

# Kafka Summit Europe 2021

## Advanced Change Data Streaming Patterns in Distributed Systems

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# Gunnar Morling



- Open source software engineer at Red Hat
    - Debezium
    - Quarkus
  - Spec Lead for Bean Validation 2.0
  - Java Champion
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# Hans-Peter Grahsl



- Technical Trainer at NETCONOMY
- Independent Engineer & Consultant
- Confluent Community Catalyst
- MongoDB Champion

 @hpgrahsl



# Today's Objective: Learn About...

Outbox  
Pattern

Strangler Fig  
Pattern

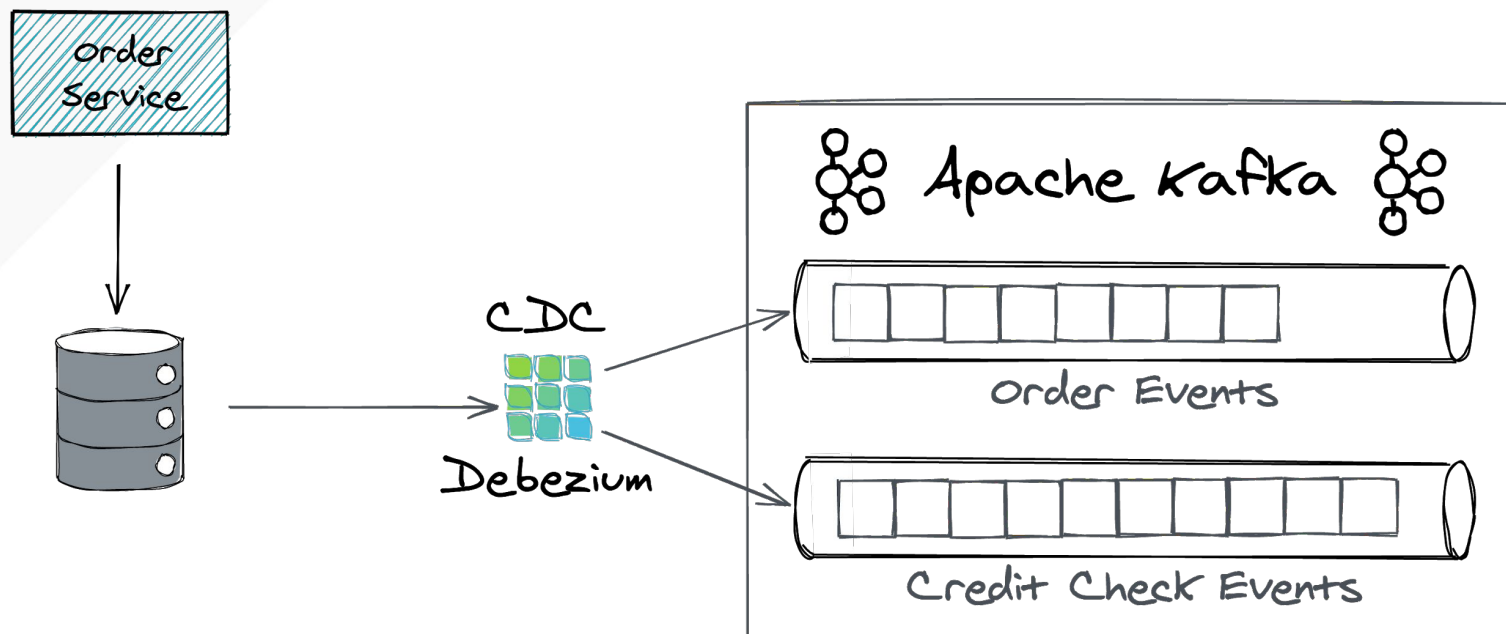
Saga  
Pattern

... implemented using **Change Data Capture**





# Debezium — Log-based Change Data Capture



- **Taps into TX log** to capture INSERT/UPDATE/DELETE events
- Propagated to consumers via **Apache Kafka** and Kafka Connect



# Outbox Pattern



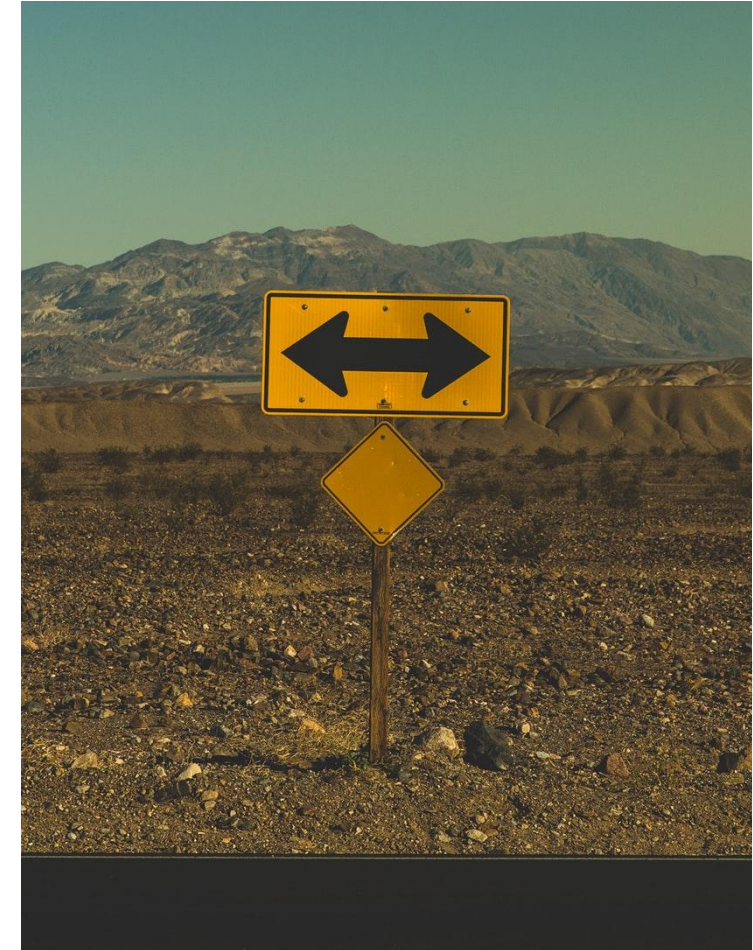
Montag-Freitag Samstag Sonntag	letzte Tagesleistung 15:15 11:30		
Nächster Briefkasten mit späteren Leerungen	Berliner Straße 17-25 Filiale 21481 Lauenburg	Nachbildung eines Briefkasten von 1898	





# The Problem: Microservices Data Exchange

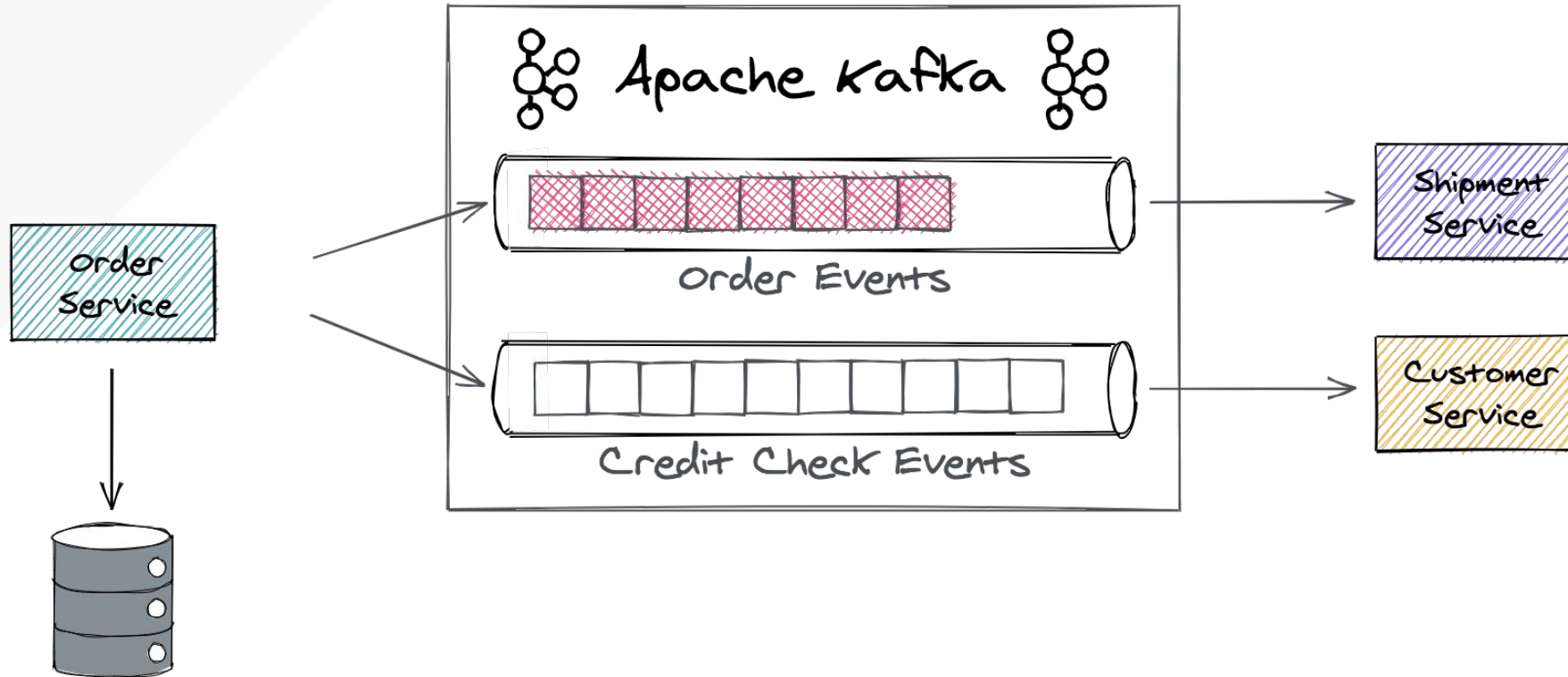
- Services need to update their **database**,
- send messages to **other services**,
- and that **consistently!**







