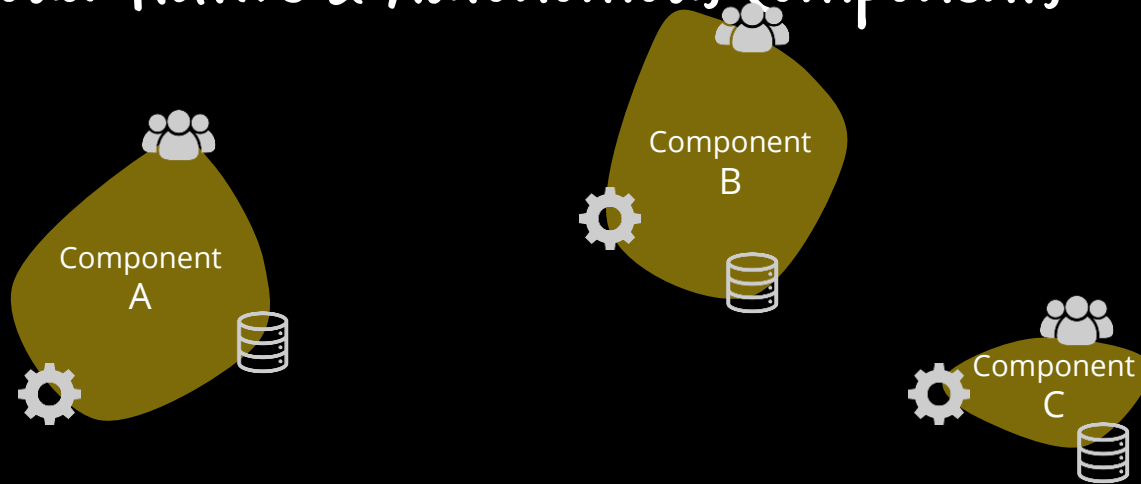


Automating Processes in Cloud-Native Architectures

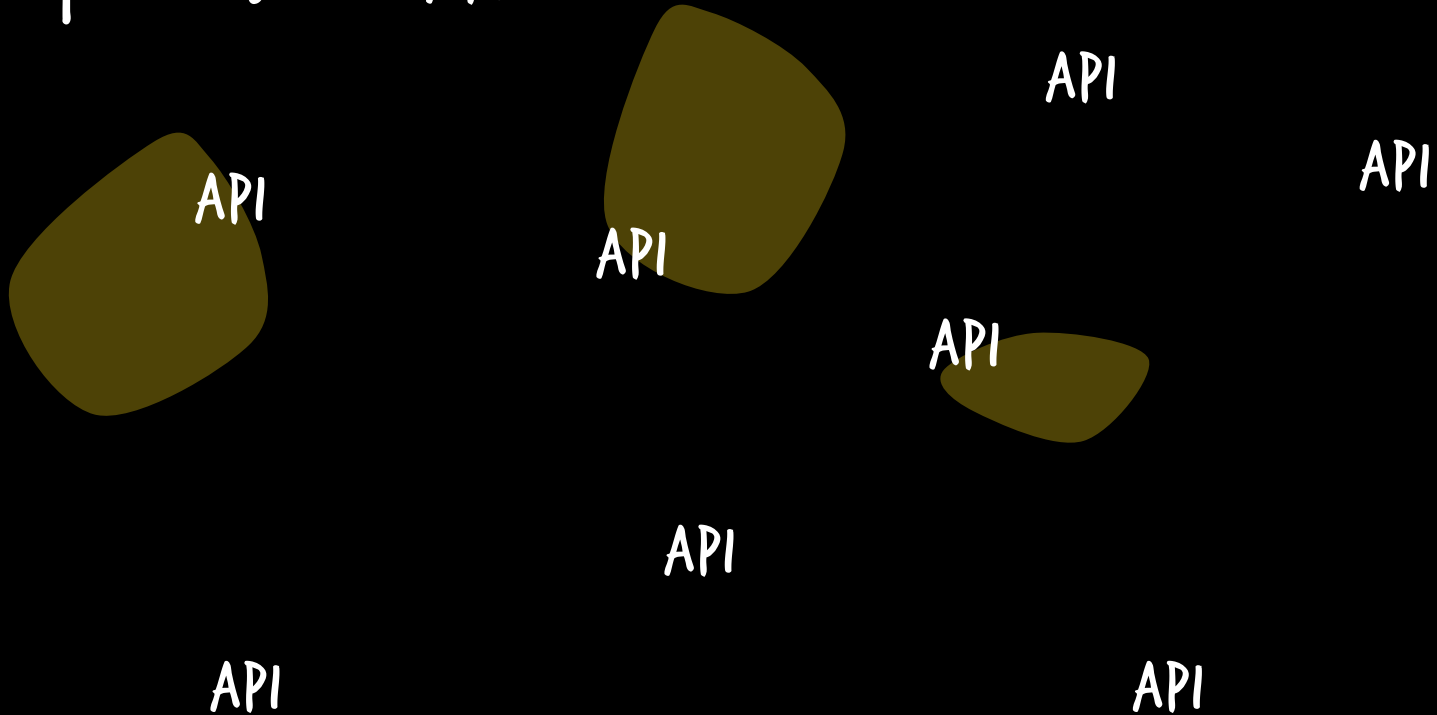
@berndruecker



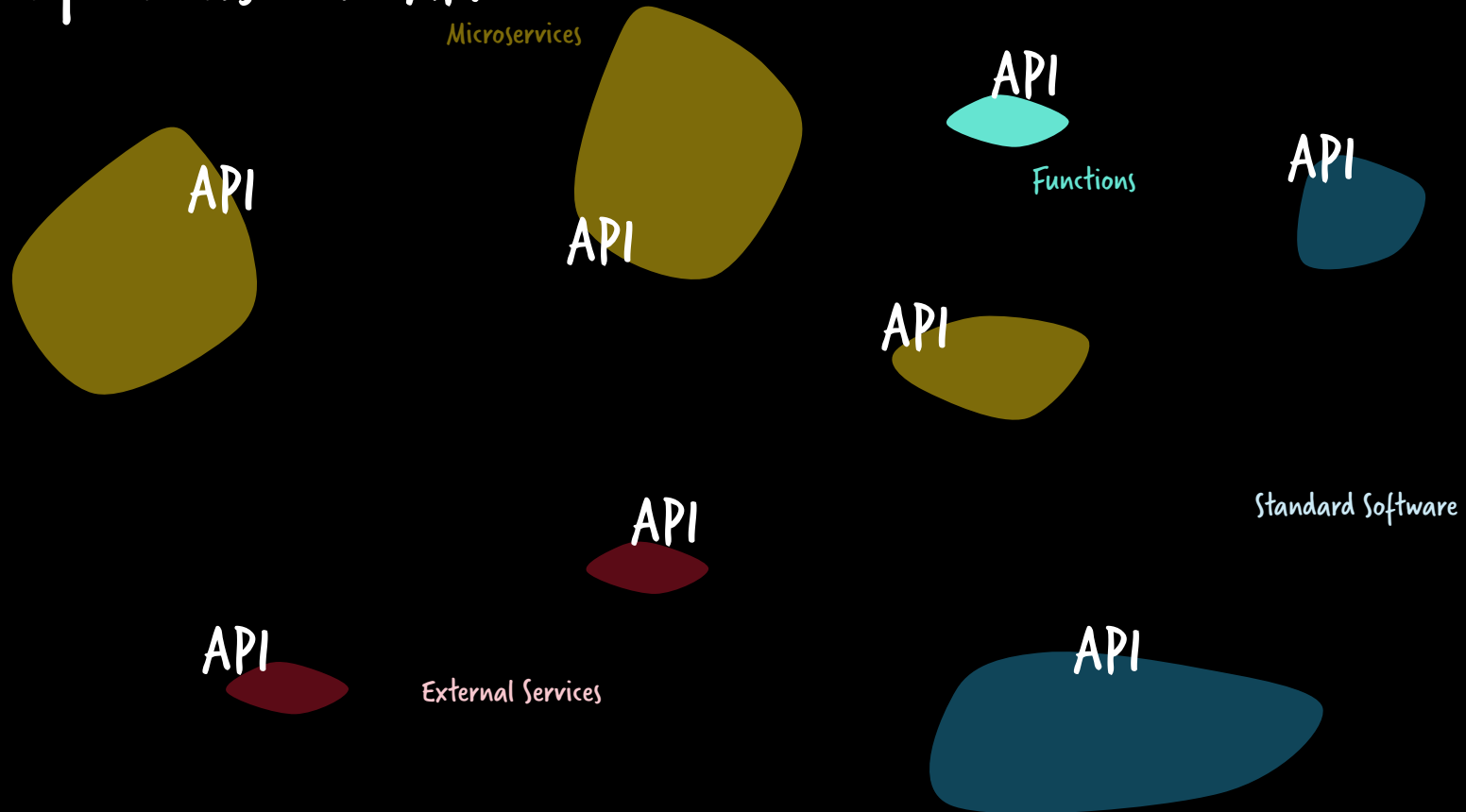
Cloud-Native & Autonomous Components



