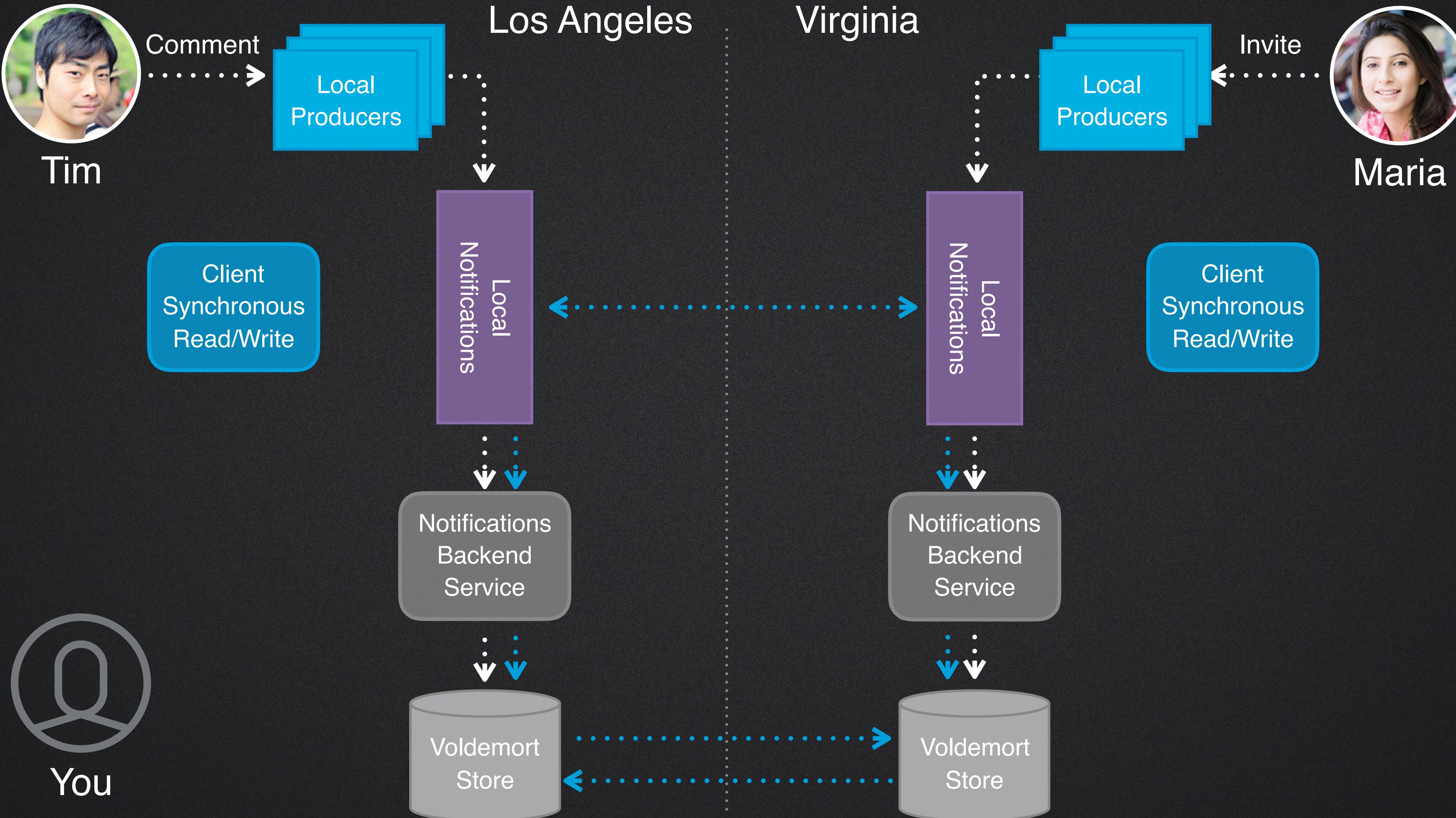
100 M

Notifications per day

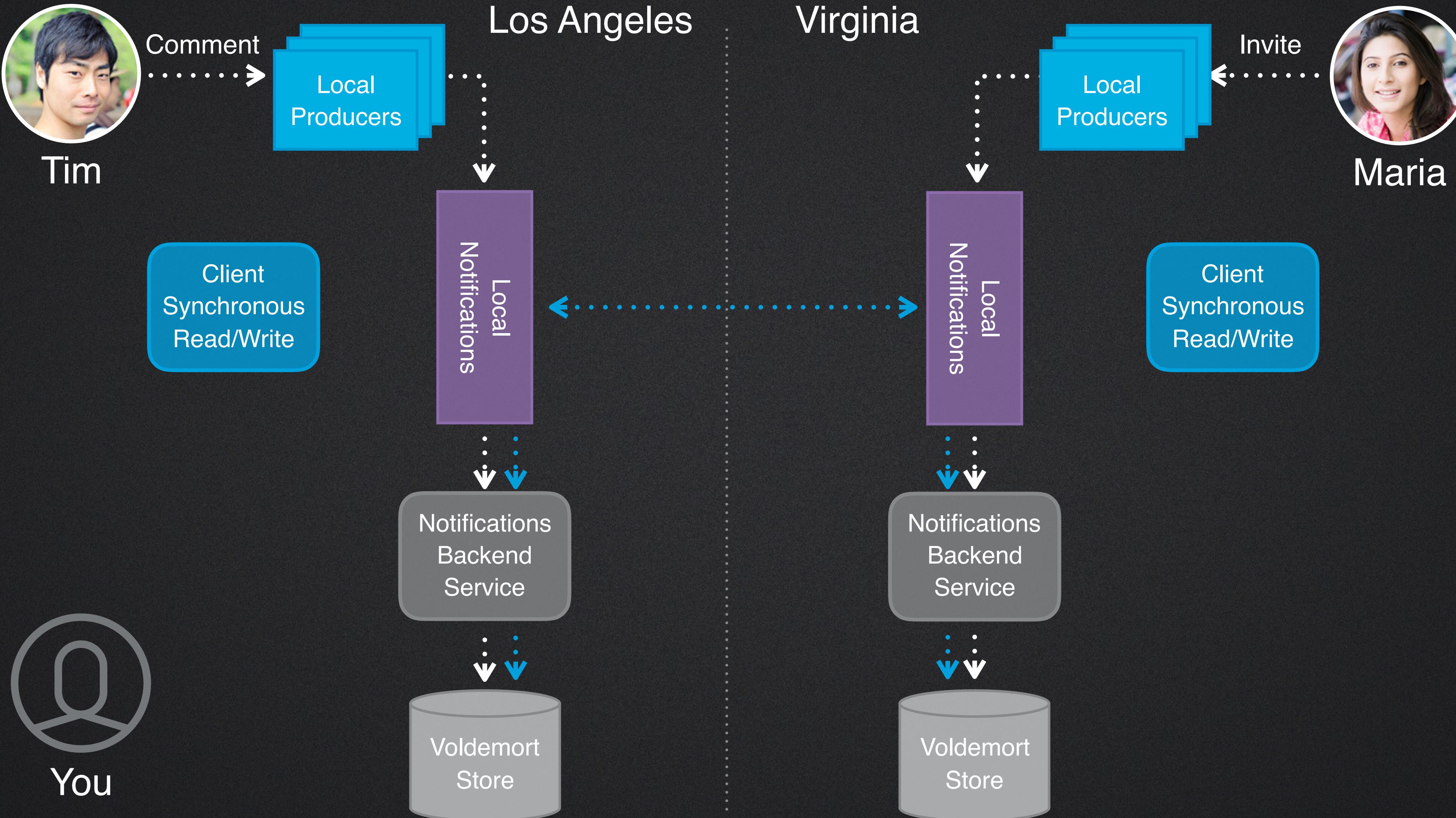




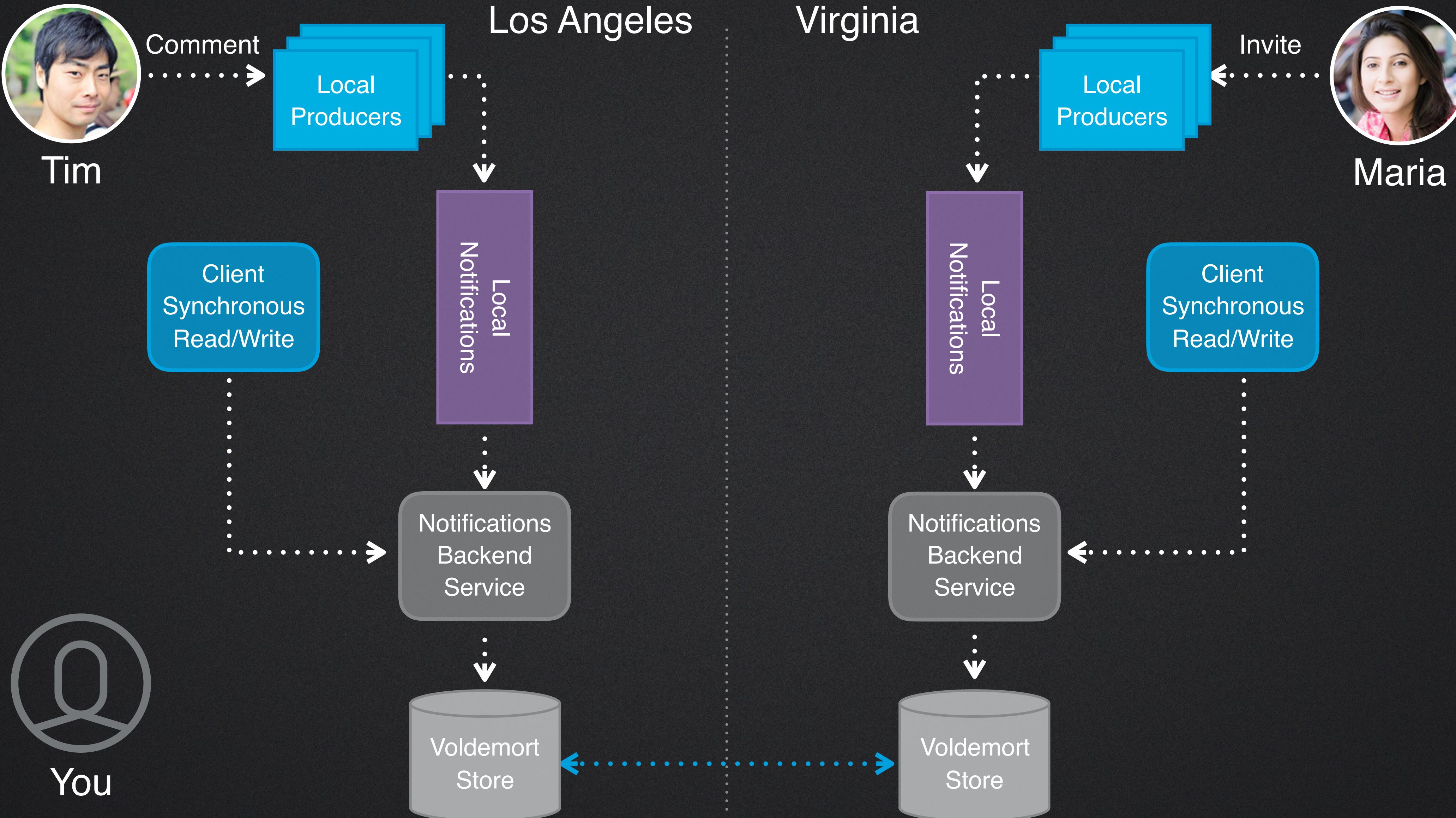
Problem: Double Processing



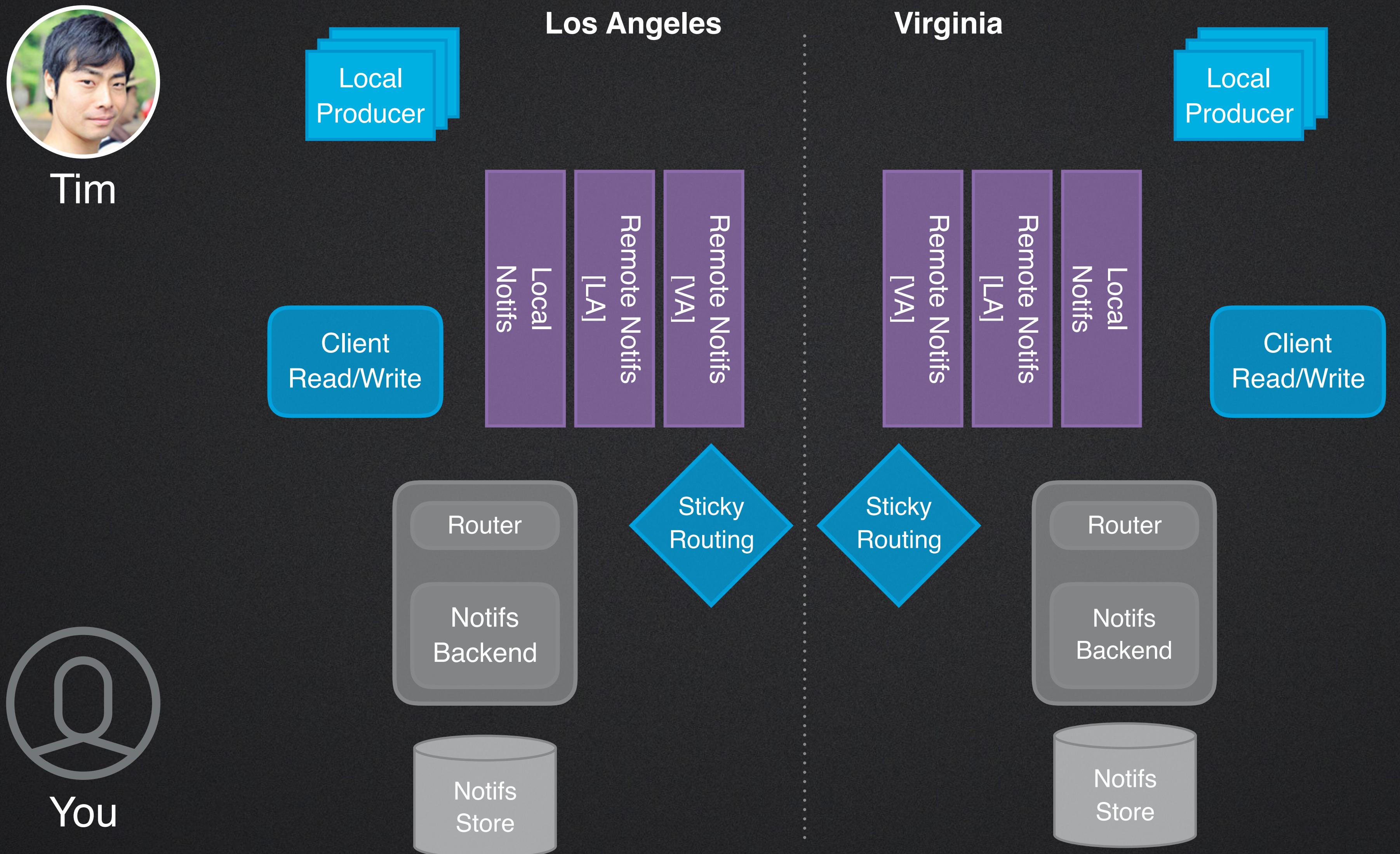
Option 1: Replicate Kafka only



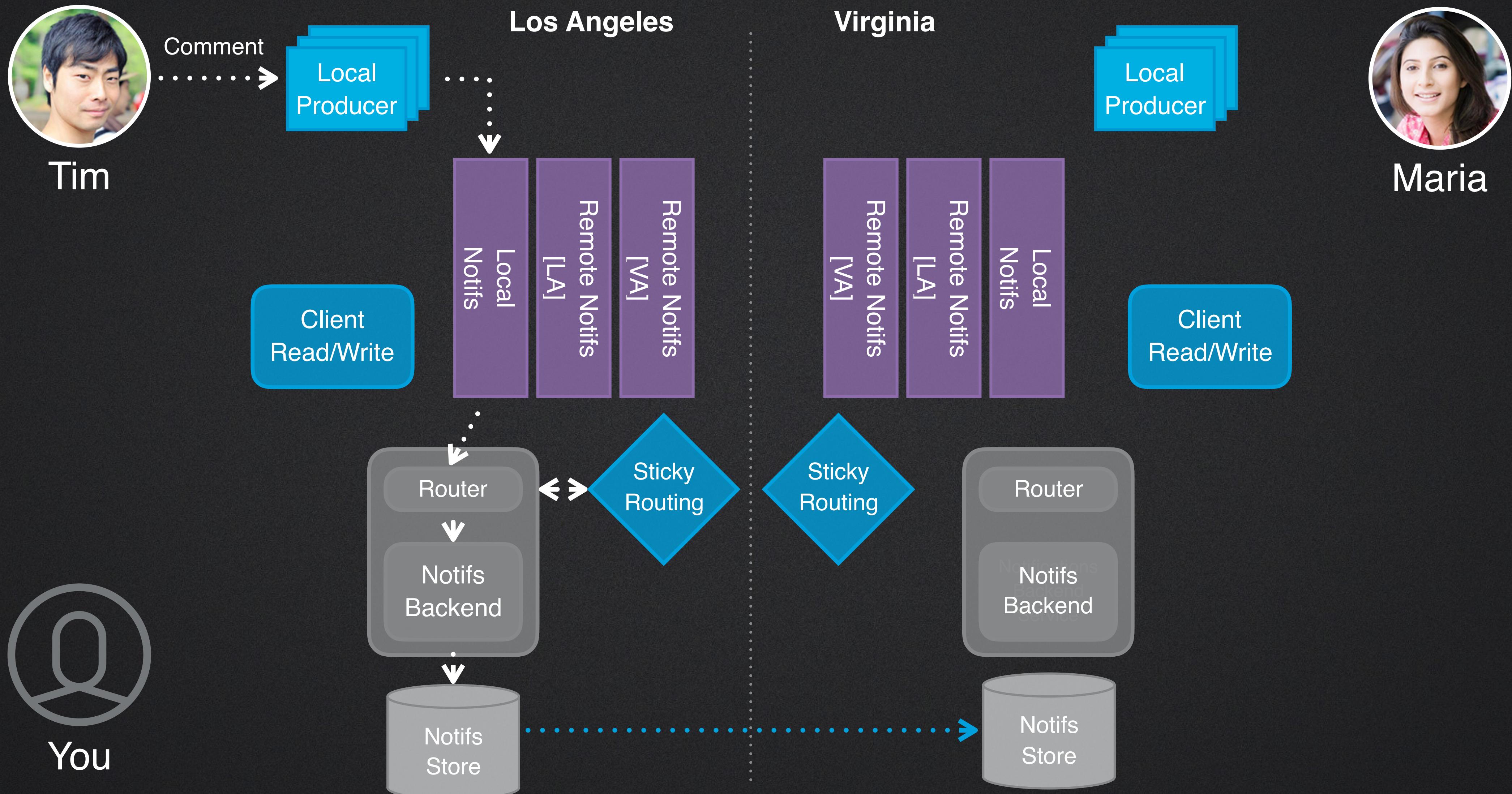