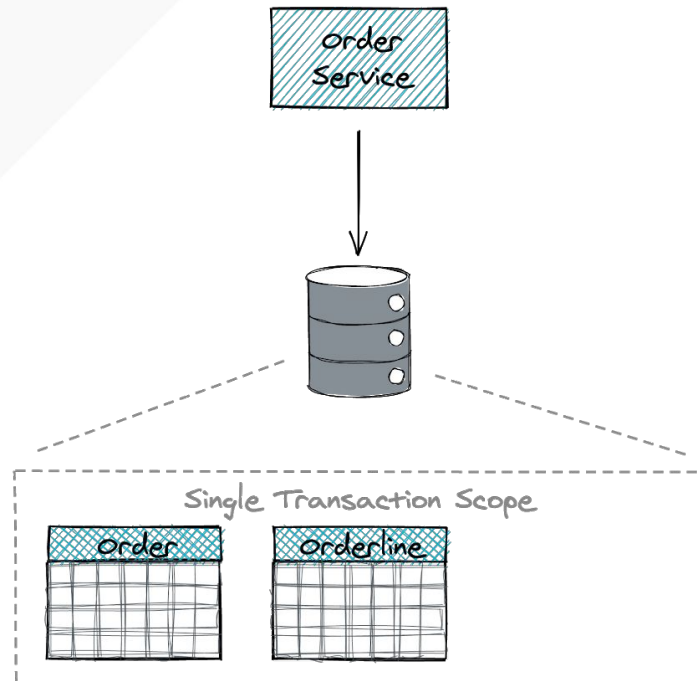
# Outbox Pattern



"Dual writes" are **prone to inconsistencies!**

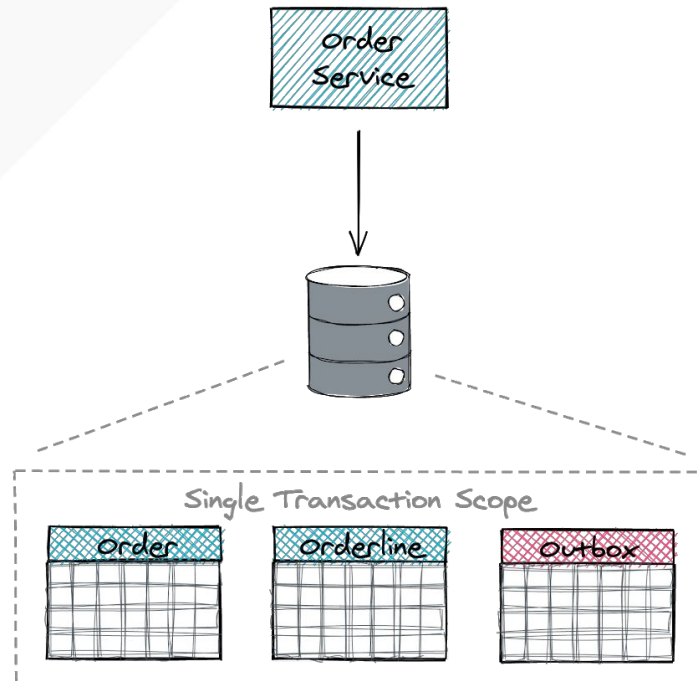


# Outbox Pattern





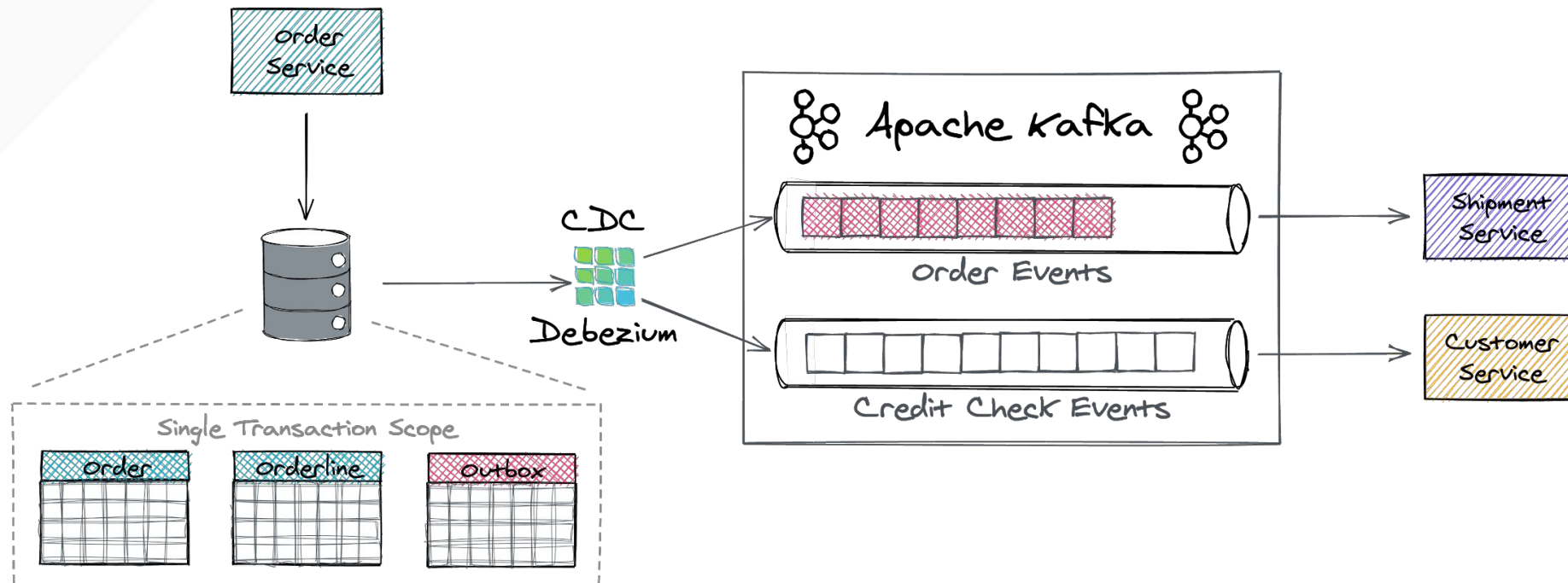
# Outbox Pattern







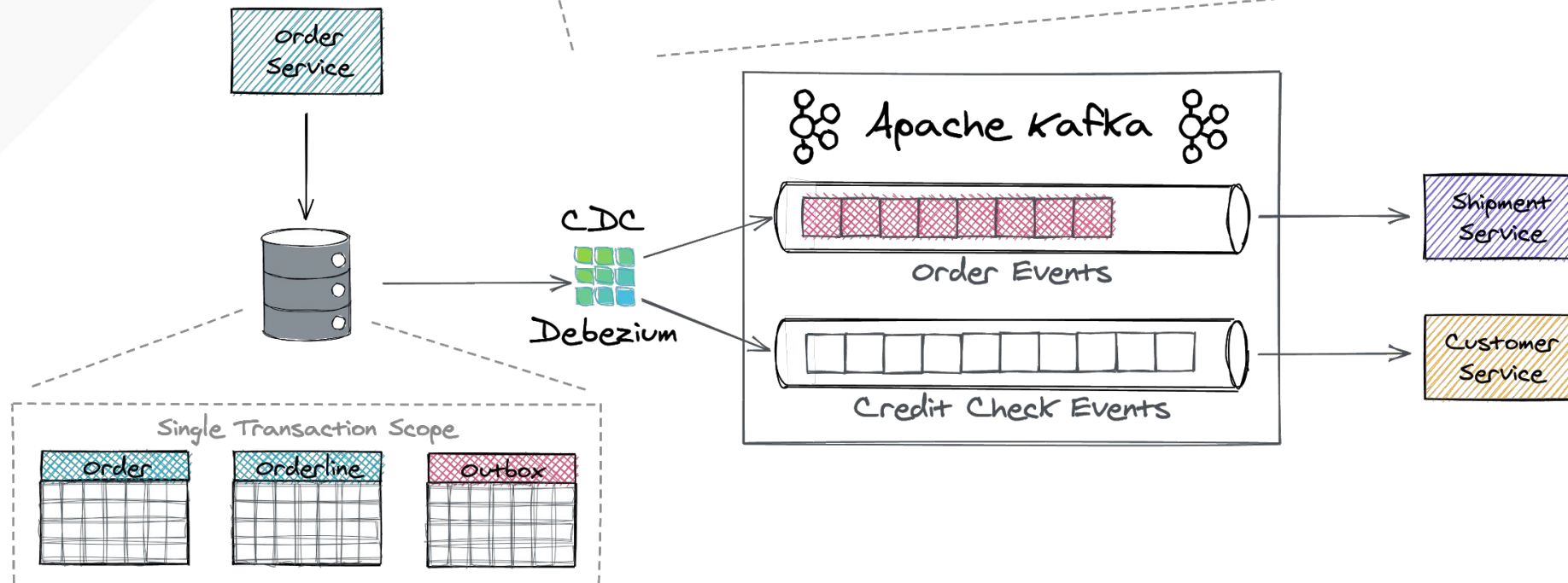
# Outbox Pattern





# Outbox Pattern

Outbox Table				
Id	AggregateType	AggregateId	EventType	Payload
ec6e	order	123	orderCreated	{ "id": 123, ... }
8af8	order	456	orderLineChanged	{ "id": 456, ... }
...				





