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Data Consistency In Distributed Systems

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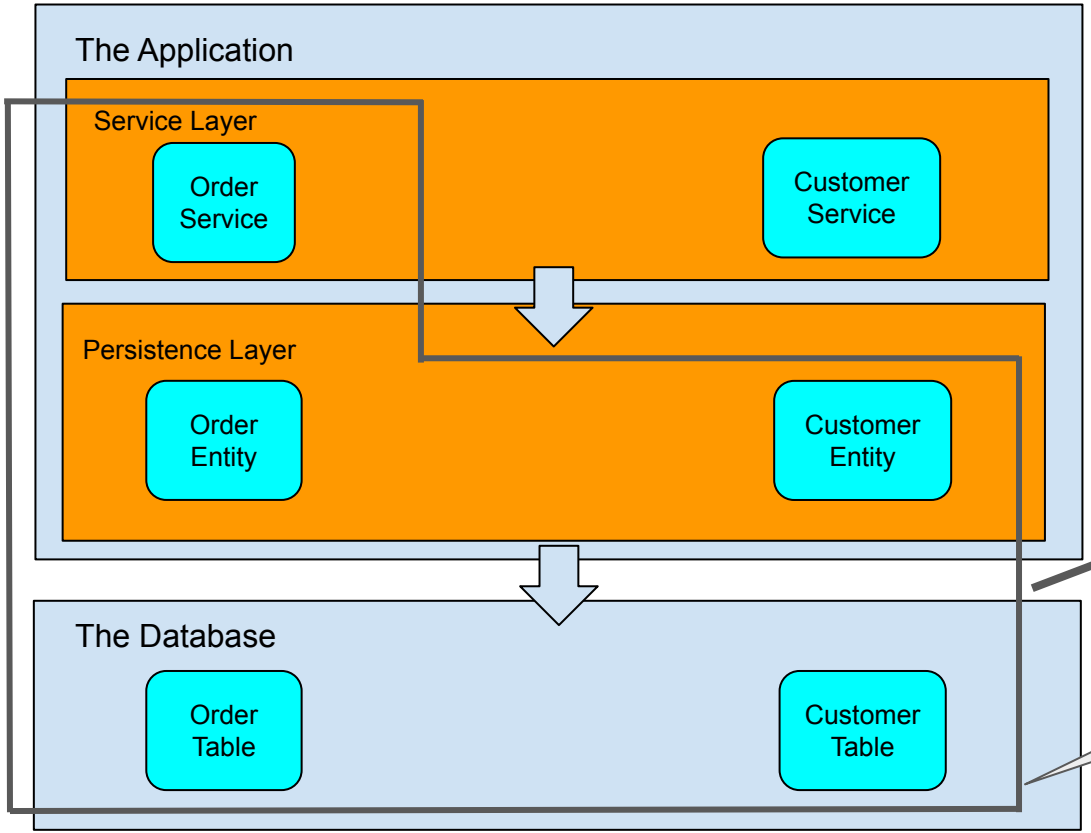
Agenda

- ❑ ACID and distributed systems
- ❑ 2PC
- ❑ BASE
- ❑ SAGA
- ❑ Implement SAGA with BPMN

Transactions in a Monolithic Architecture




```
class OrderService{

    @Transactional
    public void createOrder(Order order){
        //...
    }
}
```

Transaction
All or nothing

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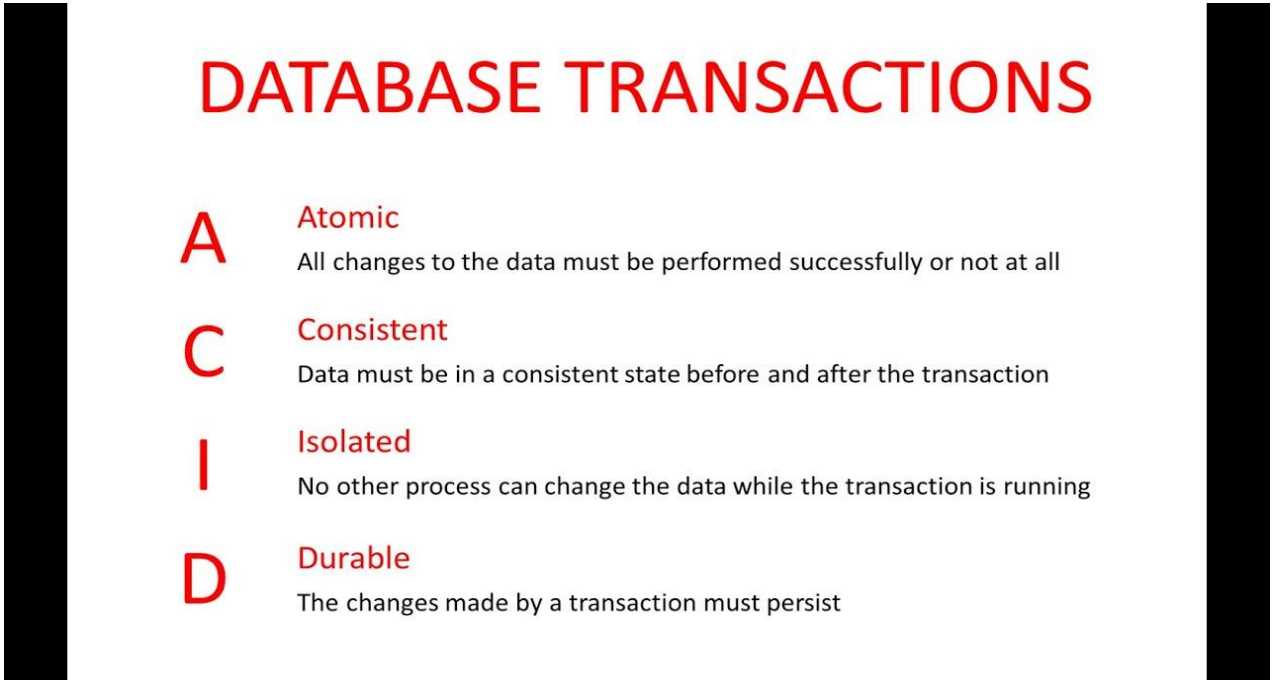
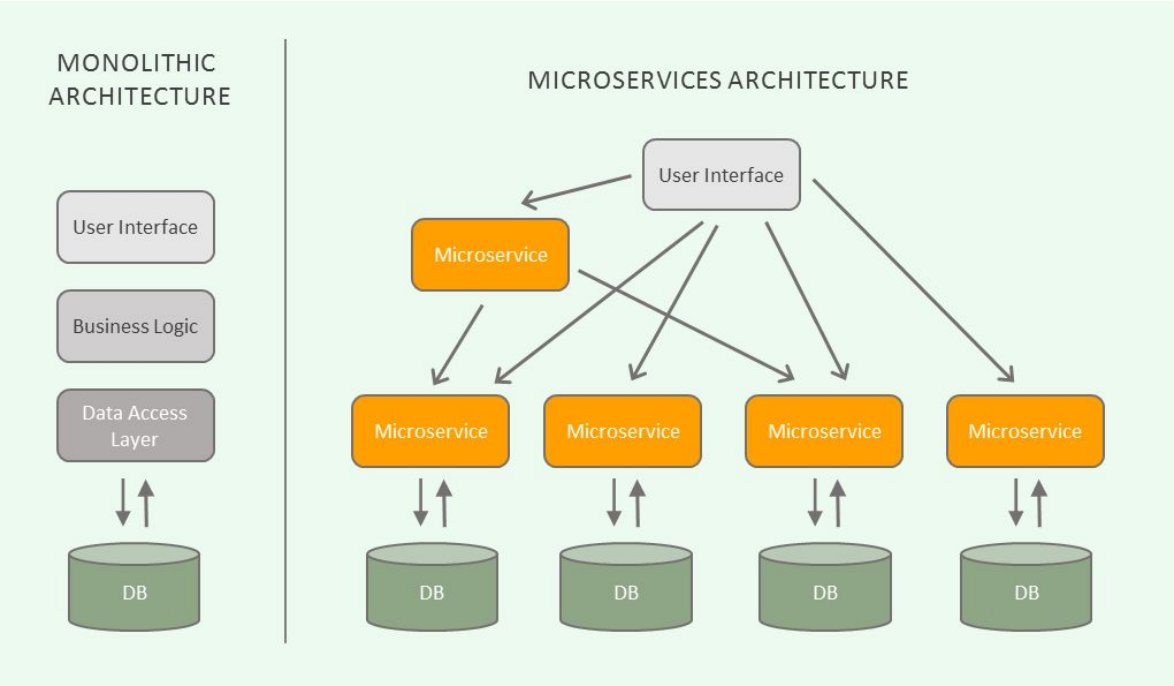
ACID