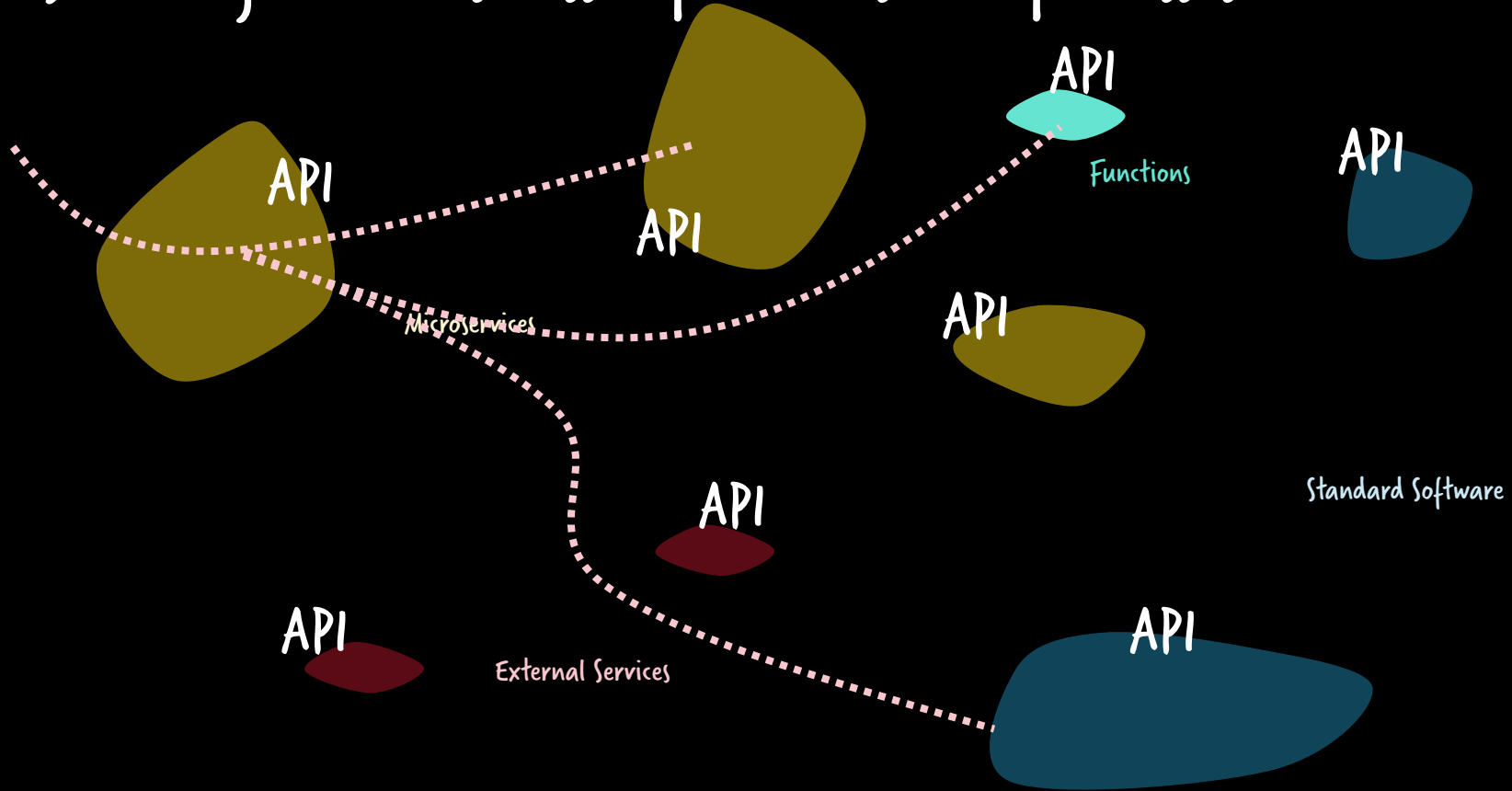
Components with API

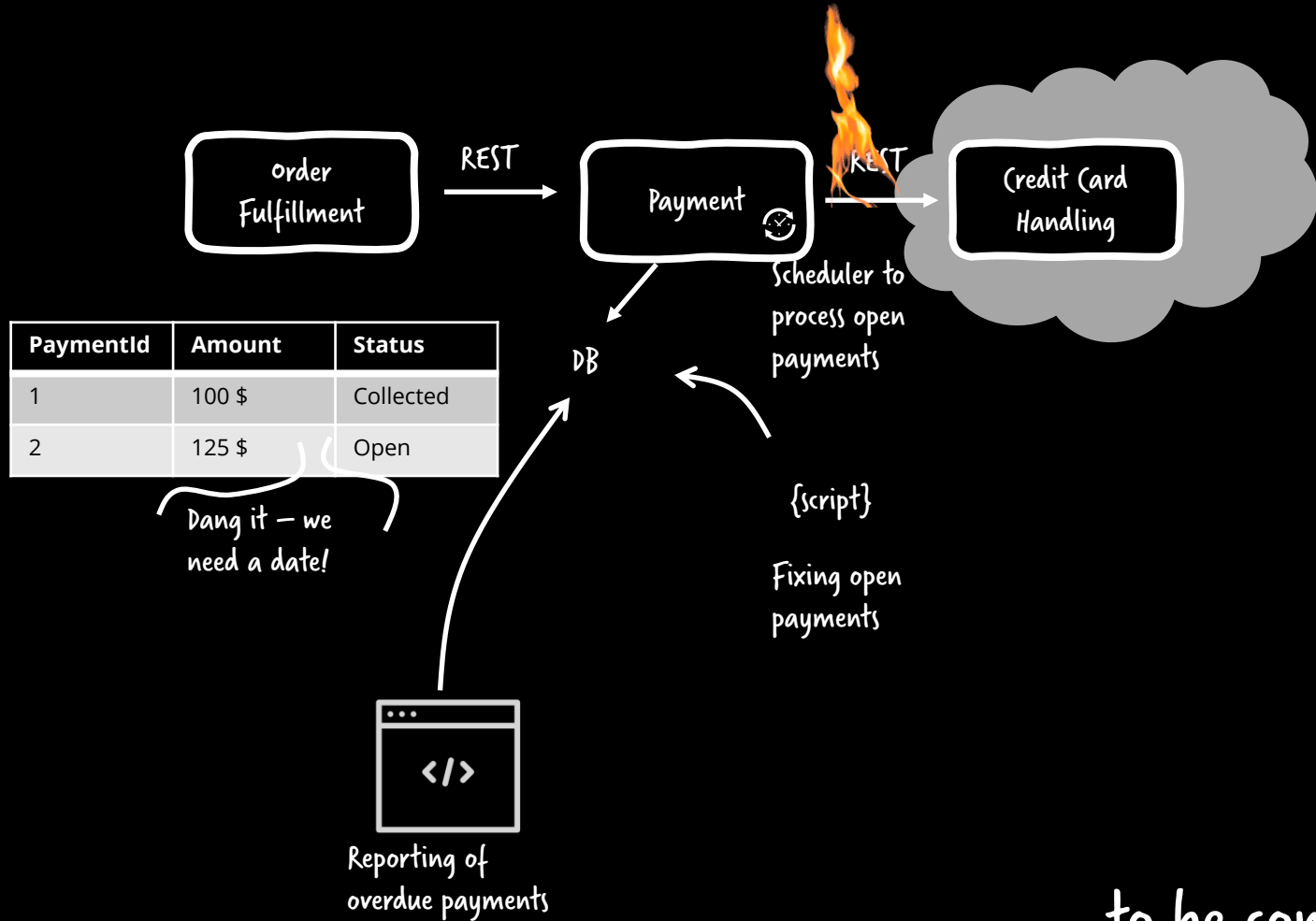


Components with API



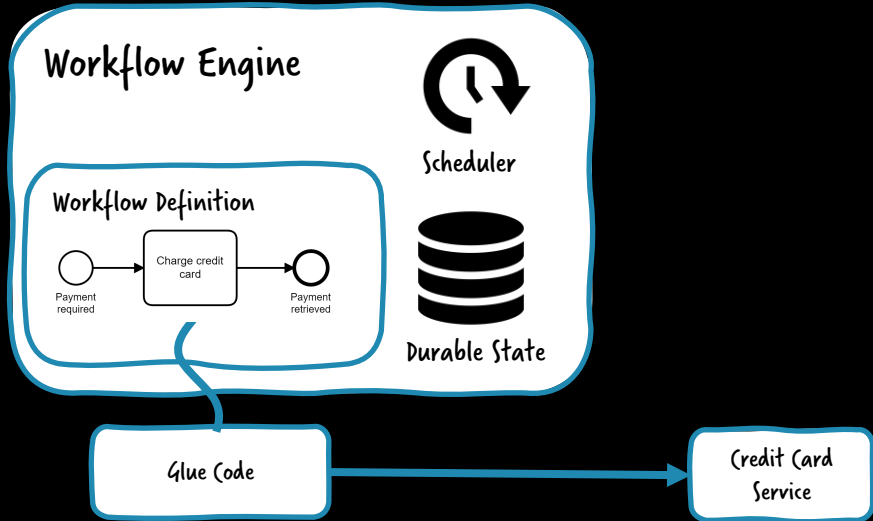
Stich together business capabilities and processes





...to be continued...