Option 2: Replicate Voldemort only



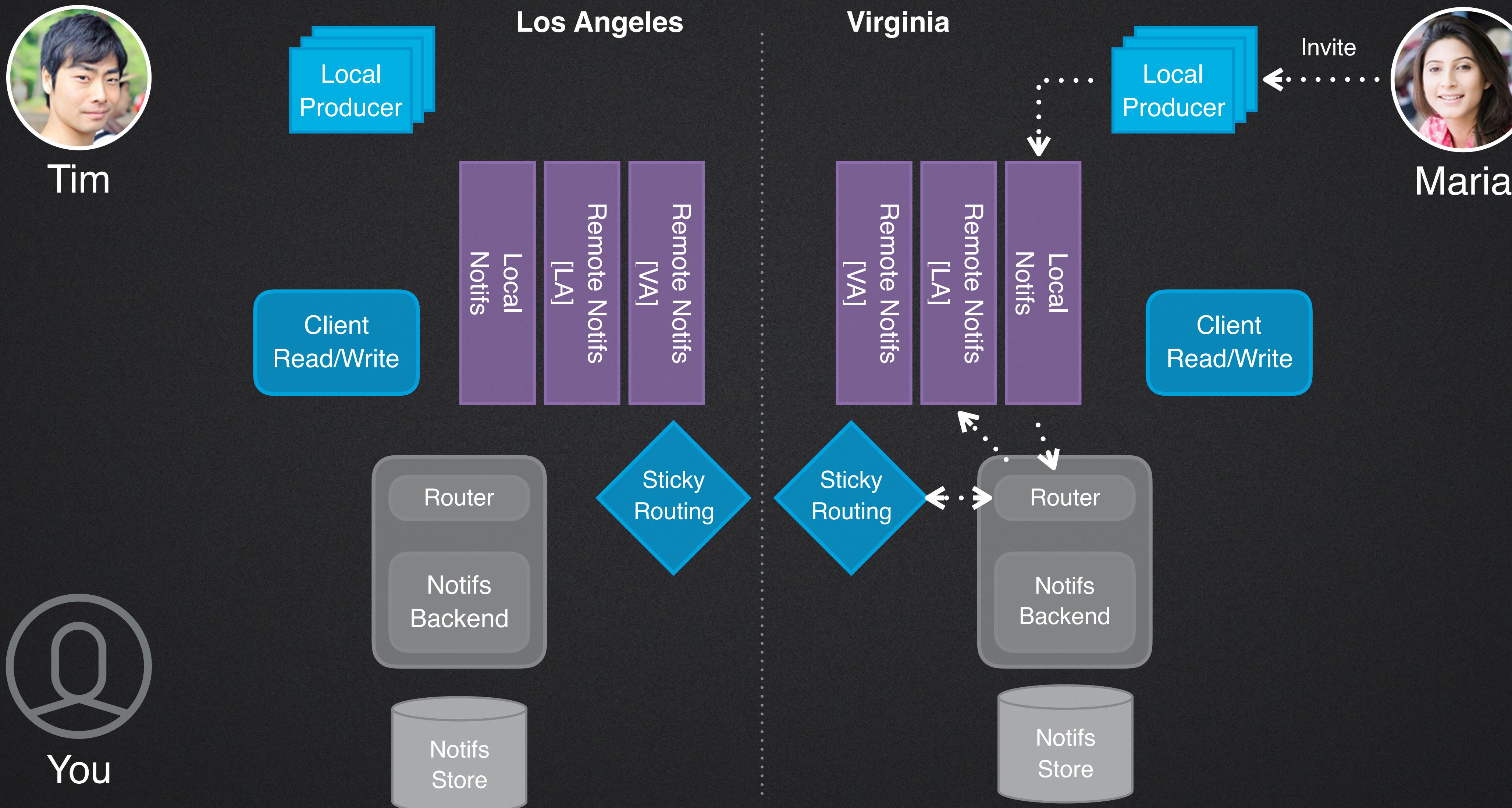
The Solution



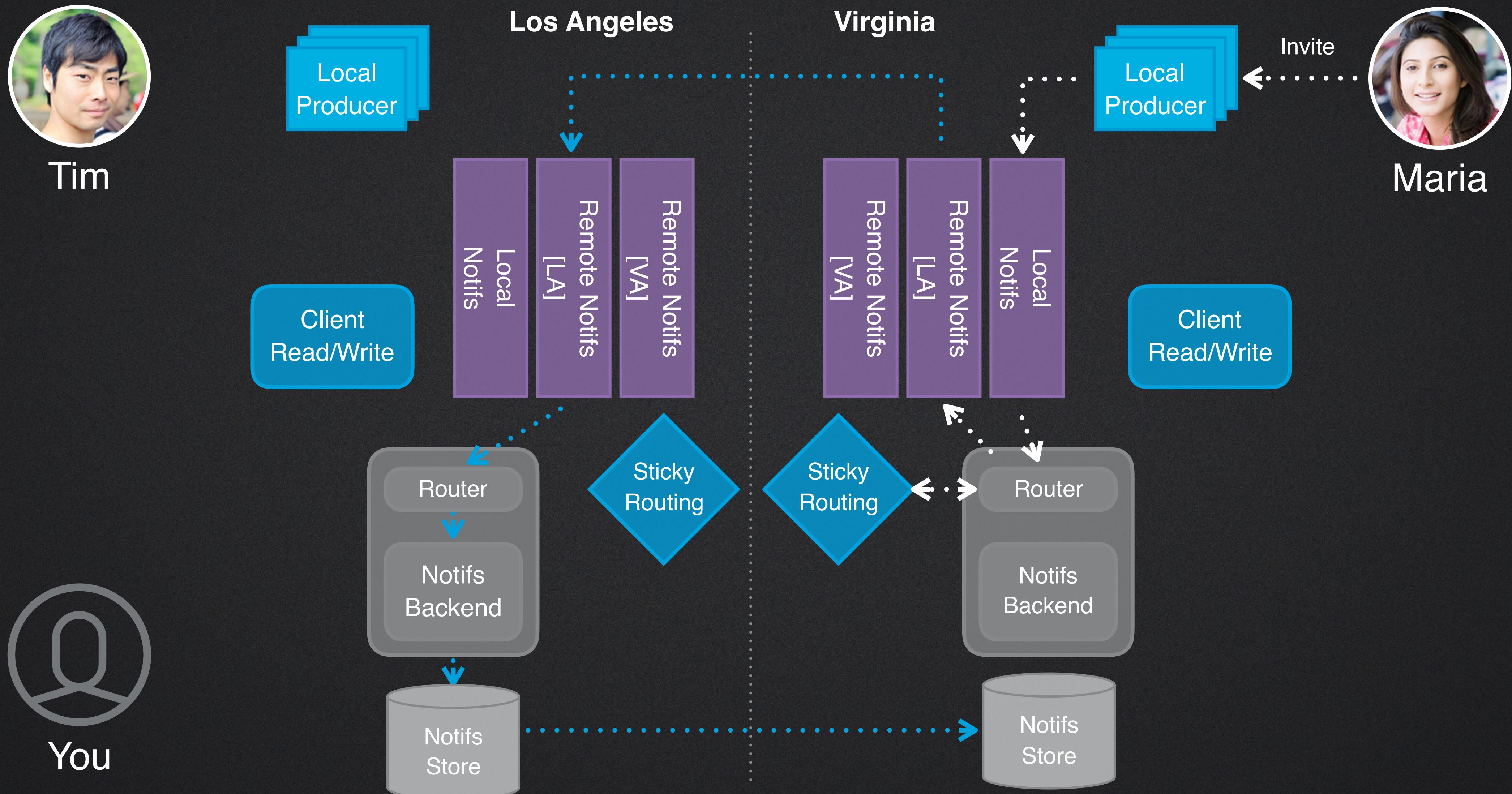
Example



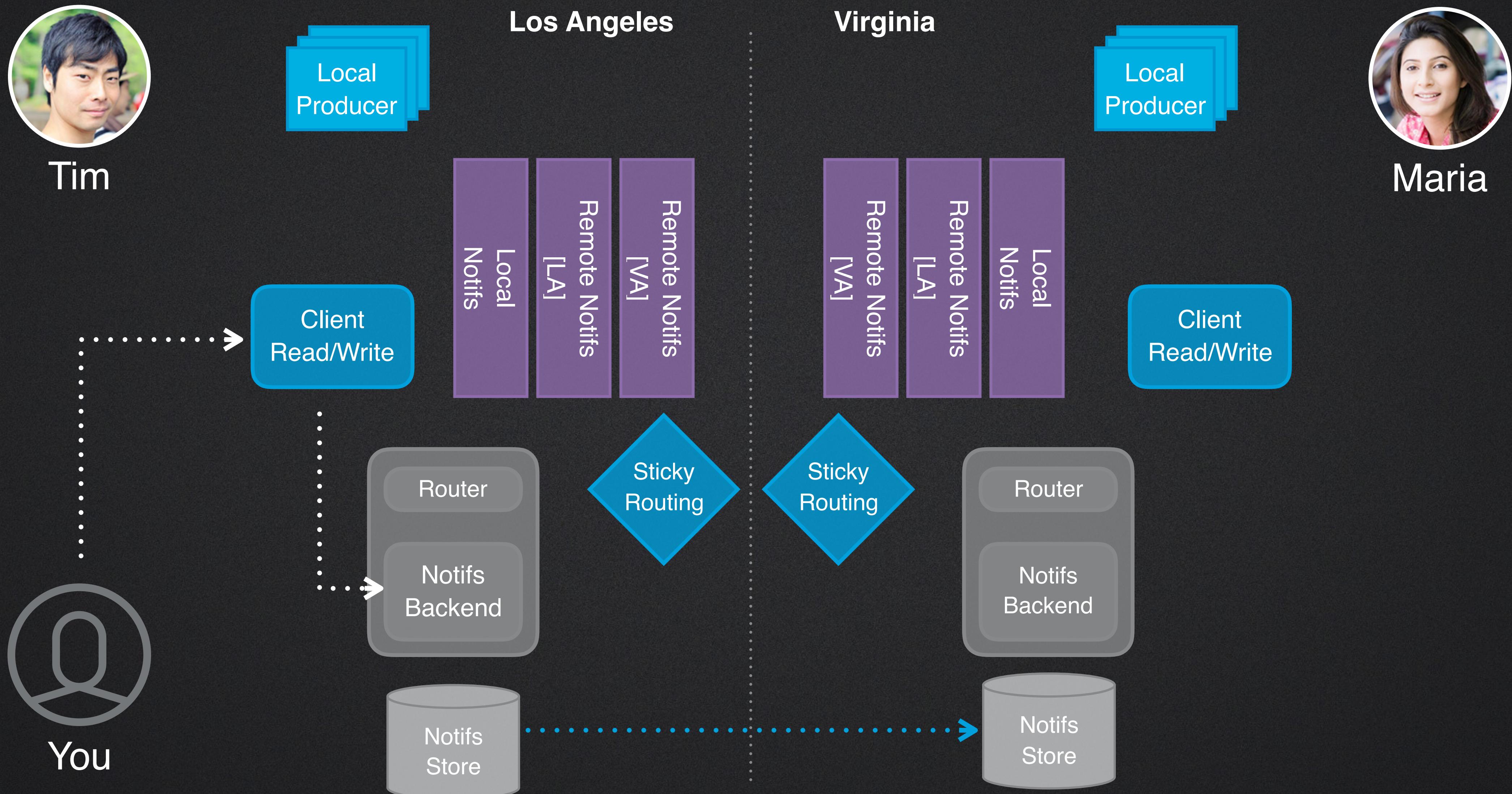
Example



Example



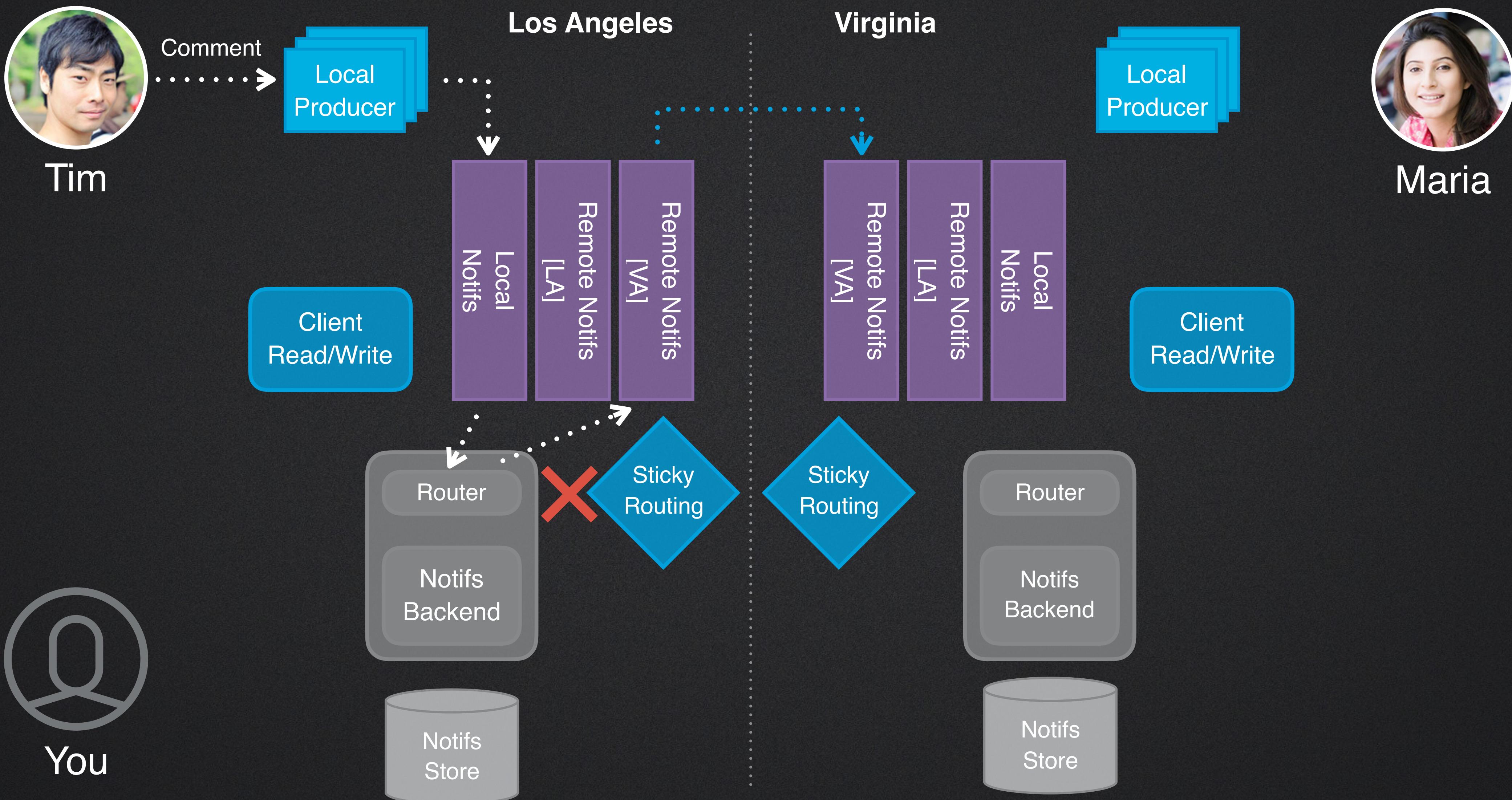
Example



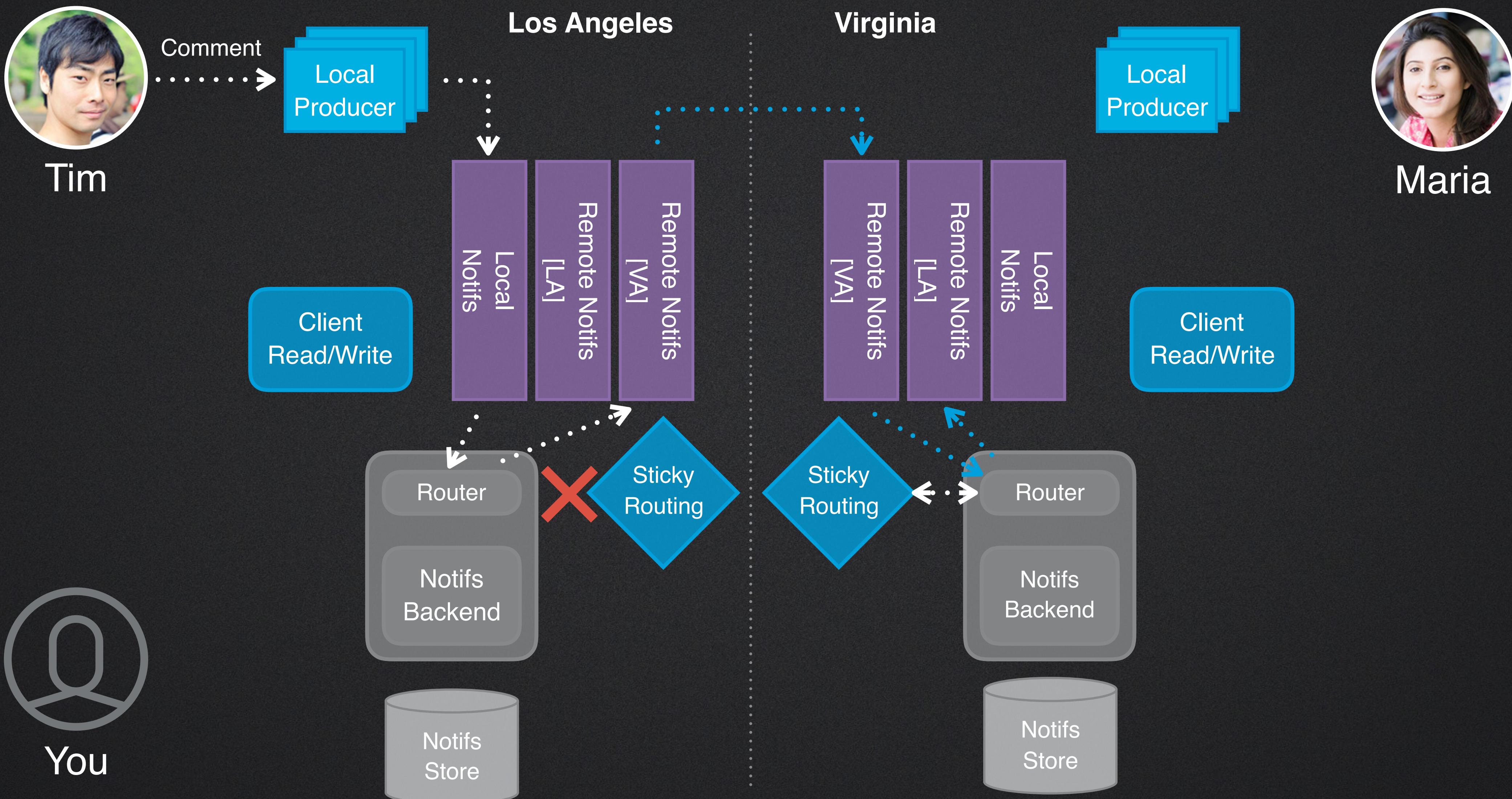
Edge Cases!