https://thecustomizewindows.com/2021/02/what-is-acid-in-computing/

Distributed Systems



https://medium.com/hackernoon/how-microservices-saved-the-internet-30cd4b9c6230

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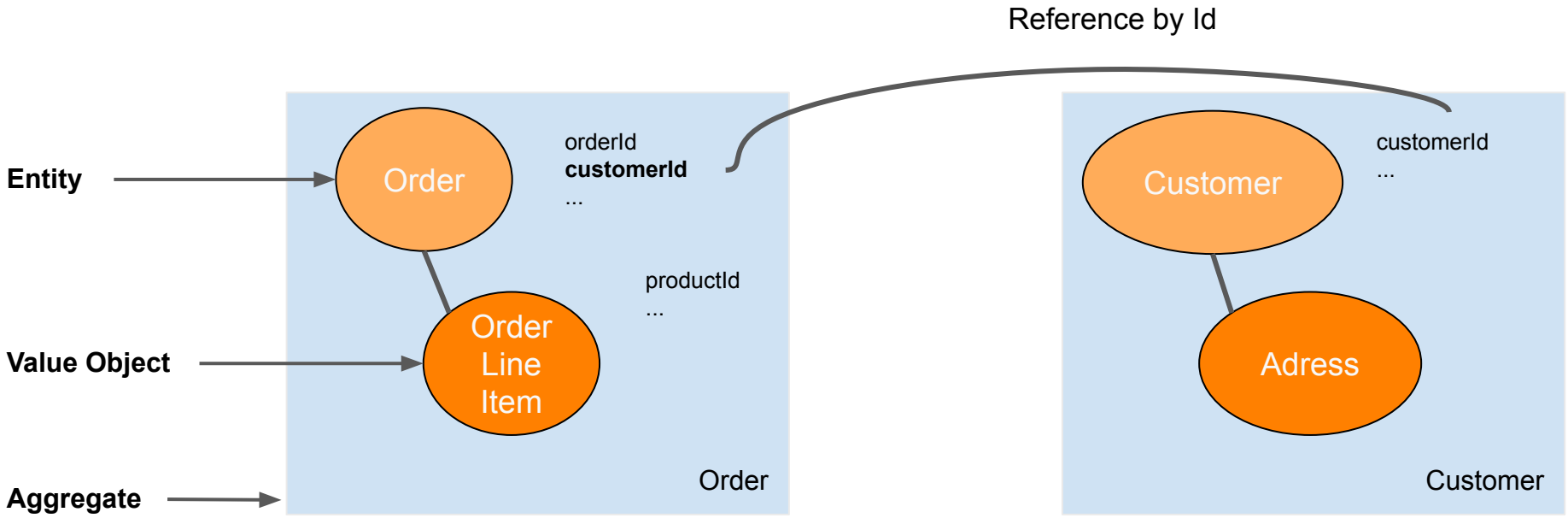
Aggregates



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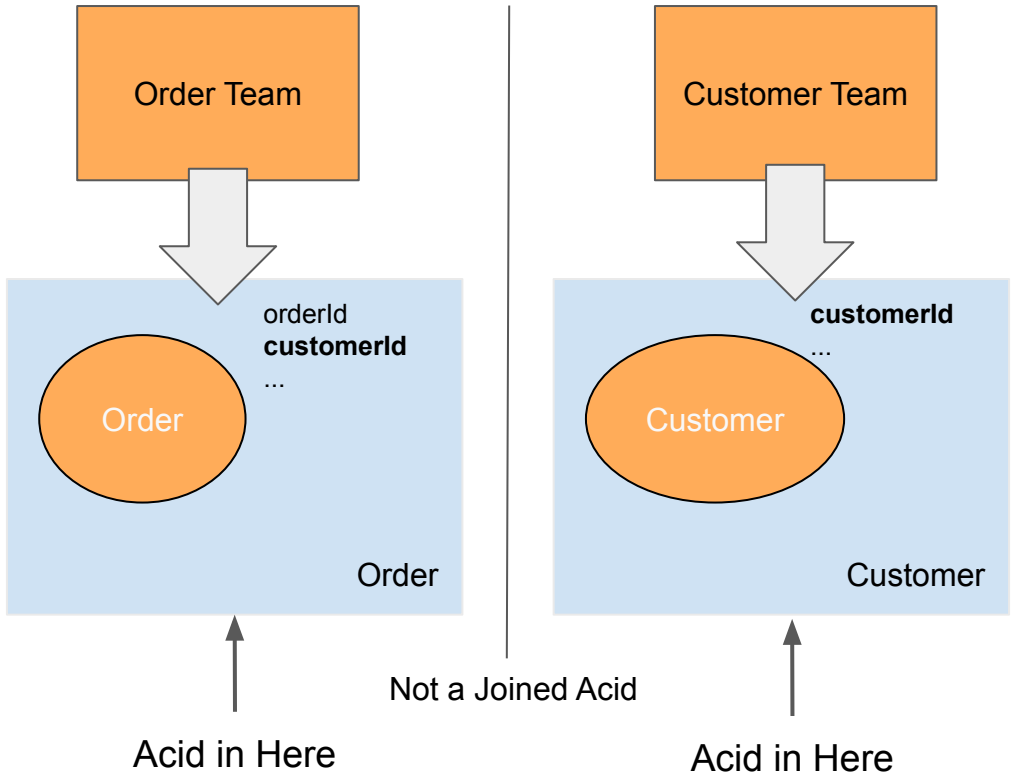
Transaction in Aggregates