Using a workflow engine



Workflow Engine:

Is stateful

Can wait

Can retry

Can escalate

Can compensate

Provides visibility

**Warning:
Contains Opinion**

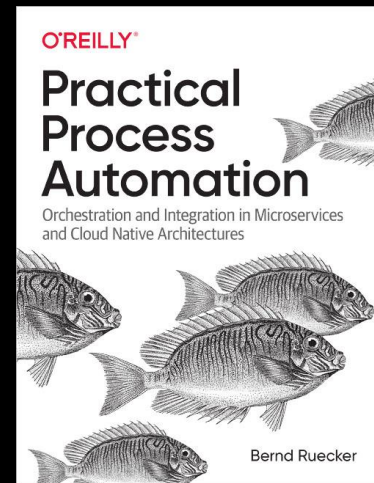


Bernd Ruecker
Co-founder and
Chief Technologist of
Camunda

mail@berndruecker.io

@berndruecker

<http://berndruecker.io/>



Camunda

- Source-Available & Developer Friendly
- Supports BPMN
- Mature tooling, widely adopted
- on-prem or cloud
- <http://camunda.com/>



```

@RestController
public class PaymentRestHacksControllerV3 {

    @Autowired
    private ProcessEngine camunda;

    @PostConstruct
    public void createFlowDefinition() {
        BpmnModelInstance flow = Bpmn.createExecutableProcess("paymentV3") //
            .startEvent() //
            .serviceTask("stripe").camundaDelegateExpression("#{stripeAdapter}") //
            .camundaAsyncBefore().camundaFailedJobRetryTimeCycle("R3/PT1M") //
            .endEvent().done();

        camunda.getRepositoryService().createDeployment() //
            .addModelInstance("payment.bpmn", flow) //
            .deploy();
    }

```

```

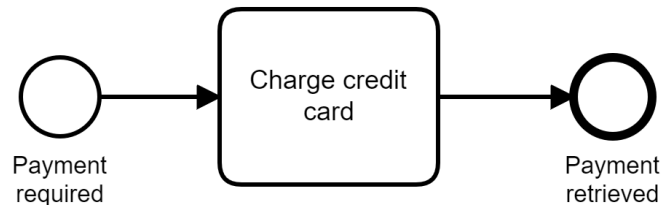
@Component("stripeAdapter")
public static class StripeAdapter implements JavaDelegate {

    @Autowired
    private RestTemplate rest;
    private String stripeChargeUrl = "http://localhost:8099/charge";

    public void execute(DelegateExecution ctx) throws Exception {
        CreateChargeRequest request = new CreateChargeRequest();
        request.amount = (long) ctx.getVariable("amount");

        CreateChargeResponse response = new HystrixCommand<CreateChargeResponse>(HystrixCommandGroupKey.Factory.asKey("stripe")) {
            protected CreateChargeResponse run() throws Exception {
                return rest.postForObject( //
                    stripeChargeUrl, //
                    request, //
                    CreateChargeResponse.class);
            }
        }.execute();
    }

```



<https://github.com/berndruecker/flowing-retail/blob/master/rest/java/payment-camunda/src/main/java/io/flowing/retail/payment/resthacks/PaymentRestHacksControllerV3.java>

```

@RequestMapping(path = "/payment/v3", method = PUT)
public String retrievePayment(String retrievePaymentPayload, HttpServletResponse response) throws Exception {
    String traceId = UUID.randomUUID().toString();
    String customerId = "0815"; // get somehow from retrievePaymentPayload
    long amount = 15; // get somehow from retrievePaymentPayload

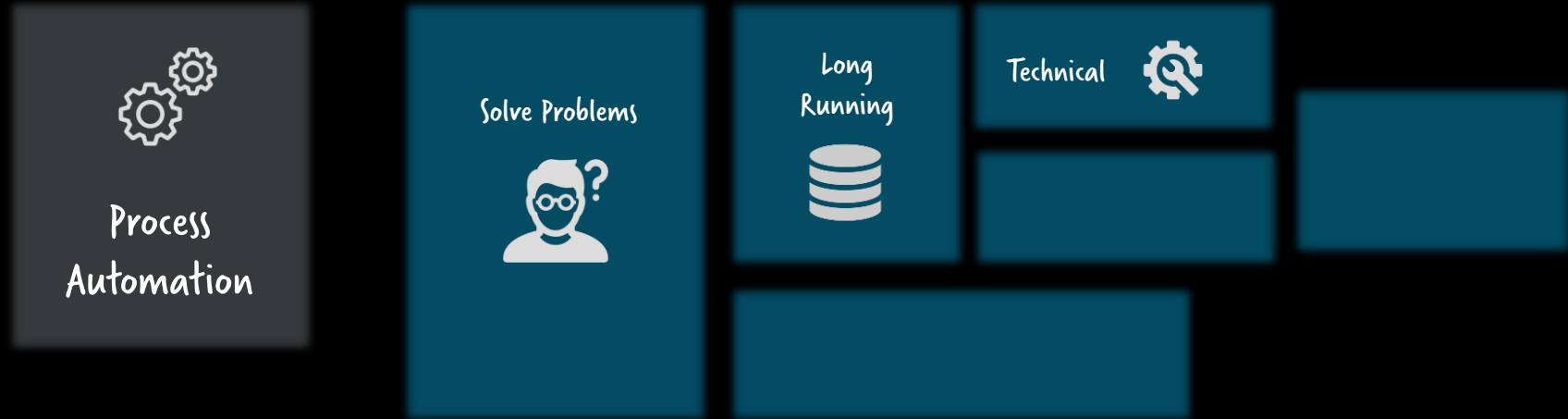
    chargeCreditCard(customerId, amount);

    response.setStatus(HttpServletResponse.SC_ACCEPTED);
    return "{\"status\": \"pending\", \"traceId\": \"" + traceId + "\"}";
}

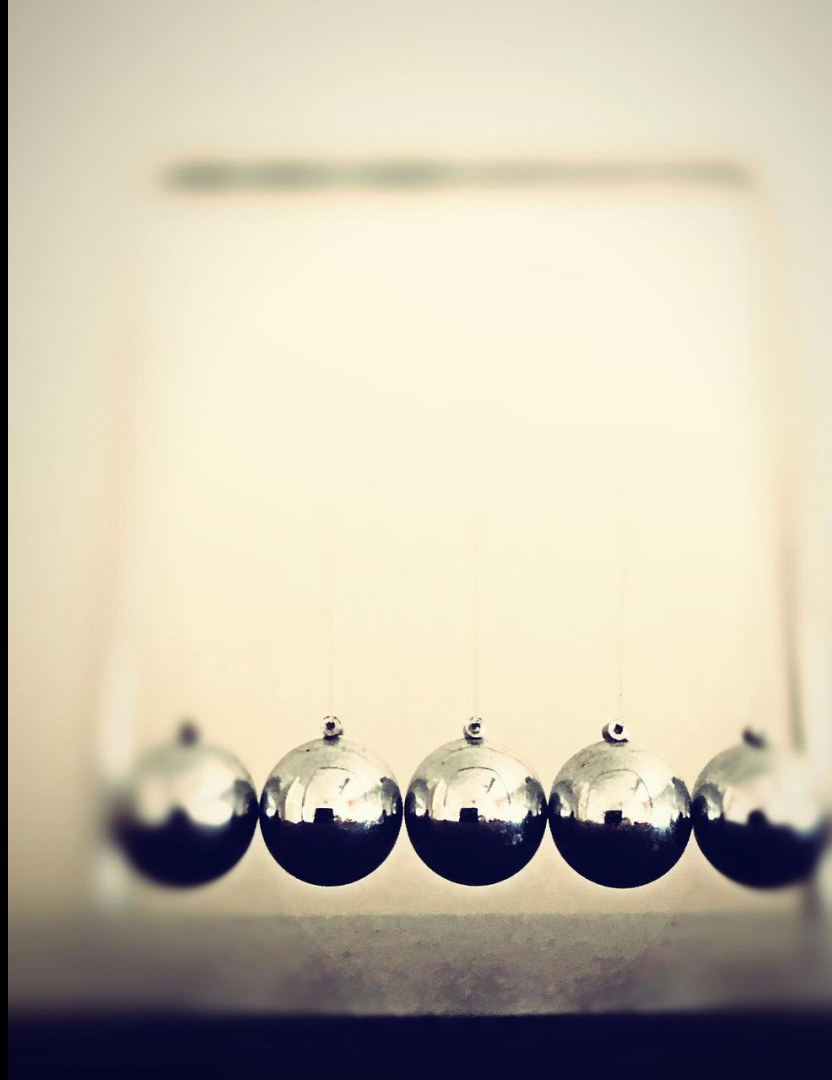
public void chargeCreditCard(String customerId, long remainingAmount) {
    ProcessInstance pi = camunda.getRuntimeService() //
        .startProcessInstanceByKey("paymentV3", //
            Variables.putValue("amount", remainingAmount));
}