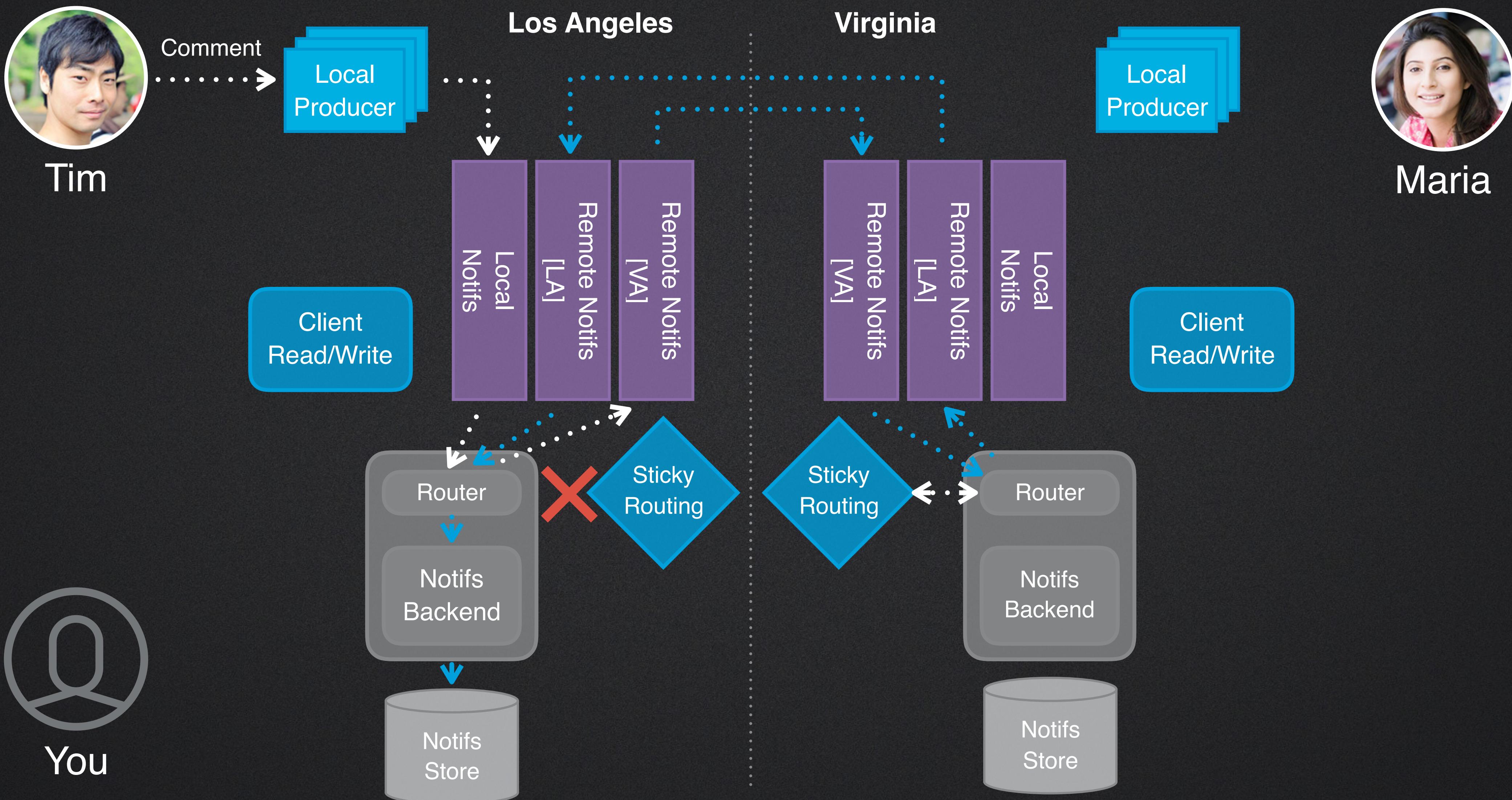
Edge Case 1: Sticky routing is down



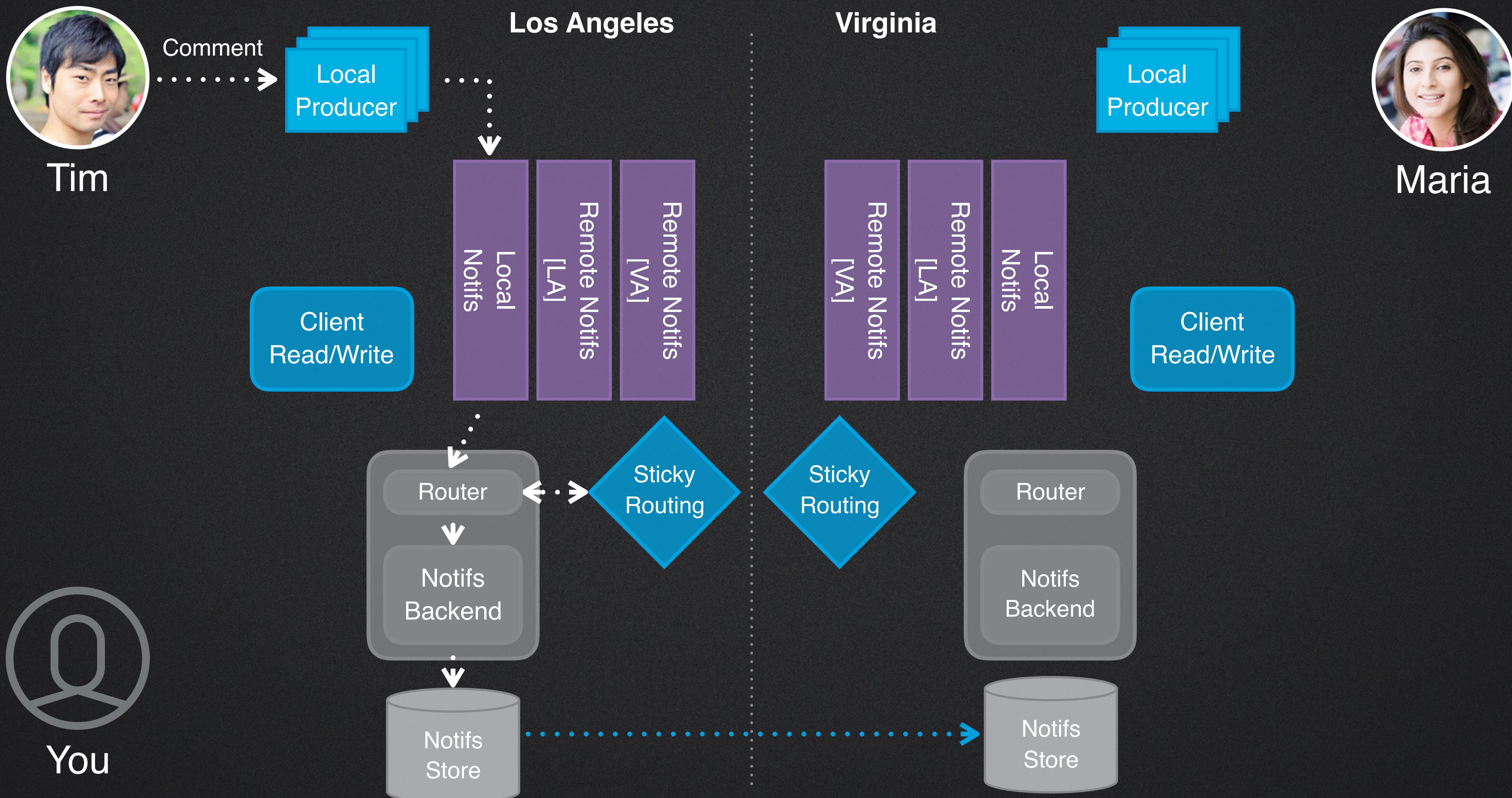
Edge Case 1: Sticky routing is down



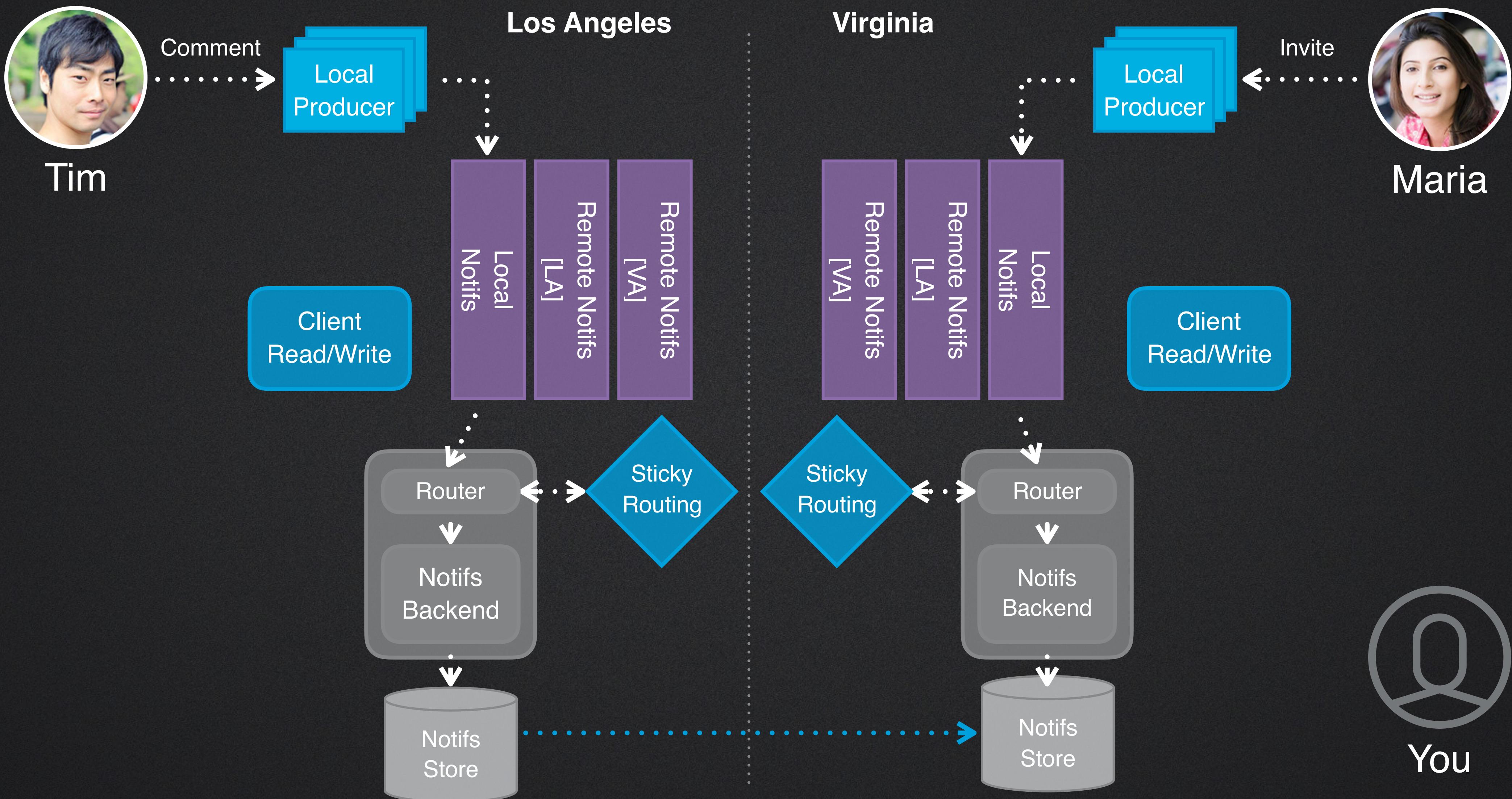
Edge Case 1: Sticky routing is down



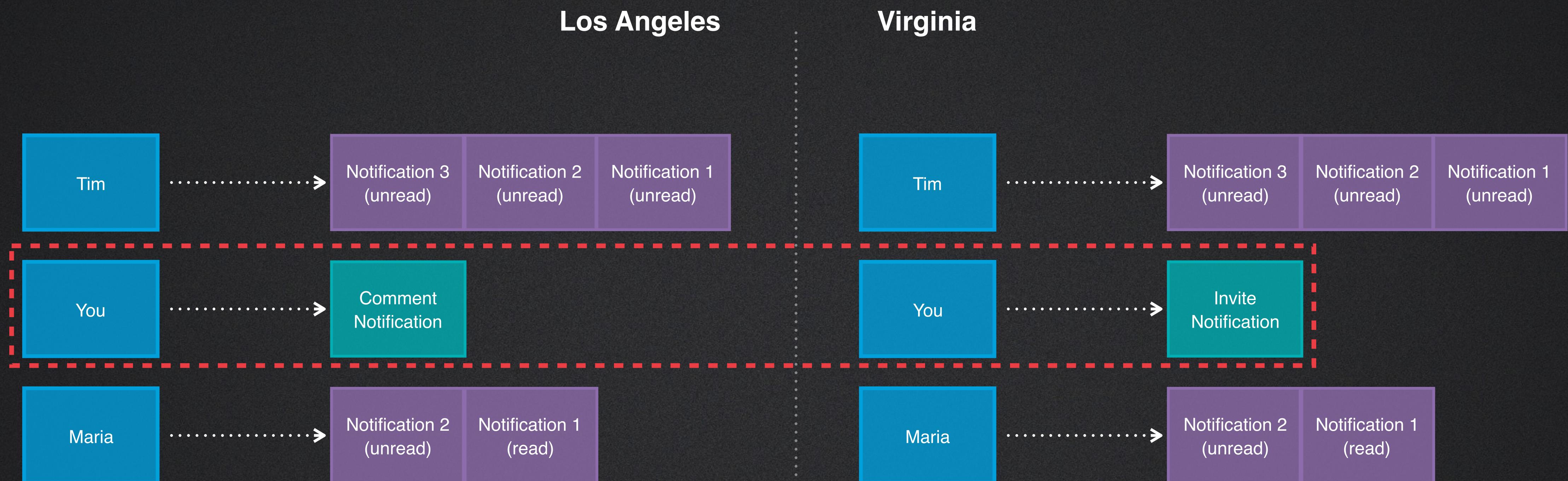
Edge Case 2: Traffic shift race



Edge Case 2: Traffic shift race



Edge Case 2: Traffic shift race



Only Process Once



2

Personal Data



Your data
is *your* data.

Complication #1

Some of our personal
databases are very large

95

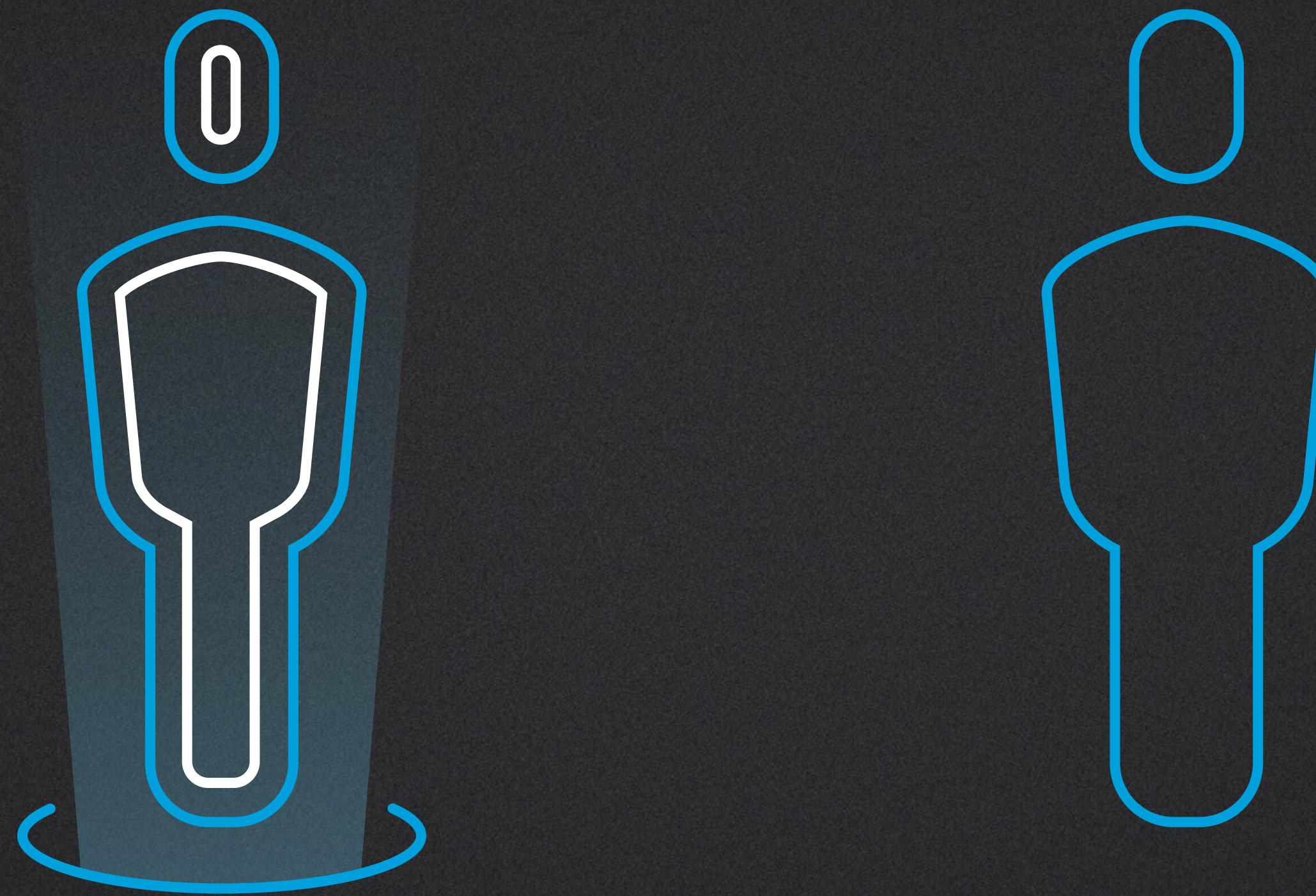
TeraBytes

Complication #2

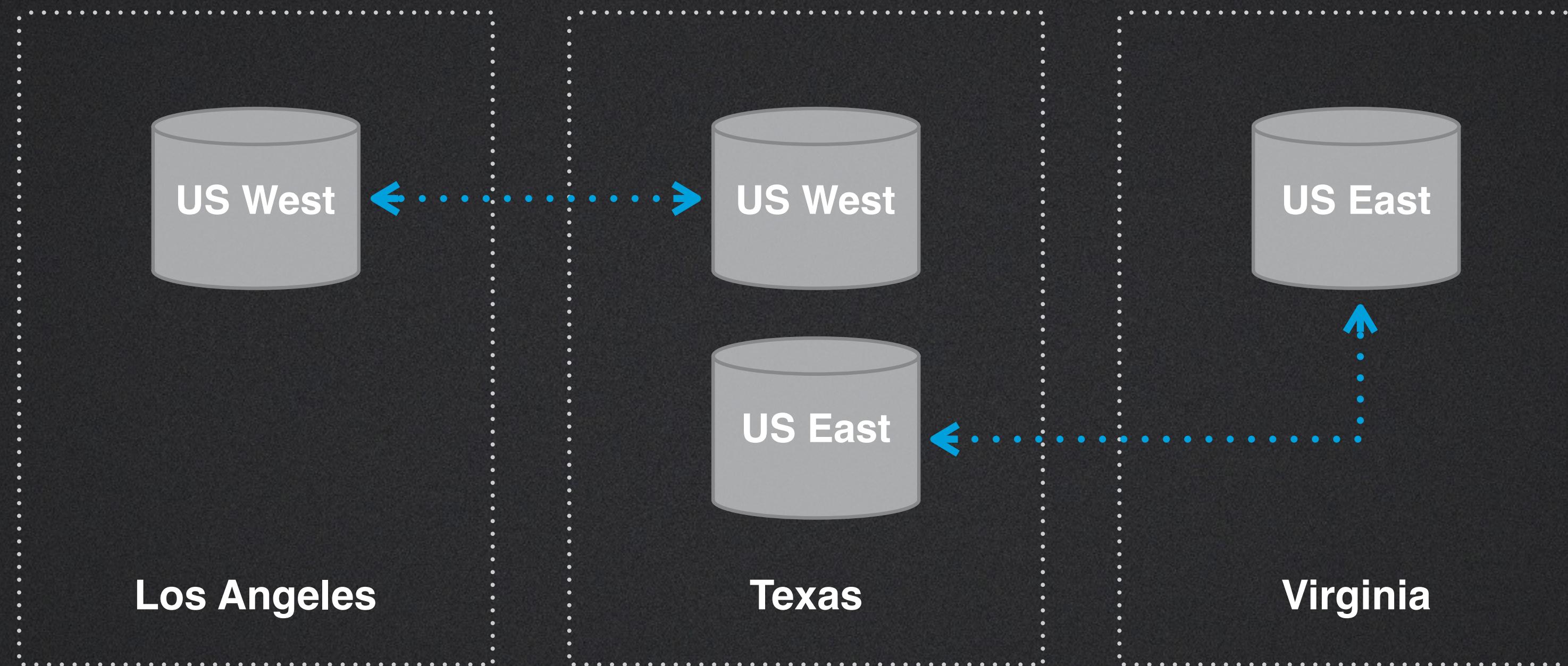
It's illegal to replicate
personal data outside of
some countries



