Atlassian

Event sourcing and CQRS from the trenches

SIDNEY SHEK · ARCHITECT · ATLASSIAN · @SIDNEYSHEK

Universe of Users

users

Id	Name	Username	APIKey
1	Homer	homer	d0a
2	Bart	bart	f00
3	Maggie	maggie	baa

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Universe of Users

users_new

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2	Bart	Bart2
3	Lisa Jr	Lisa Jr3

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elastic

Our Identity System requirements

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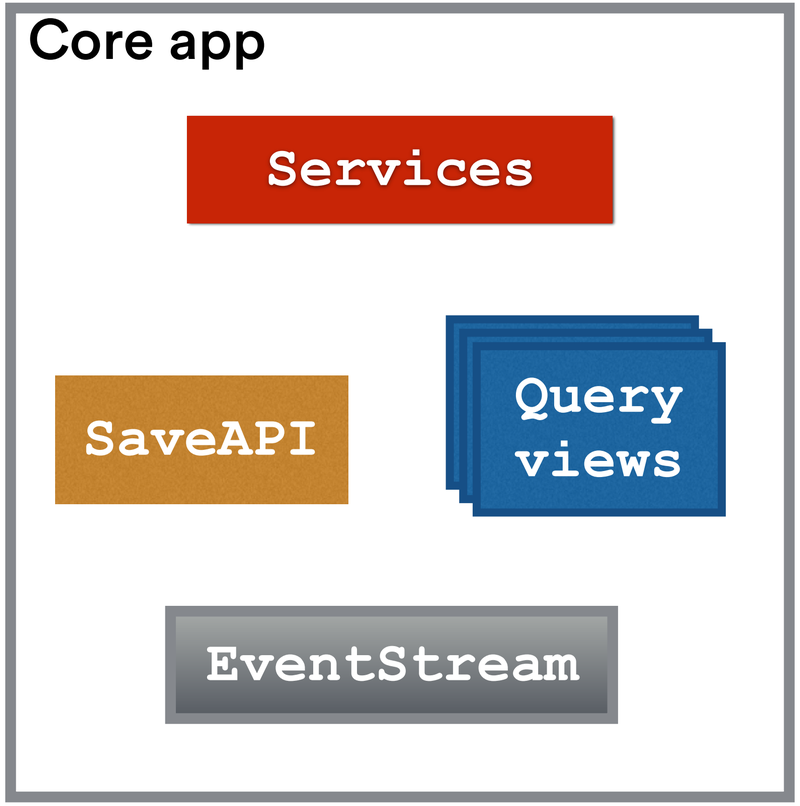
- Audit trails for changes
- High volume low latency reads
- Highly available
  - Disaster recovery
  - Zero-downtime upgrades
- Testing with production-like data