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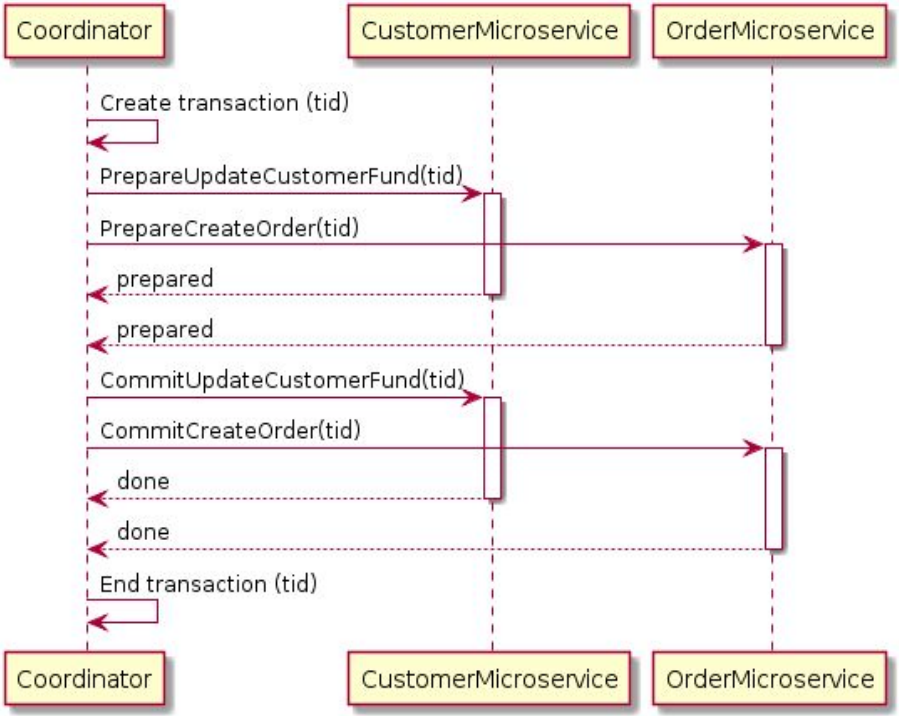
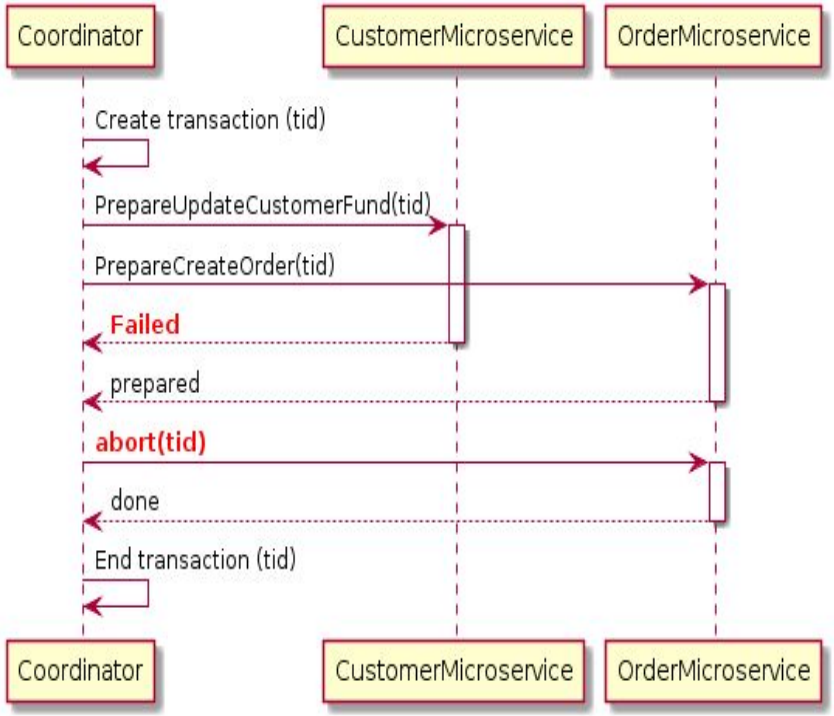
2PC (XA)





https://developers.redhat.com/blog/2018/10/01/patterns-for-distributed-transactions-within-a-microservices-architecture#what_is_a_distributed_transxaction_

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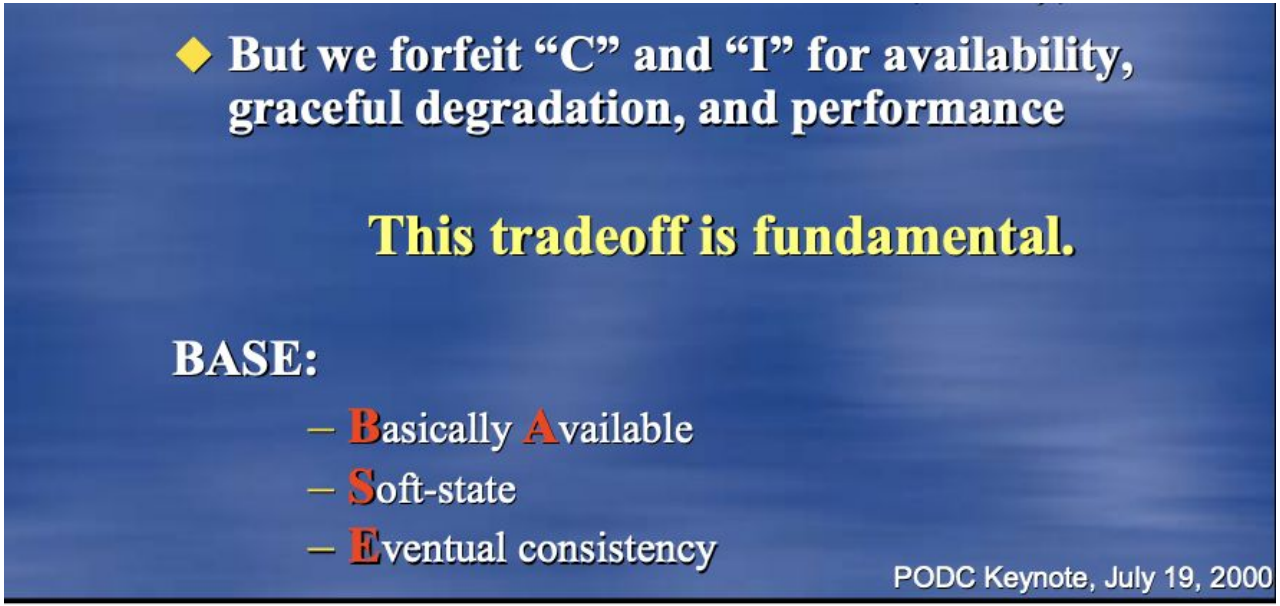
2PC Advantages/Disadvantages