A low-angle photograph of a massive, ancient tree in a lush forest. The tree's trunk is thick and gnarled, with a dense network of aerial roots hanging down from the canopy. The roots are light brown and appear to be in various stages of growth, some reaching the ground. The foliage is dense and green, with sunlight filtering through the leaves. The overall scene is one of a well-preserved, old-growth forest.

# Strangler Fig Pattern





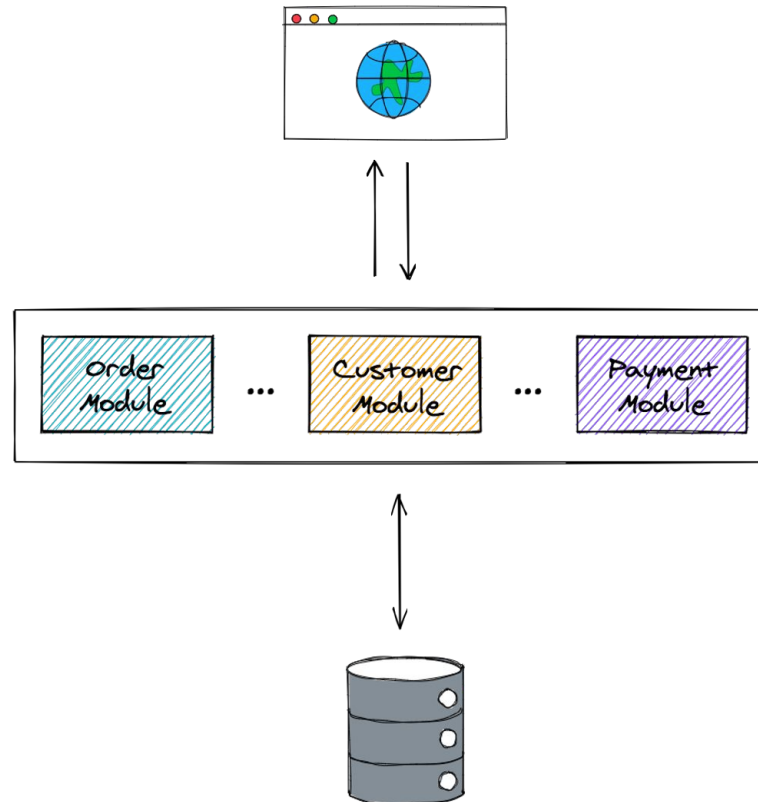
# The Problem: Migrating Systems

- **Gradually evolve** from old into new
- Support temporary **coexistence**
- **Avoid big bang** cut-over