```

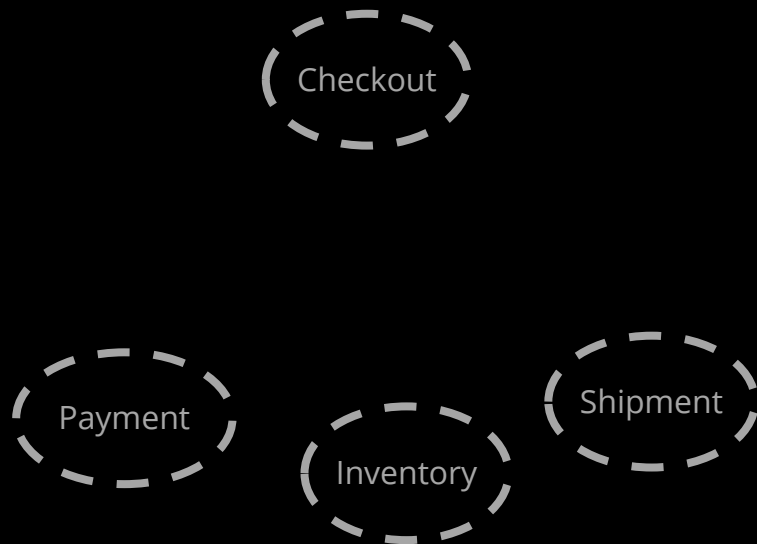
Long Running Capabilities



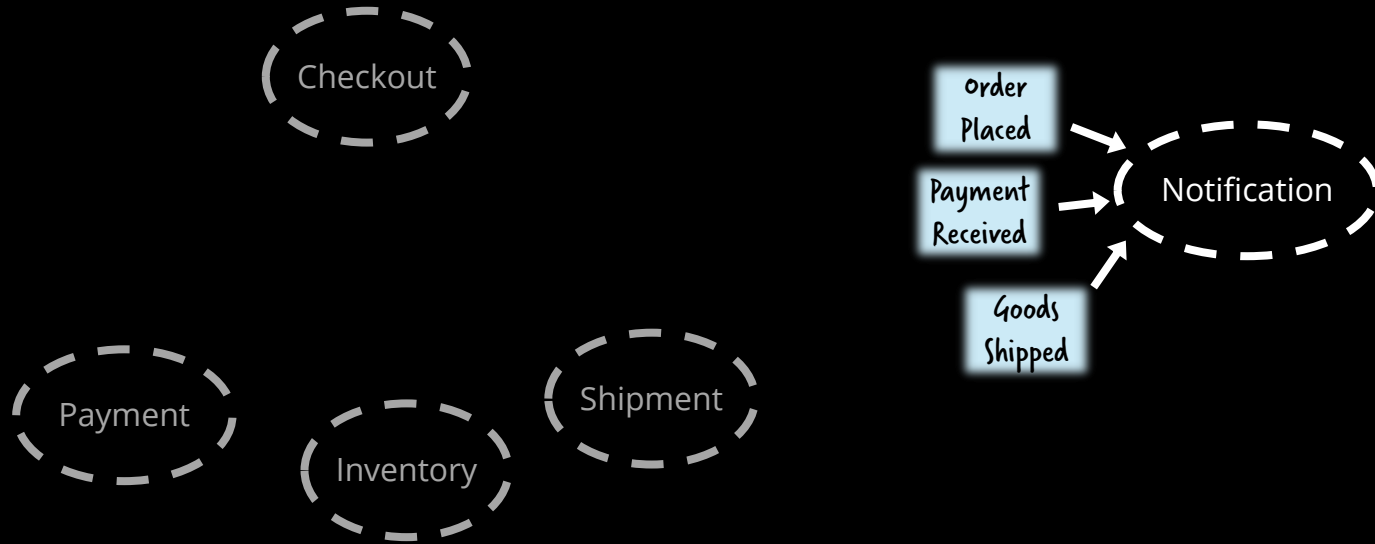
Going reactive!



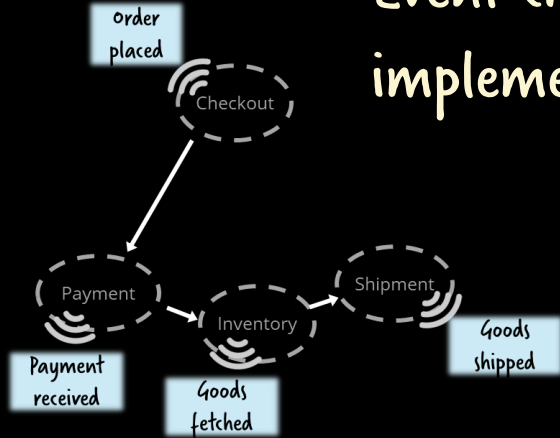
Example



Event-driven & Reactive



But there is also trouble in the event-driven land!