- ❏ Strong consistency
- ❏ Read Write Isolation

BUT

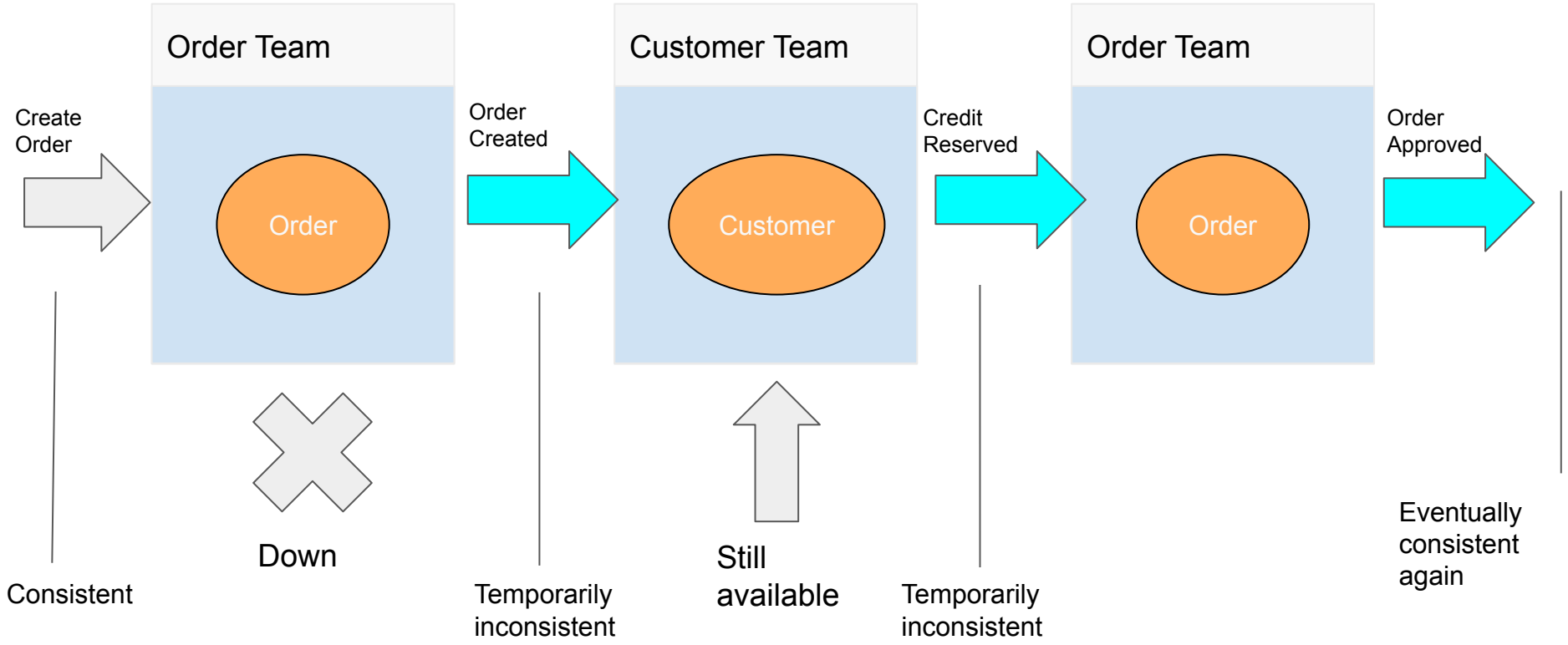
- ❏ Single point of failure
- ❏ Long delays due to locks
- ❏ More messaging
- ❏ Not support by many No-Sql databases