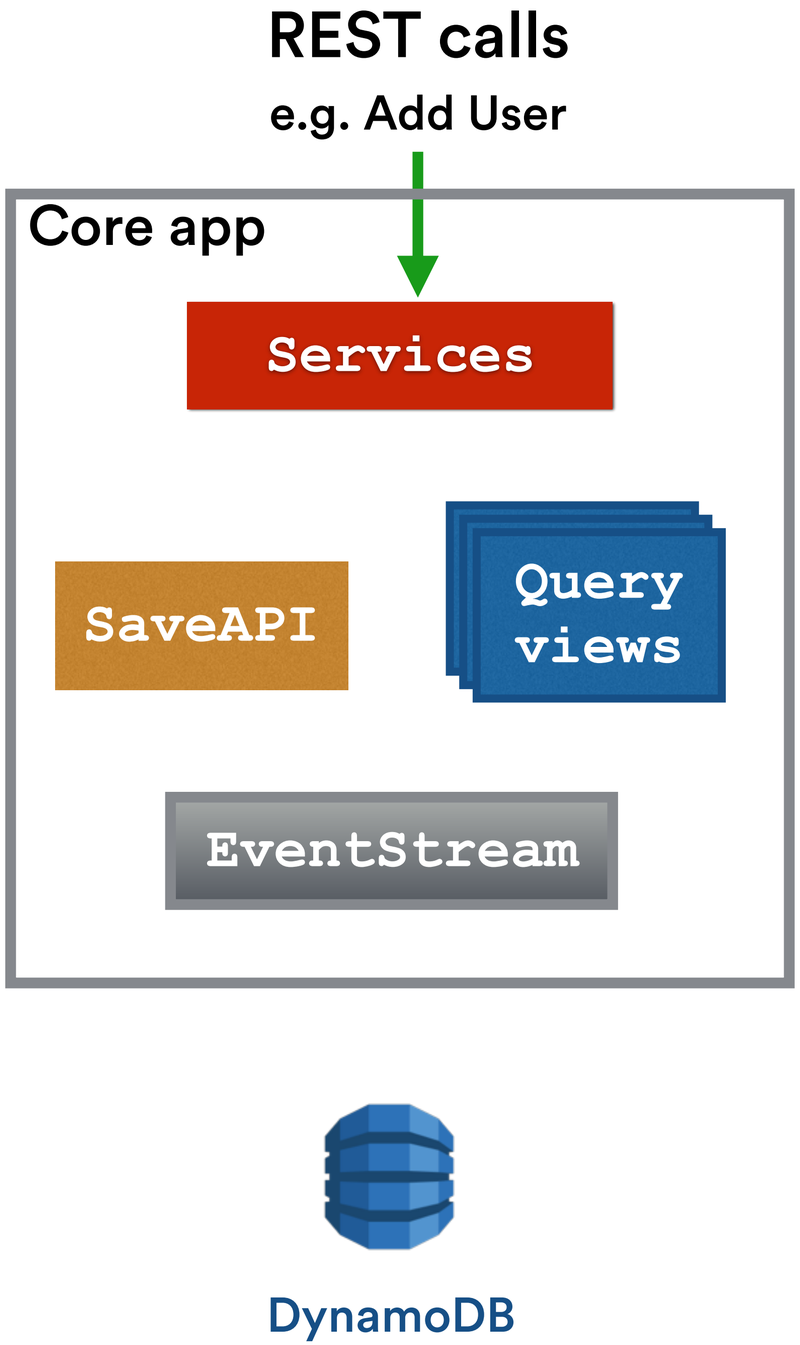
Evolving the architecture

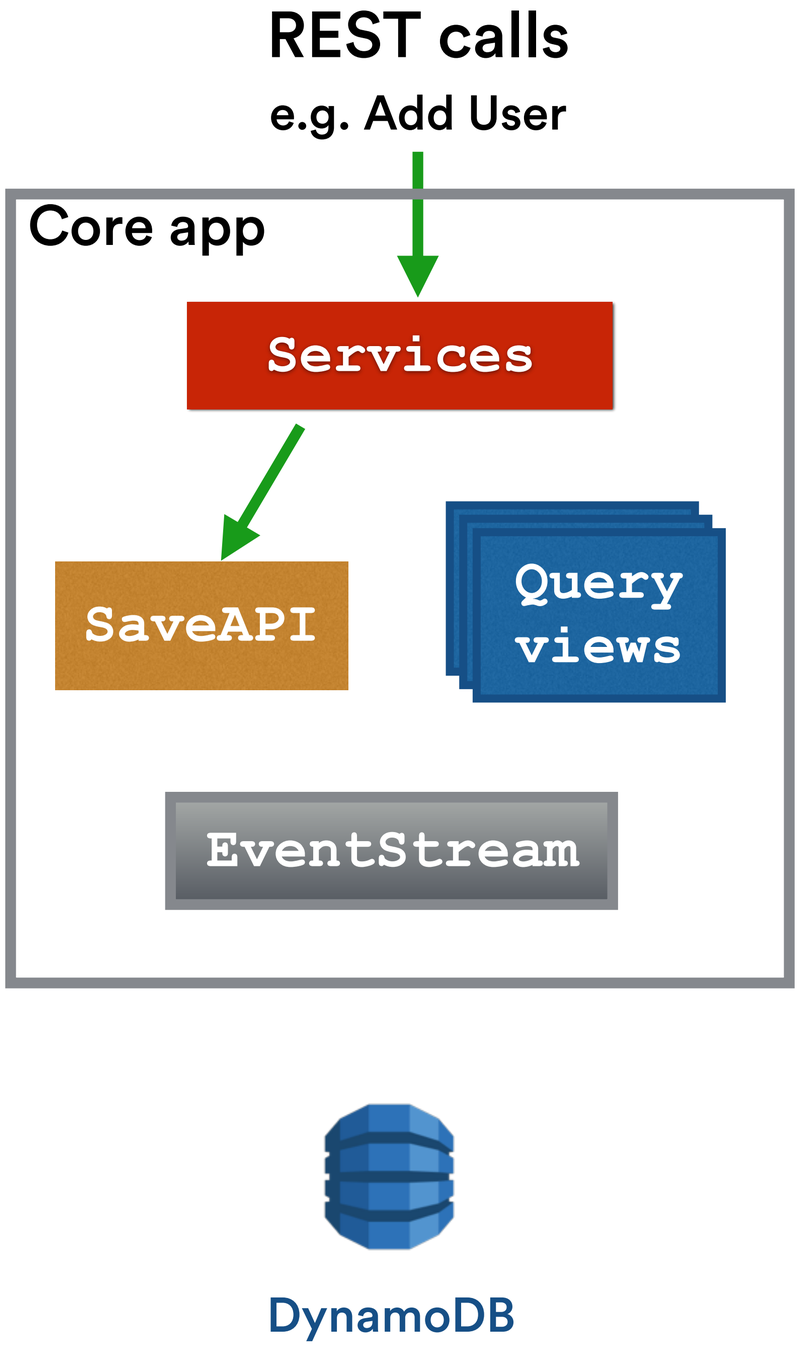
REST calls

e.g. Add User



DynamoDB


REST calls
e.g. Add User
Core app
Services
SaveAPI
Query views
EventStream
DynamoDB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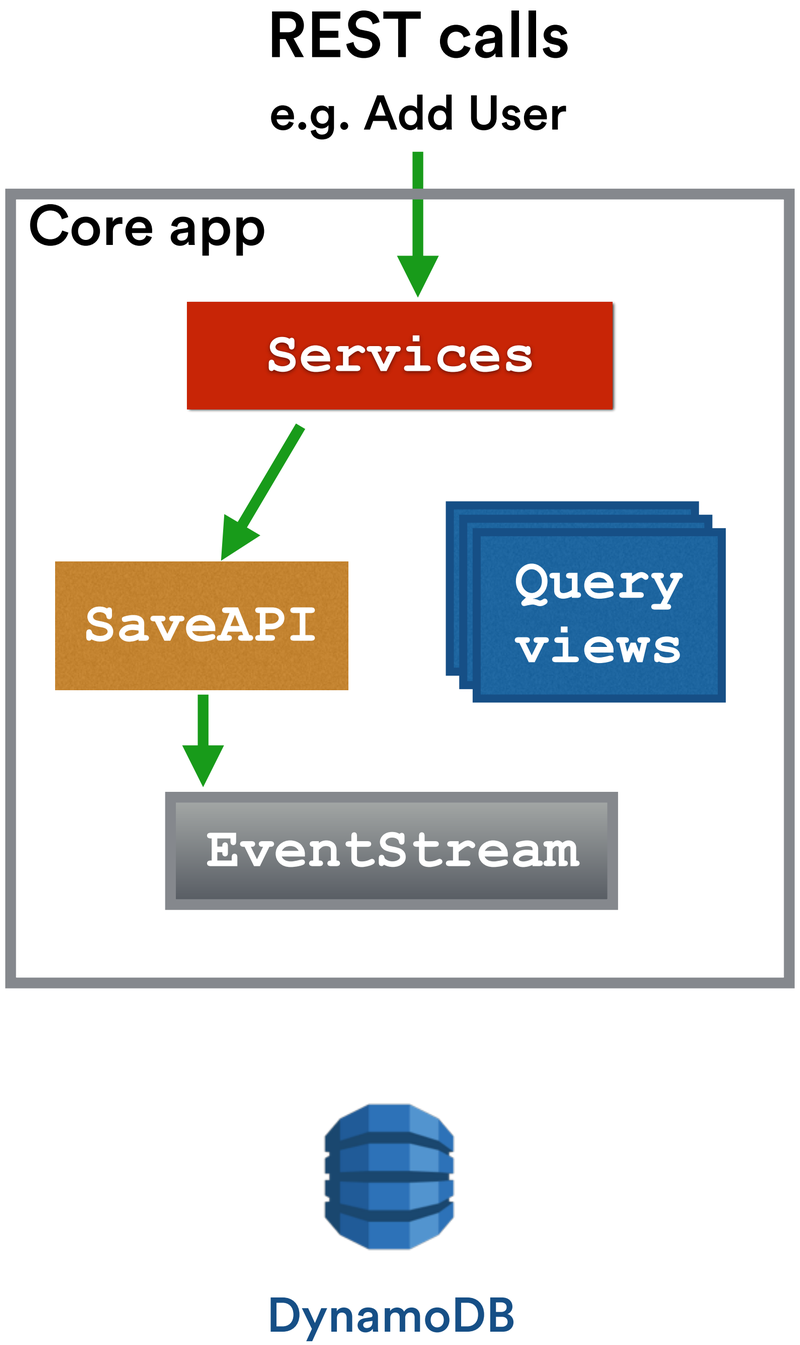
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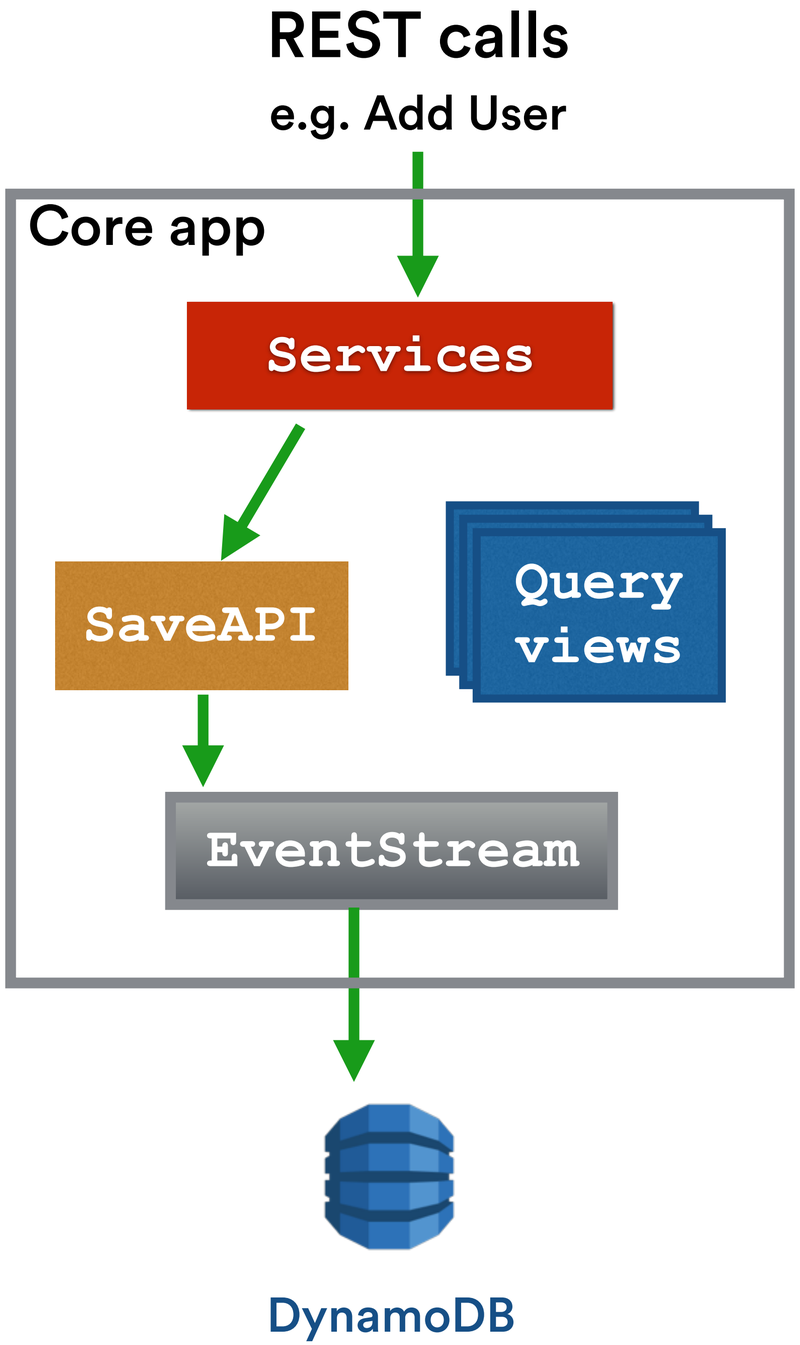
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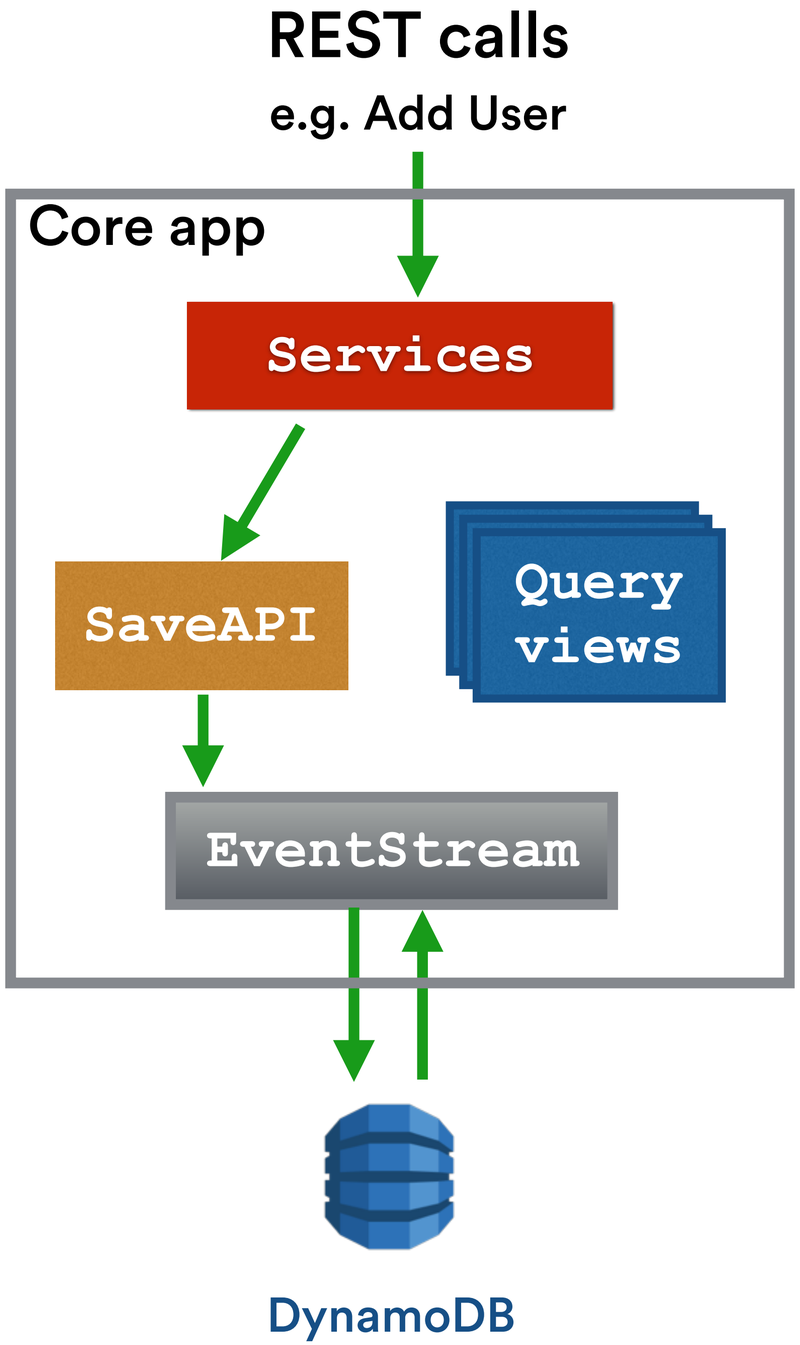
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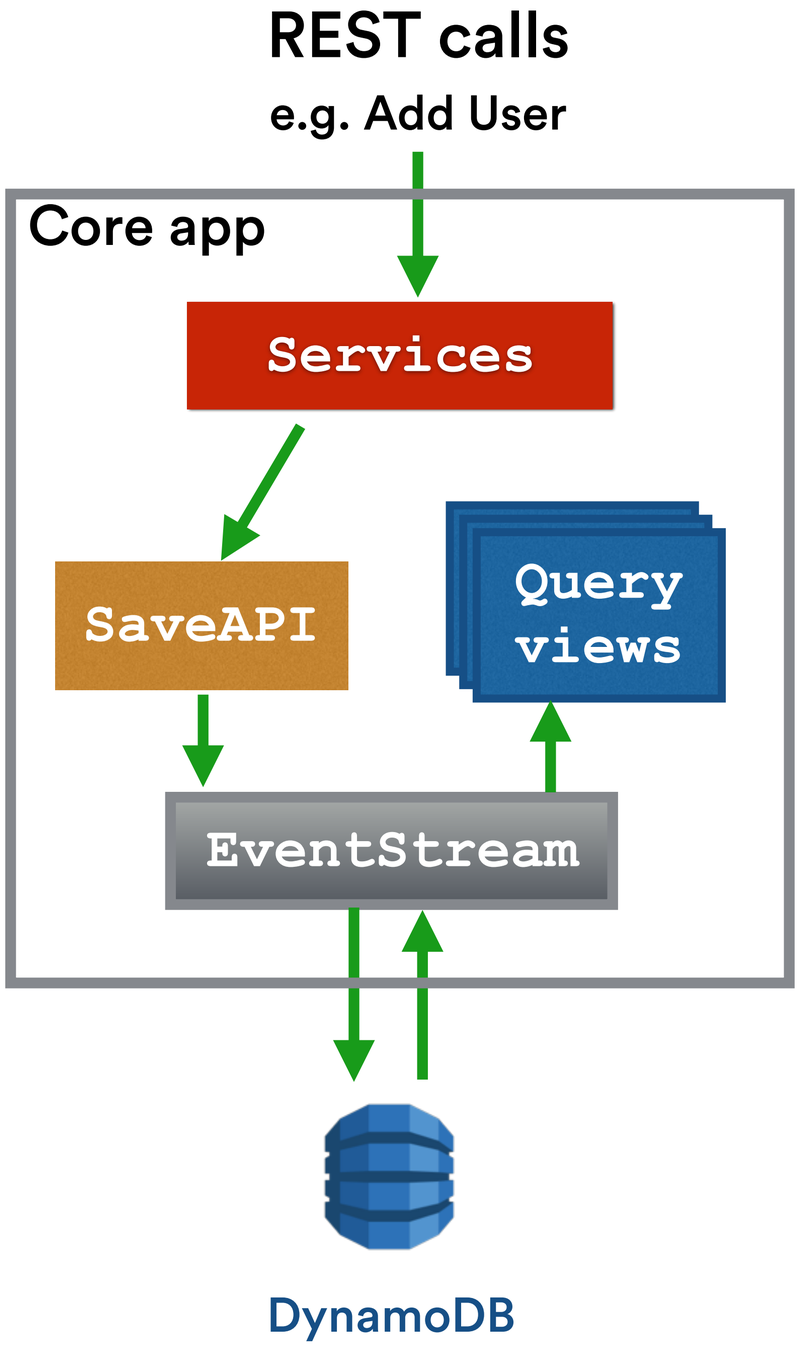
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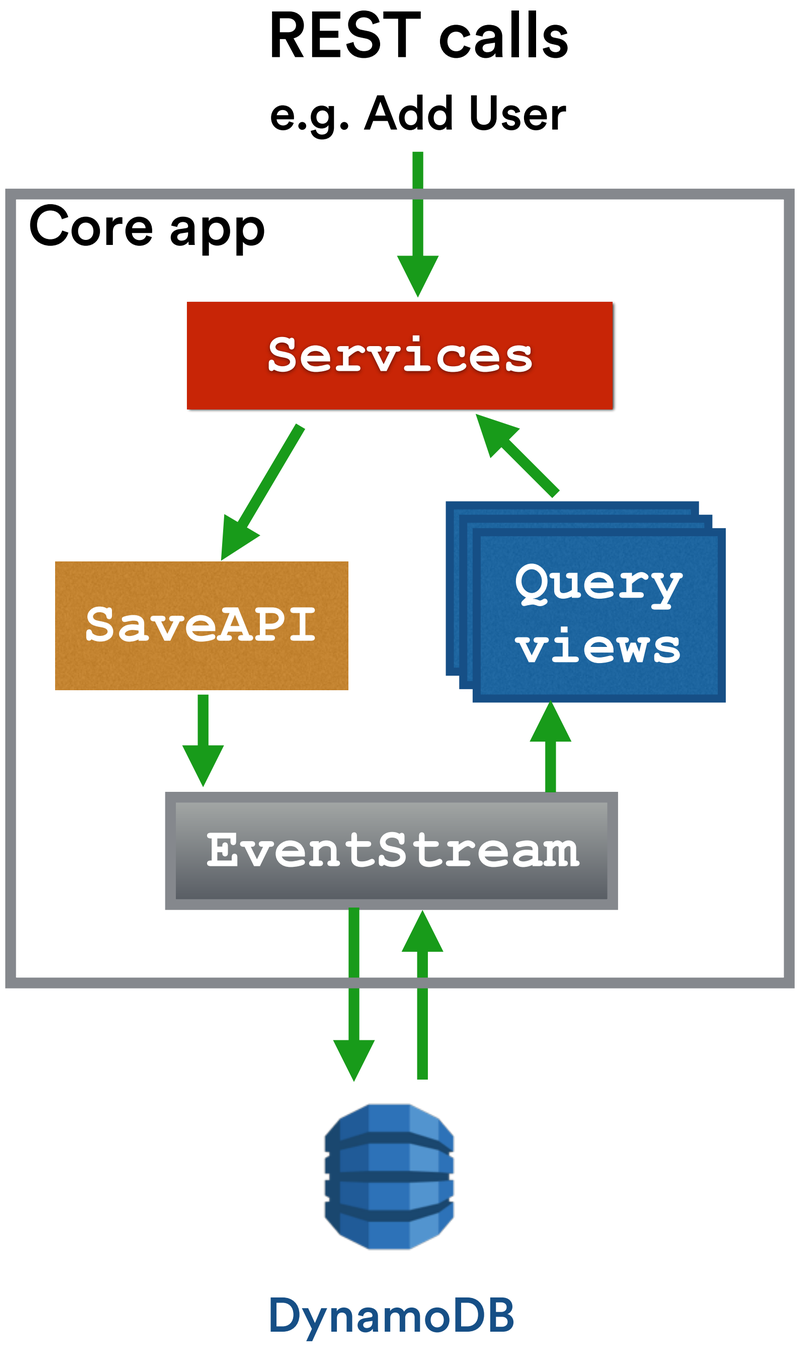
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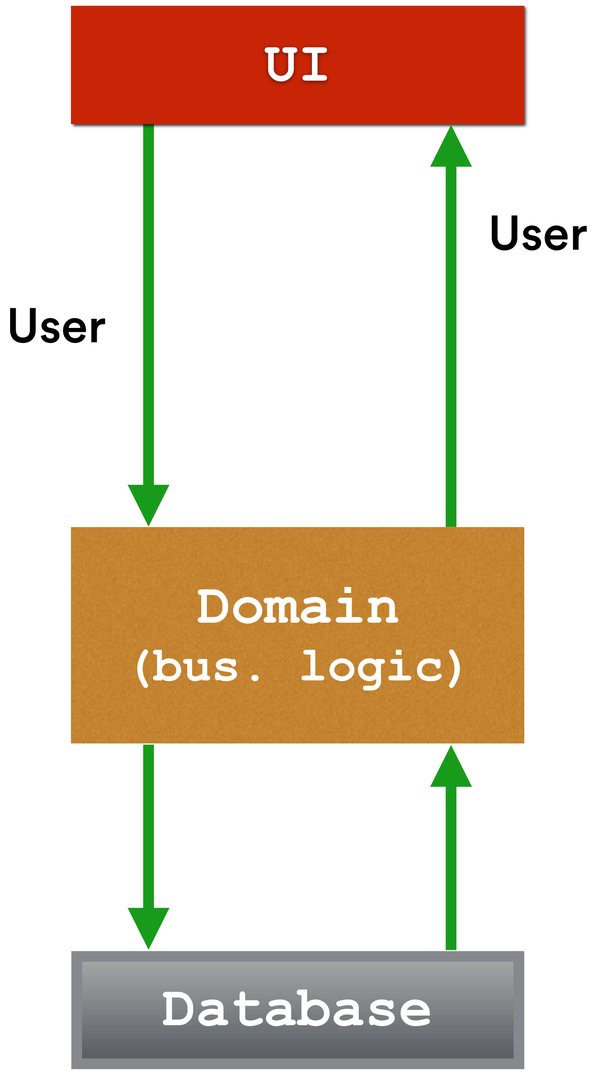
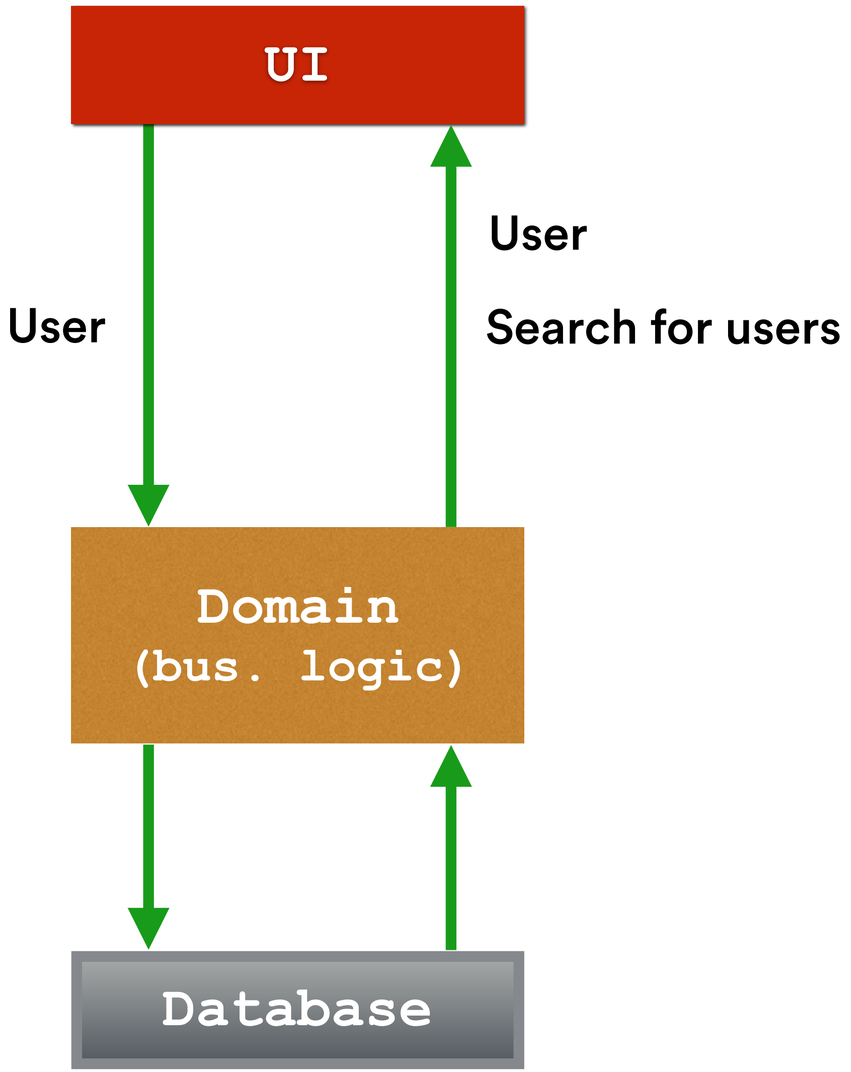
Command Query Responsibility Segregation