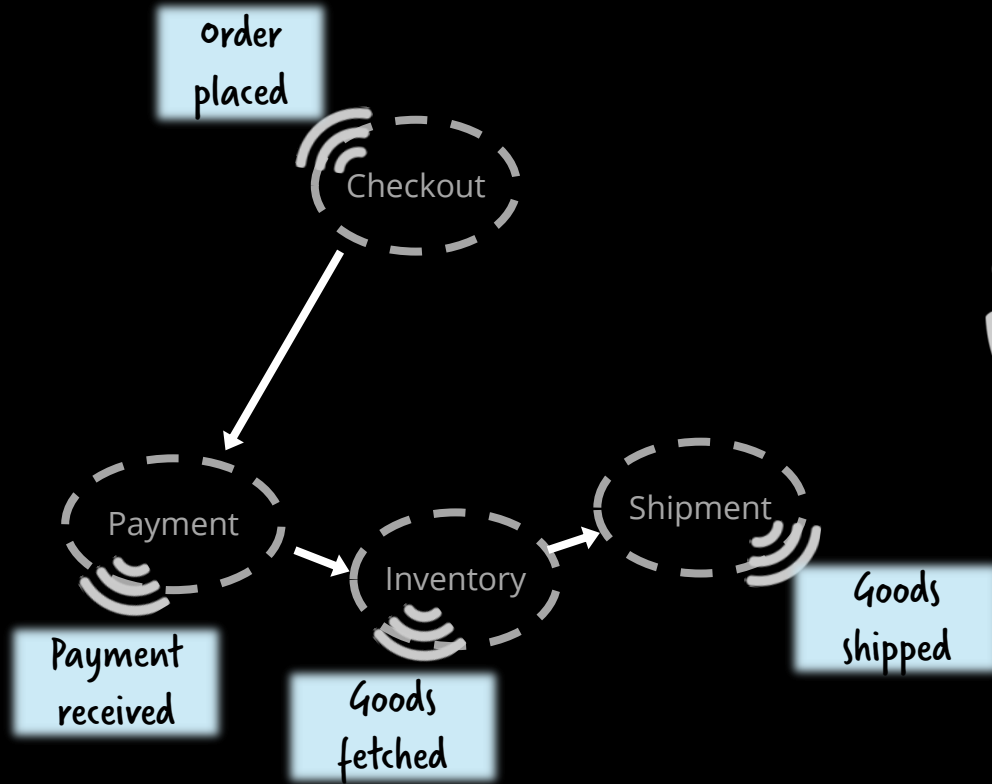


Event chains that implement processes

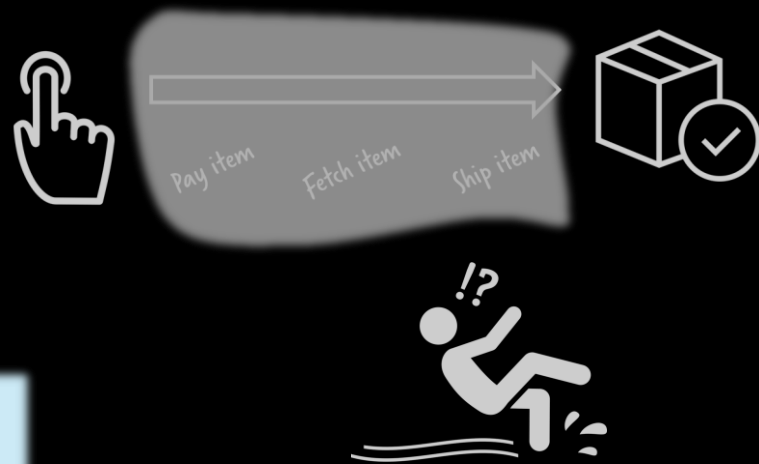
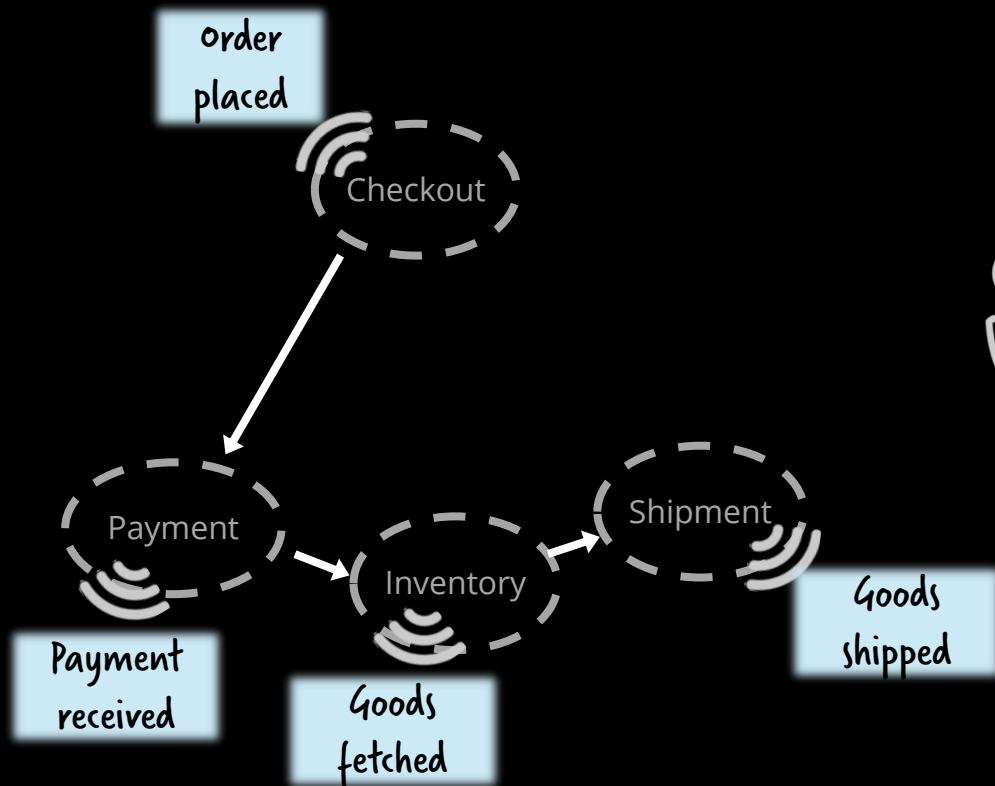


Implementing long running behavior

Peer-to-peer event chains



Peer-to-peer event chains





The danger is that it's very easy to make nicely decoupled systems with event notification, without realizing that you're losing sight of that larger-scale flow, and thus set yourself up for trouble in future years.



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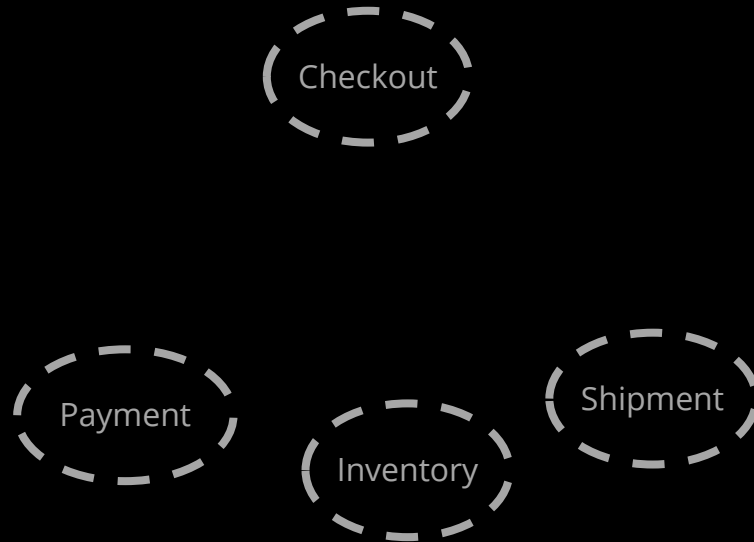


The danger is that it's very easy to make nicely decoupled systems with event notification, without realizing that you're losing sight of that larger-scale flow, and thus set yourself up for trouble in future years.

We were suffering from
Pinball machine Architecture



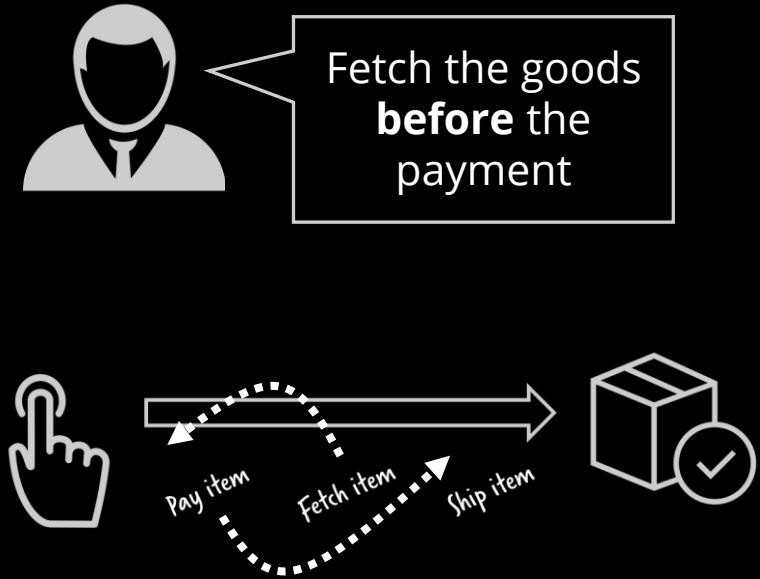
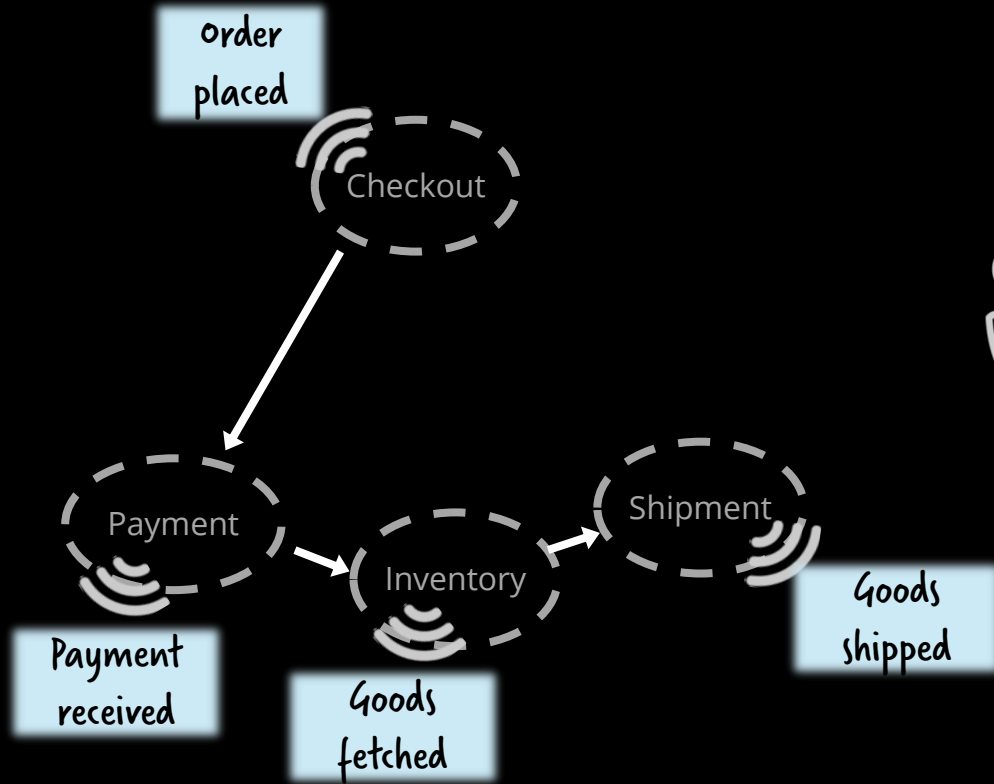
Pinball Machine Architecture