Base

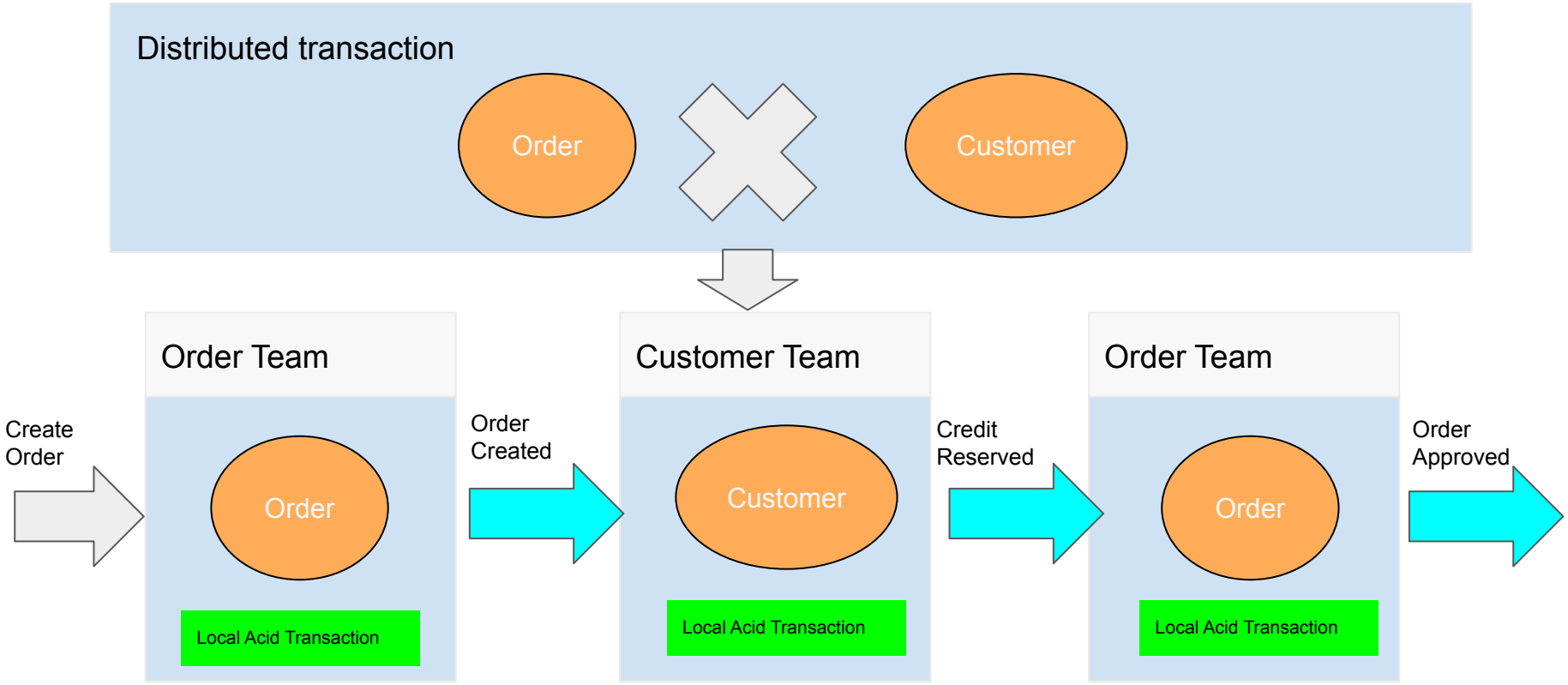


http://pld.cs.luc.edu/courses/353/spr11/notes/brewer_keynote.pdf

Base


Order Team
Customer Team
Order Team
Create Order
Order
Order Created
Customer
Credit Reserved
Order
Order Approved
Consistent
Down
Temporarily inconsistent
Still available
Temporarily inconsistent
Eventually consistent again

Use Sagas



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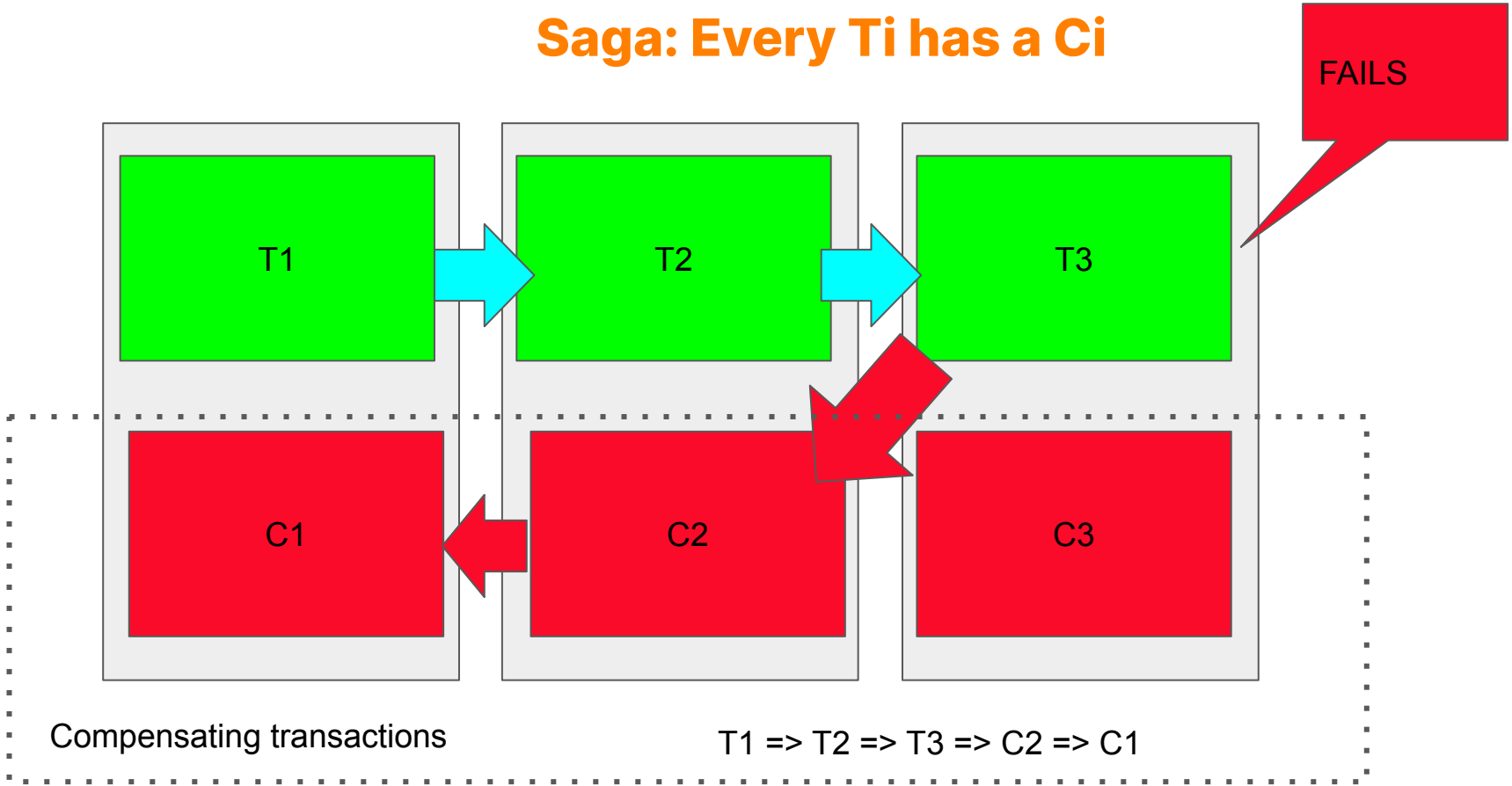
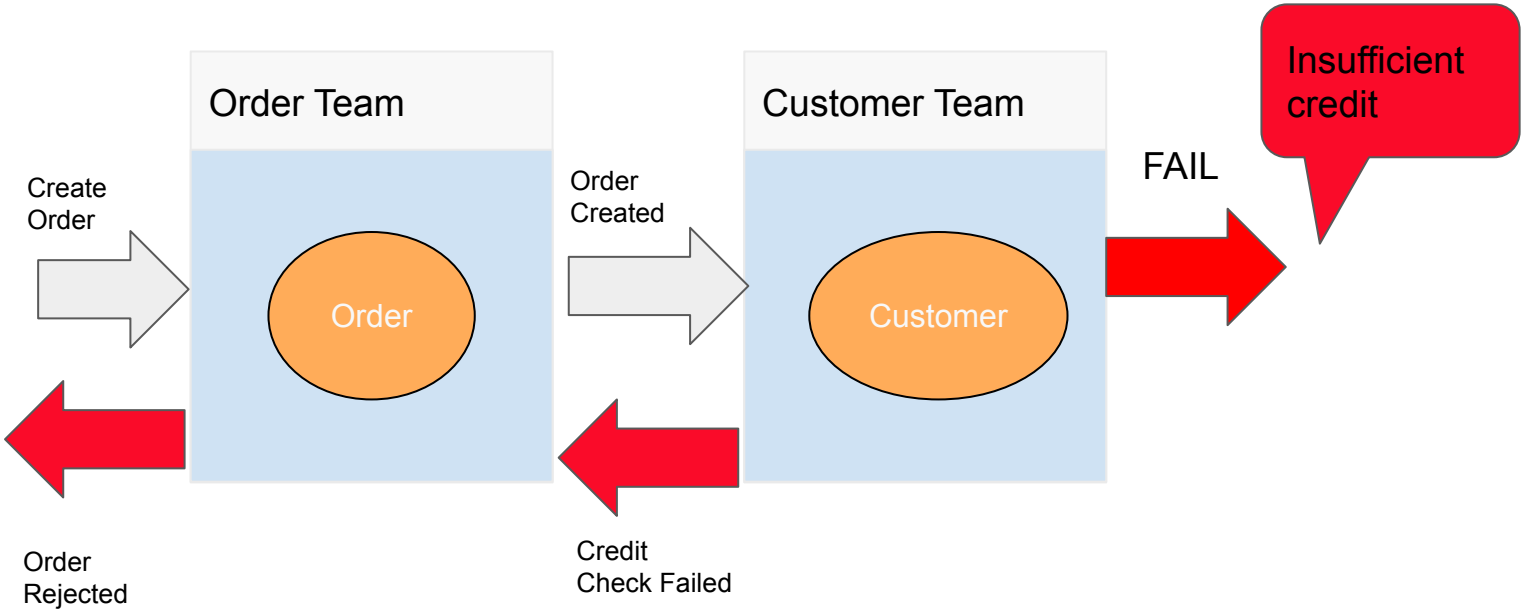
Saga: Every Ti has a Ci