UI
User
User
Domain
(bus. logic)
Database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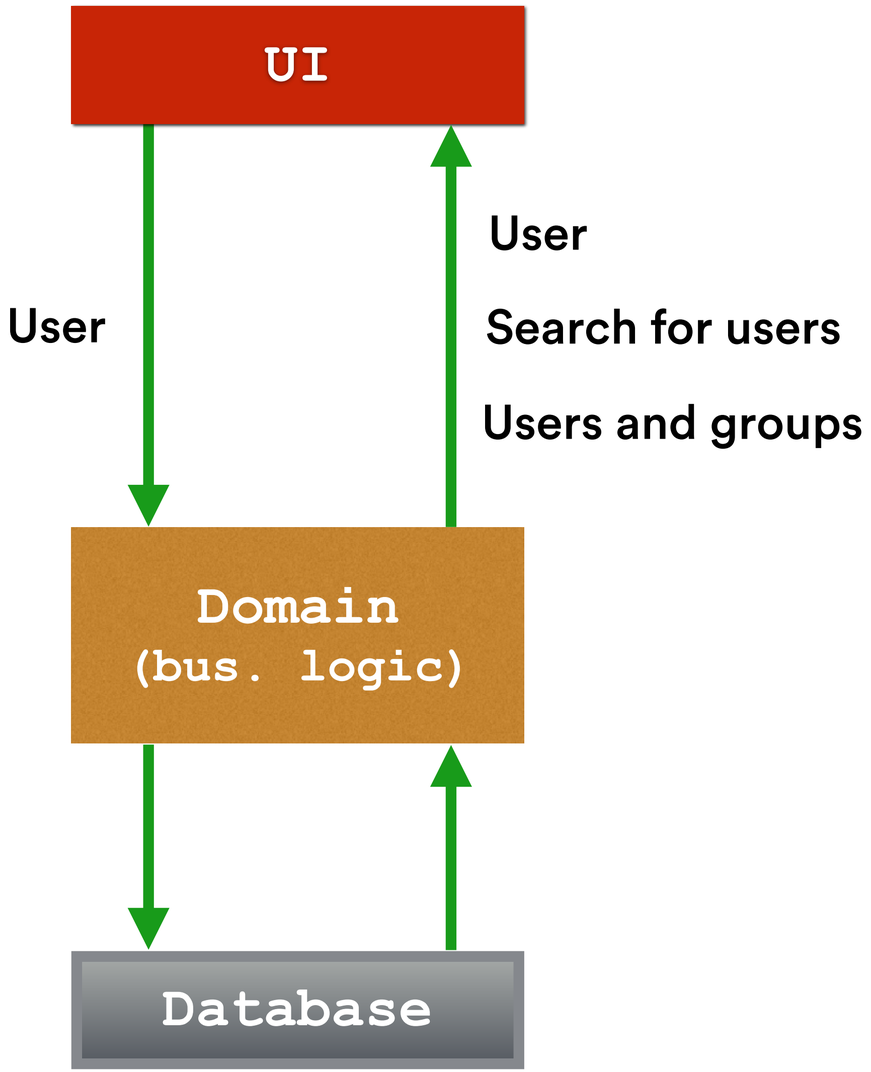
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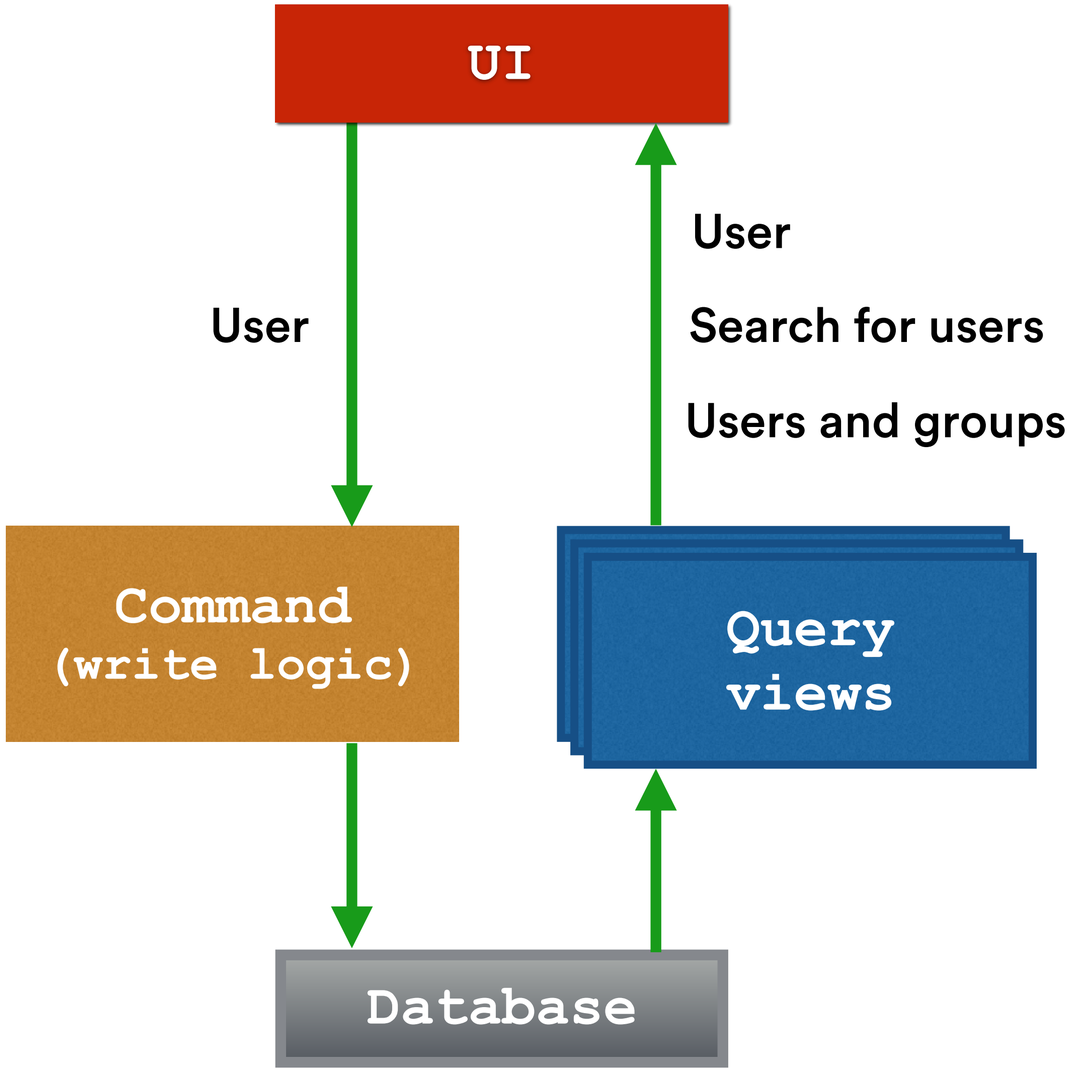
UI
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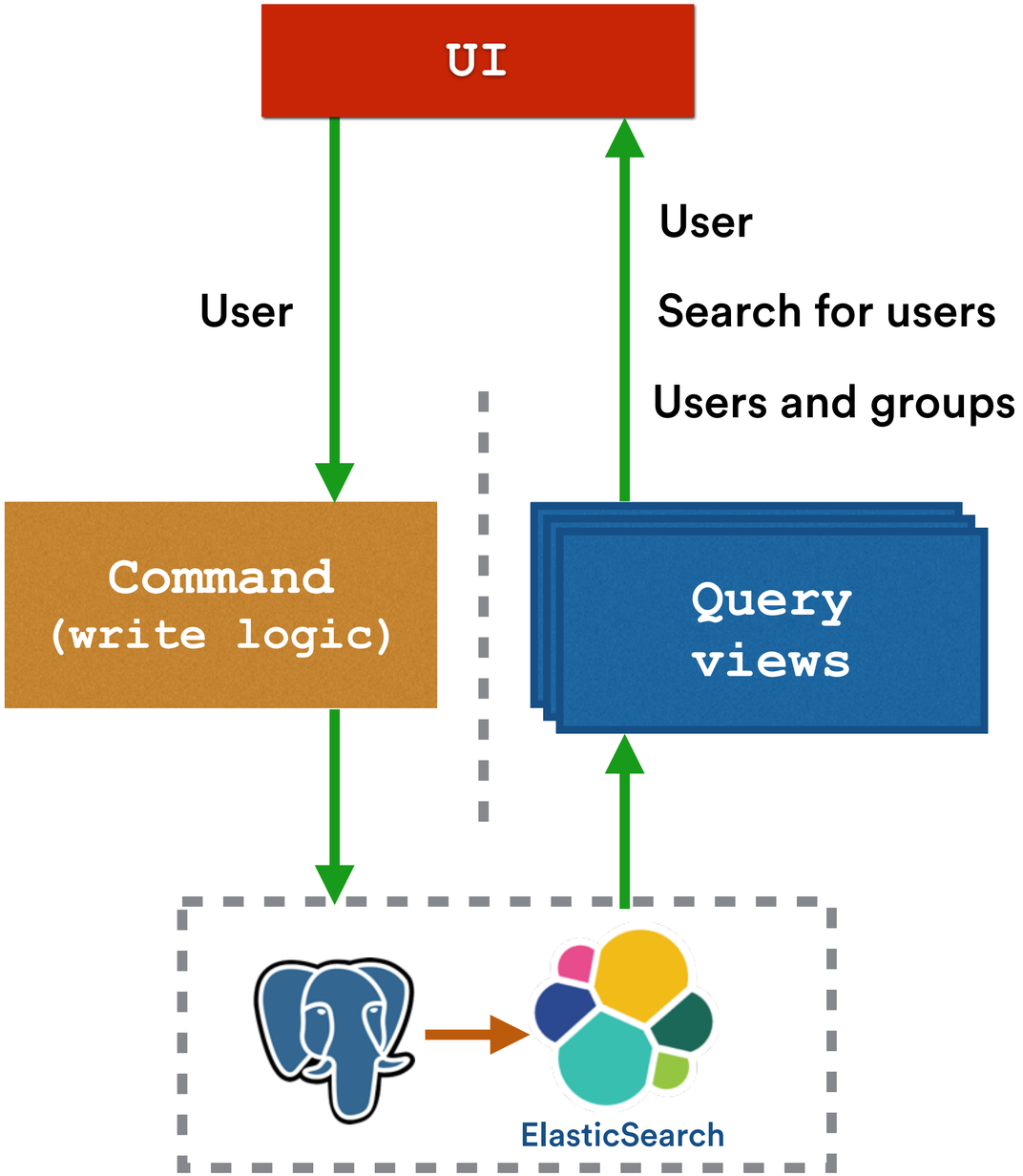
Search for users
Users and groups
Command
(write logic)
Query
views
Database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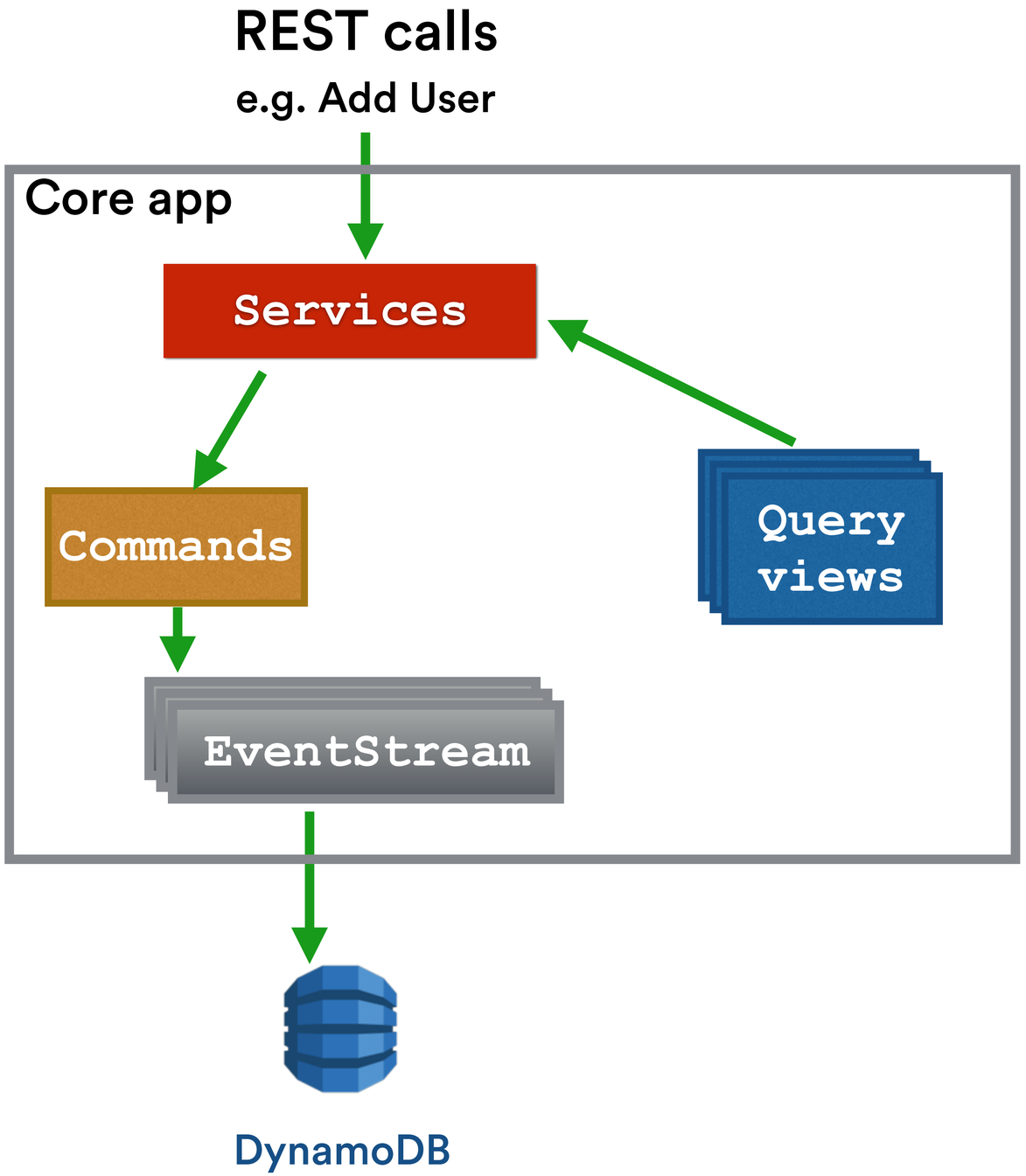
ElasticSearch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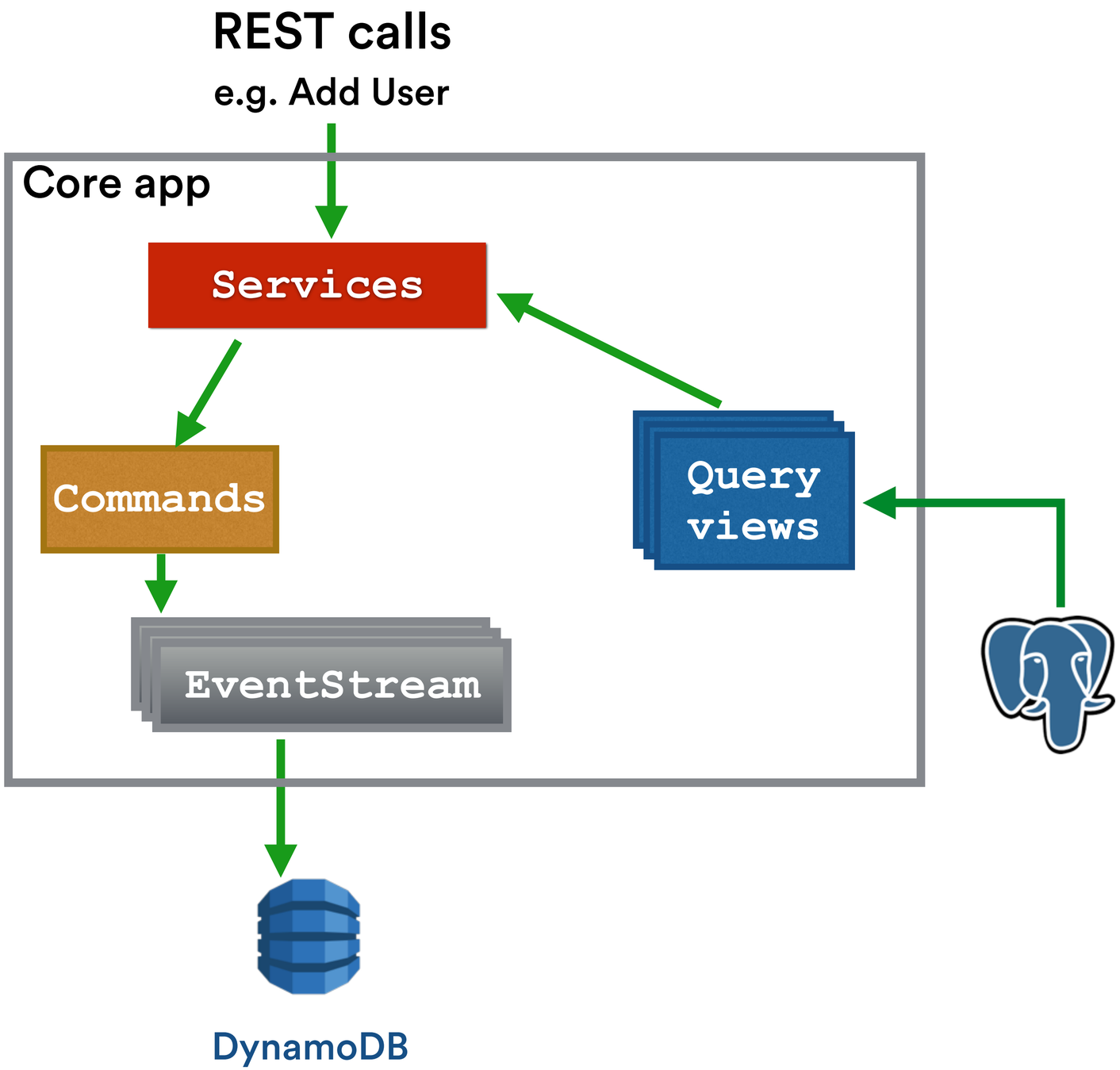