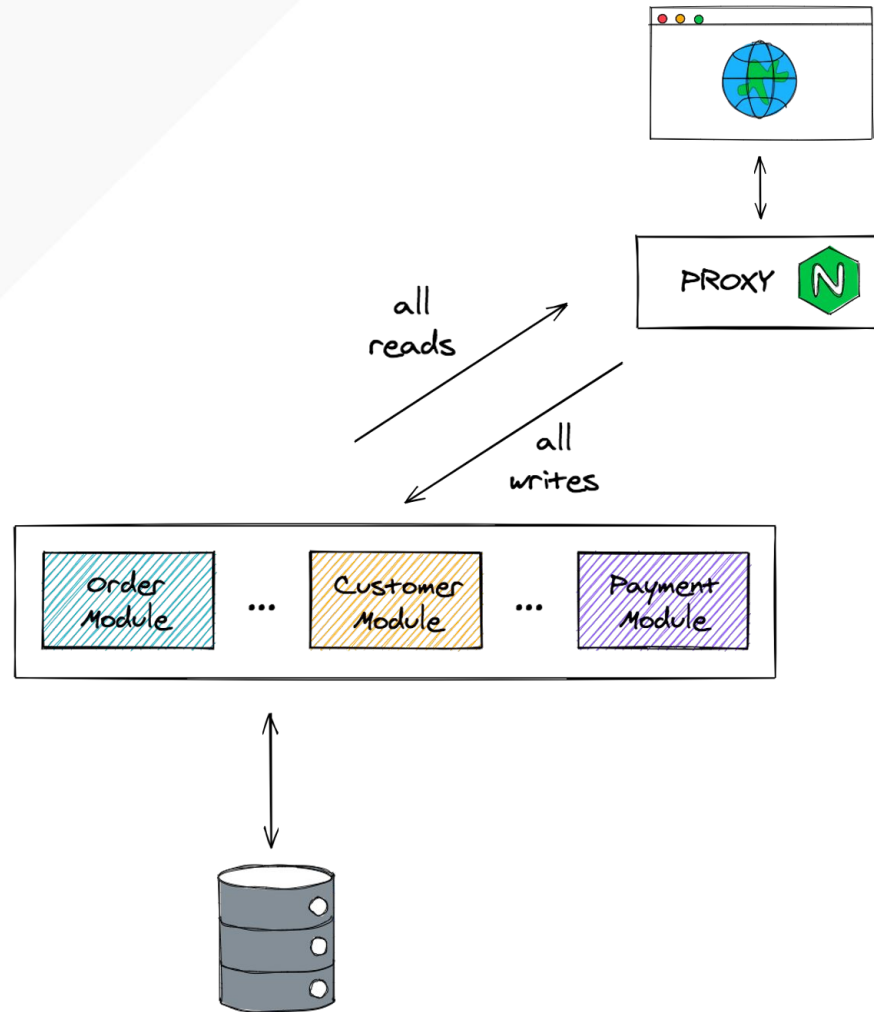


# Strangler Fig Pattern





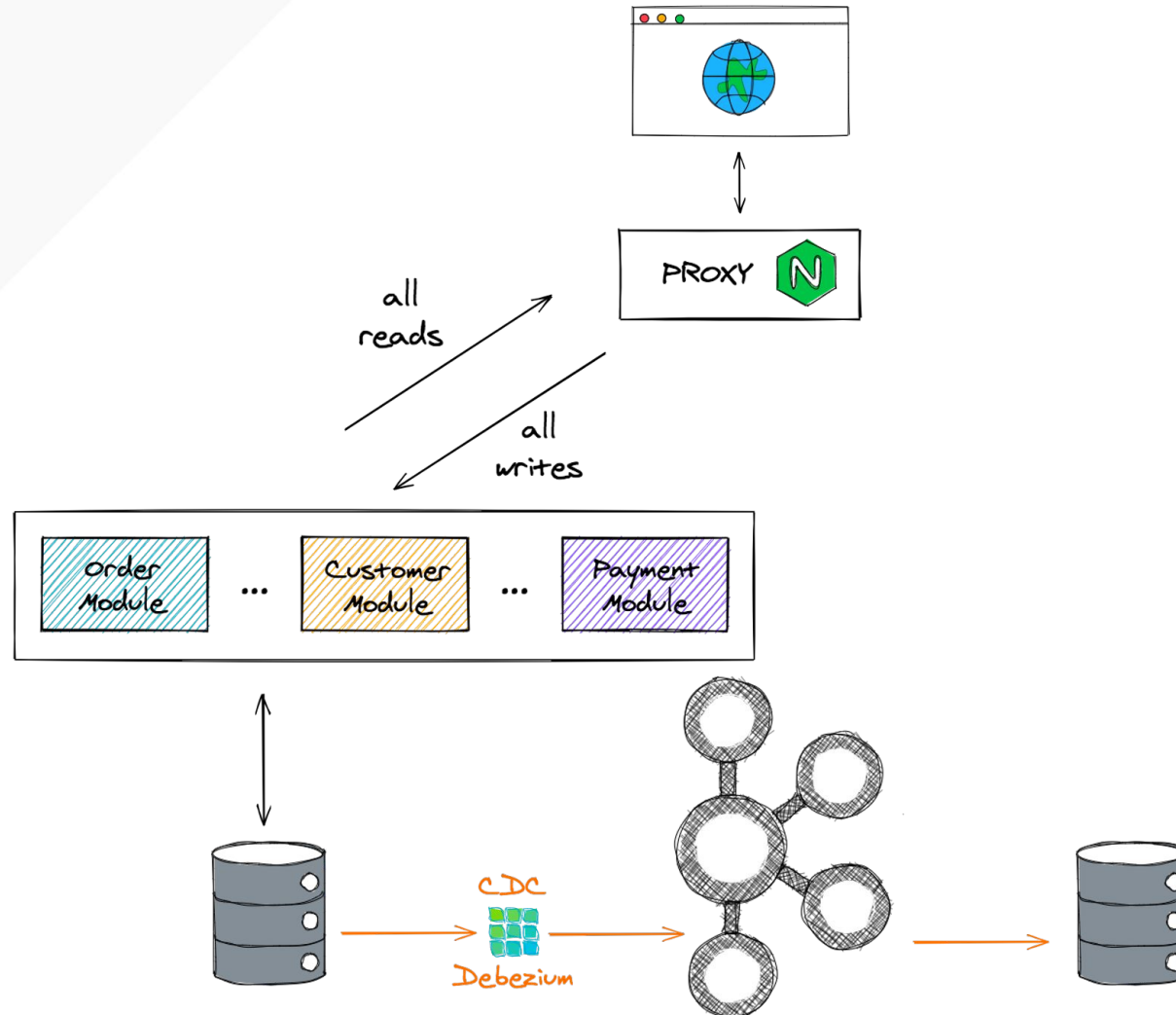
# Strangler Fig Pattern





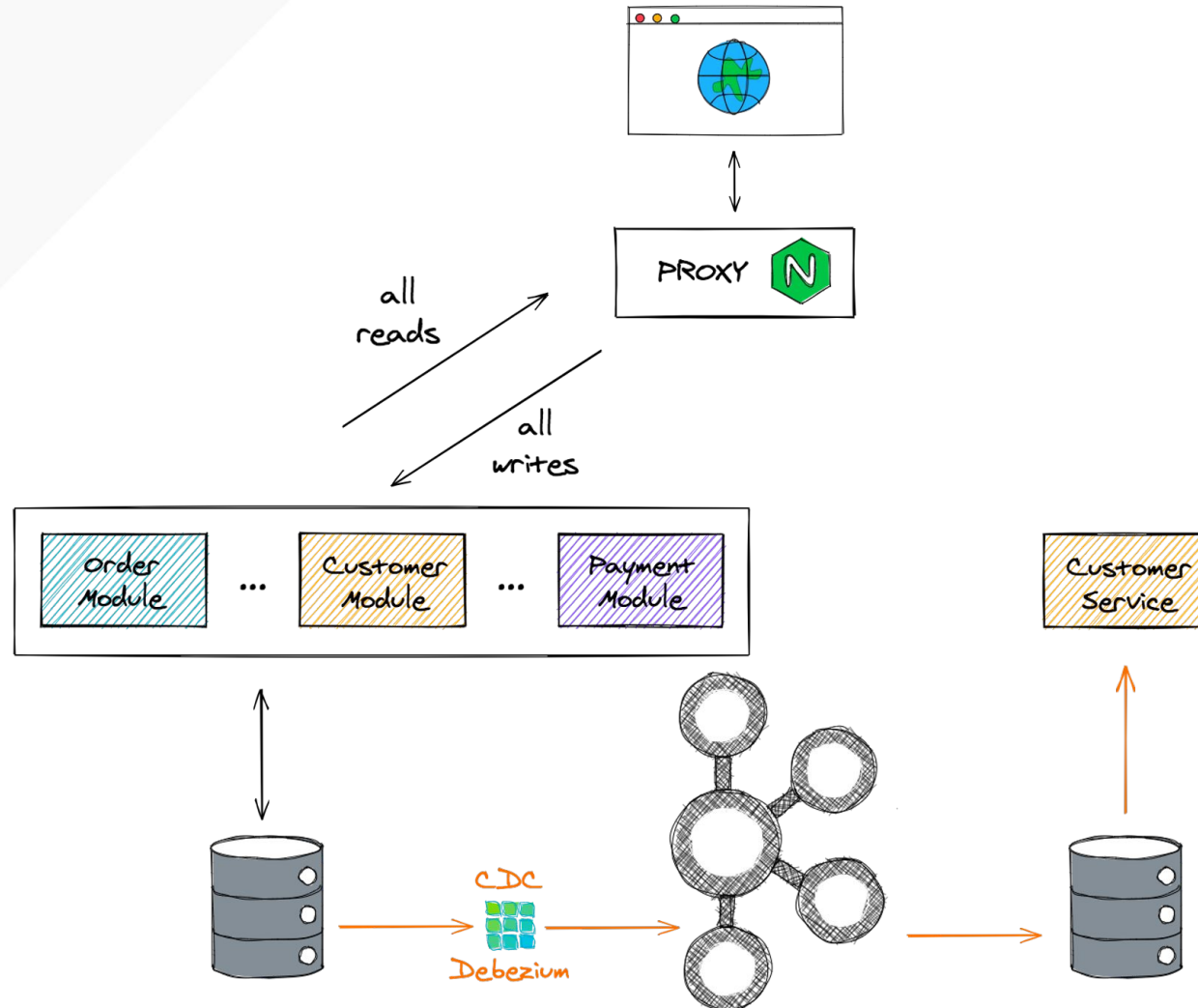


# Strangler Fig Pattern



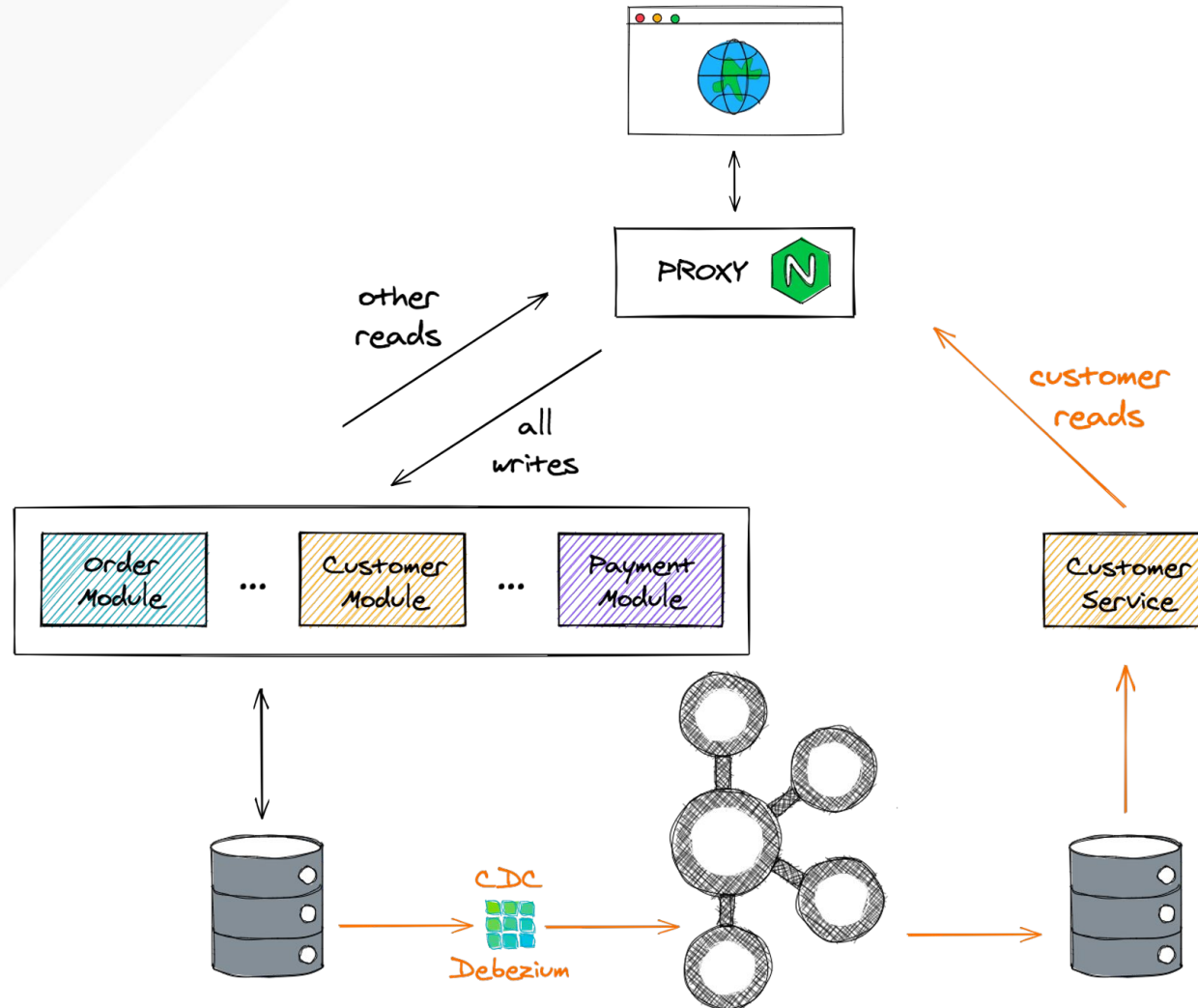