https://www.youtube.com/watch?v=YPbGW3Fnmbc

Compensation



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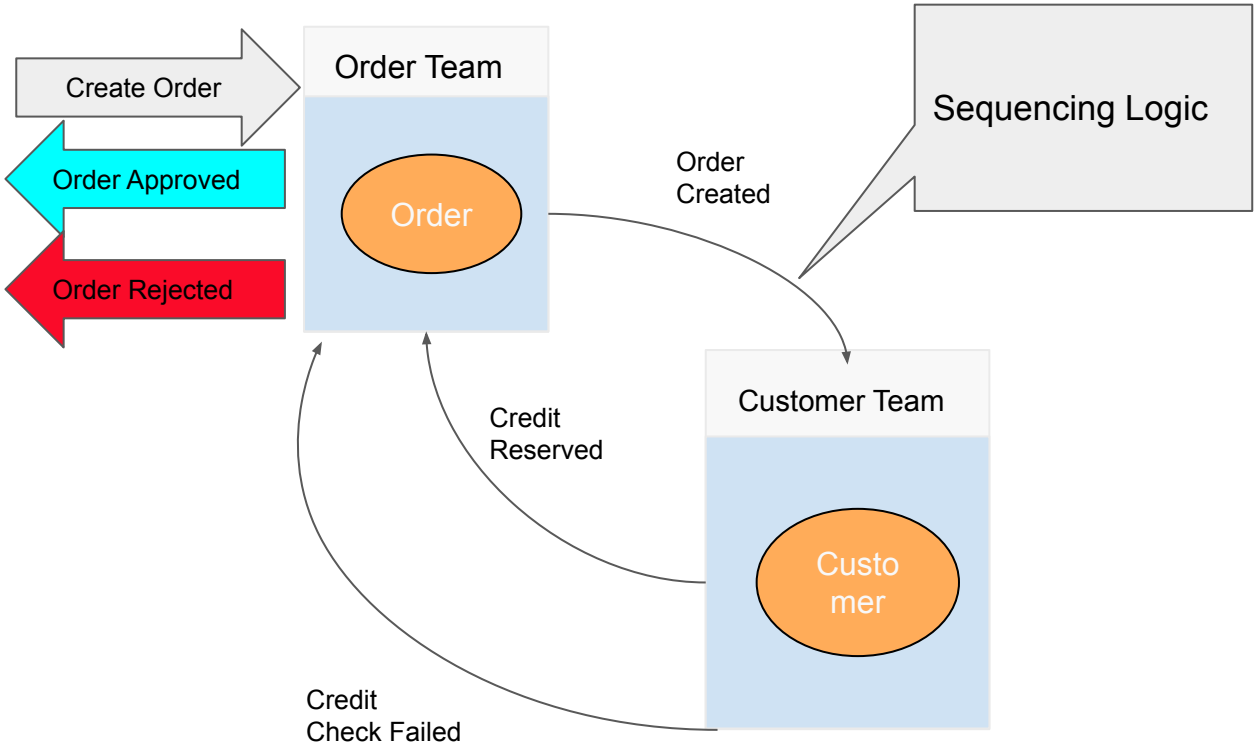
Saga Options

Choreography : distributed decision making

vs

Orchestration: centralized decision making

Option 1: Choreography



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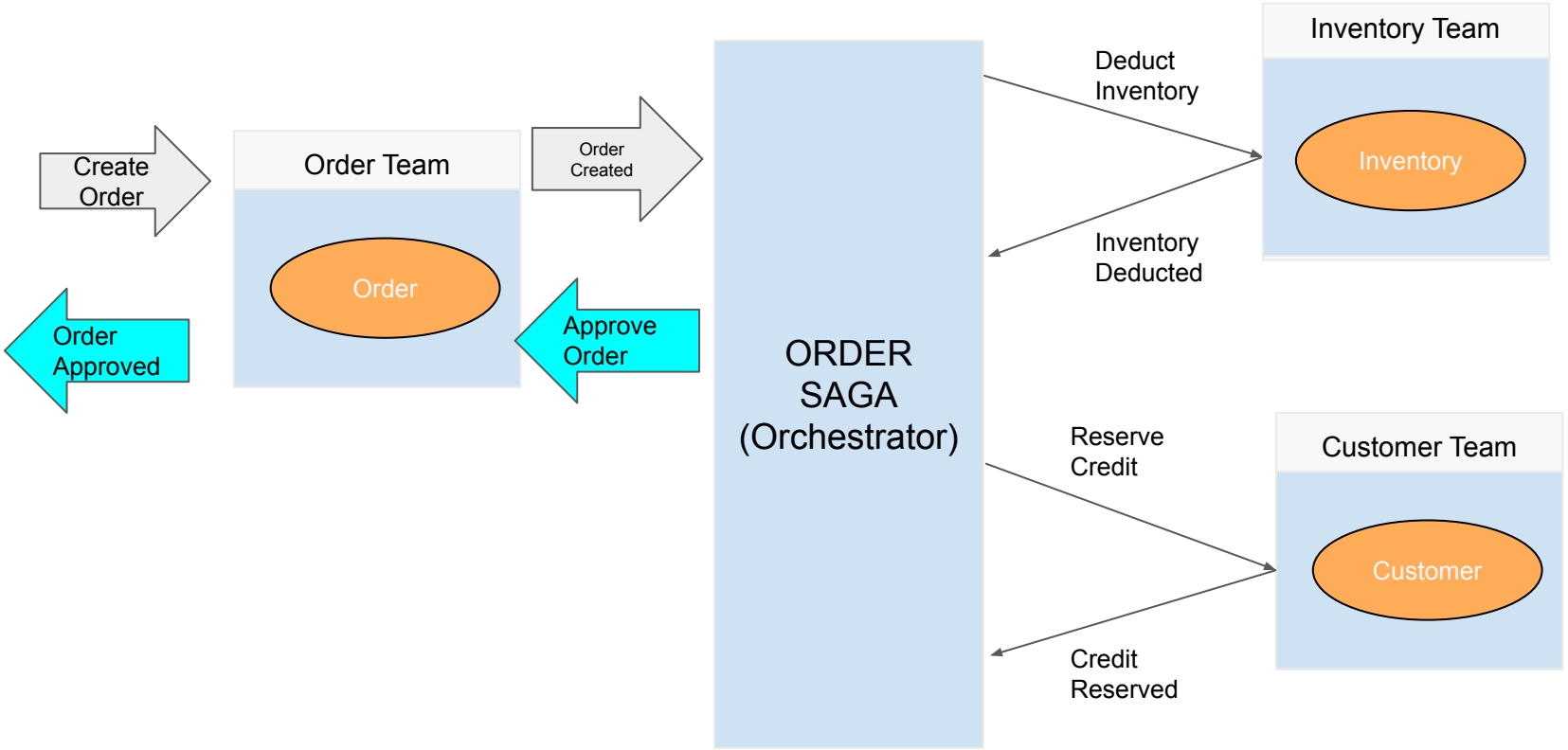
Option 1: Choreography