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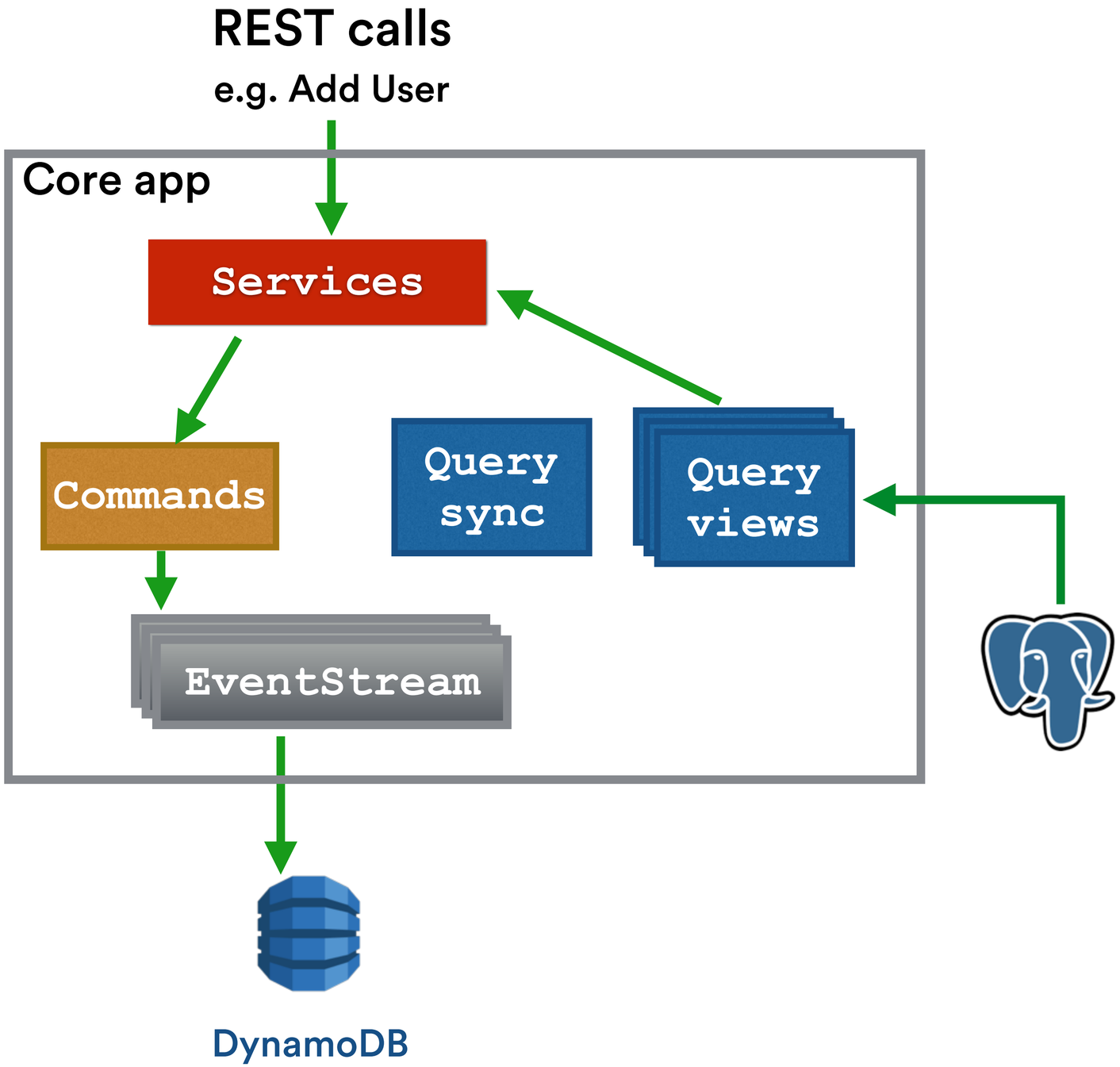
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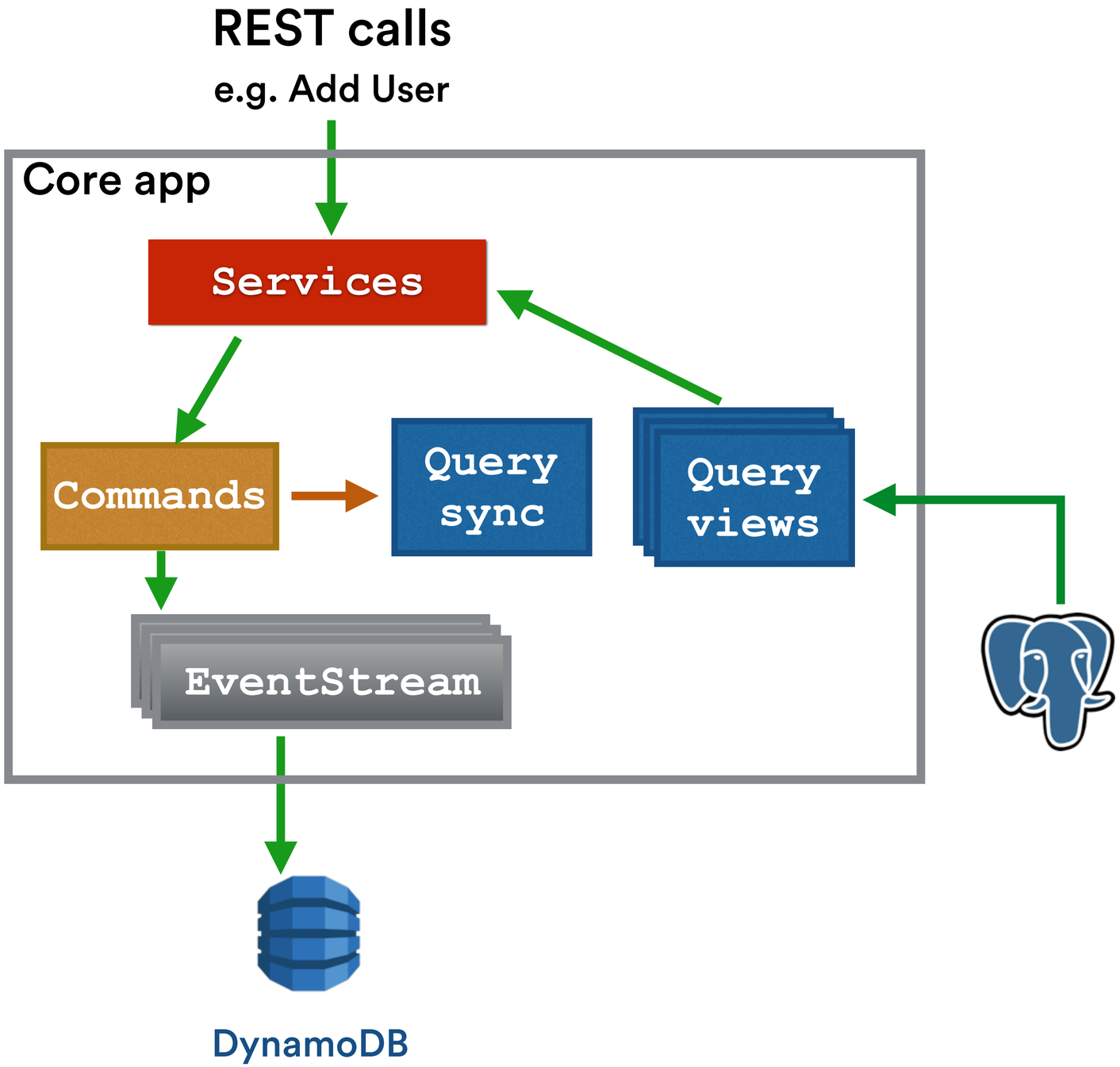
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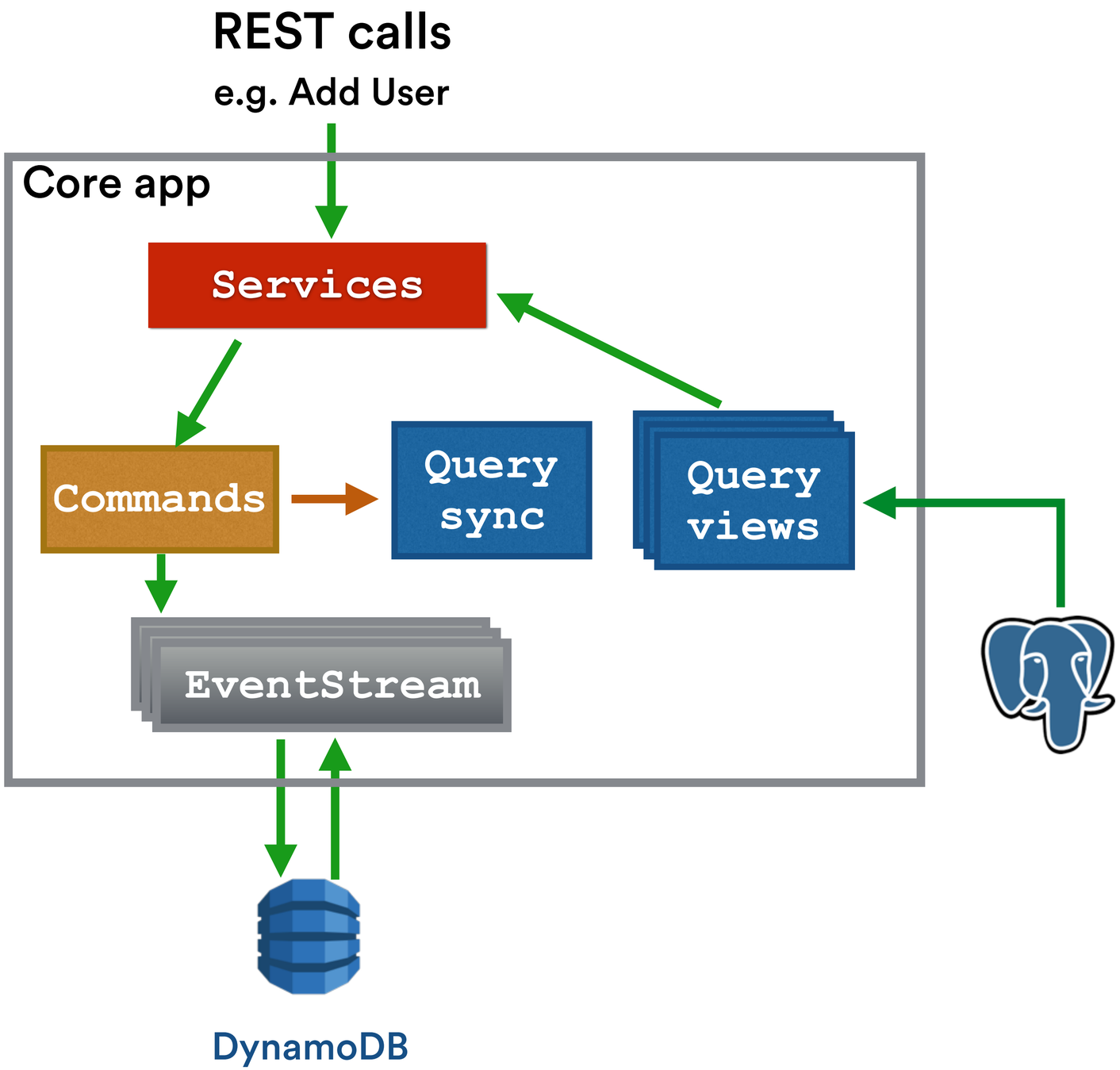
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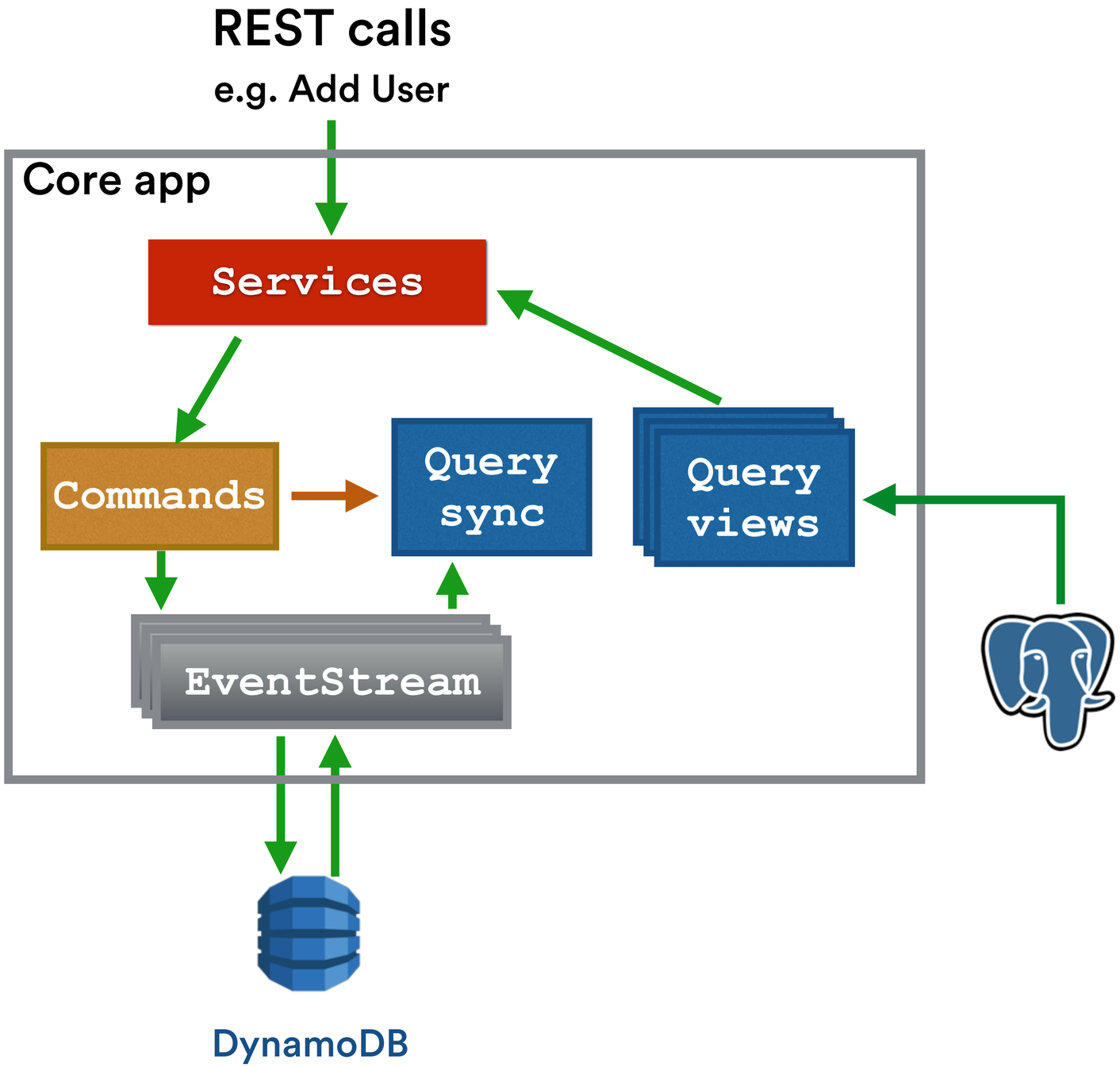
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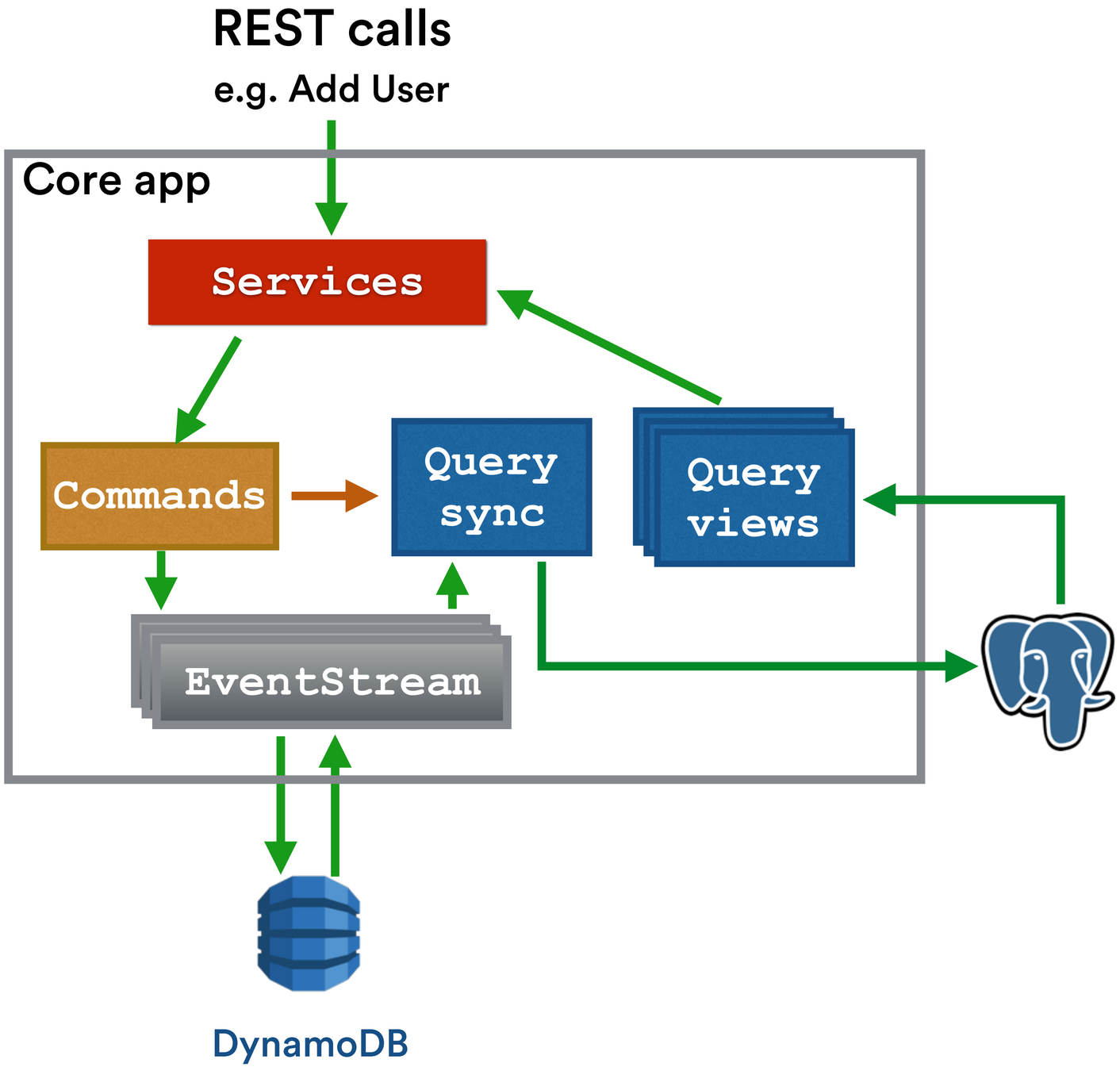
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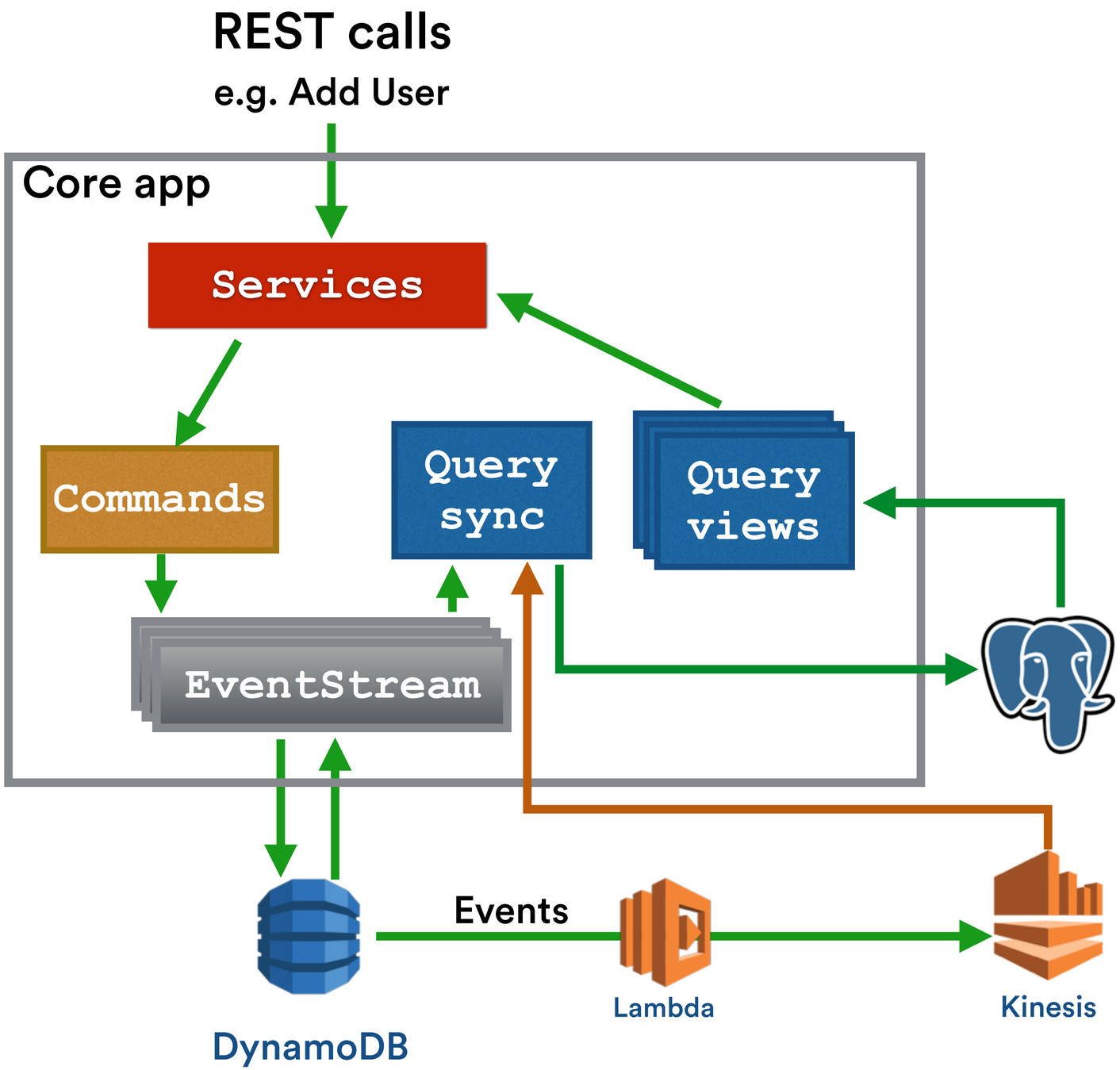