# Strangler Fig Pattern



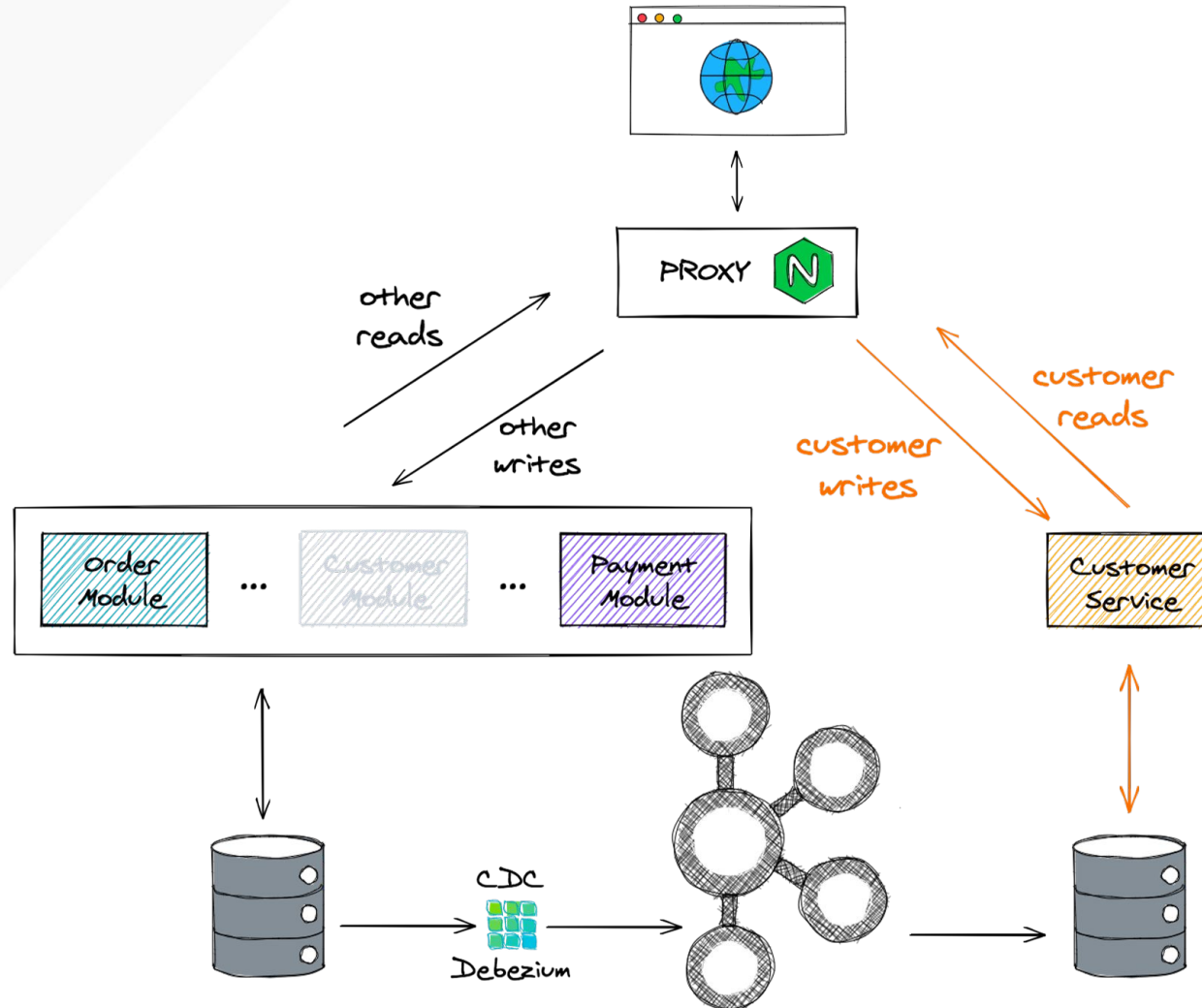


# Strangler Fig Pattern





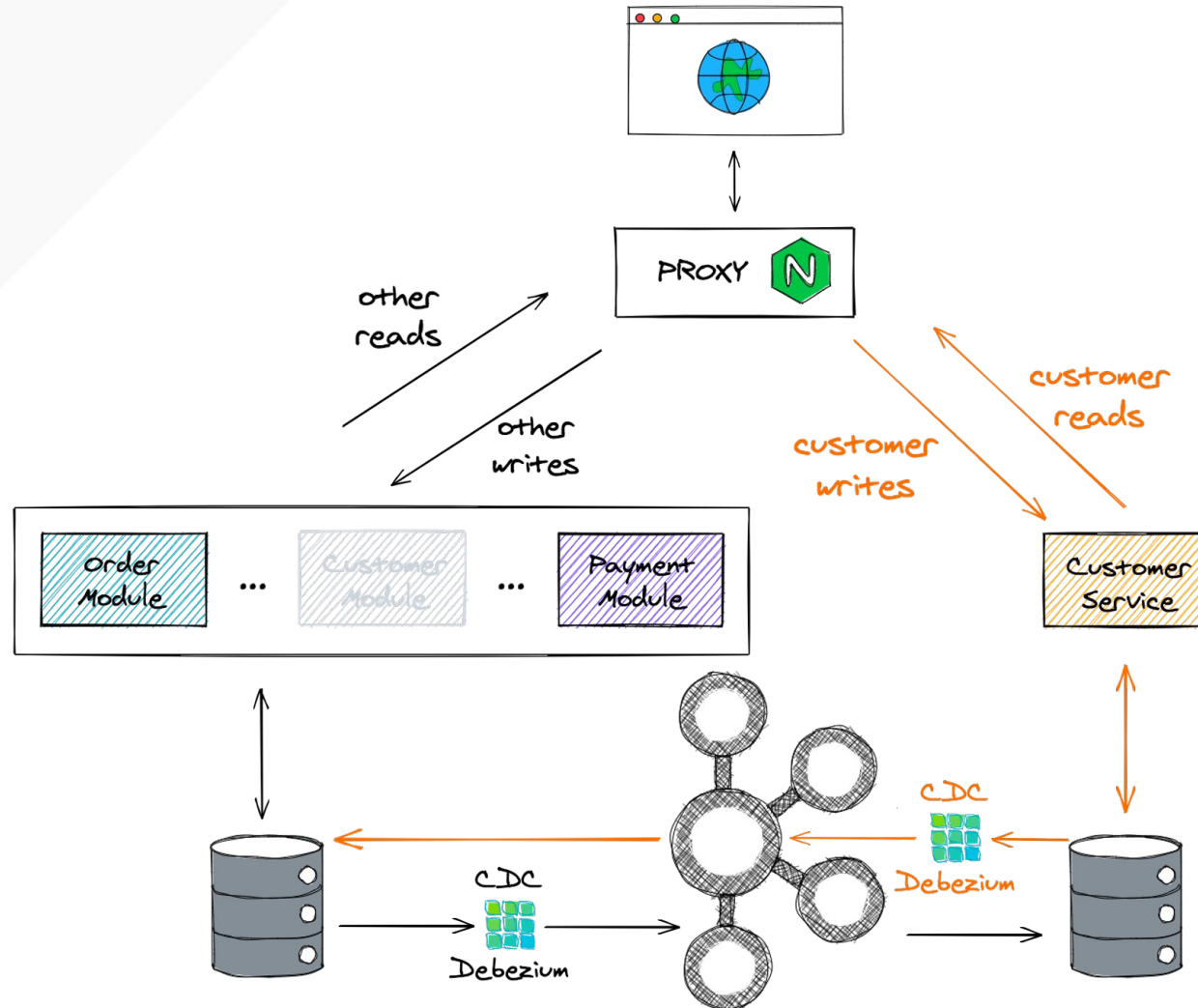
# Strangler Fig Pattern







# Strangler Fig Pattern





# Benefits

- Incremental migration → **“baby steps”**