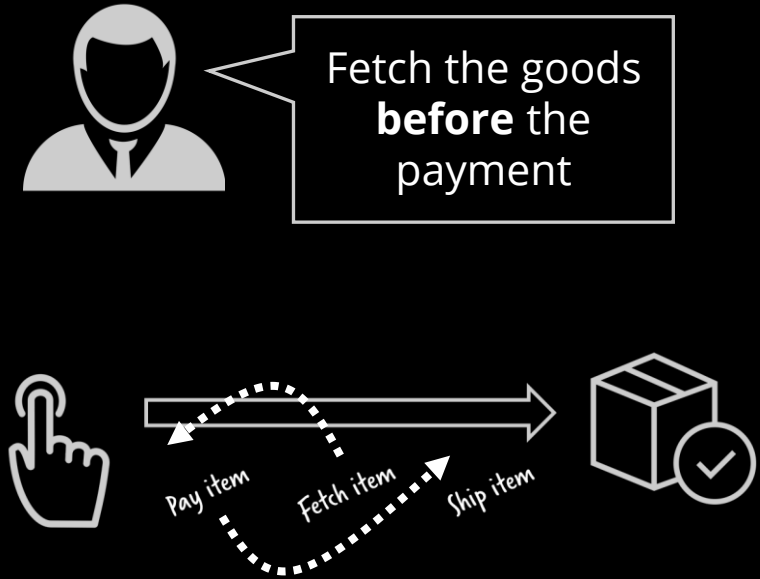
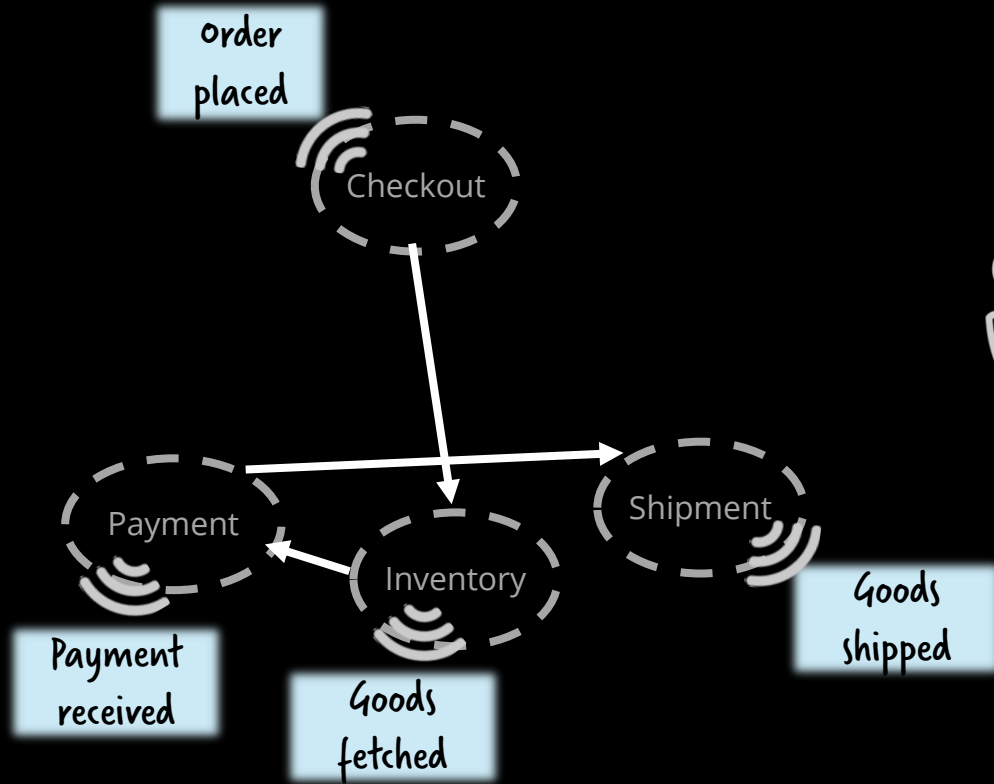
Notifica

„What the hell
just
happened?“

Peer-to-peer event chains



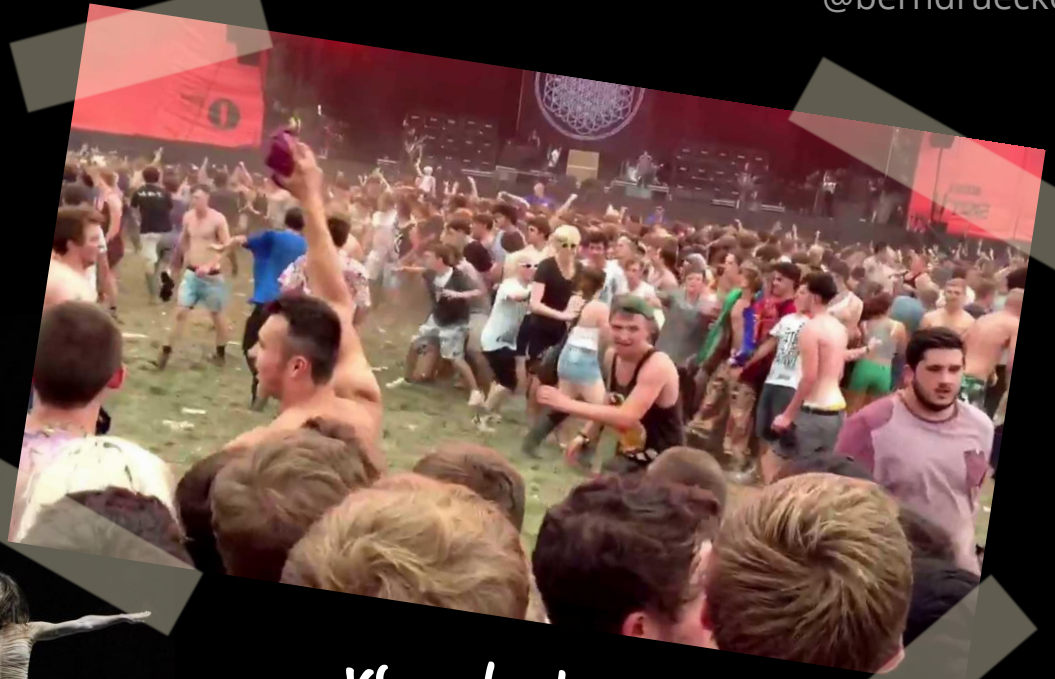
Peer-to-peer event chains



What we wanted

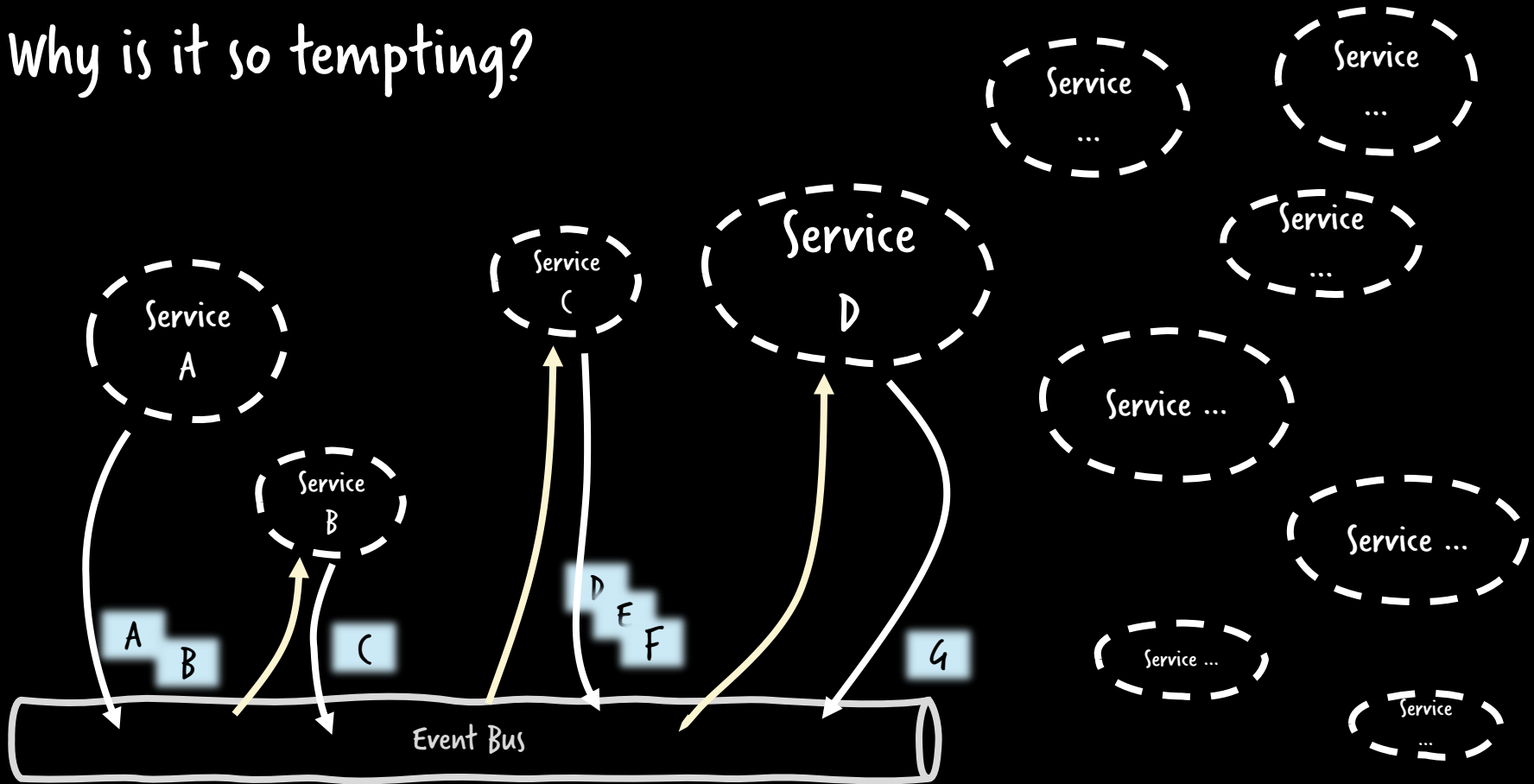


(choreography)