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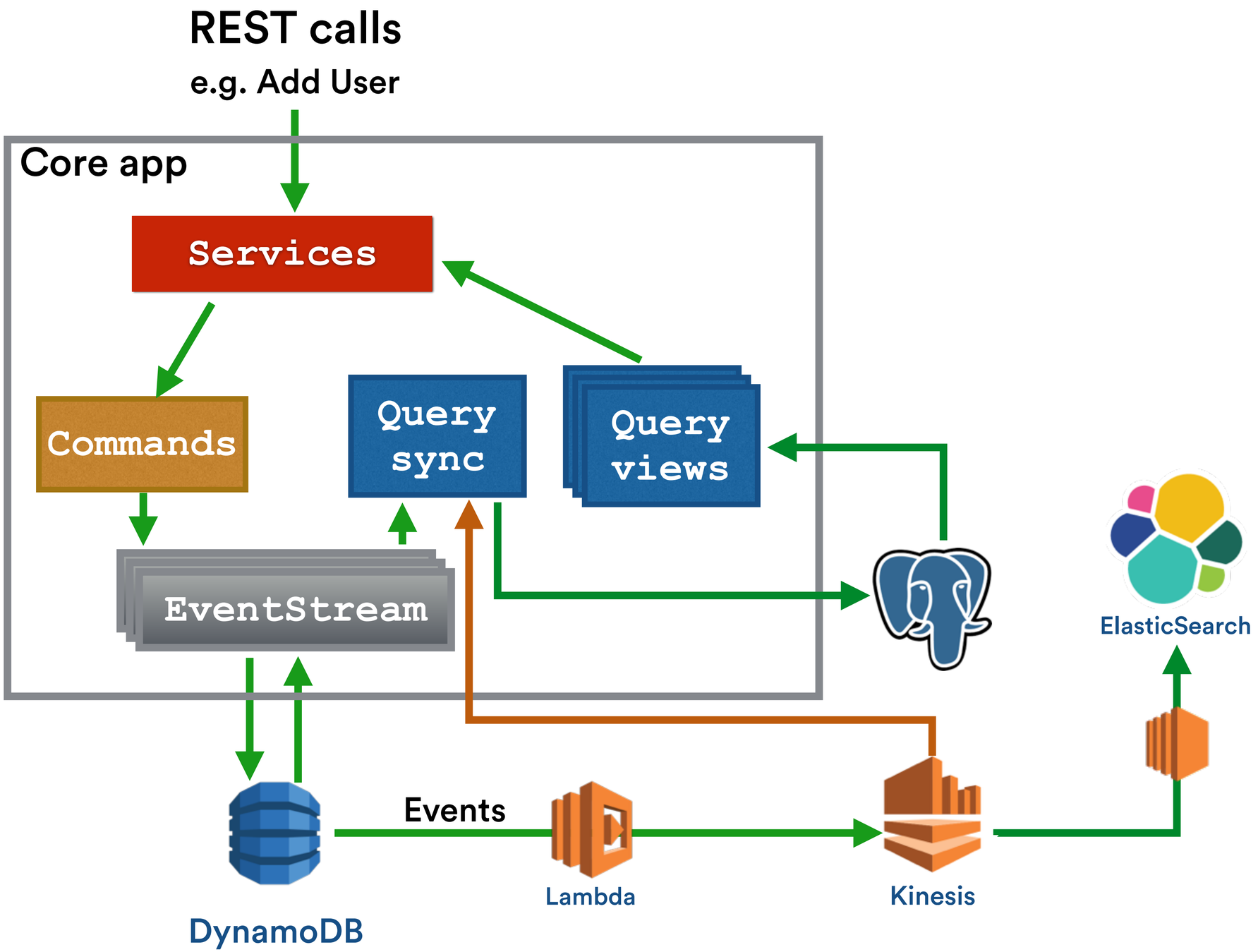
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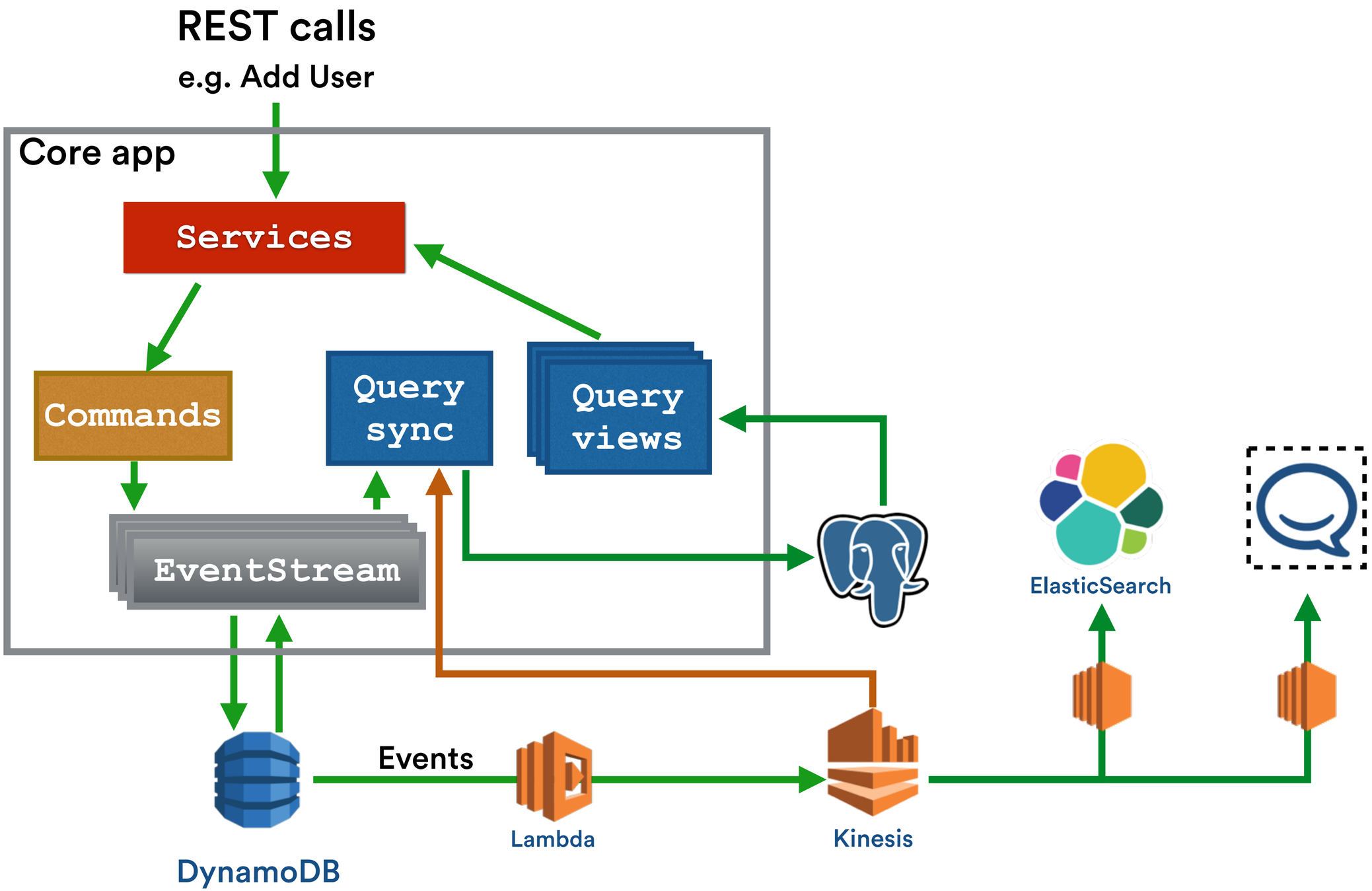
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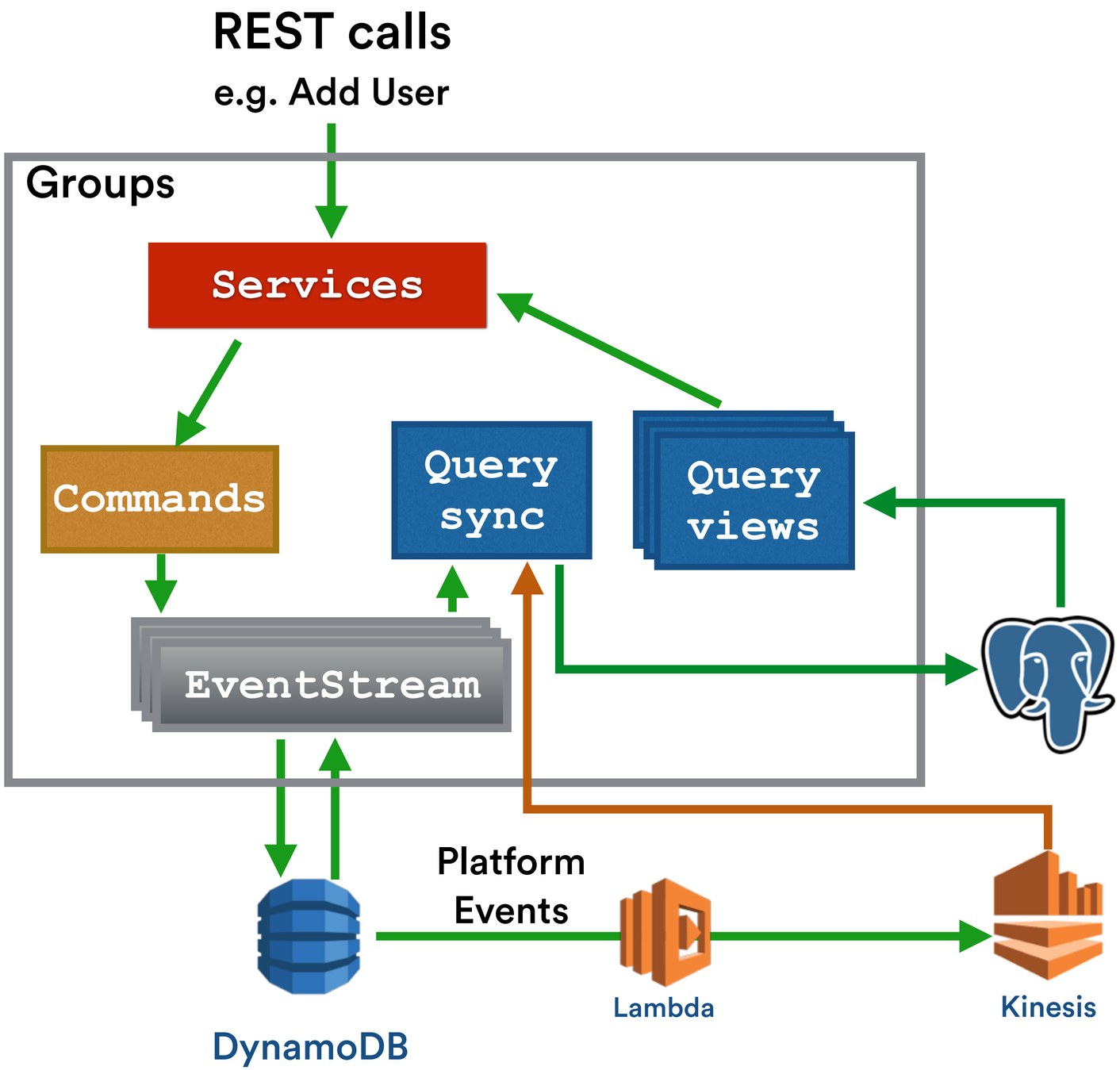
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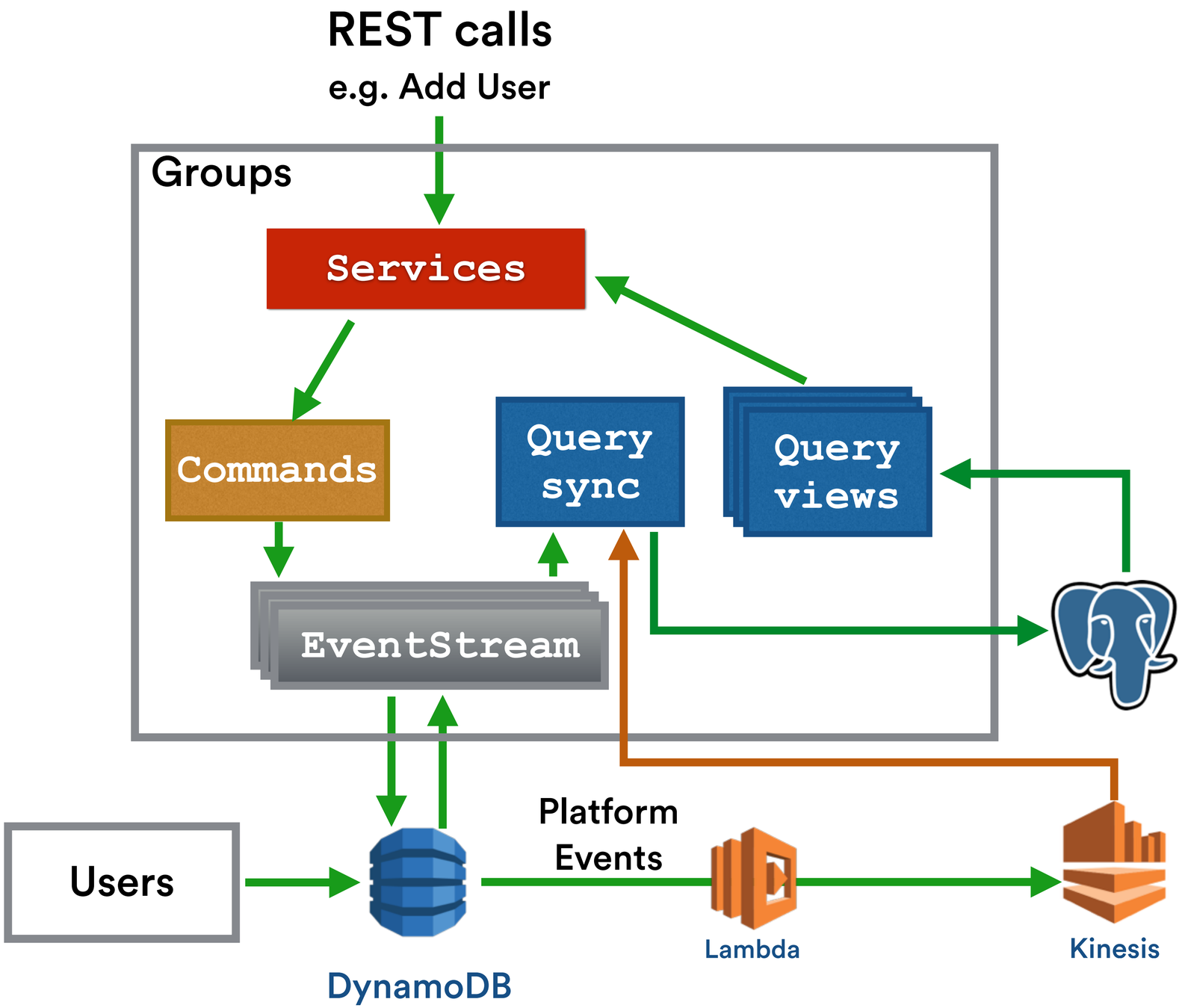
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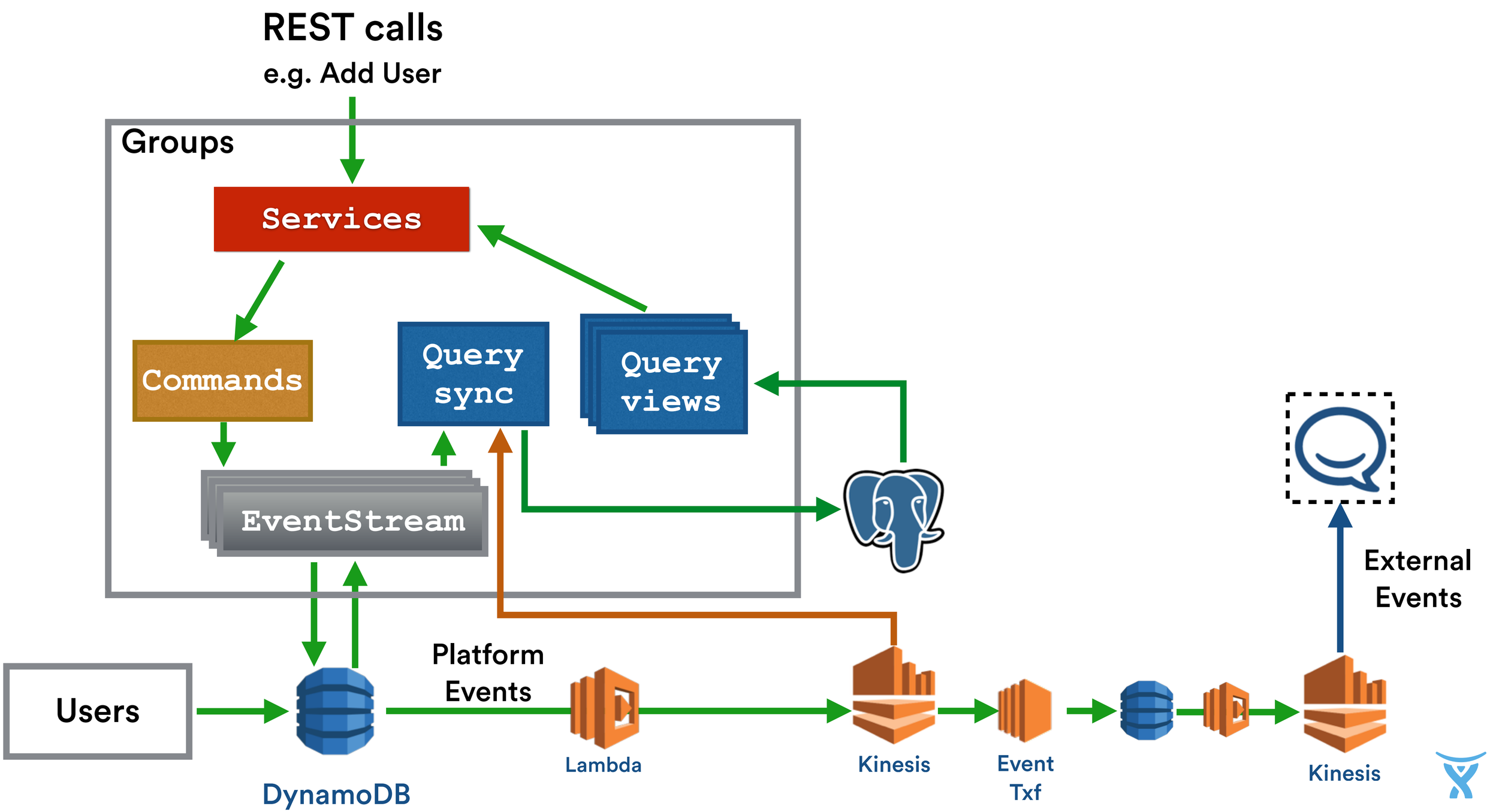
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External Events