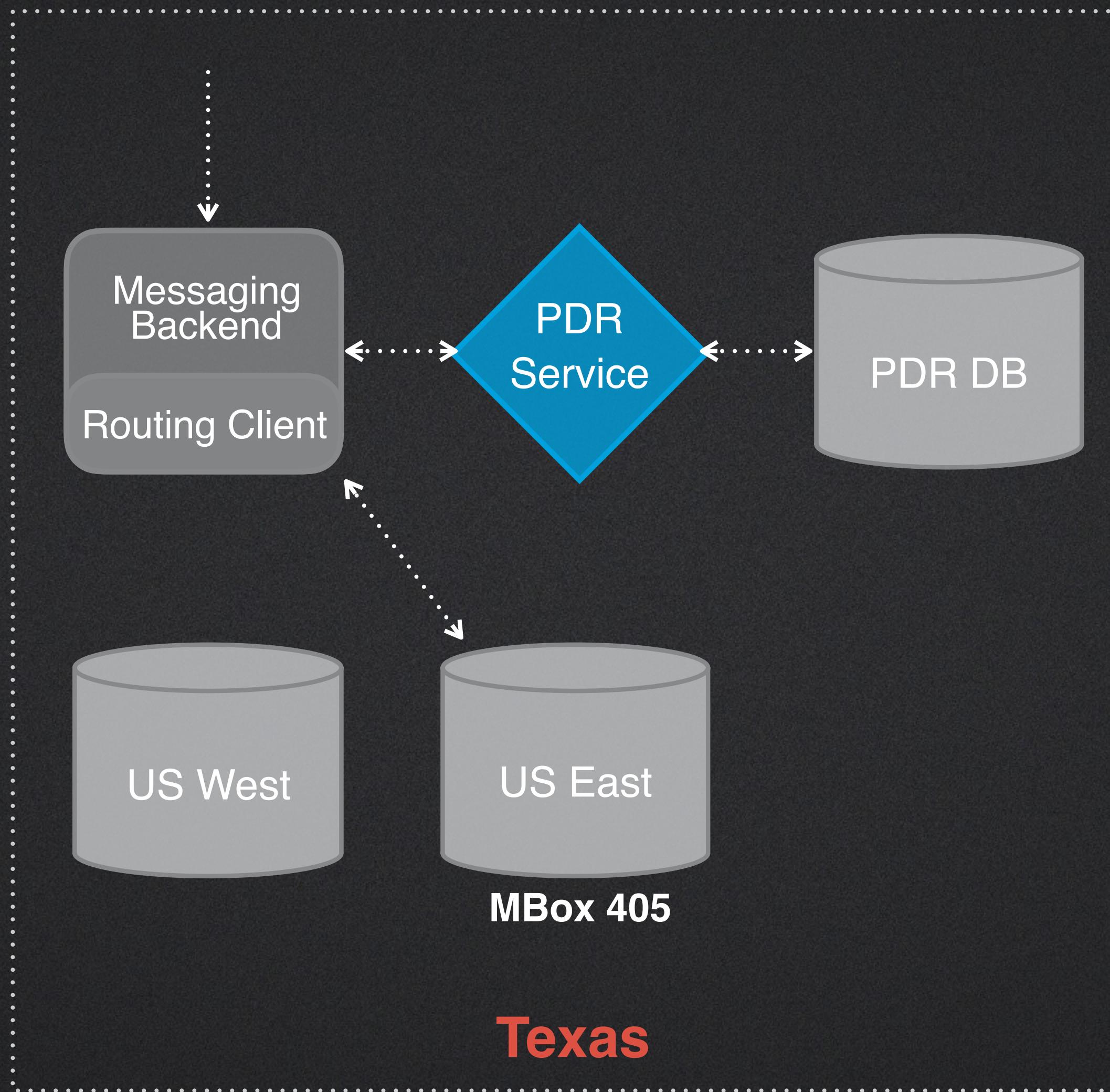
You only need two copies of Personal Data