- ❏ It is good for if transaction contains few steps

BUT

- ❏ Adding more steps can make more confusing to understand big picture of flow.
- ❏ It is difficult to follow which services listens to which events
- ❏ Hard to change sequence of steps
- ❏ Cyclic dependency

Option 2: Orchestration



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Bpmn

Business Process Model and Notation

From Wikipedia, the free encyclopedia

This article has multiple issues. Please help improve it or discuss these issues on the talk page. *(Learn how and when to remove these template messages)* [hide]

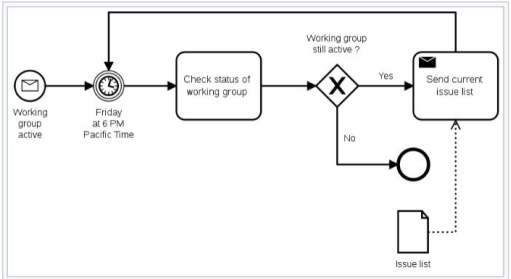
- **A major contributor to this article appears to have a close connection with its subject.** *(February 2019)*
- This article **may rely excessively on sources too closely associated with the subject**, potentially preventing the article from being verifiable and neutral. *(February 2019)*

Business Process Model and Notation (**BPMN**) is a graphical representation for specifying business processes in a business process model.

Originally developed by the Business Process Management Initiative (BPMI), BPMN has been maintained by the Object Management Group (OMG) since the two organizations merged in 2005. Version 2.0 of BPMN was released in January 2011,[1] at which point the name was amended to **Business Process Model *and* Notation** to reflect the introduction of execution semantics, which were introduced alongside the existing notational and diagramming elements. Though it is an OMG specification, BPMN is also ratified as ISO 19510. The latest version is BPMN 2.0.2, published in January 2014.[2]

Contents [hide]

1 Overview
2 Topics
  2.1 Scope
  2.2 Elements
  2.3 Flow objects and connecting objects
  2.4 Swim lanes and artifacts



Example of a Business Process Model and Notation for a process with a normal flow.

https://en.wikipedia.org/wiki/Business_Process_Model_and_Notation

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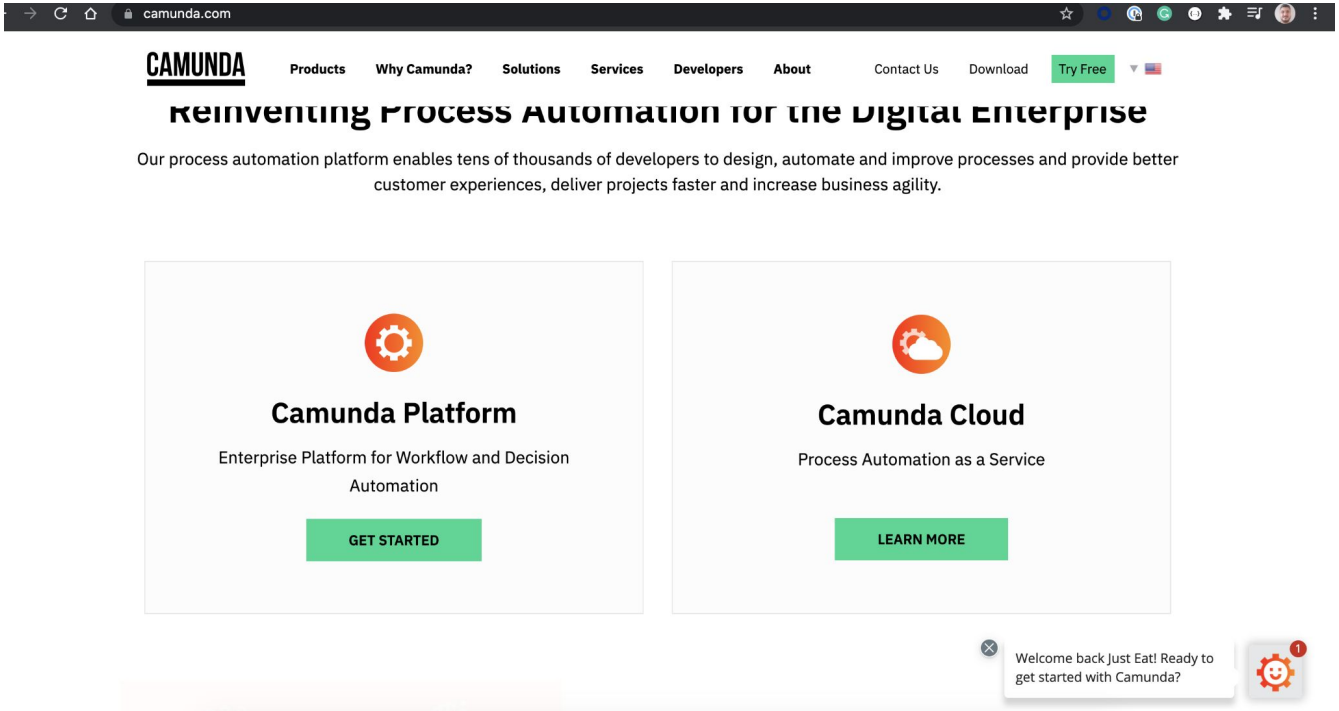
Camunda