Events as an API

Insert / Update Delta vs ‘Set’ events

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UserAdded(id, name, email1)

Insert / Update Delta vs ‘Set’ events

UserAdded(id, name, email1)

UserUpdated(id, email = *Some*(email))

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SetUserName(id, name)

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vs

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Single code path for query sync

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Single stream

Multiple streams

Single stream	Multiple streams
Transactions and consistent data resolution	

Single stream

Transactions and consistent data resolution

Multiple streams

Sharding for throughput

Single stream

~~Transactions and consistent data resolution~~

Multiple streams

Sharding for throughput

Better availability vs consistency compromise

Rules for splitting streams

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1. Place independent events on different streams
2. Split streams by event type and unique Id
3. Identify the ‘transactions’ you really need
4. Use hierarchical streams to maximise number of streams
5. Splitting and joining streams later is possible

But… no guaranteed order between streams

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- A field should only be updated by a single event stream
- No foreign key constraints
- In general, unique or data constraints ‘enforced’ on write

Let go of transactions and consistency

Why do we need transactions?

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- Enforce business constraints e.g. uniqueness

Why do we need transactions?

- Enforce business constraints e.g. uniqueness

- Guaranteed to see what I just wrote

Write and Read Consistency

But CAP theorem…

CAP or PACELC?

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During a network **Partition**, choose between

Availability versus **Consistency**

CAP or PACELC?

During a network **Partition**, choose between

Availability versus **Consistency**

Else choose between

Latency versus **Consistency**

There is a middle ground...