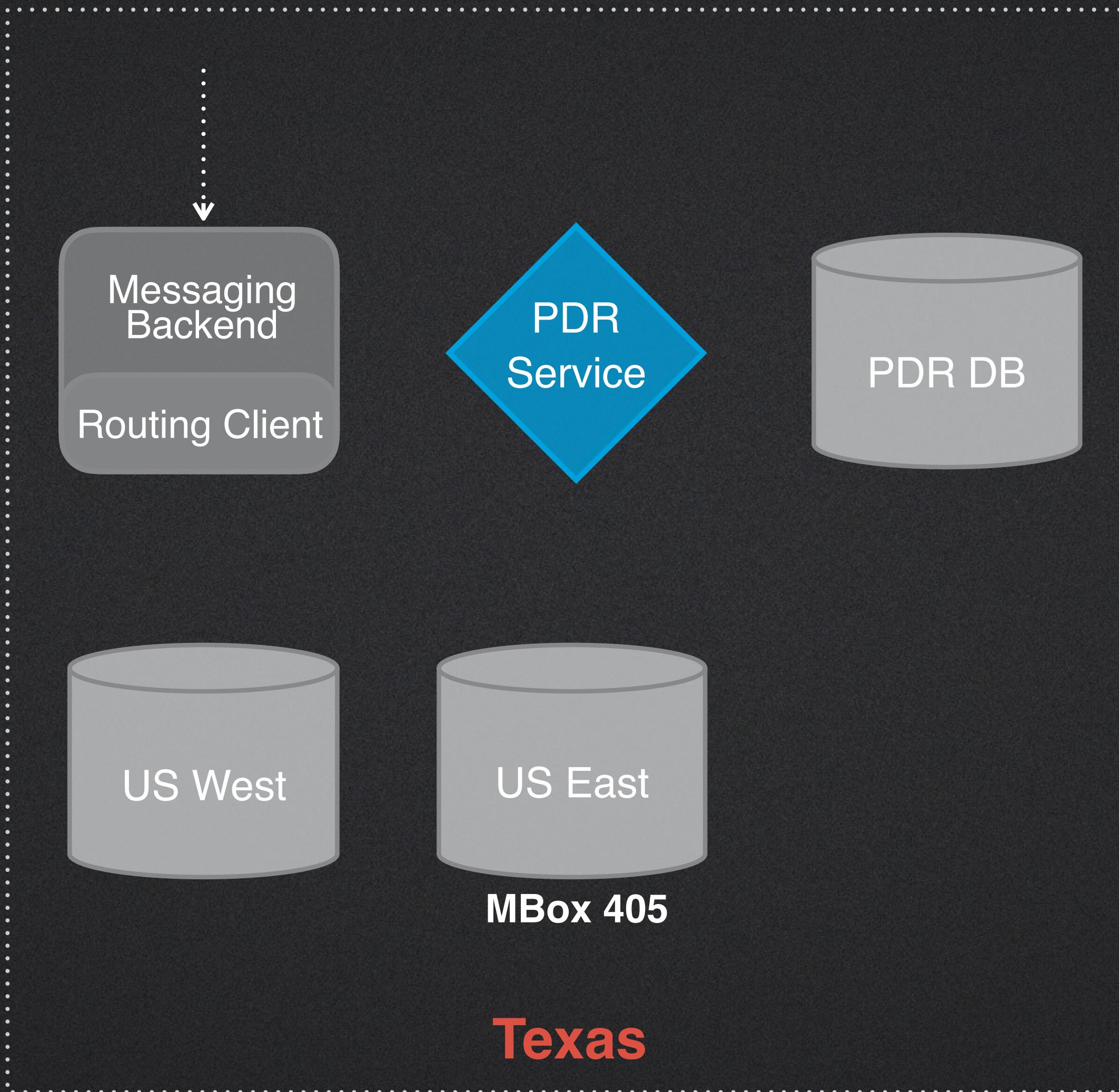
Solution: Two Clusters



Solution: Personal Data Routing

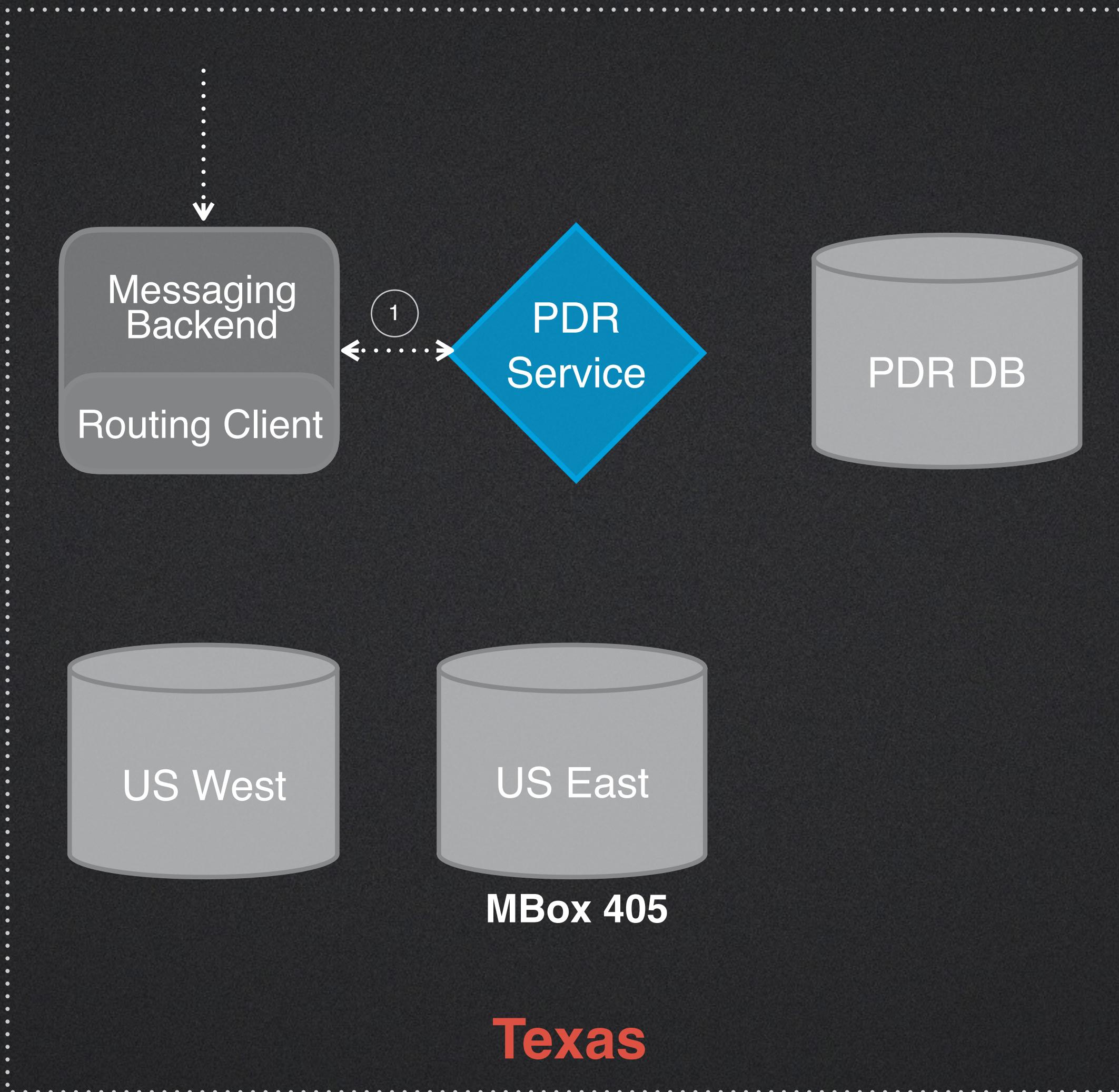


How PDR works



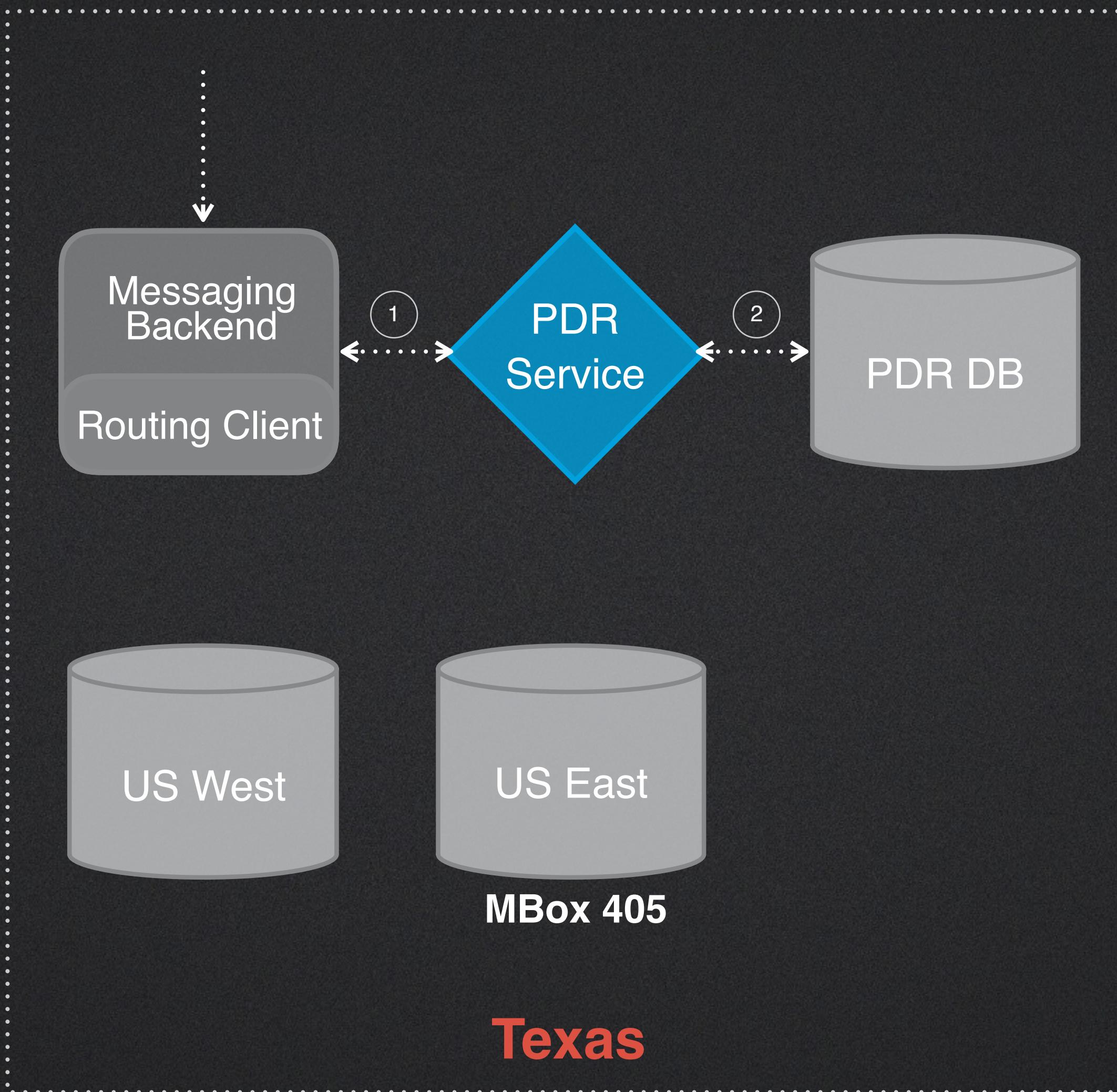
/MESSAGING/MailboxDB/Mailbox/m-405

How PDR works



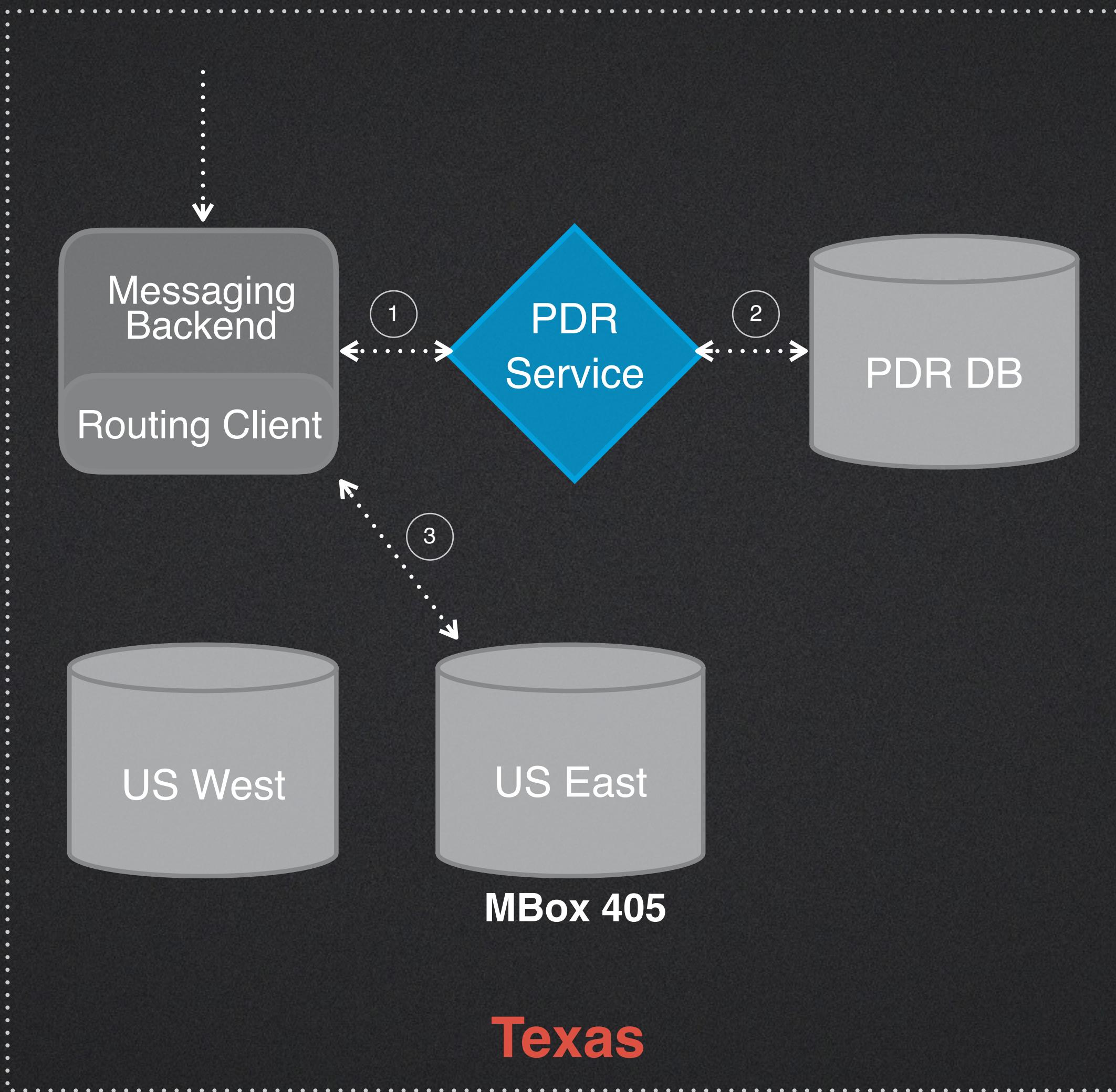
/MESSAGING/MailboxDB/Mailbox/m-405

How PDR works



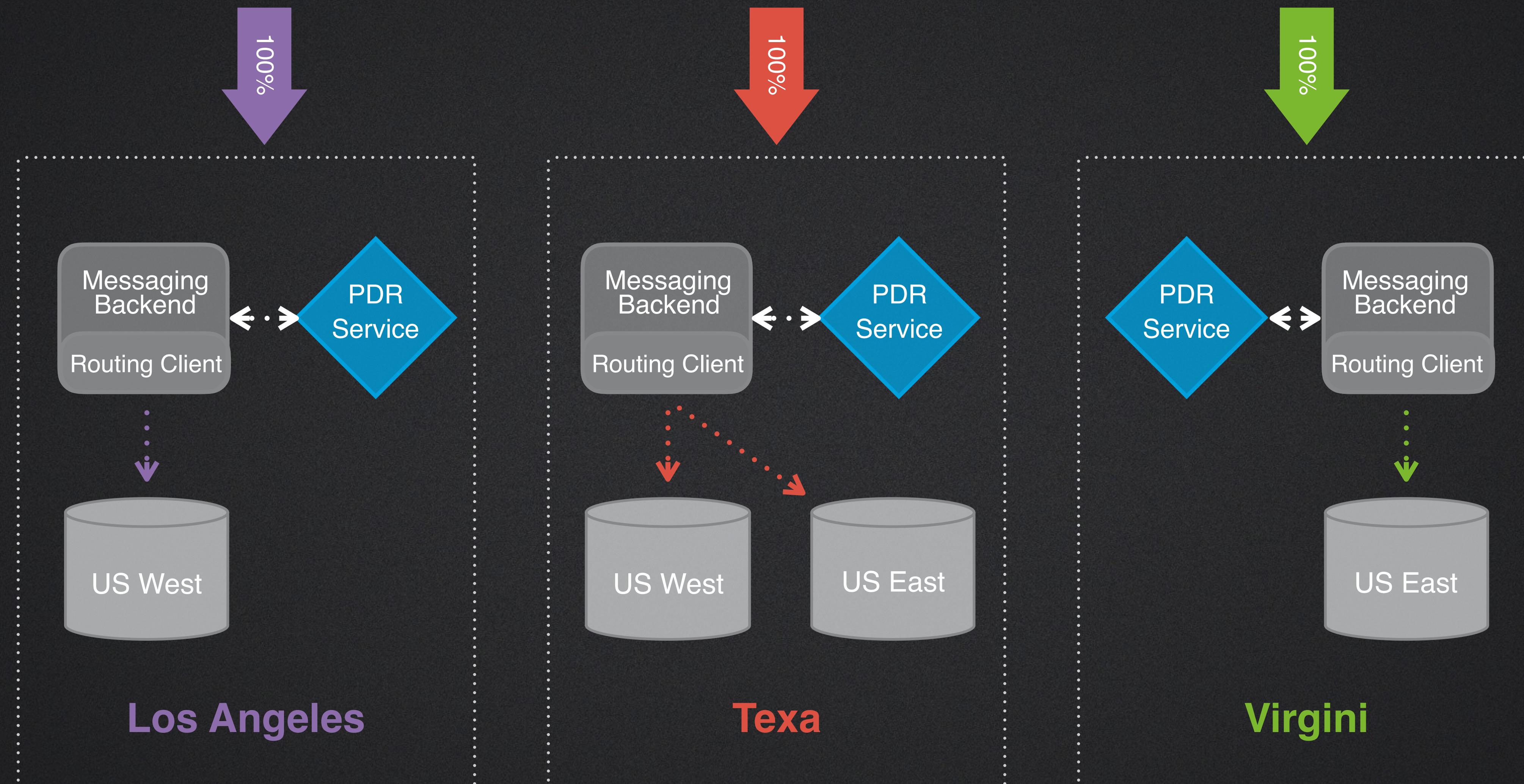
/MESSAGING/MailboxDB/Mailbox/m-405

How PDR works

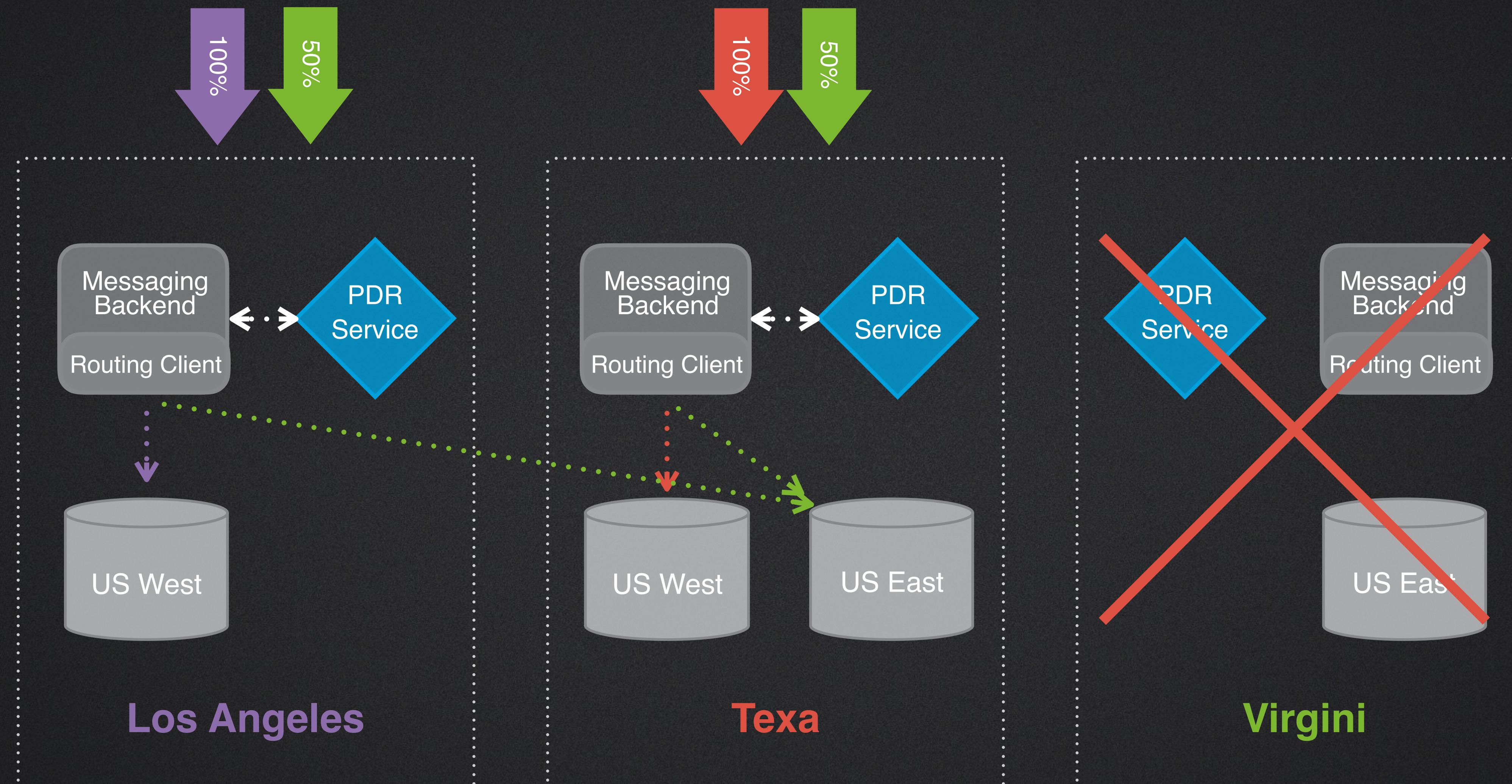


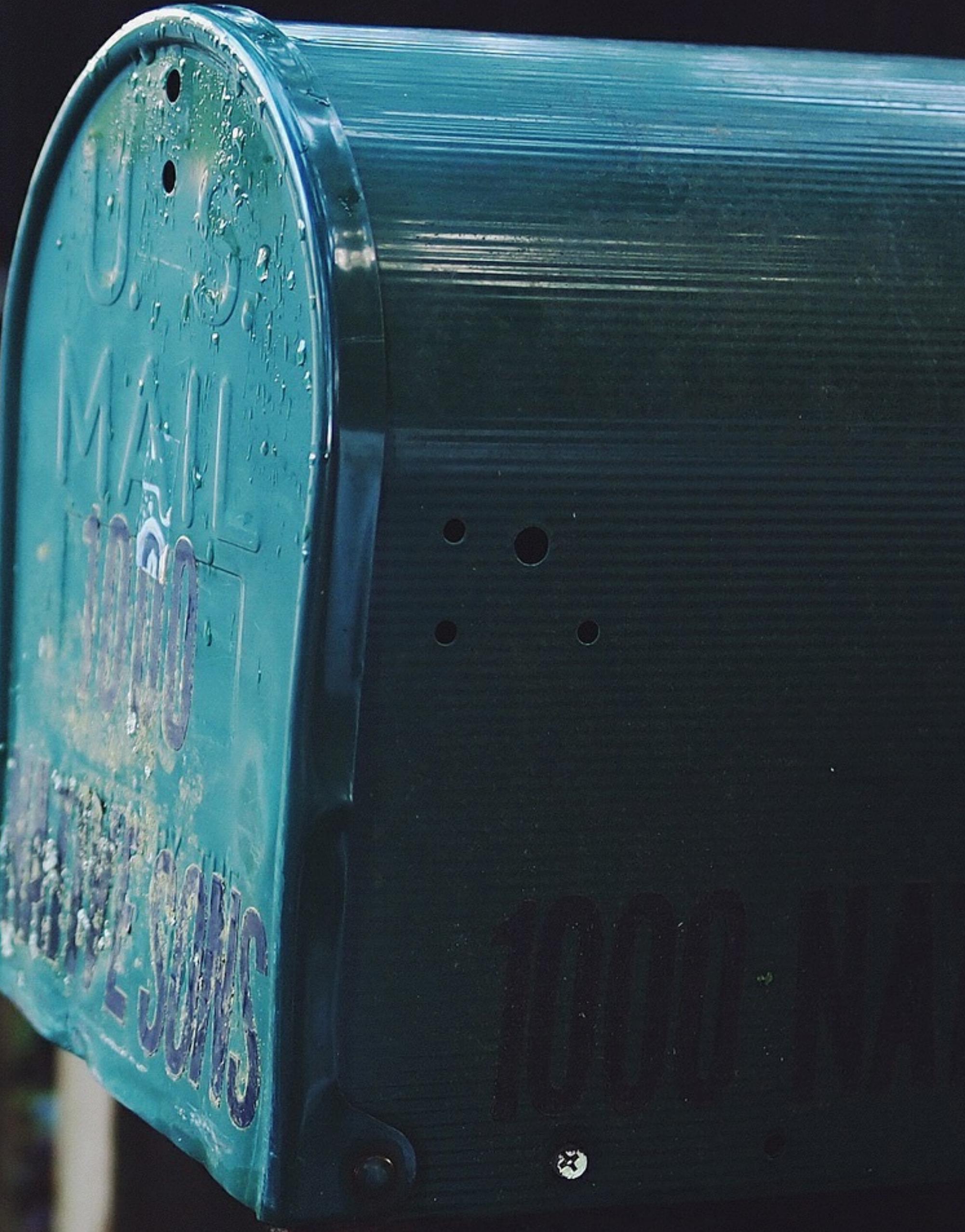
/MESSAGING-US_EAST/MailboxDB/Mailbox/m-405