- **Pause or stop** migration without losing spent efforts
- Migration steps ideally **reversible**

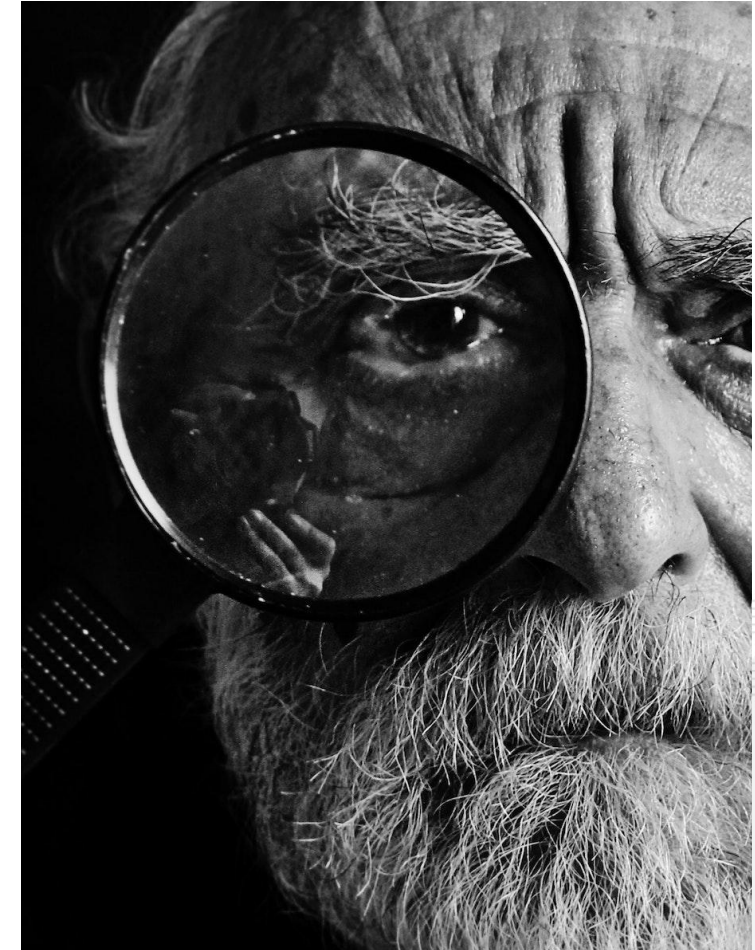
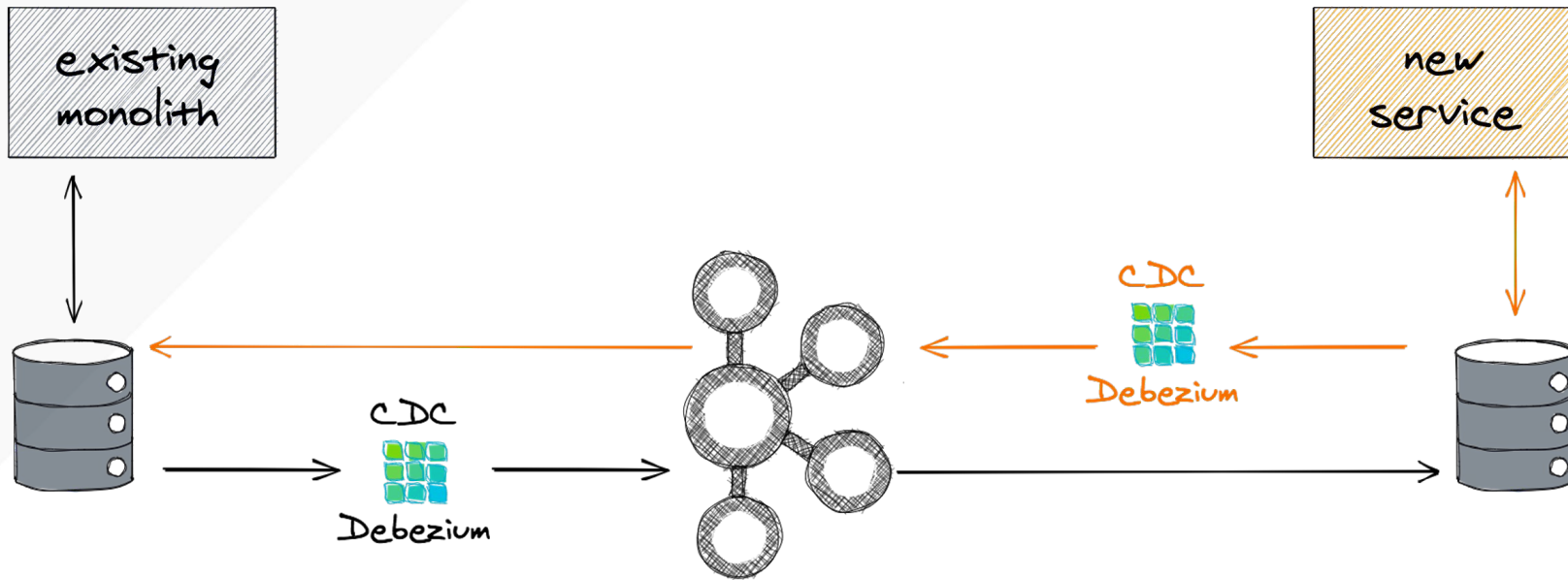
Rationale: ⚠️ **minimize risk** ⚠️