Check-and-Set writes

Optional forced reads

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Potentially conflicting events on same stream

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Do not use as default

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Smaller streams alleviate problems

Optional forced reads

Query view must be at stream seq X

Potential increased latency

Do not use as default

Enforce timed waits

Tokens to emulate transactions and consistency

User: homer (id 4)

All Users: Seq 100

User 4: Seq 23

Tokens to emulate transactions and consistency

User: homer (id 4)

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- Returned on read and write via ETag

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  - Force query view update (‘consistency’)

Tokens to emulate transactions and consistency

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All Users: Seq 100

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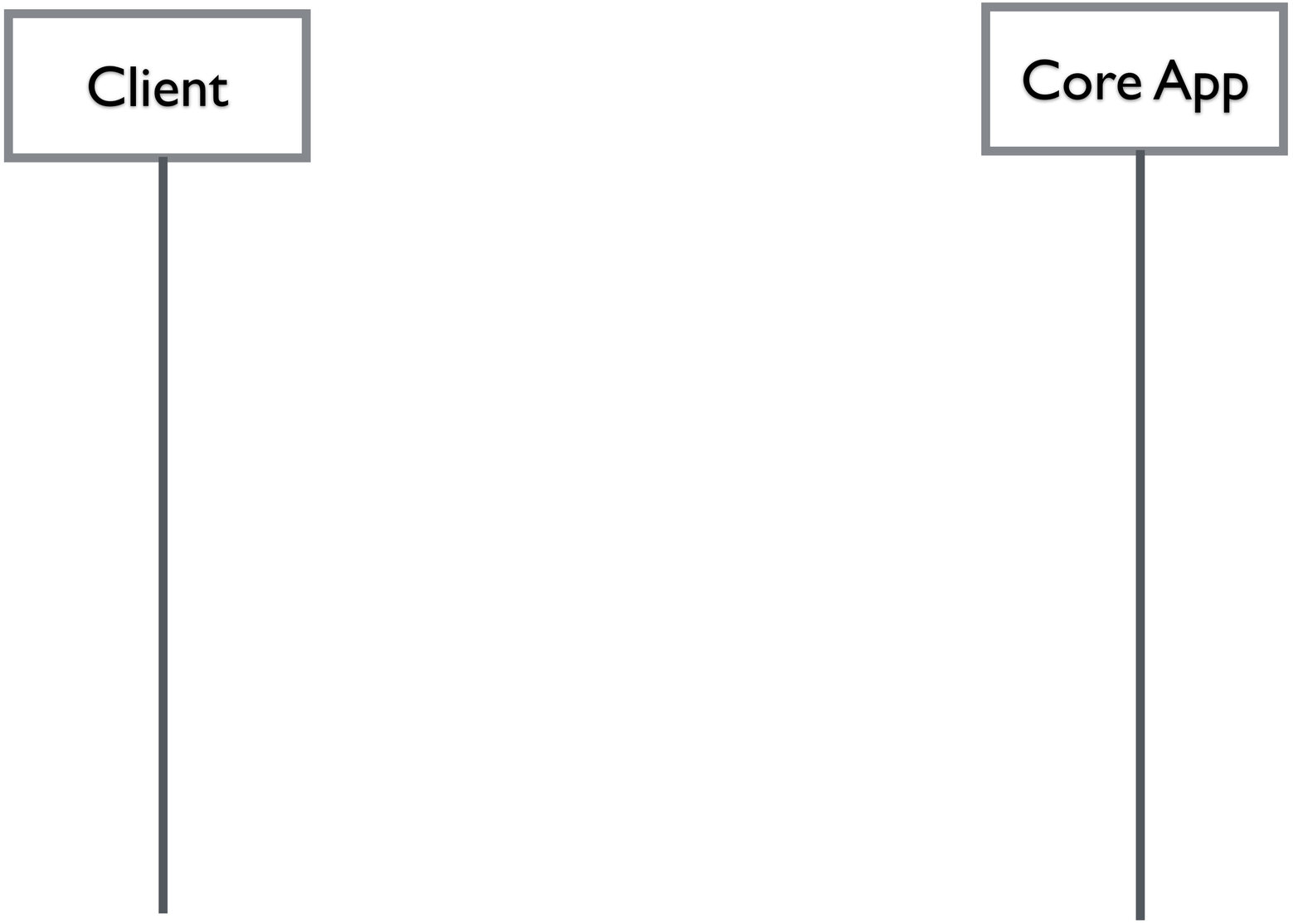
- Returned on read and write via ETag

- Pass as request header for:
  - Condition write (‘transaction’)
  - Force query view update (‘consistency’)
  - Caching

Using tokens to enforce state



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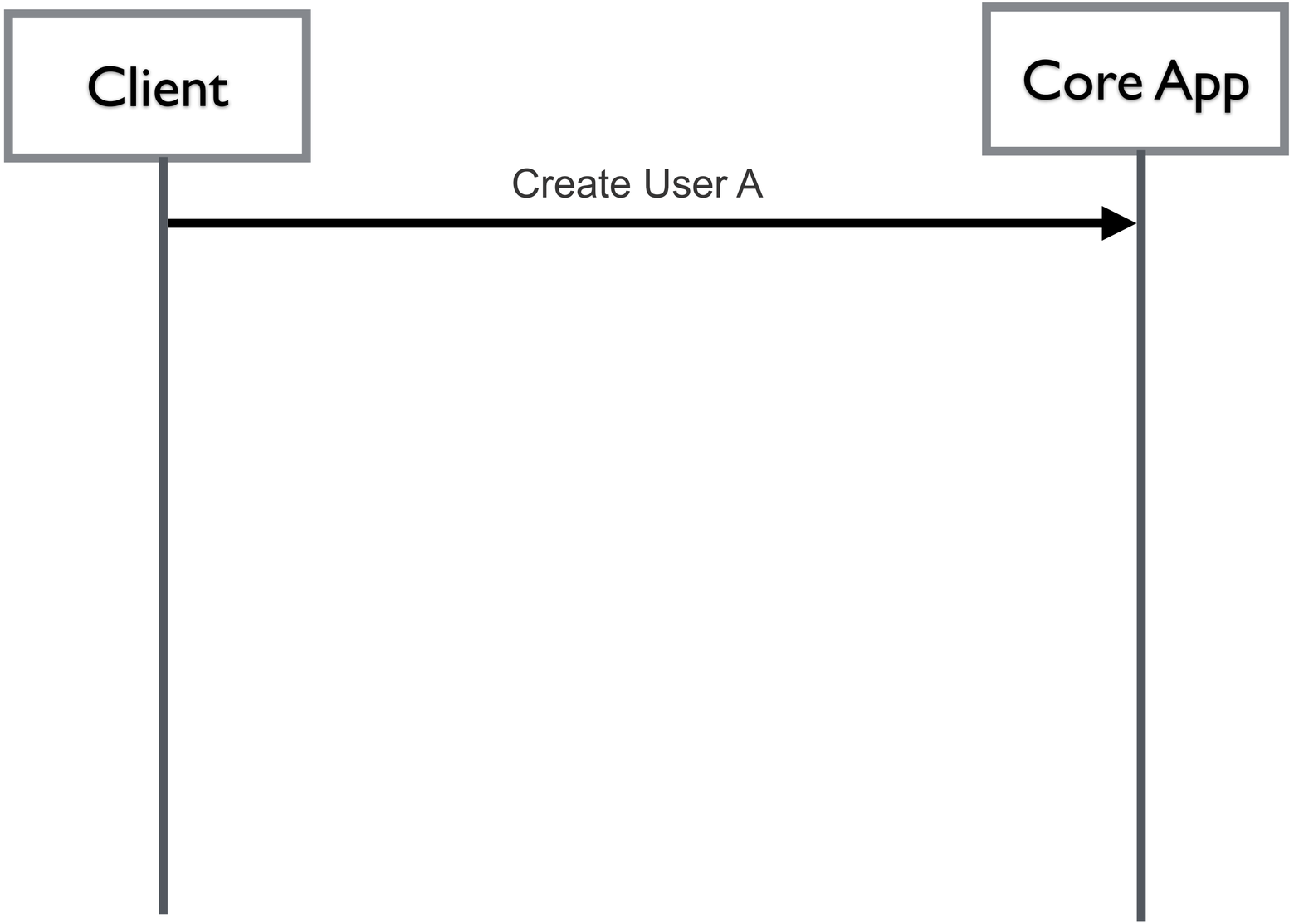
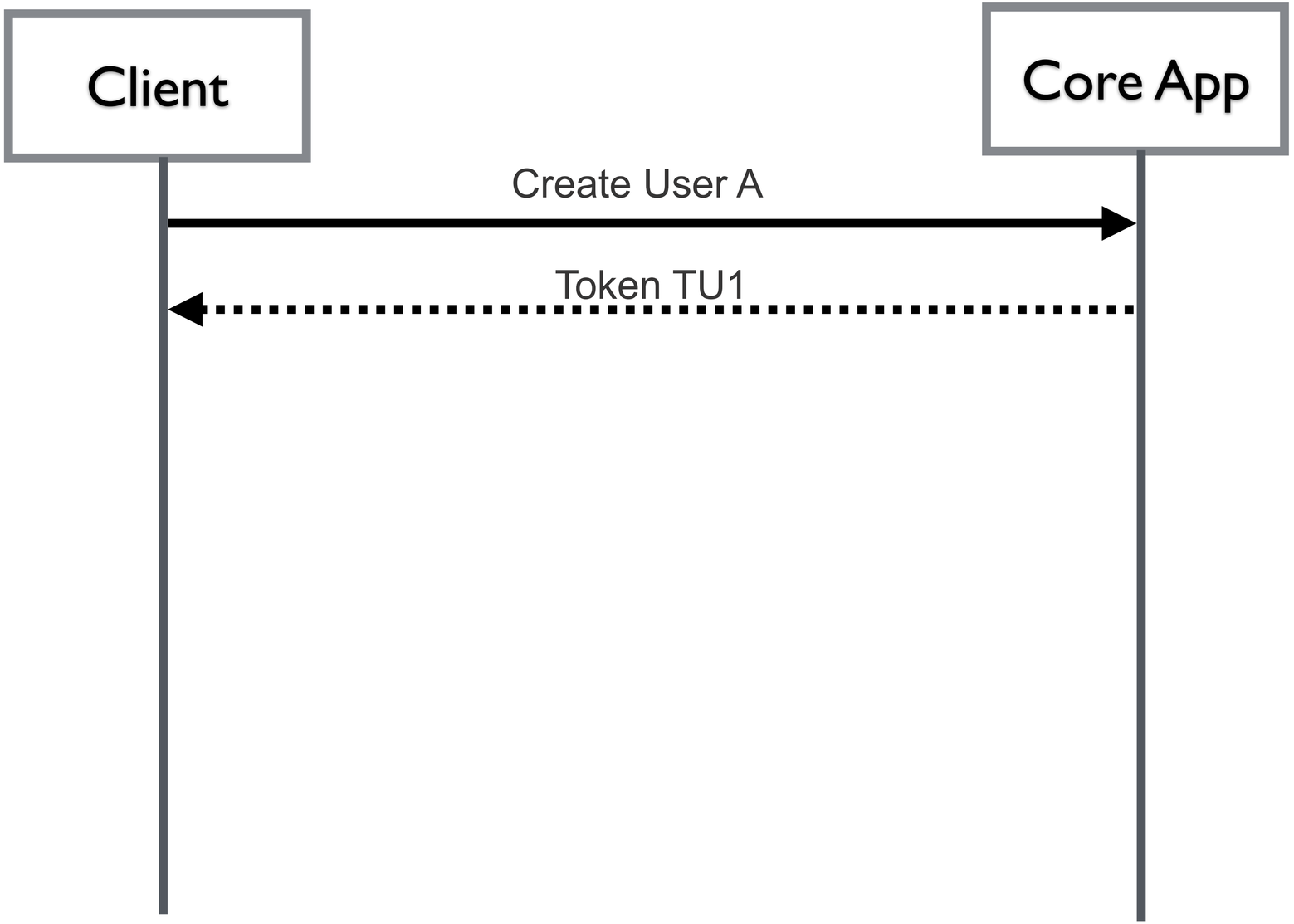
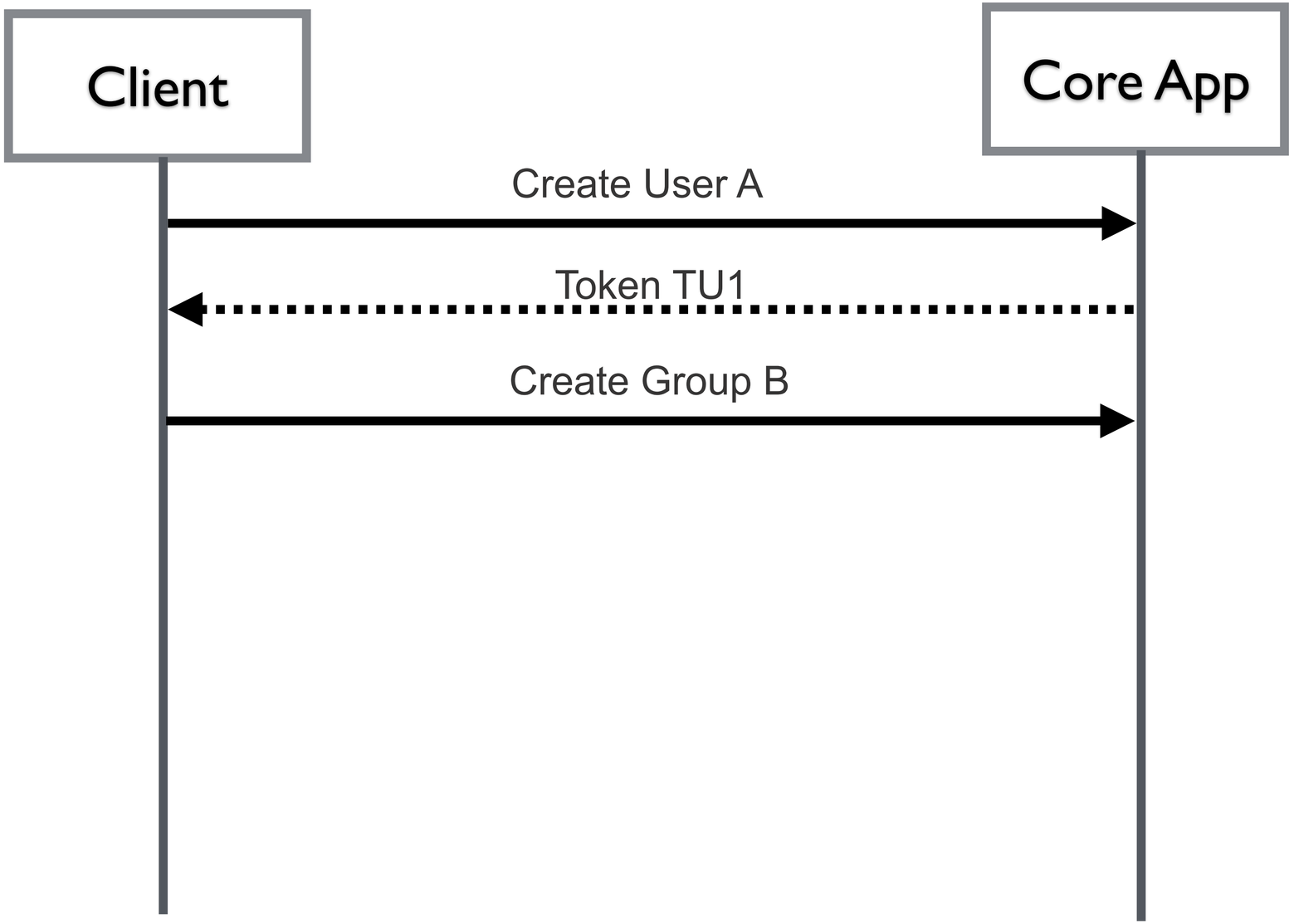