What happens when we shift traffic

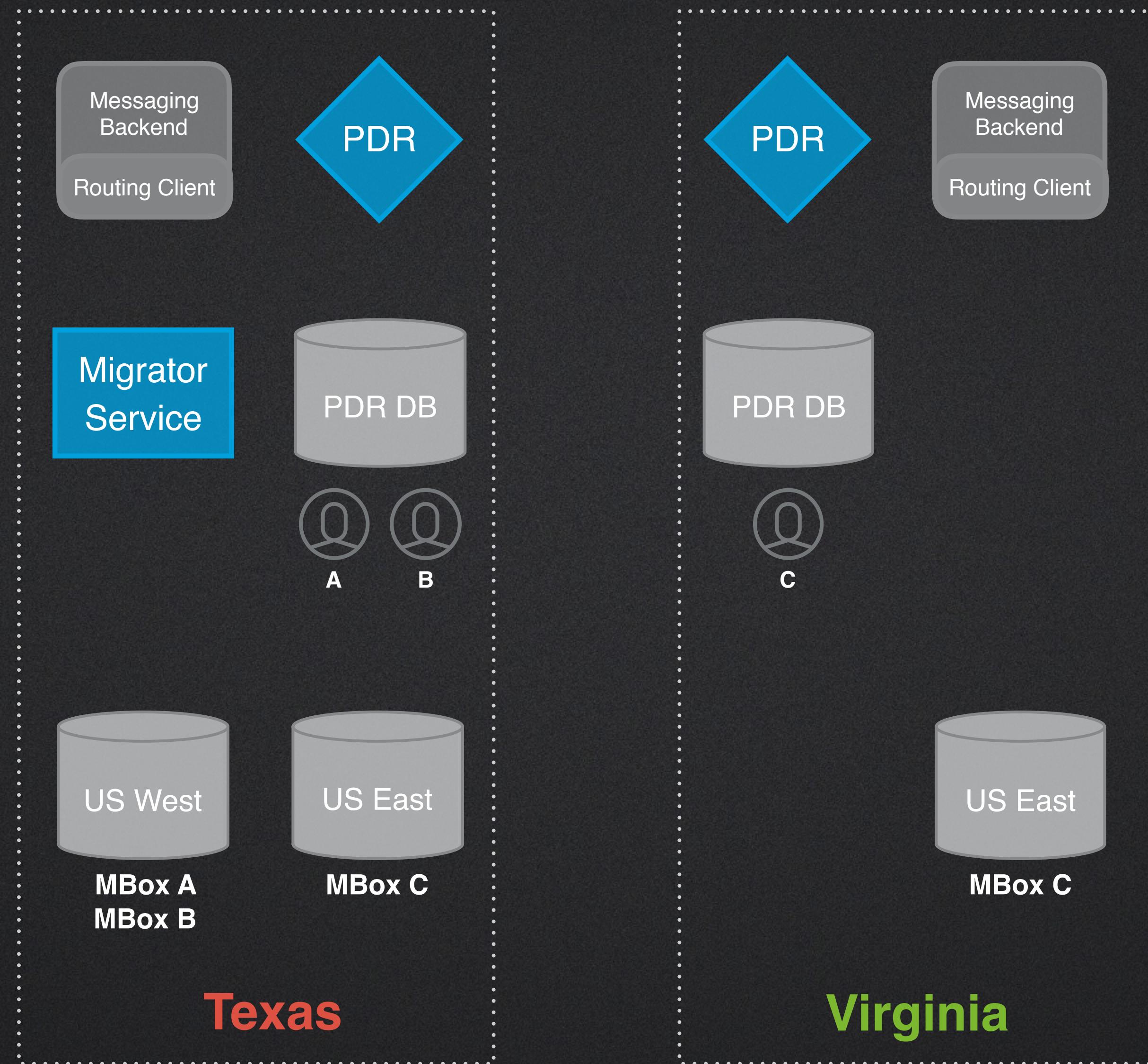


What happens when we shift traffic

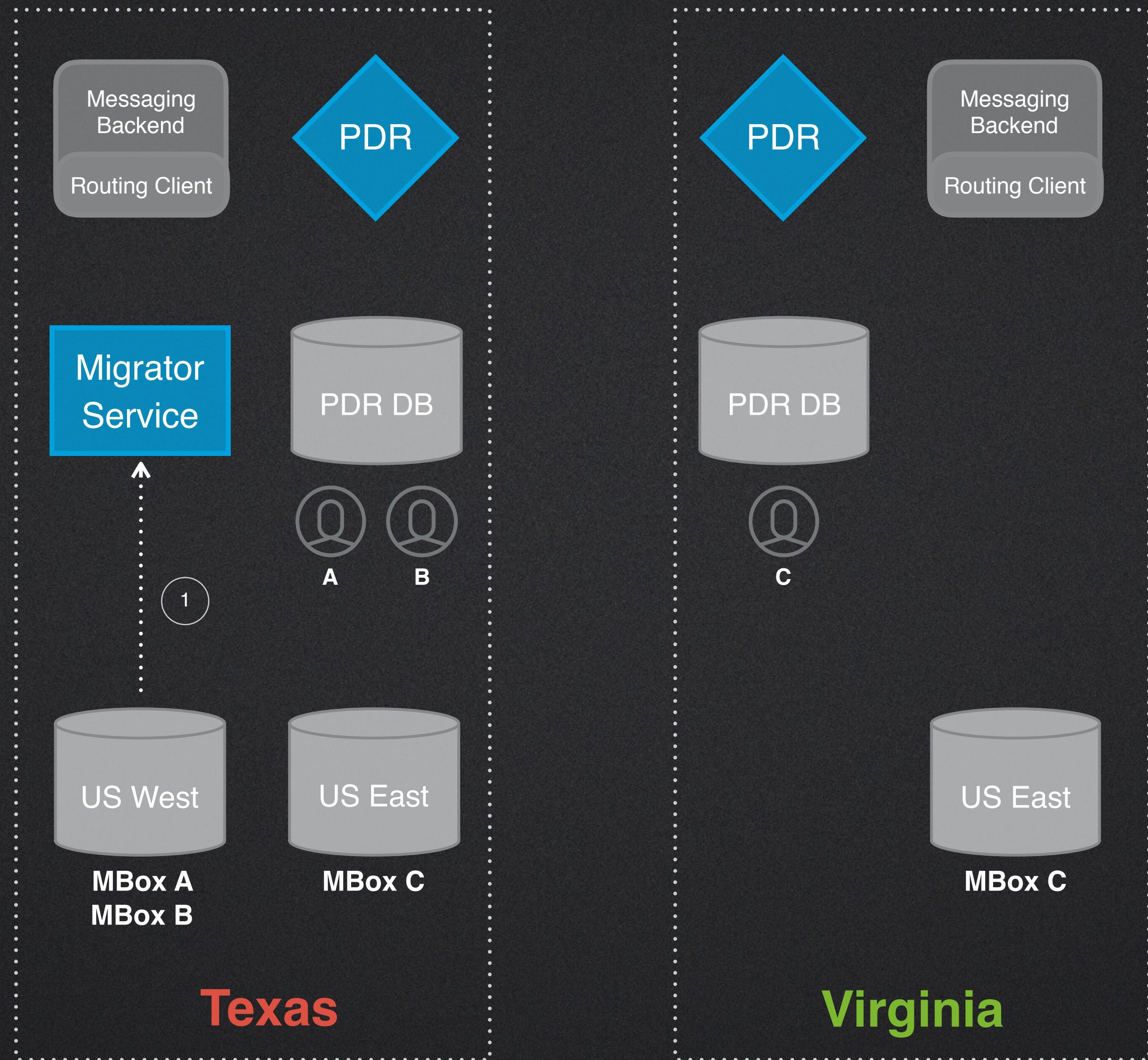




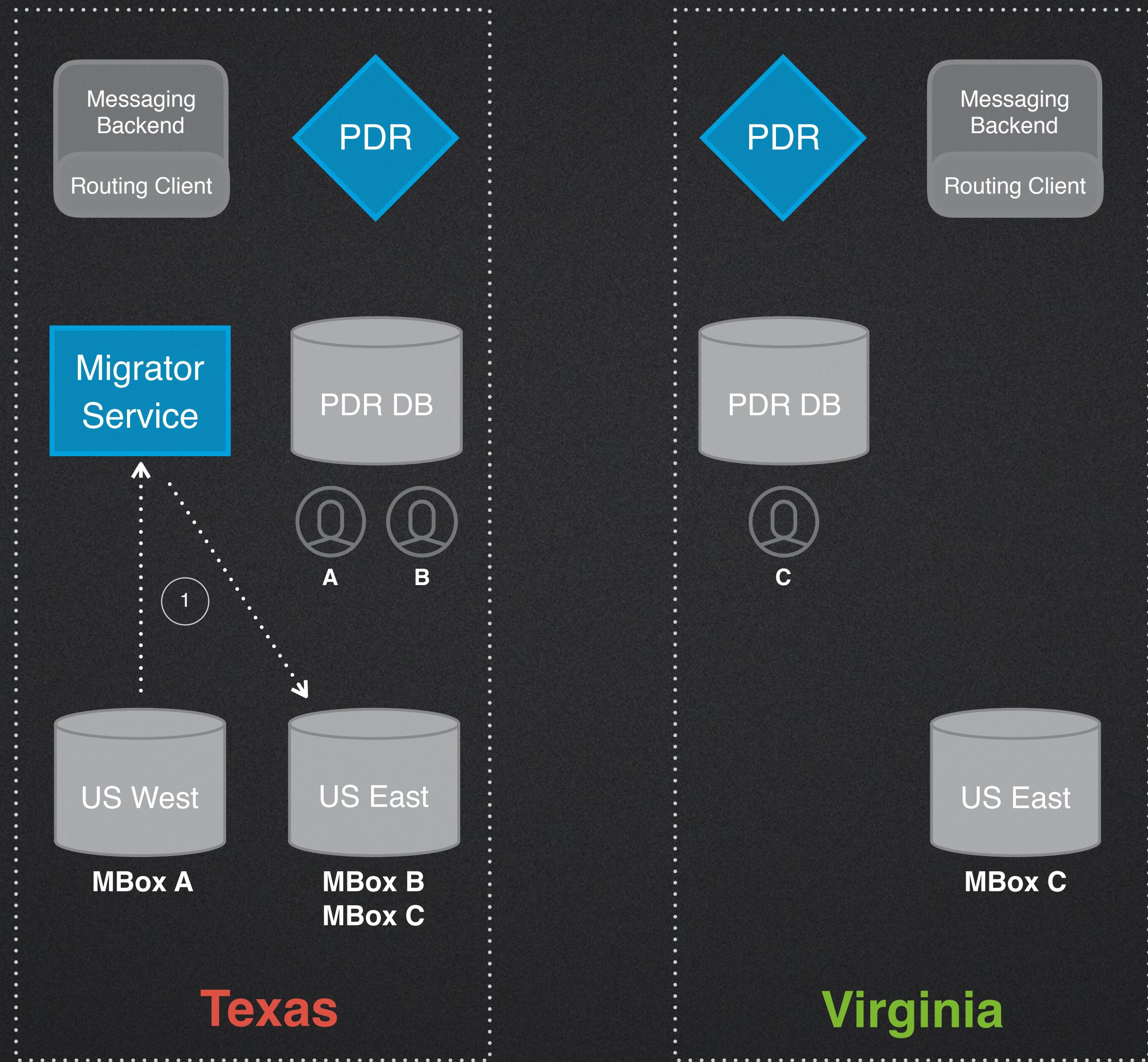
Mailbox Migration



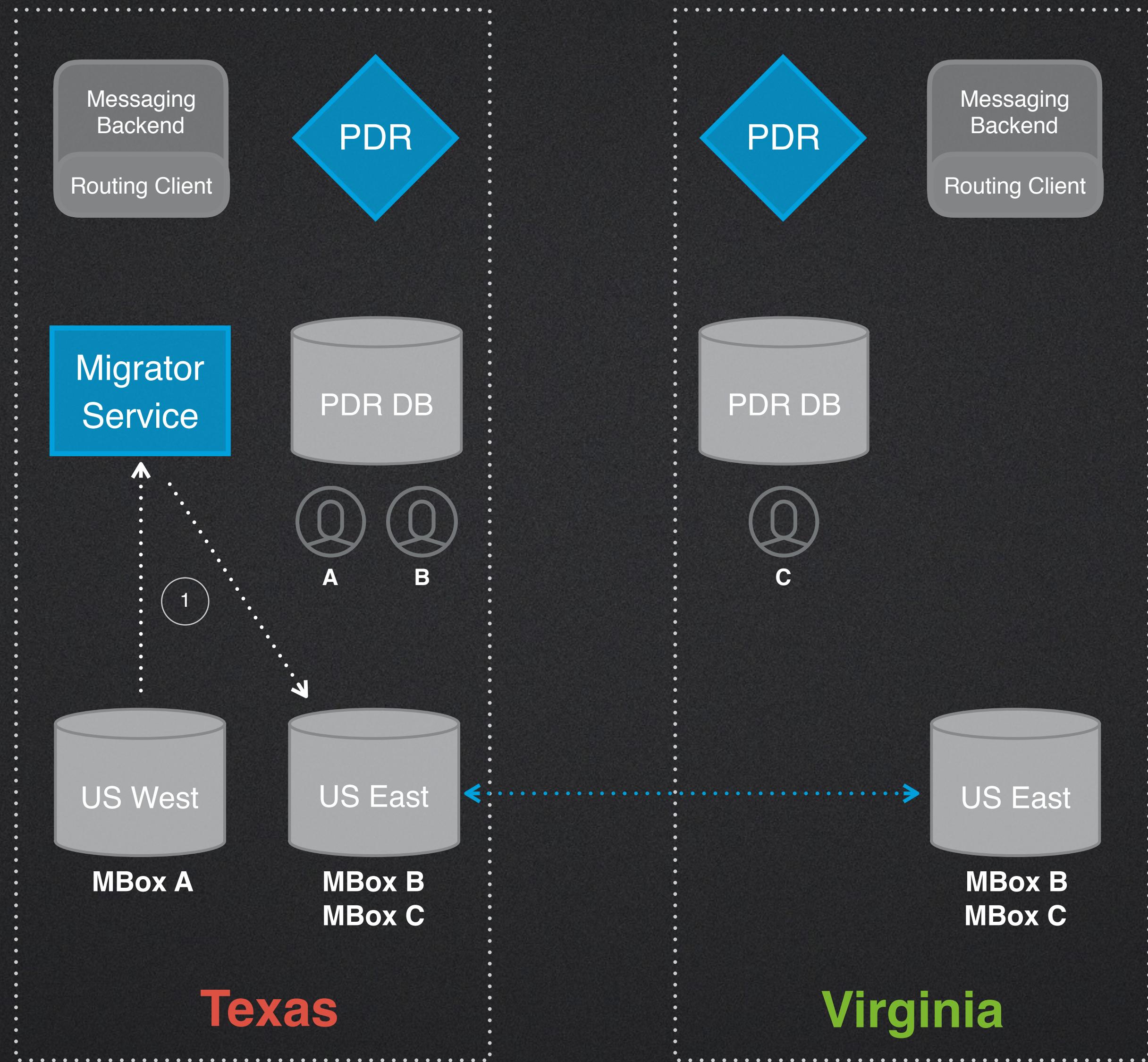
Mailbox Migration



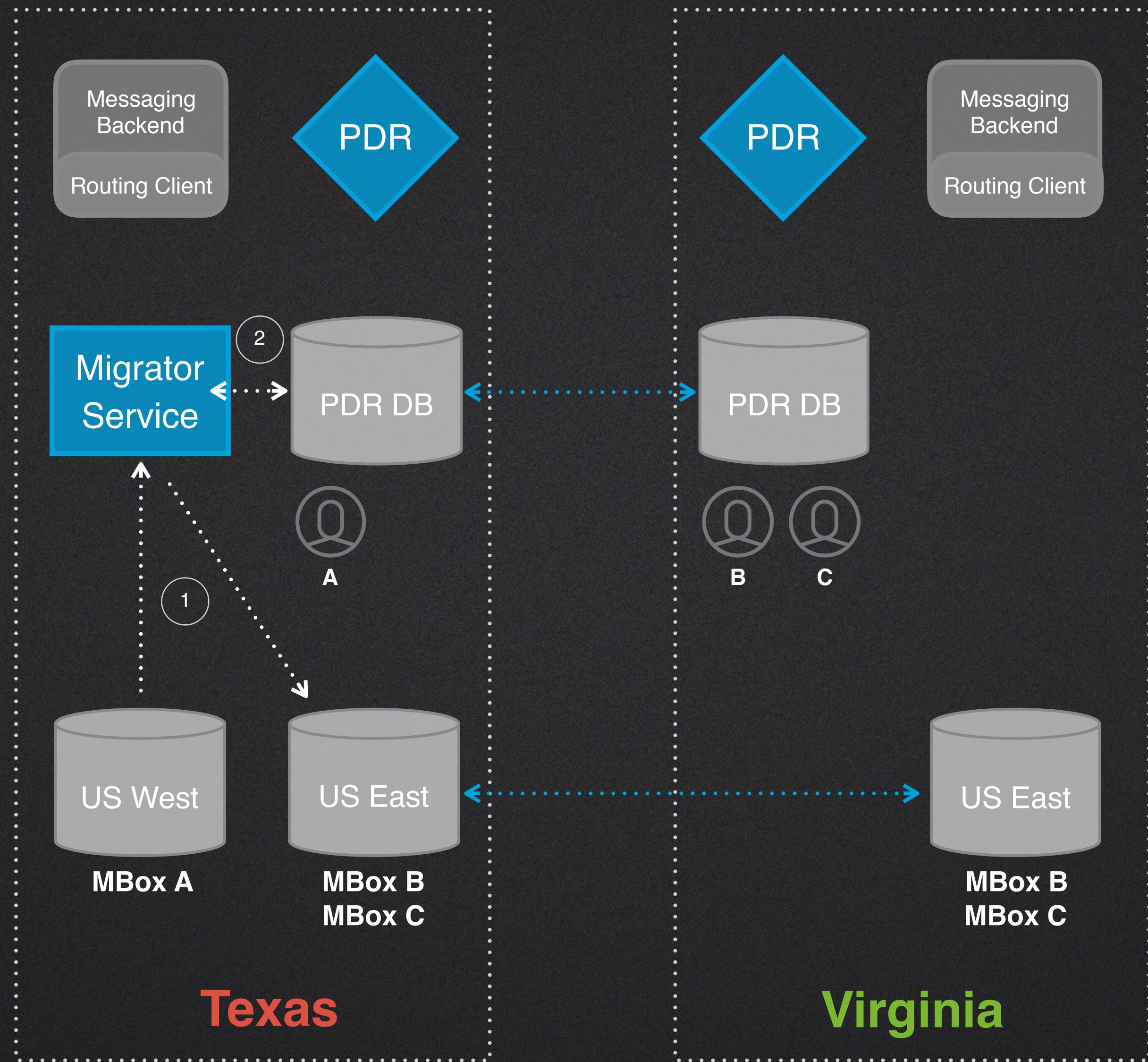
Mailbox Migration



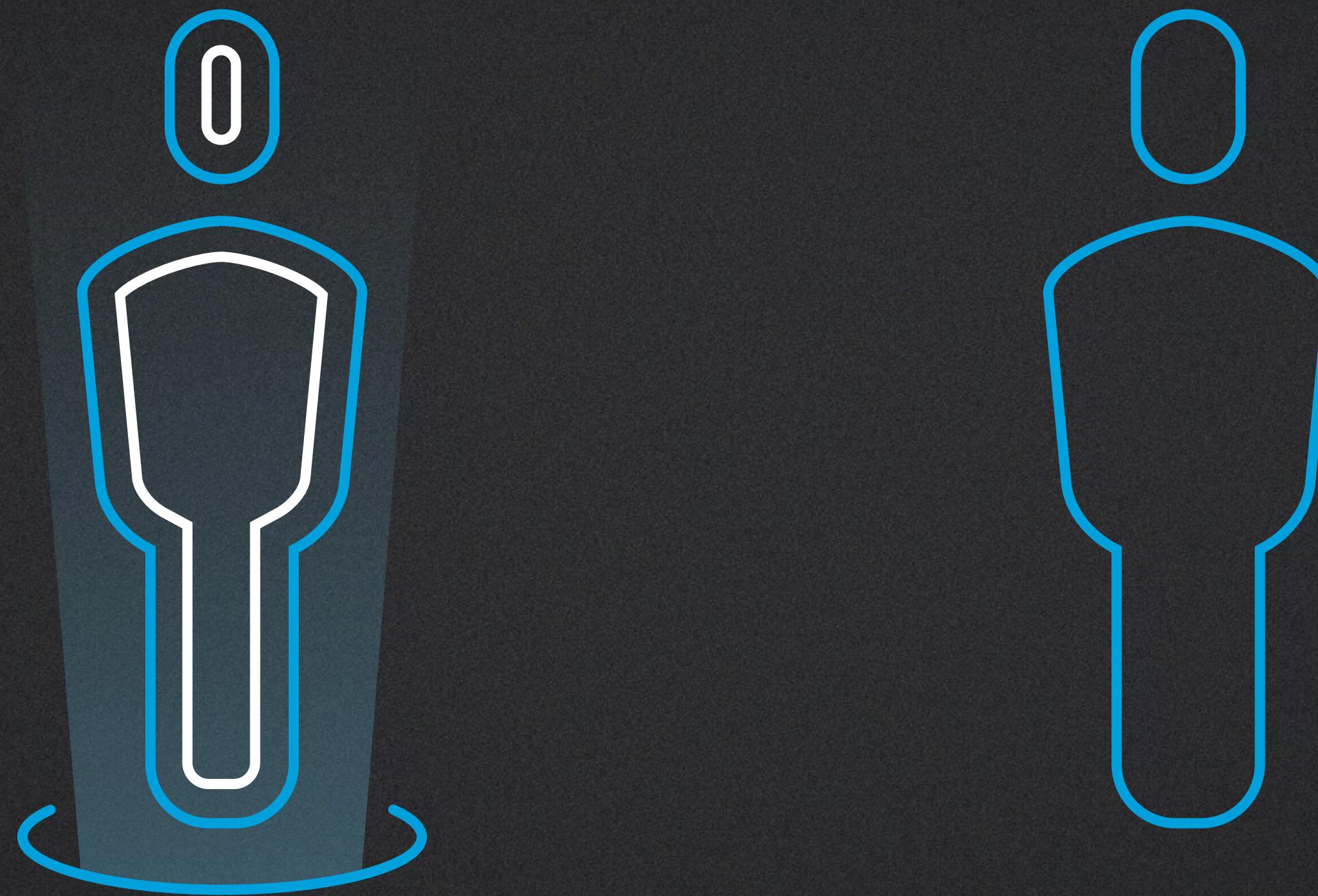
Mailbox Migration



Mailbox Migration



You only need two copies of Personal Data





3

Cache Invalidation & Replication Conflicts