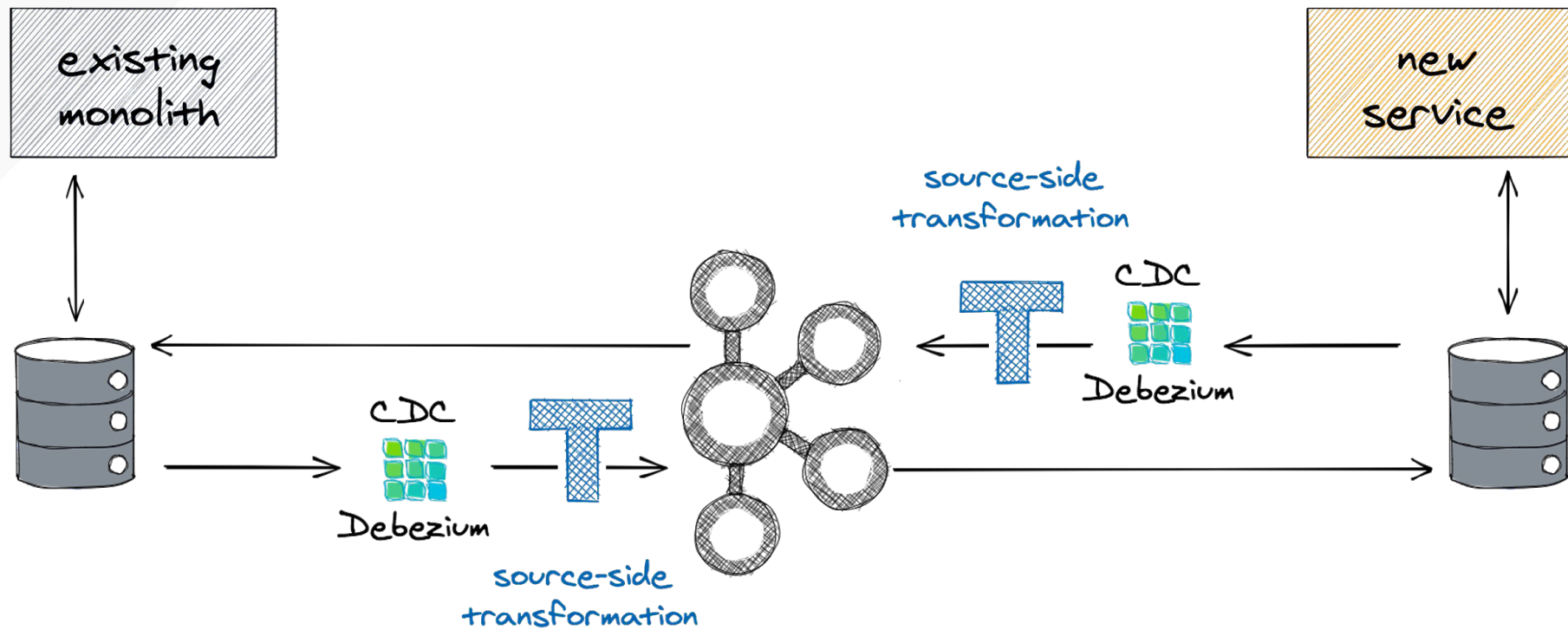


# CDC Close-Up





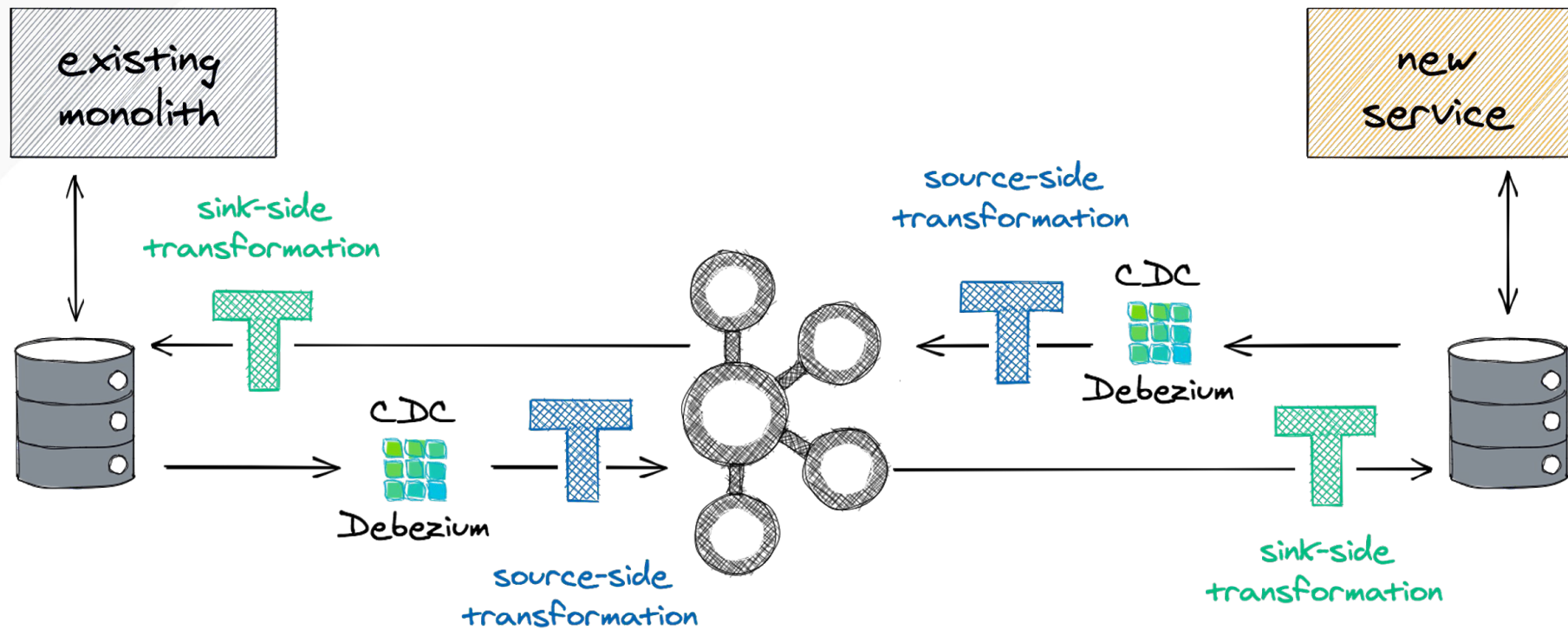
# Enhanced CDC Processing





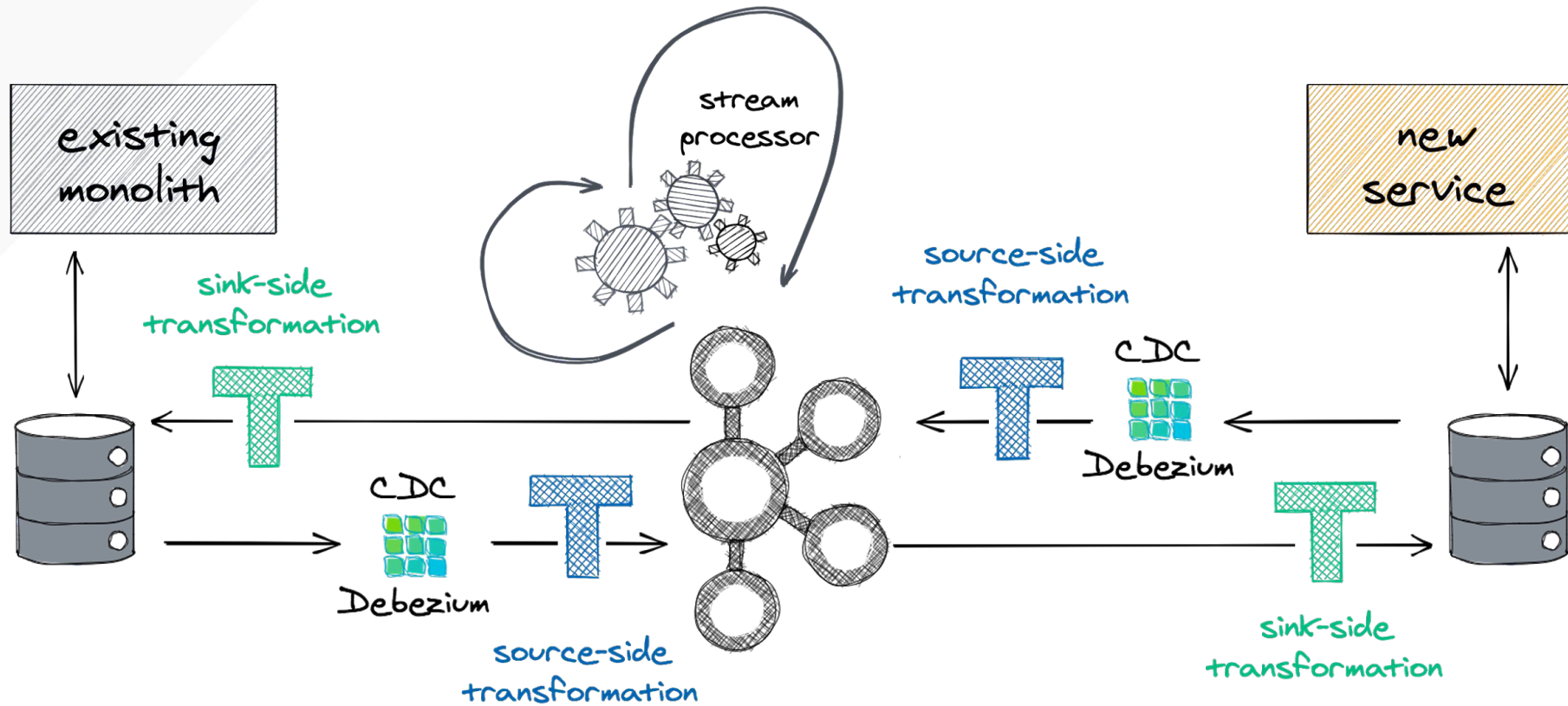


# Enhanced CDC Processing





# Enhanced CDC Processing



# Saga Pattern







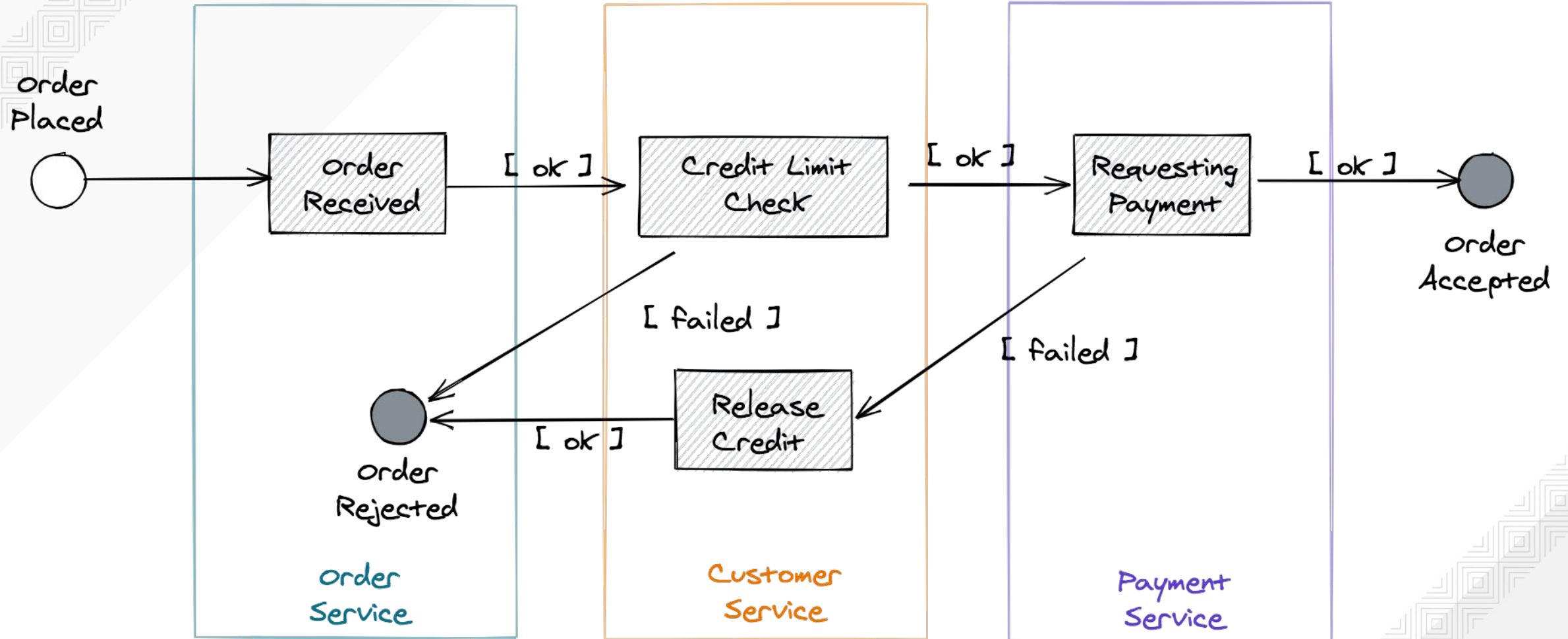
# The Problem: Long-running Business Transactions

- Multiple services need to **act collaboratively** to achieve a consistent outcome
- **Without 2-phase commit** protocols
- Ensure **correctness** in case of failures