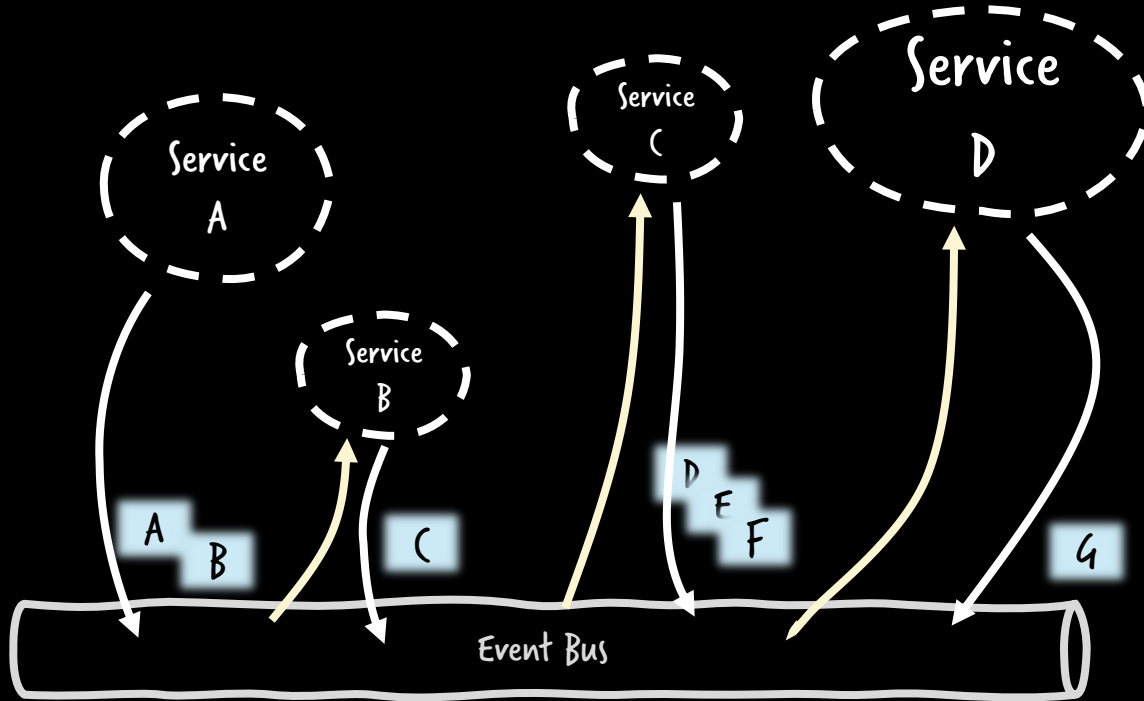


vs. what we got

Why is it so tempting?



Why is it so tempting?



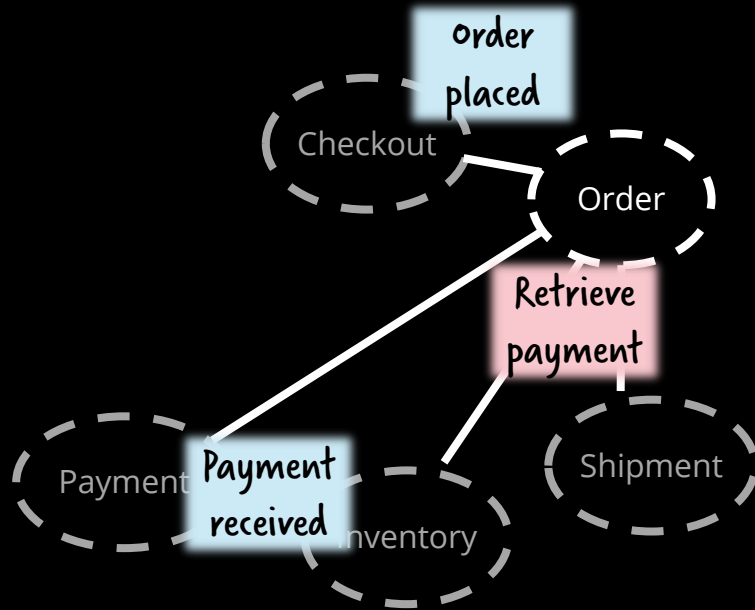
Adding is easy!

You can „buy“ a shorter initial time-to-value by choreography.

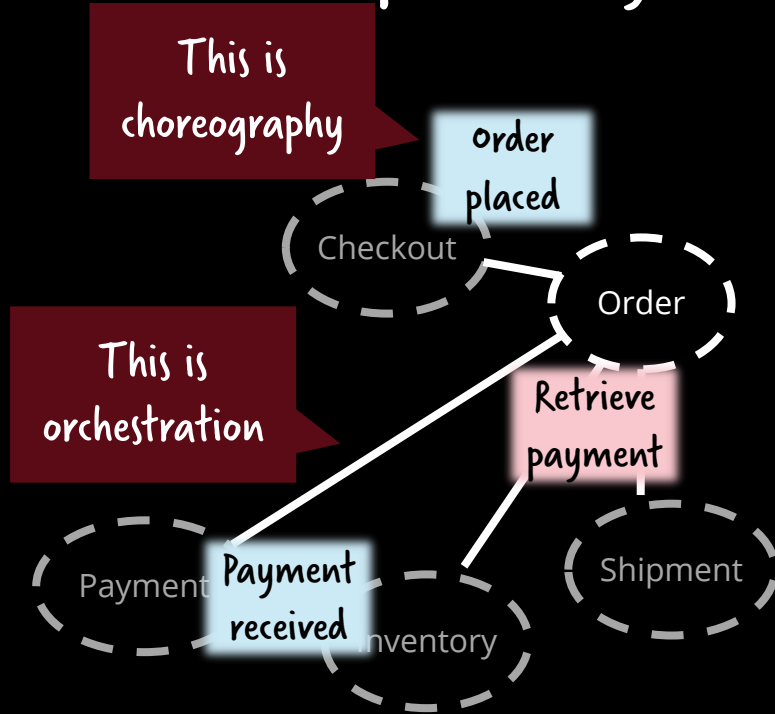
It yields in technical debt.



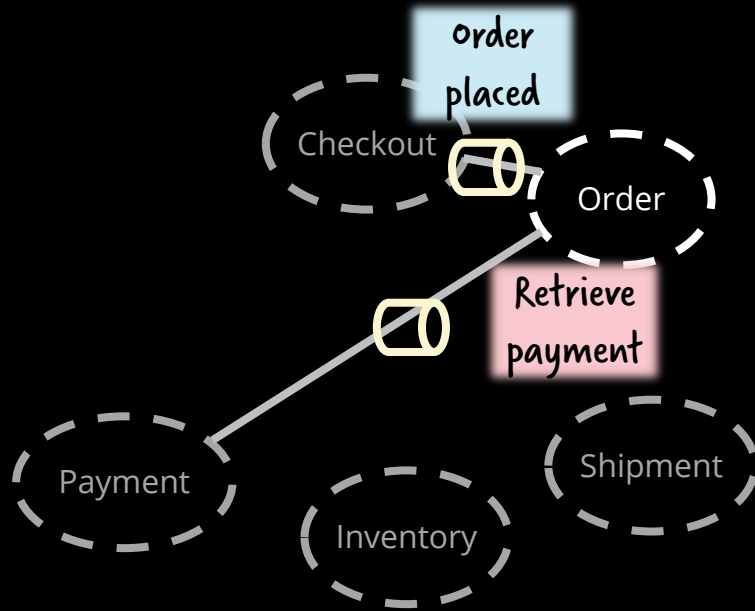
Decide about responsibility



Decide about responsibility

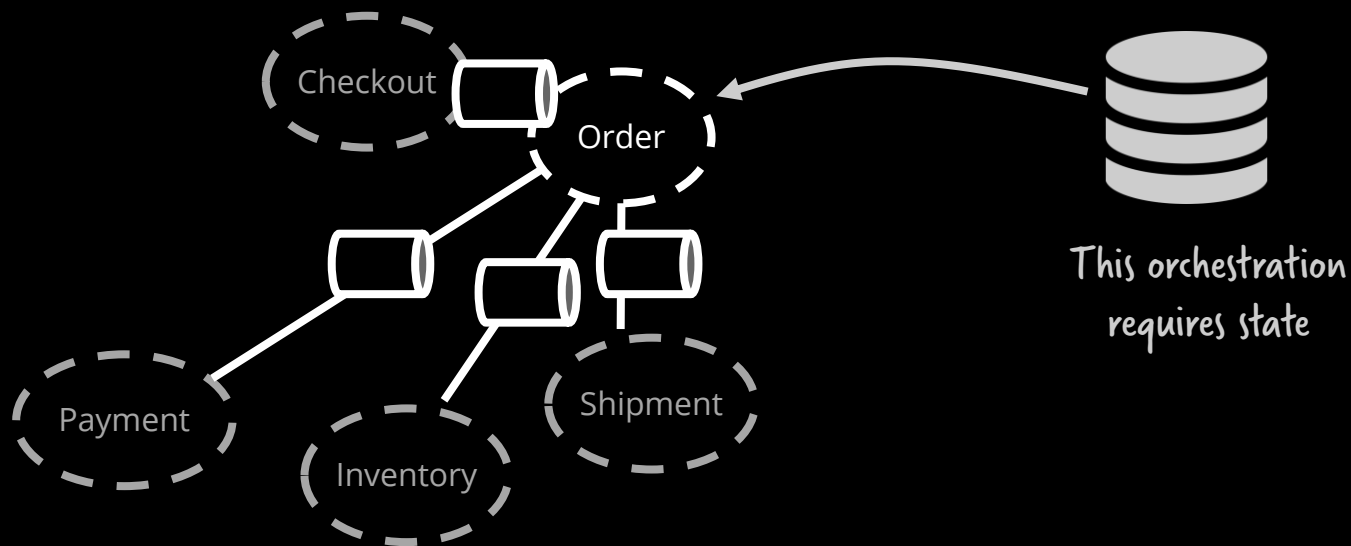


Decide about responsibility



It can still be messaging!