Endorsements



Skills & Endorsements

Top Skills

41 Creative Direction



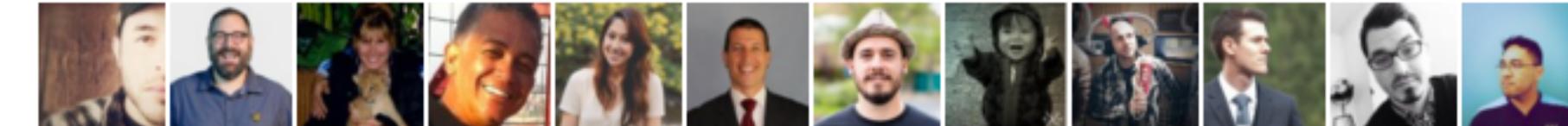
17 Branding & Identity



13 Management



12 Web Design



11 Project Management



10 Corporate Branding



10 Marketing



10 Social Media Marketing



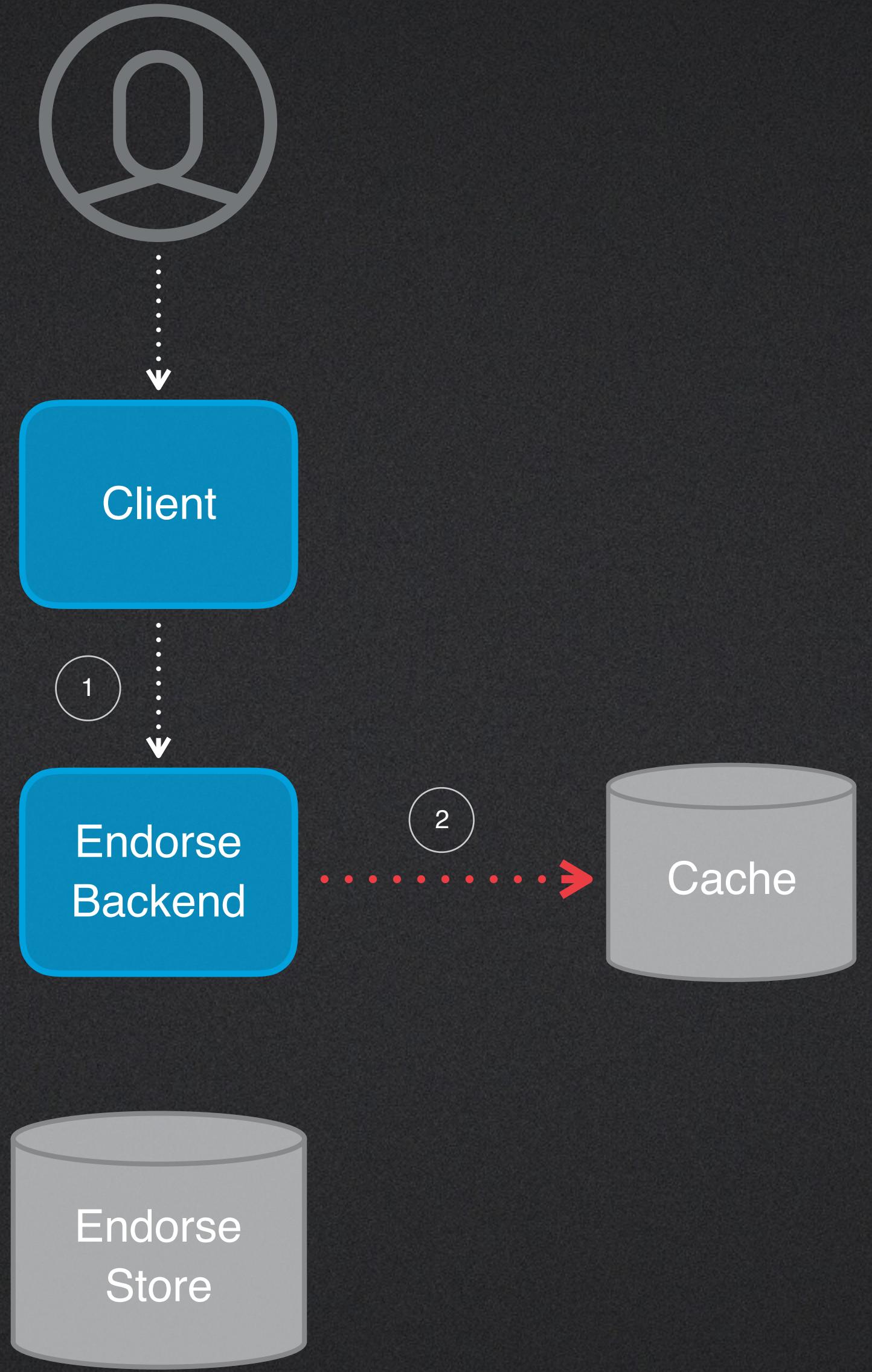
9 Adobe Creative Suite

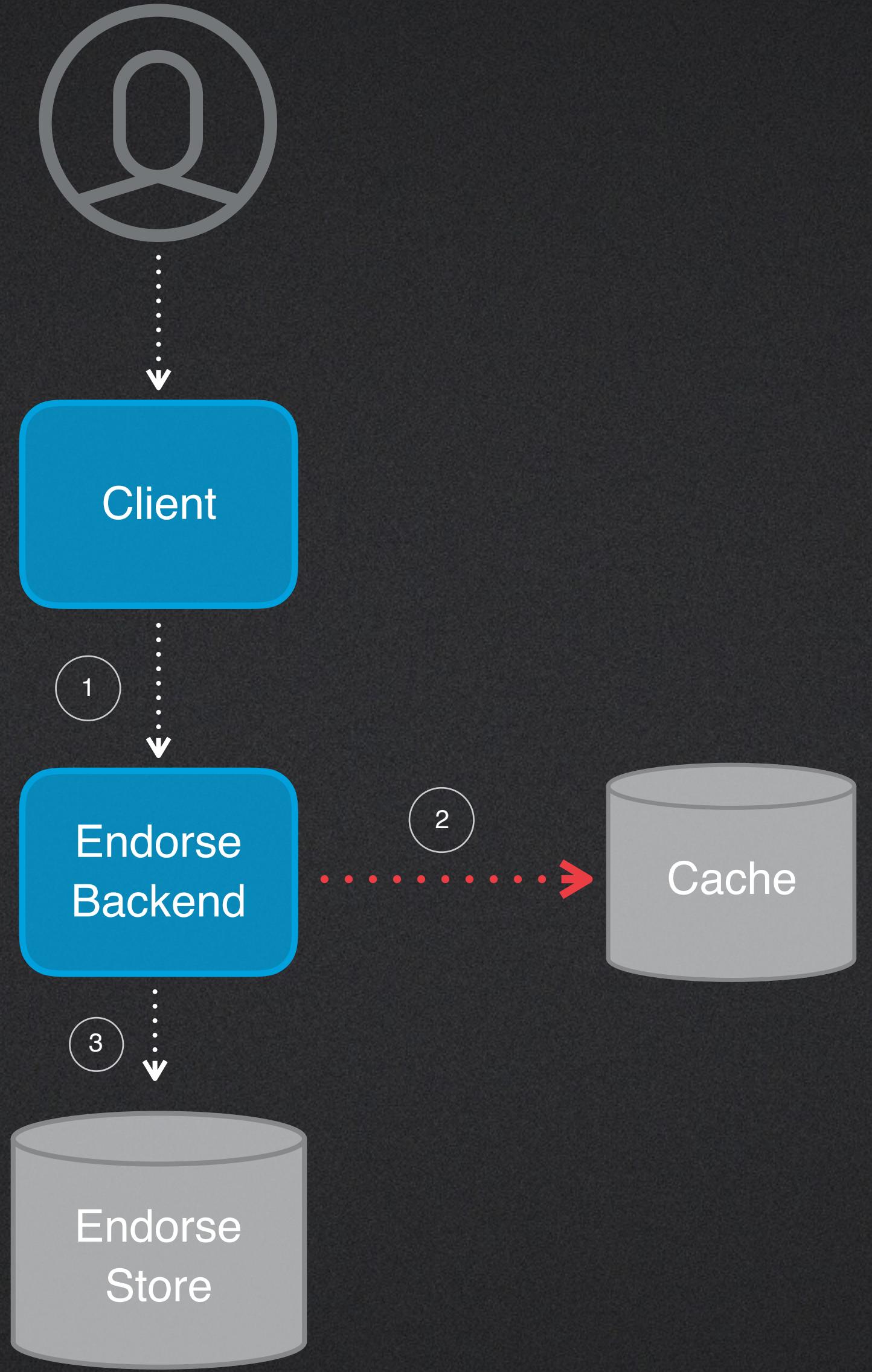


7 Concept Development



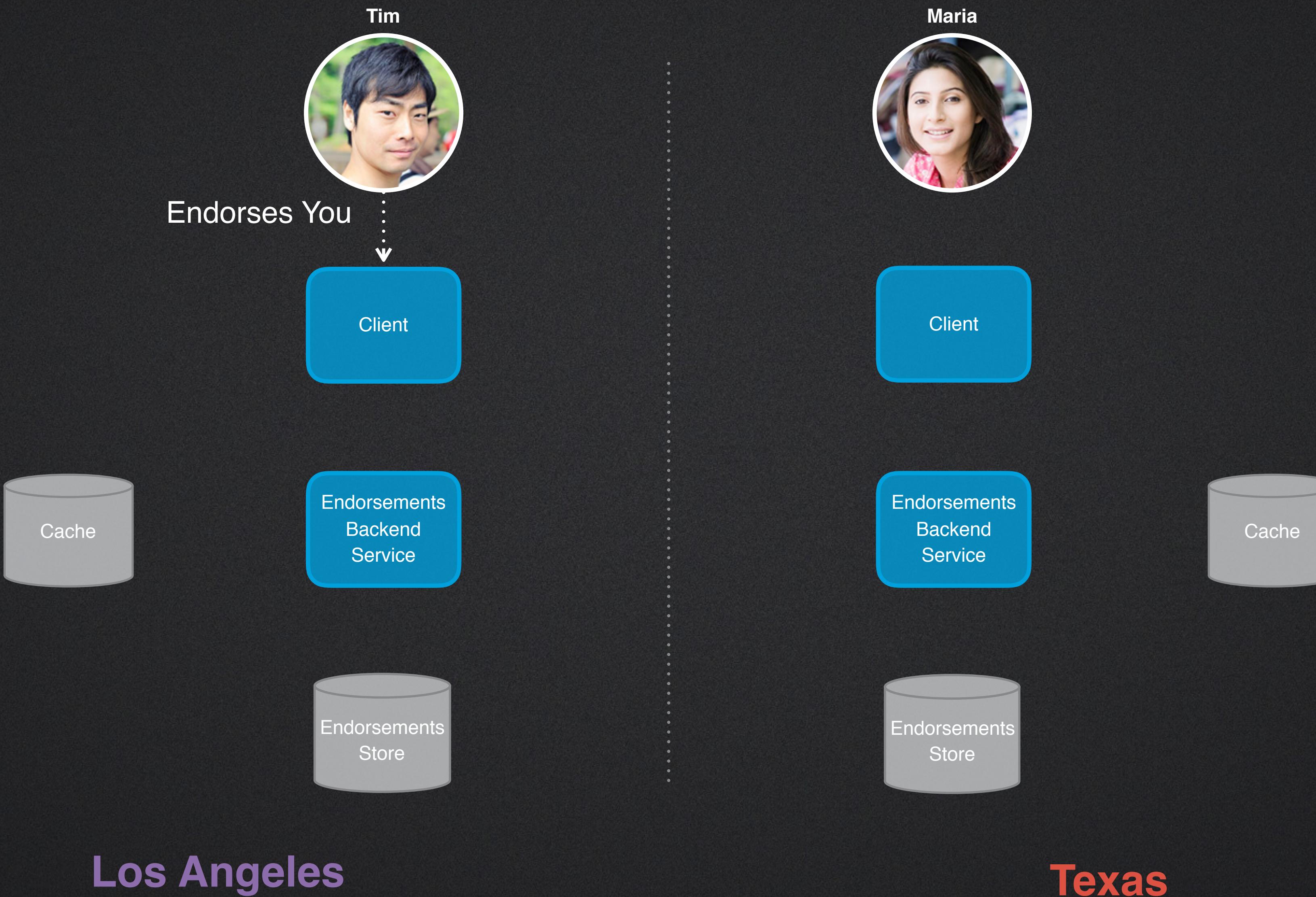
8.6
Billion



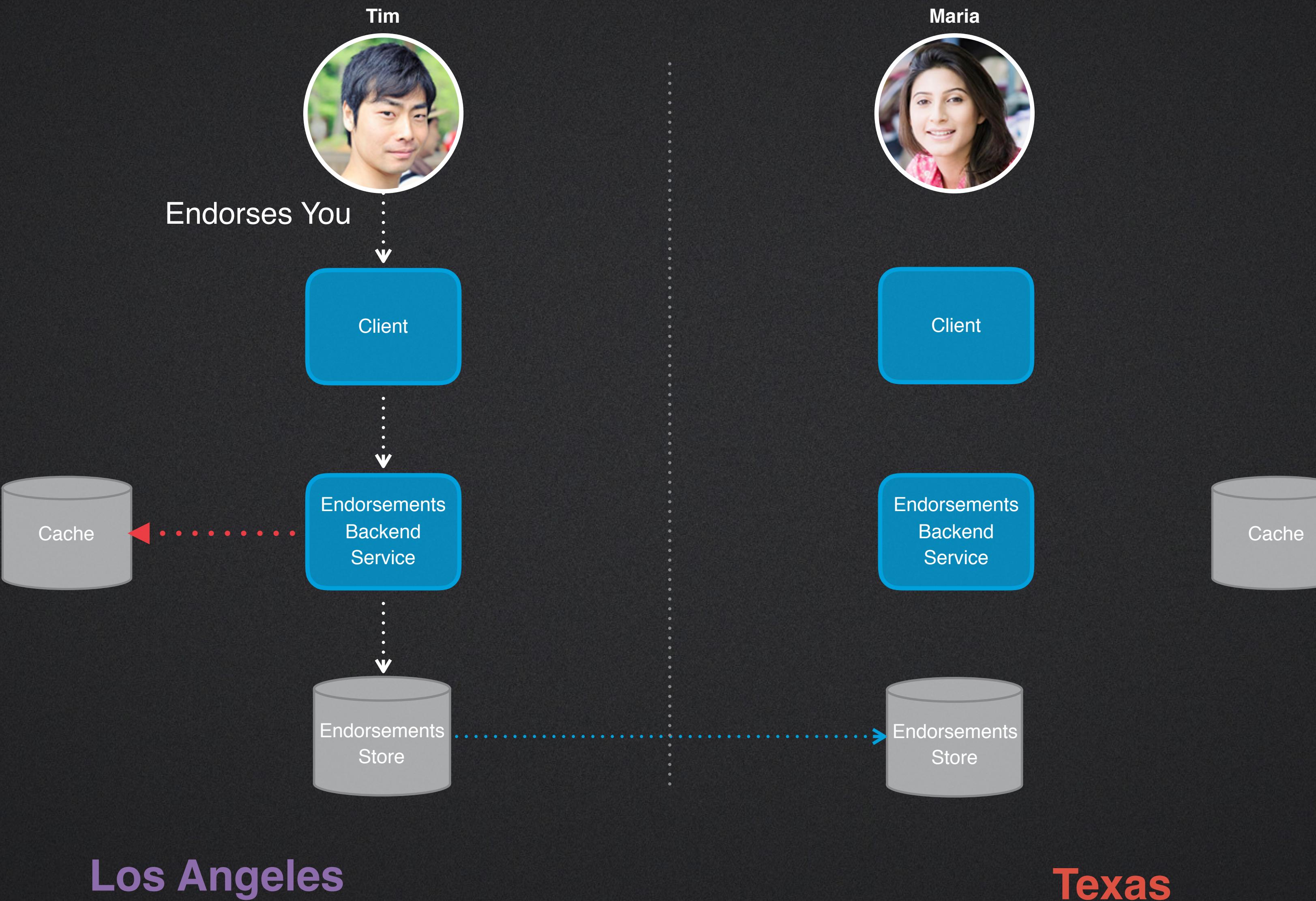


What could go wrong?