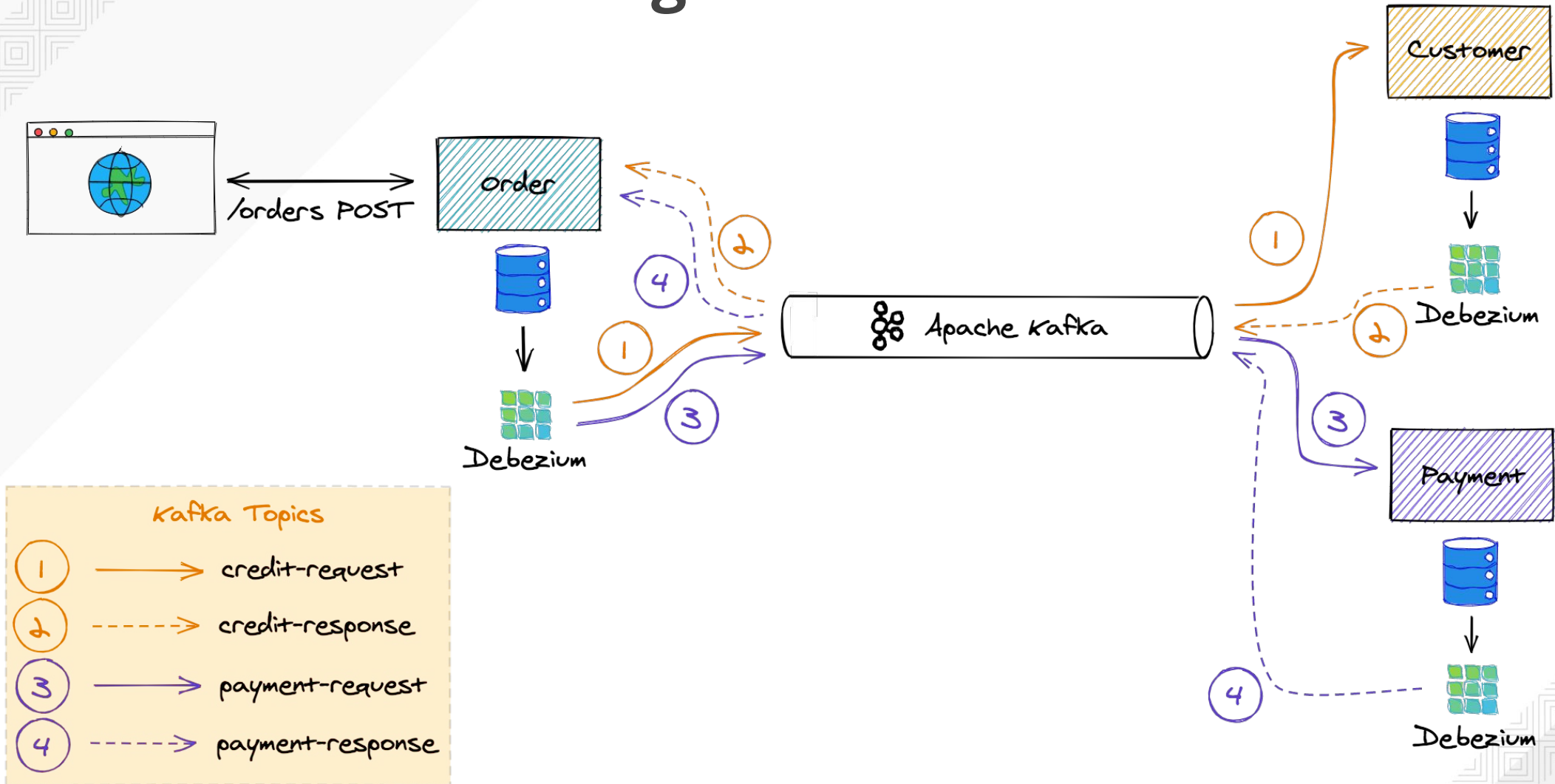


# Saga Pattern





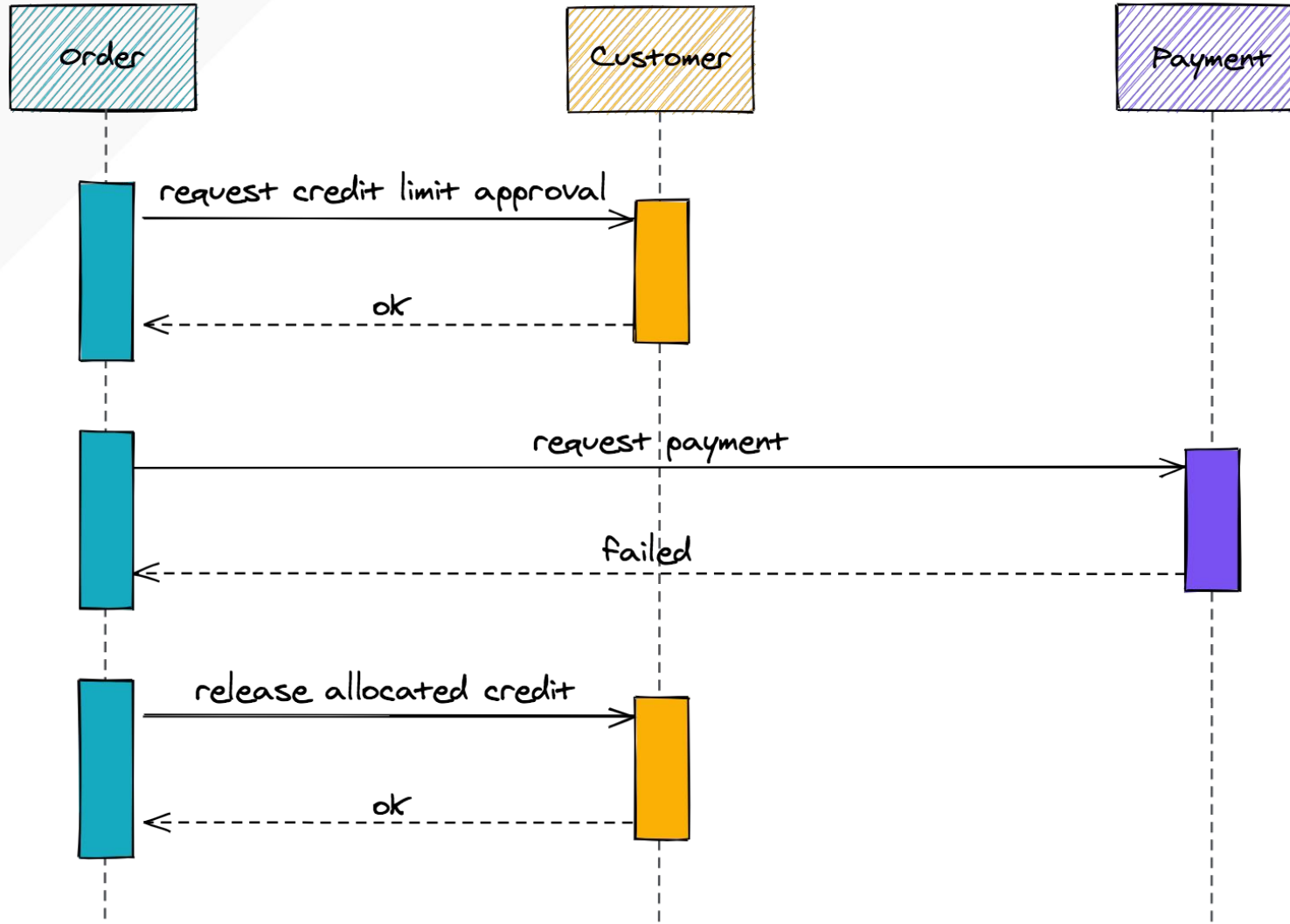
# Saga Pattern







# Saga Pattern



# Demo

```
17 do_action( 'woocommerce_before_single_product' );
18 ?>
19
20 <div itemscope itemtype="http://schema.org/Product" id="product-?php the_ID(); ?>" <?php post_class(); ?>
21
22 <div class="row">
23
24   <div class="large-9 columns">
25     <div class="row">
26       <div class="large-8 columns product-gallery">
27
28         <?php
29           /**
30            * woocommerce_show_product_images hook
31            *
32            * @hooked woocommerce_show_product_sale_flash - 10
33            * @hooked woocommerce_show_product_images - 20
34            */
35           do_action( 'woocommerce_before_single_product_summary' );
36
37         ?>
38
39       </div><!-- end large-6 - product-gallery -->
40
41     <div class="product-info large-12 small-12 columns left">
42       <div class="droite">
43         <?php
44           /**
45            * woocommerce_single_product_summary hook
46            *
47            * @hooked woocommerce_template_single_title - 5
48            * @hooked woocommerce_template_single_price - 10
49            * @hooked ProductShowReviews() (inc/template-tags.php) - 15
50            * @hooked woocommerce_template_single_excerpt - 20
51            * @hooked woocommerce_template_single_add_to_cart - 30
52            * @hooked woocommerce_template_single_meta - 40
53            * @hooked woocommerce_template_single_sharing - 50
54            */
55           do_action( 'woocommerce_single_product_summary' );
56
57         ?>
58       </div>
59     </div><!-- end product-info large-4 -->
60
61   </div><!-- row -->
62
63   <div class="row">
64     <div class="large-12 columns">
```







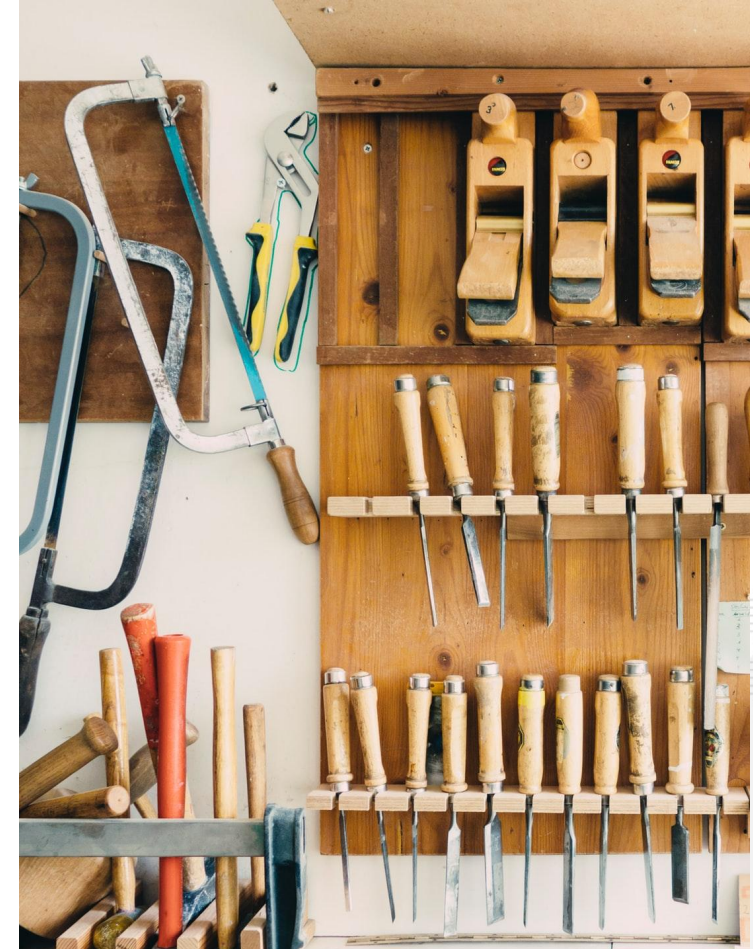
**Wrap-Up**





# Takeaways

- **CDC:** a powerful tool in the box for event-driven architectures
- **Debezium:** open-source CDC for a variety of databases
- **Call to Action:**  
Would you like **built-in Saga support**?





# Resources

- **Outbox** implementation

<https://debezium.io/blog/2019/02/19/reliable-microservices-data-exchange-with-the-outbox-pattern/>

- **Strangler fig** pattern

<https://martinfowler.com/bliki/StranglerFigApplication.html>

- **Saga** implementation

<https://www.infoq.com/articles/saga-orchestration-outbox/>



# Q & A



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