https://camunda.com/

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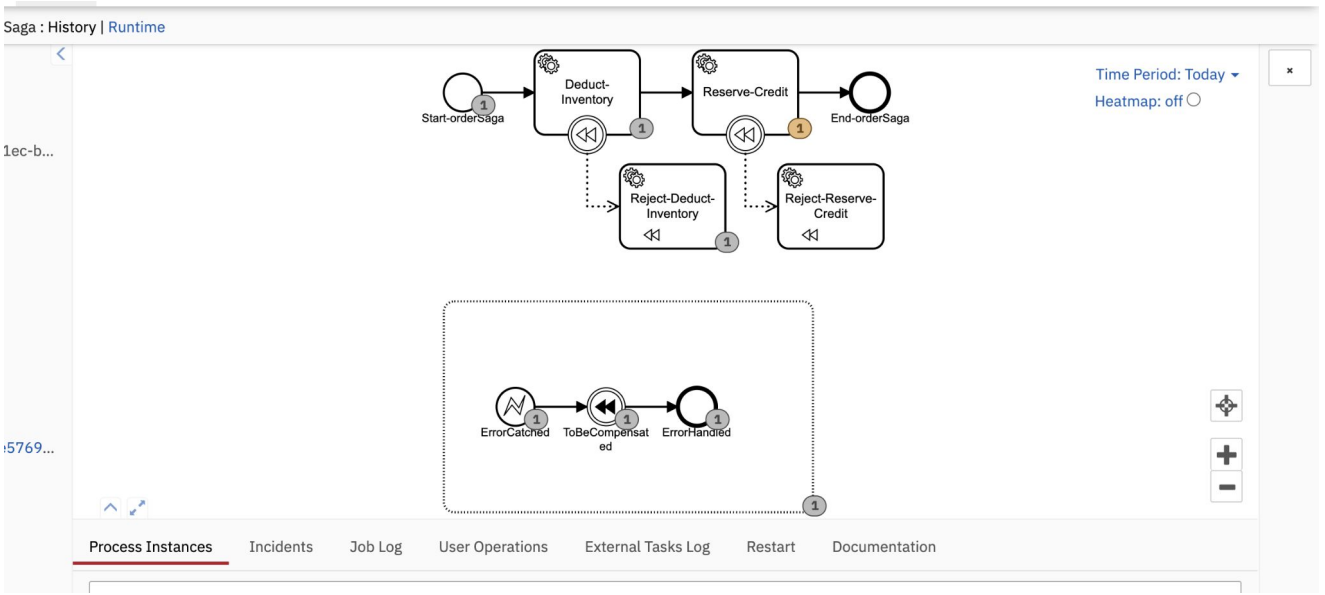
Bpmn Orchestration

ORDER SAGA (Orchestrator)



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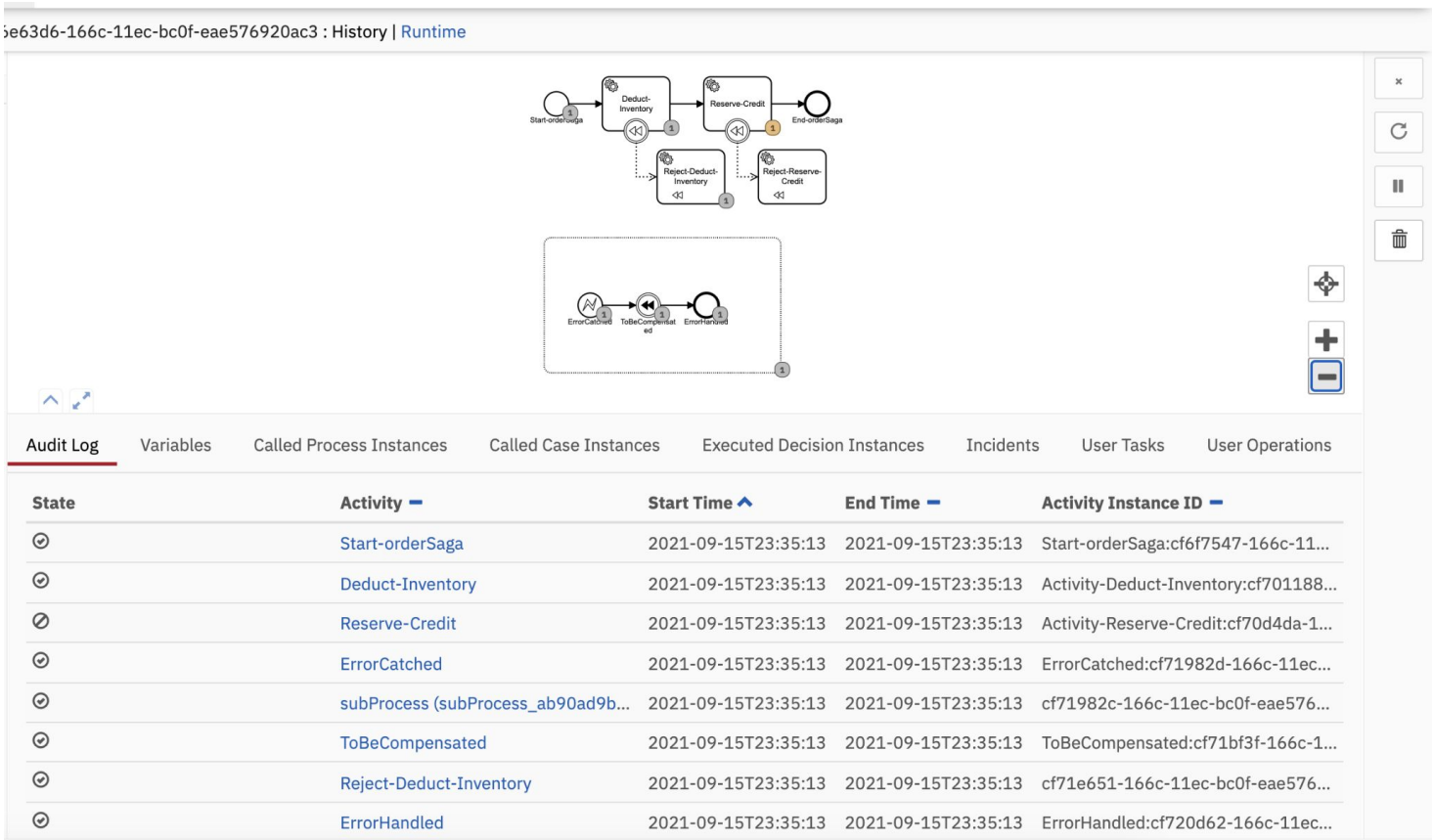
Bpmn Orchestration



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Bpmn Orchestration

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THANK YOU

References

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