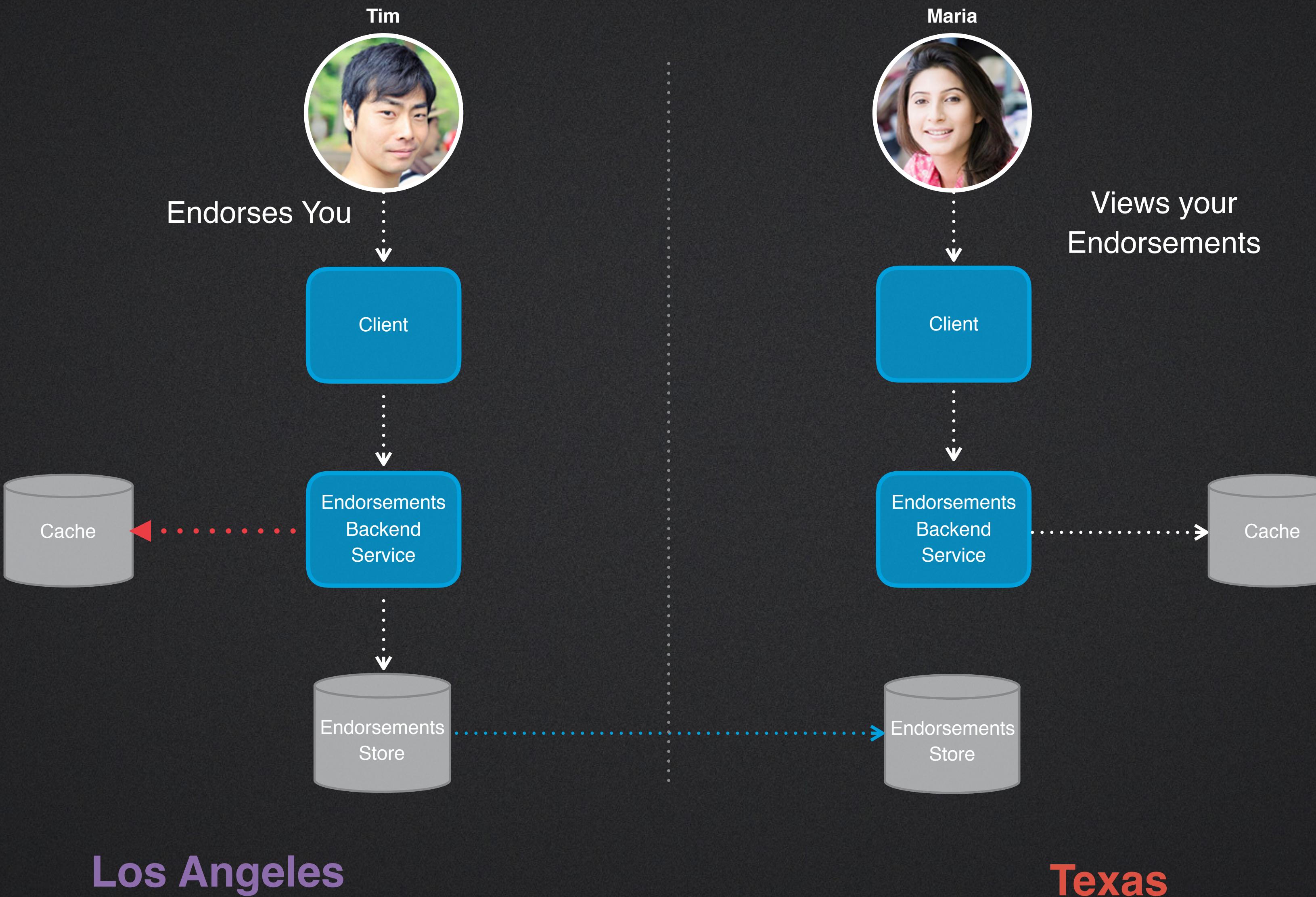
The Problem with Cache Invalidation



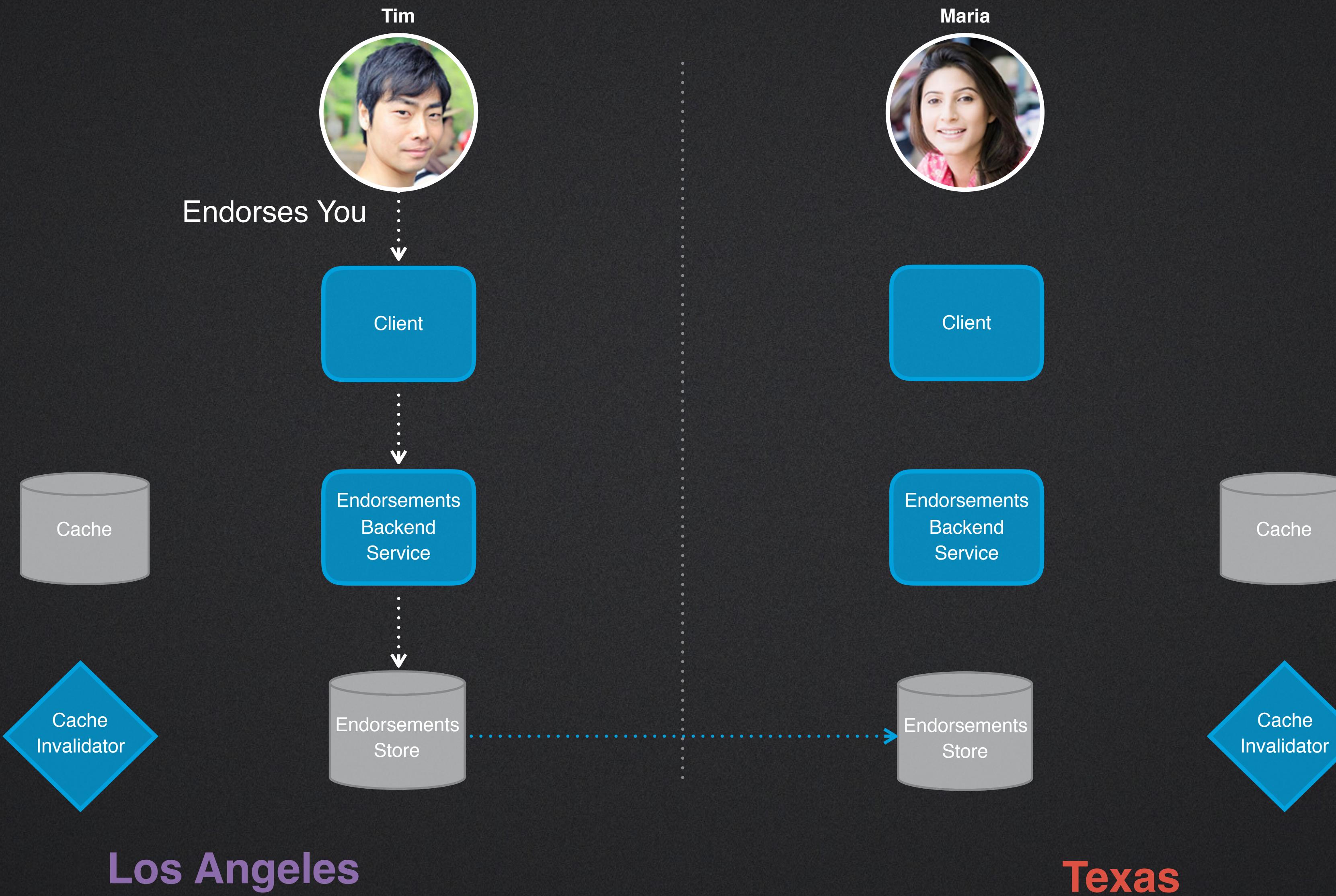
The Problem with Cache Invalidation



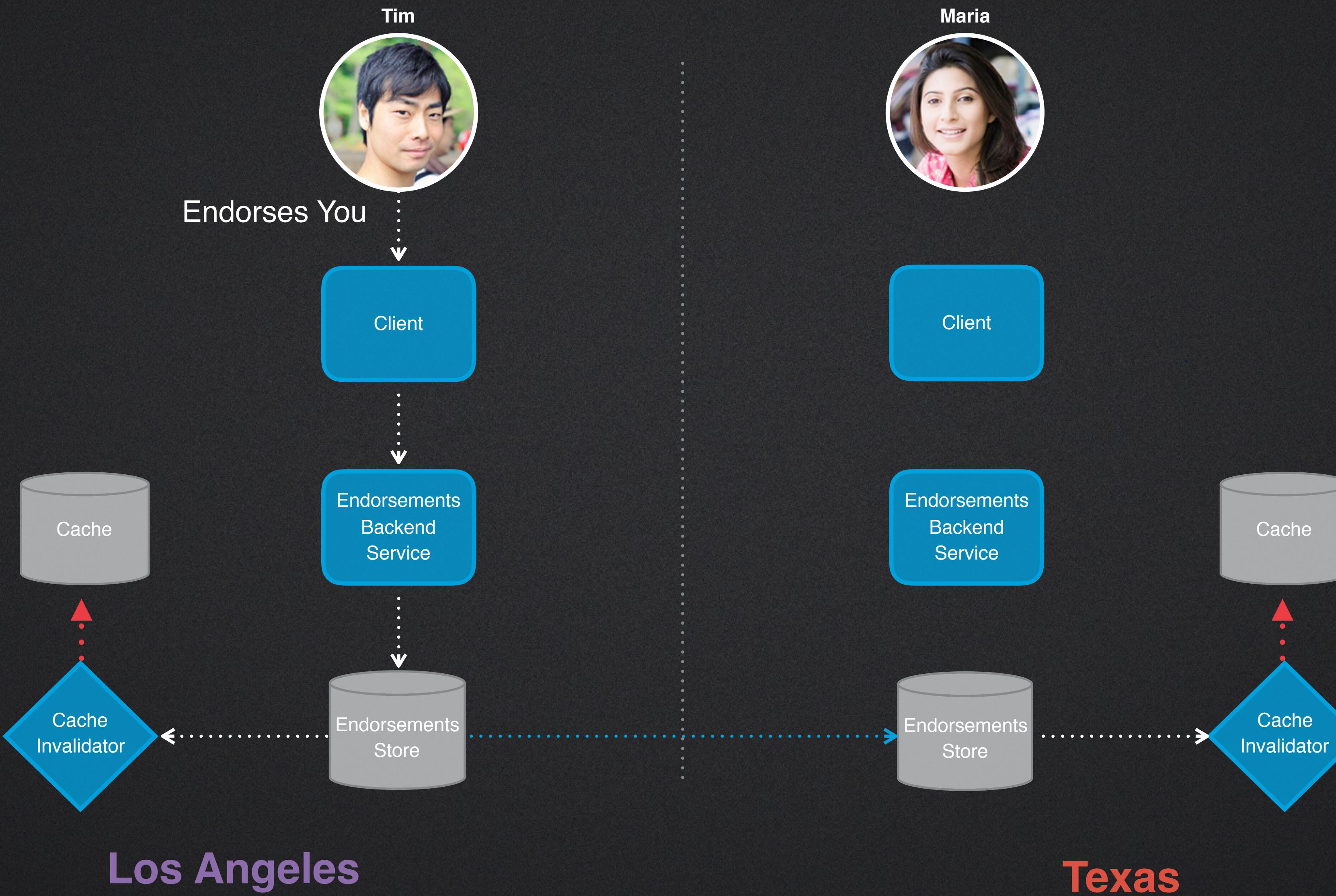
The Problem with Cache Invalidation



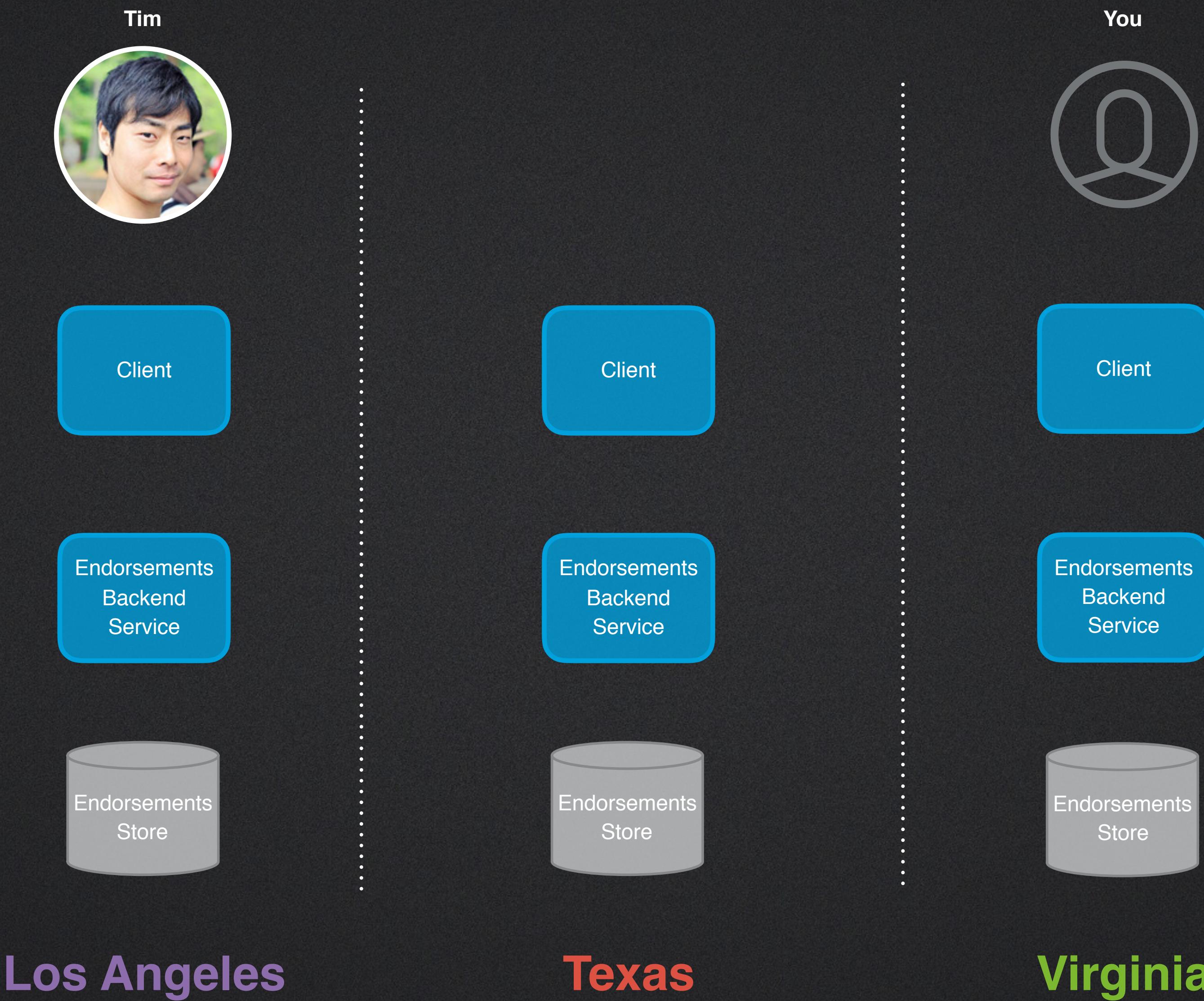
The Solution



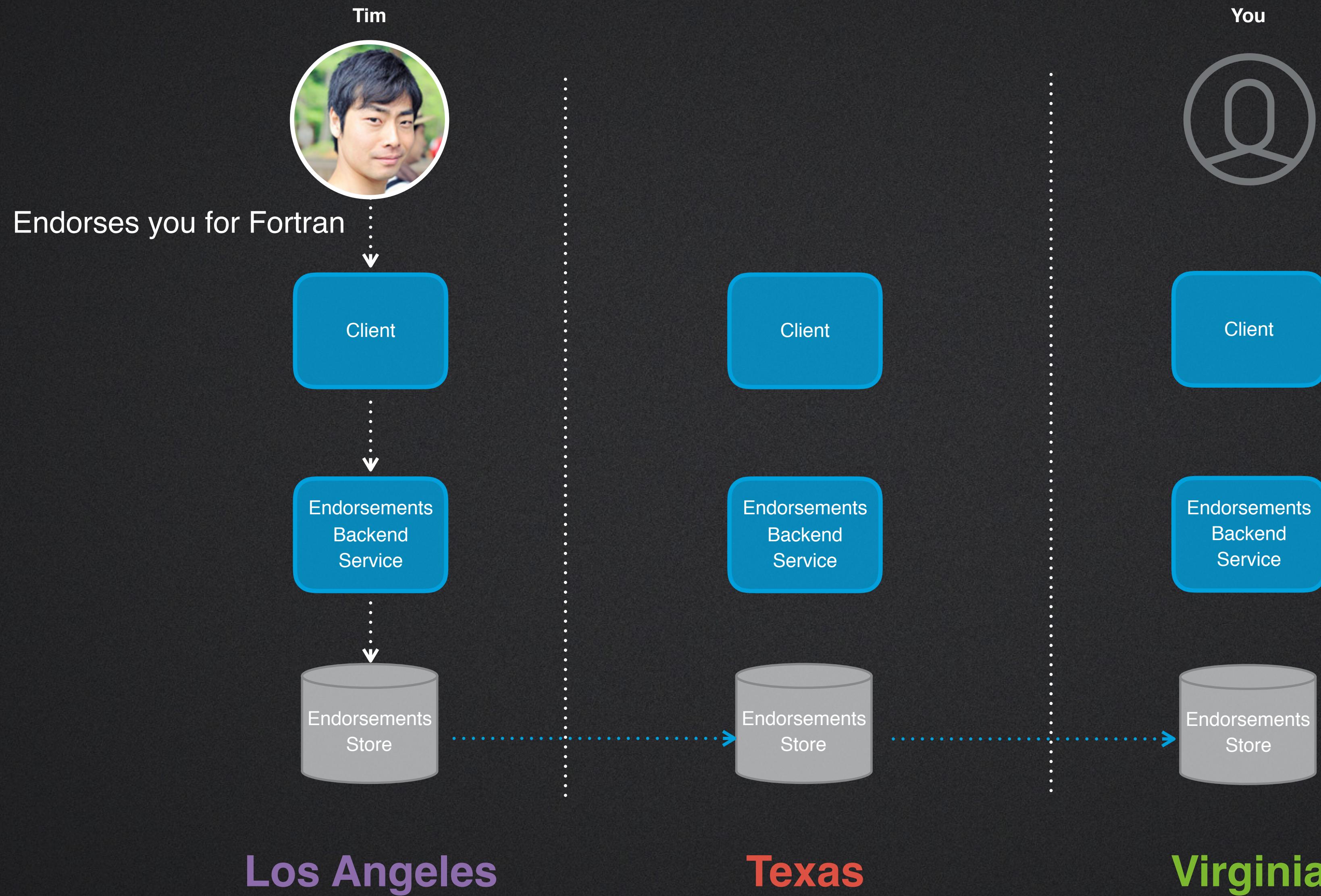
The Solution



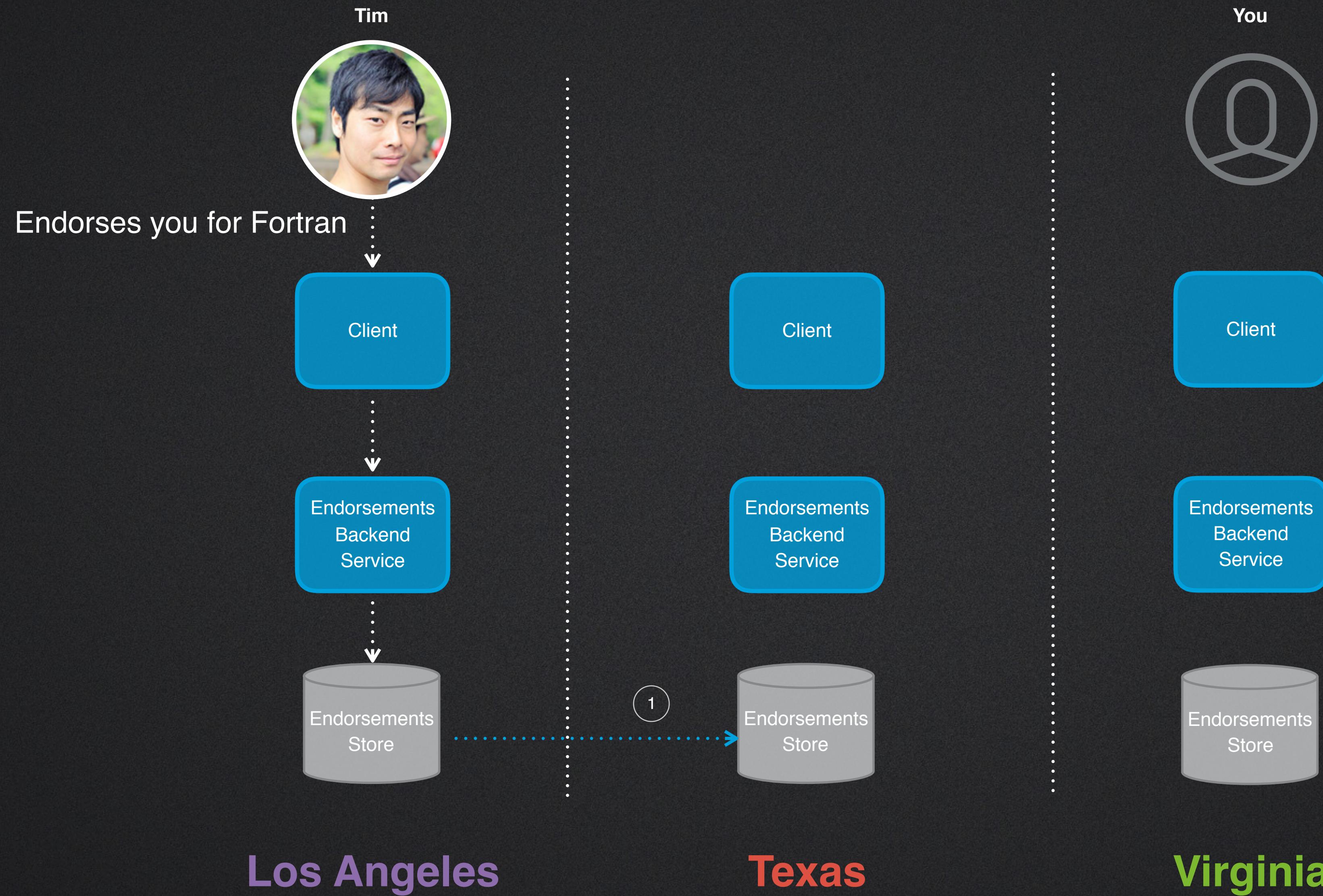
The Problem with Data Replication



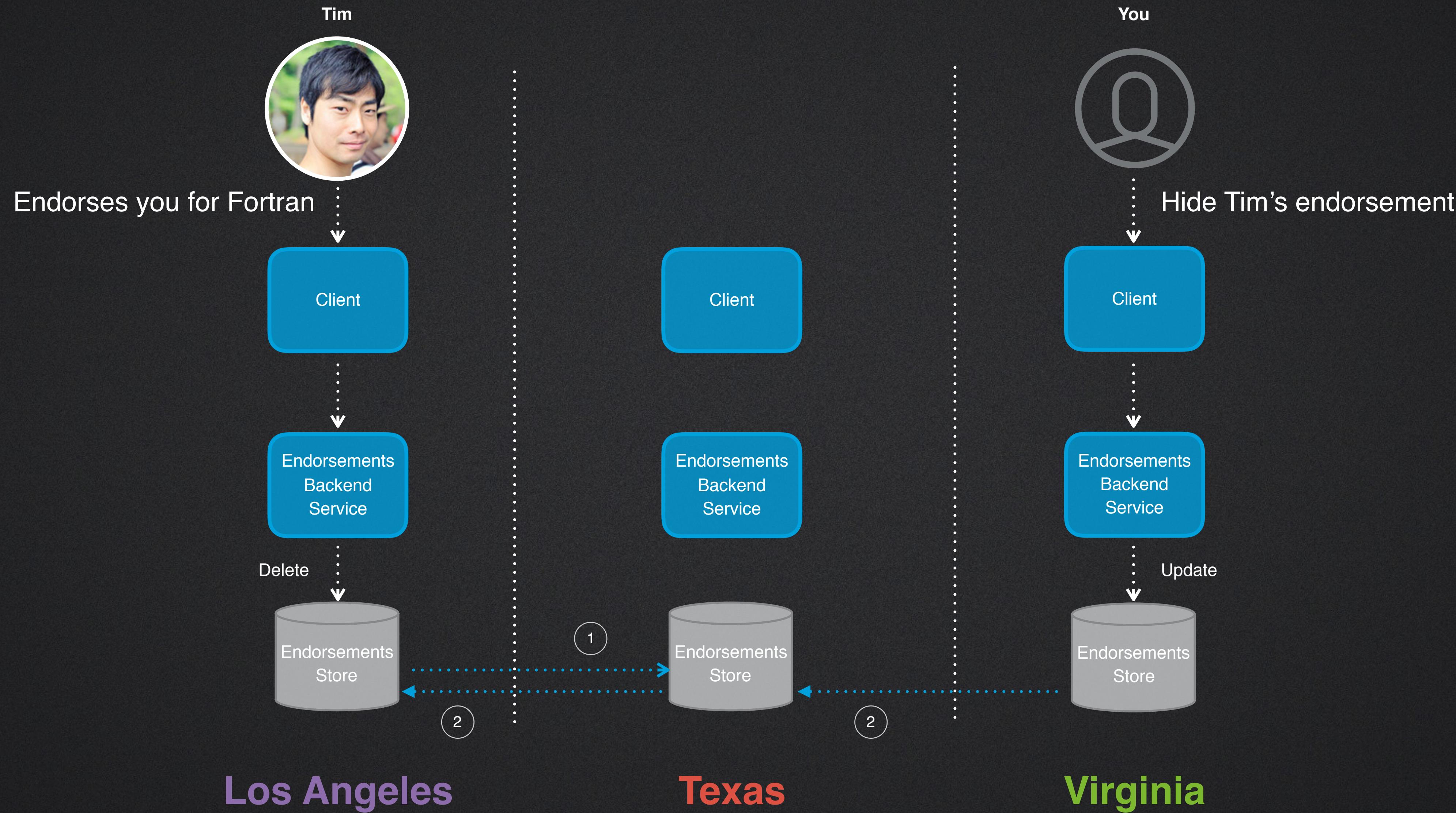
The Problem with Data Replication



The Problem with Data Replication



The Problem with Data Replication

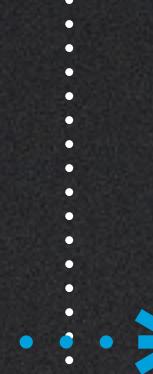


Soft Deletes

Endorser	Endorsee	Skill	Is Visible	Is Deleted
Tim	You	Fortran	1	1

Delete Priority Conflict Resolution Policy

Endorser	Endee	Skill	Is Visible	Is Deleted
Tim	You	Fortran	1	1



Endorser	Endee	Skill	Is Visible	Is Deleted
Tim	You	Fortran	1	1



Endorser	Endee	Skill	Is Visible	Is Deleted
Tim	You	Fortran	1	1



Endorser	Endee	Skill	Is Visible	Is Deleted
Tim	You	Fortran	0	0

Los Angeles

Texas

Virginia

Single Role Tables

Endorsements Received Table

Endorsement ID	Skill	Is Visible	Endorsee
1	Fortran	1	Me

Endorser Given Table

Endorsement ID	Endorser	Is Deleted
1	Tim	1

Takeaways



Multicol From the Get-Go

1

2

3



1

Stream Processing

2

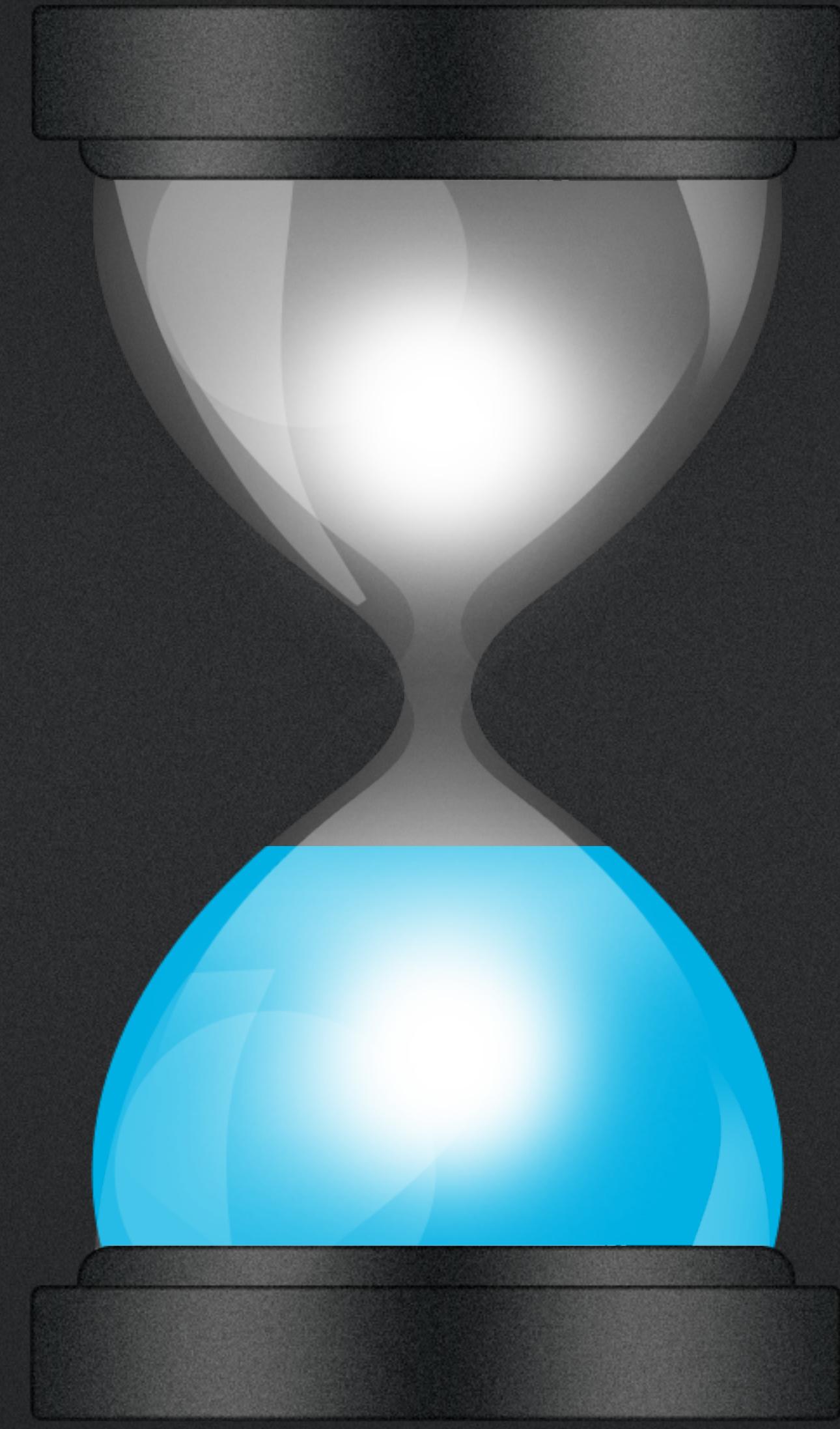
Personal Data



3

Cache Invalidation & Replication Conflicts





Q&A



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