Using tokens to enforce state



Using tokens to enforce state



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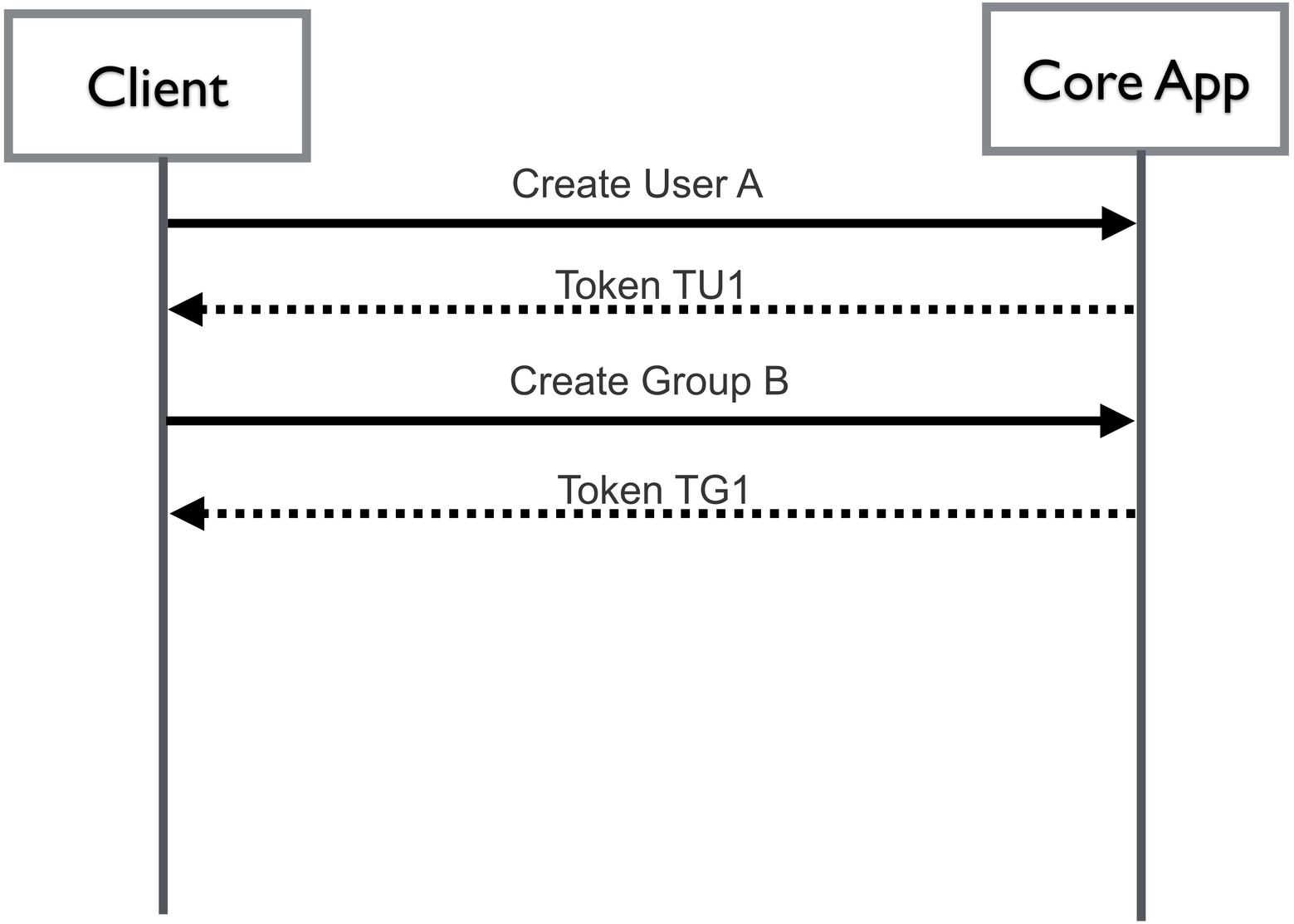

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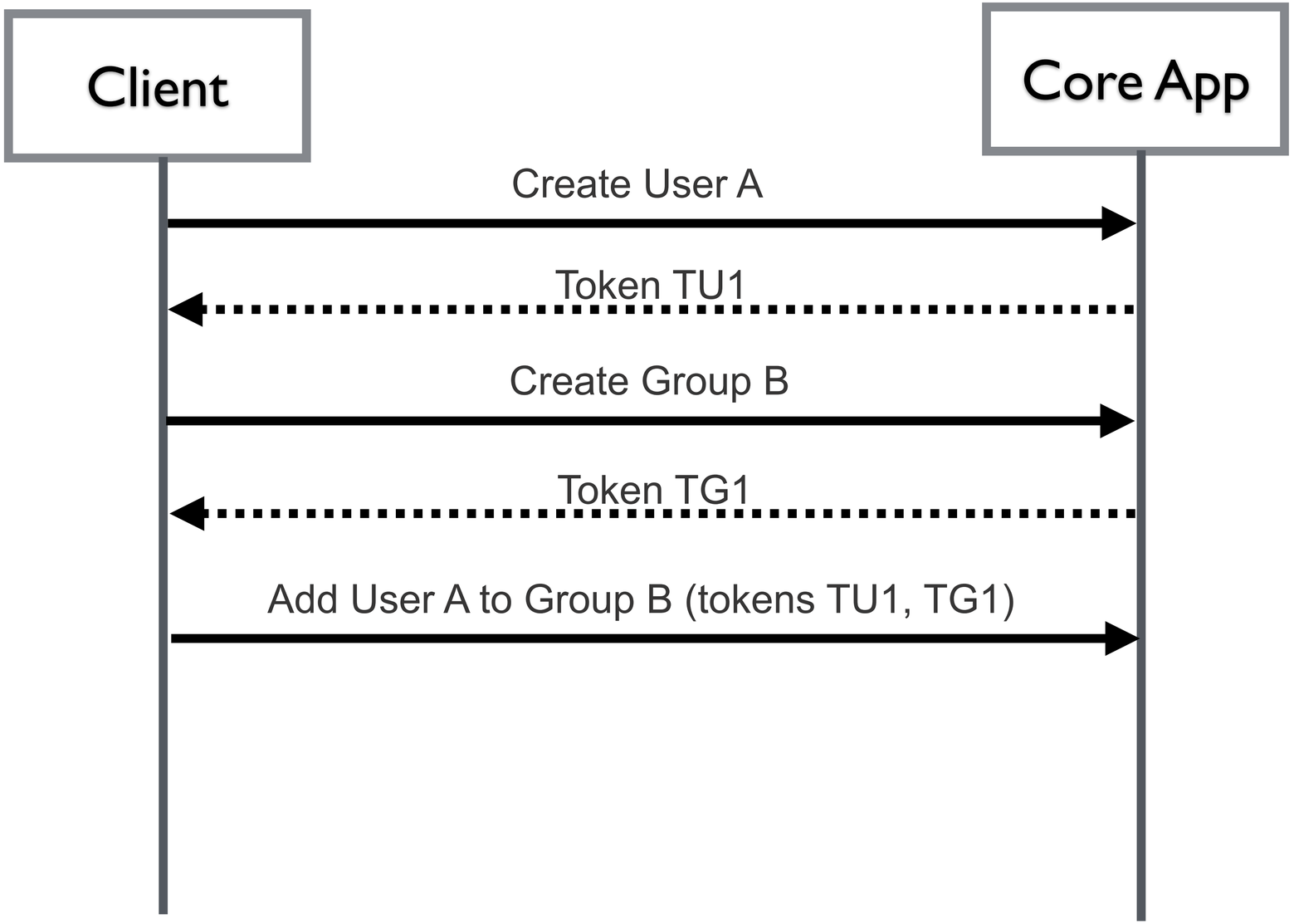

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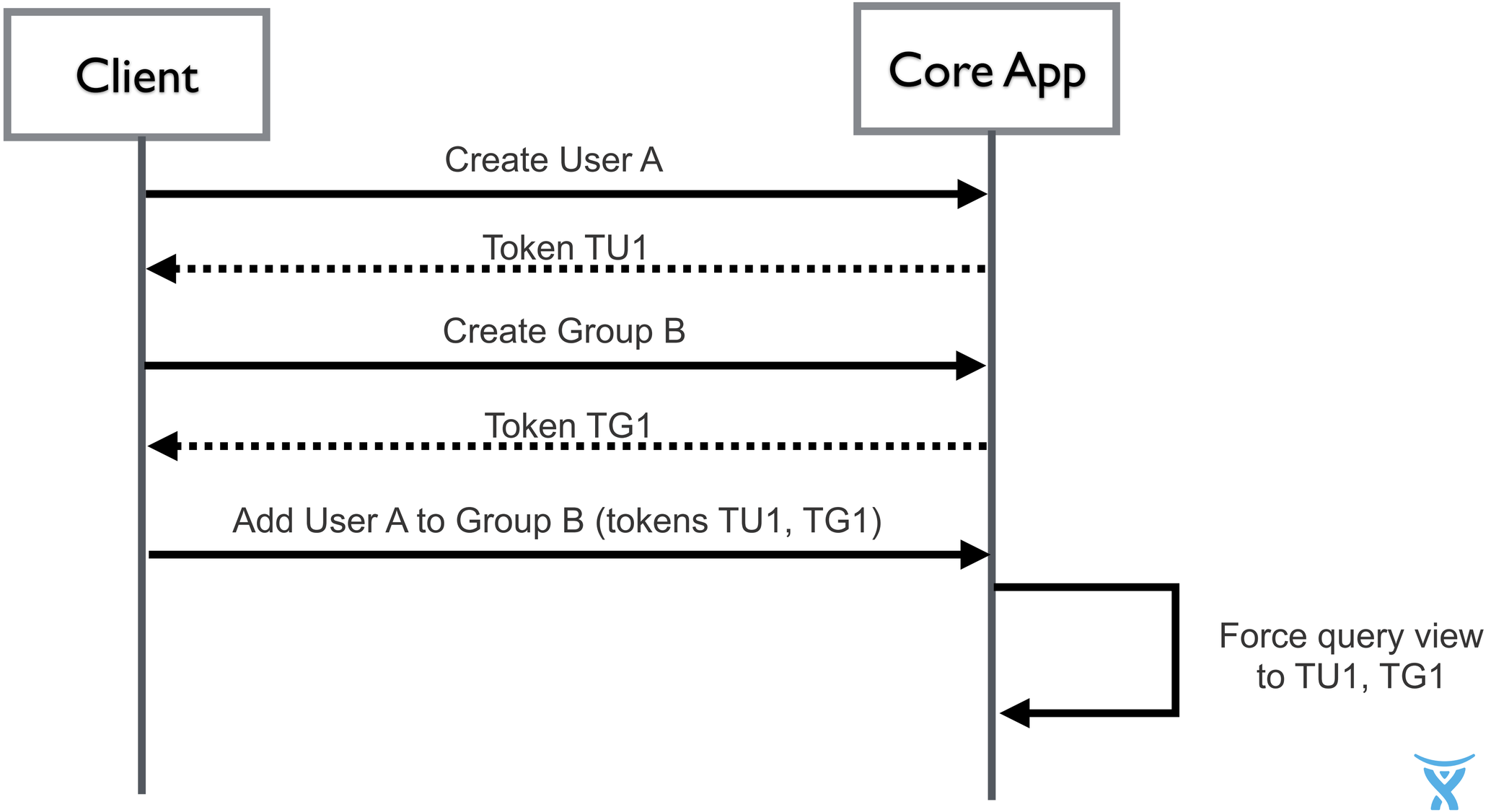

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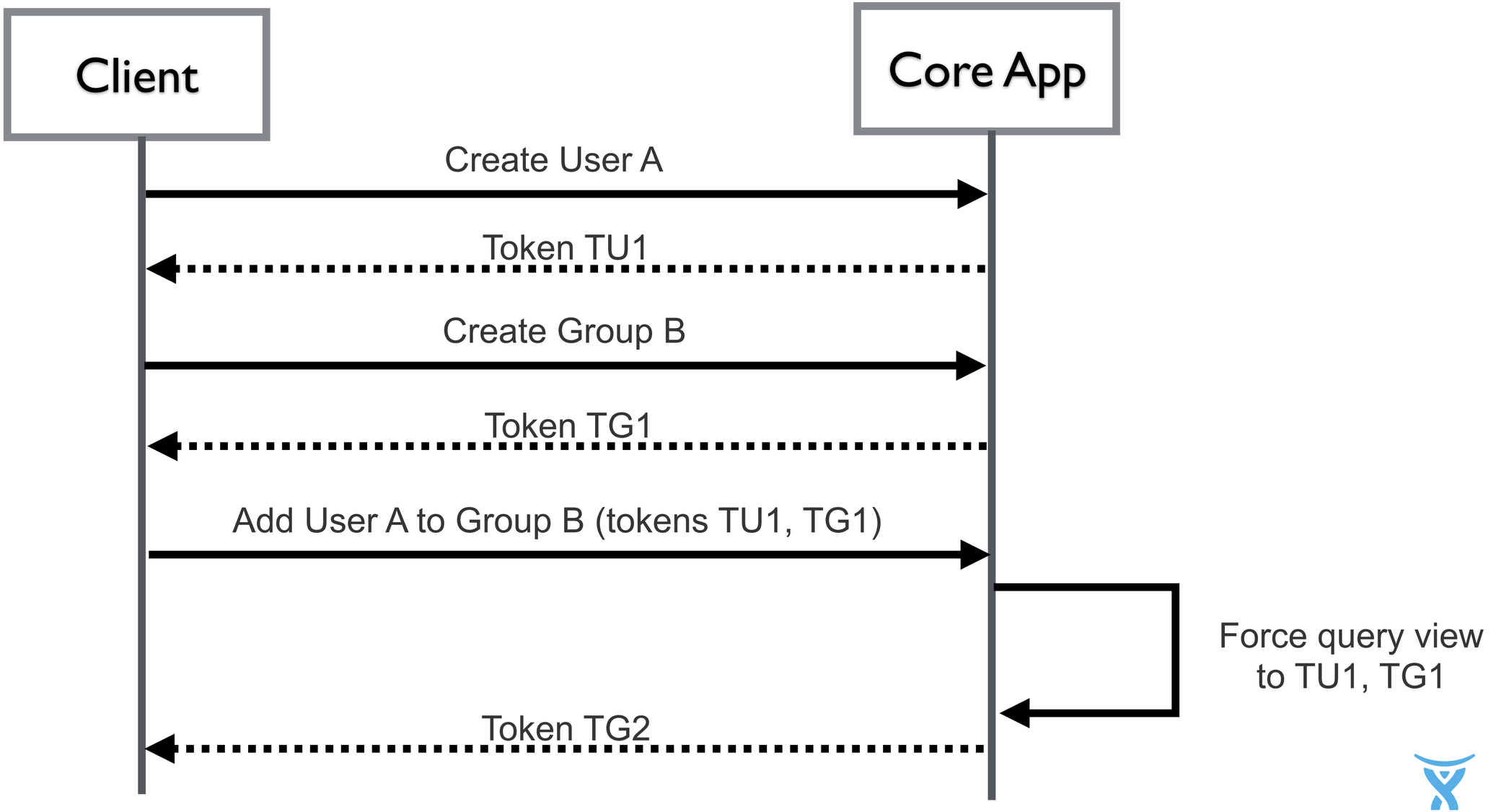

Conflict resolution instead of transactions

Resolve conflicts on query

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More resilient query views

Handles multi-region writes

Potential temporary glitch

Needs to be implemented on all query nodes

Summary

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- Incremental architecture for incremental demos
- Think “Events as an API”
- Accept weaker transactions and eventual consistency

“We should using event sourcing more than we do”

Martin Fowler (very loosely paraphrased)

event sourcing lib:
bitbucket.org/atlassianlabs/eventsrc