Stateful orchestration



Long Running Capabilities



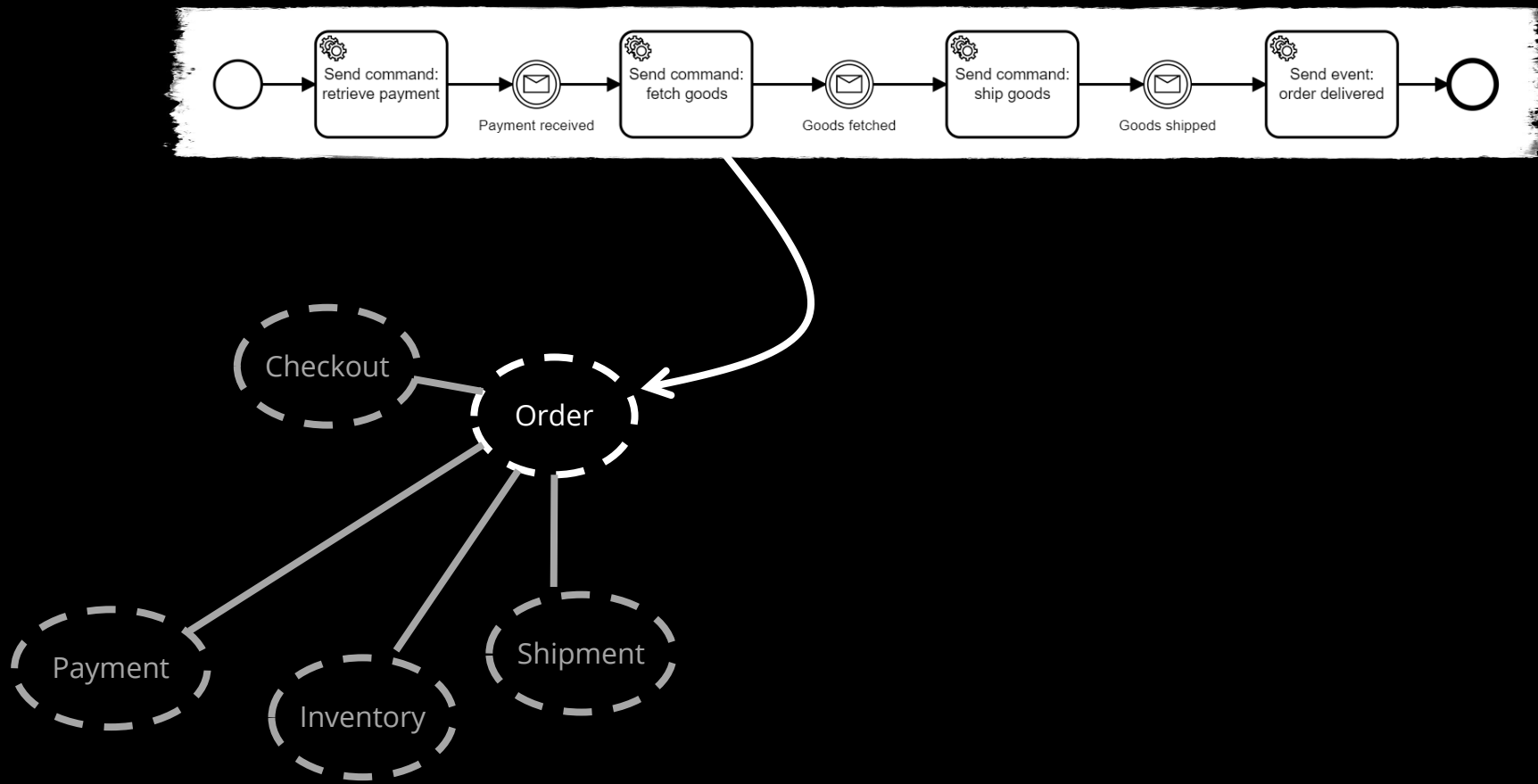
Process
Automation

Solve Problems

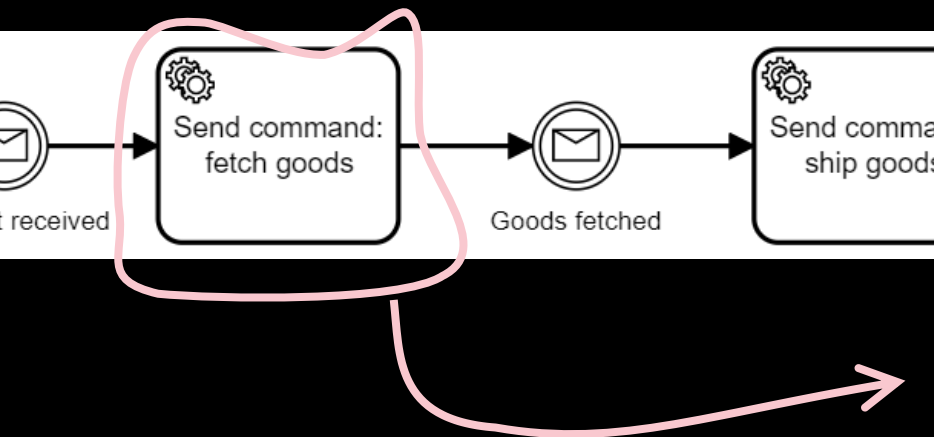


Long
Running





Glue code (e.g. Java)



<https://github.com/berndruecker/flowing-retail/blob/master/kafka/java/order-zeebe/src/main/java/io/flowing/retail/kafka/order/flow/FetchGoodsAdapter.java>

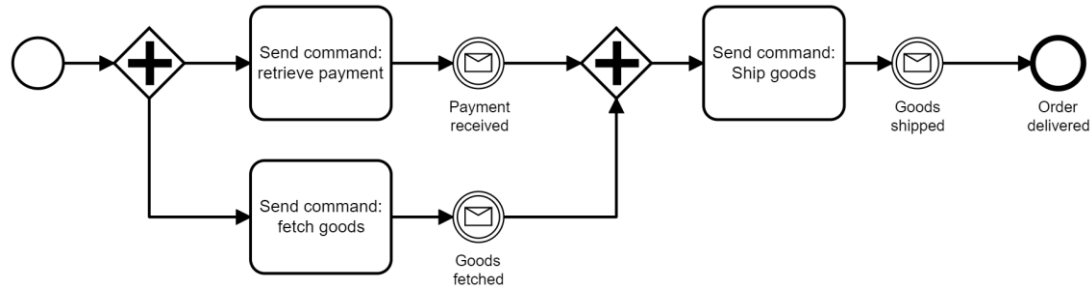
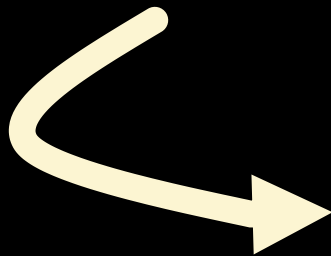
```
@Component  
public class FetchGoodsAdapter {
```

```
@Autowired  
private MessageSender messageSender;
```

```
@Autowired  
private OrderRepository orderRepository;
```

```
@ZeebeWorker(type = "fetch-goods")  
public void handle(JobClient client, ActivatedJob job) {  
    OrderFlowContext context = OrderFlowContext.fromMap(job.getVariablesAsMap());  
    Order order = orderRepository.findById( context.getOrderId() ).get();  
  
    // generate an UUID for this communication  
    String correlationId = UUID.randomUUID().toString();  
  
    messageSender.send(new Message<FetchGoodsCommandPayload>( //  
        "FetchGoodsCommand", //  
        context.getTraceId(), //  
        new FetchGoodsCommandPayload() //  
            .setRefId(order.getId()) //  
            .setItems(order.getItems()) //  
            .setCorrelationid(correlationId));  
  
    client.newCompleteCommand(job.getKey()) //  
        .variables(Collections.singletonMap("CorrelationId_FetchGoods", correlationId))  
        .send().join();  
}
```

Now it is easy to change the process flow



Long Running Capabilities



Process
Automation

Solve Problems



Long
Running



Technical



Long Running Capabilities



Process
Automation

Solve Problems



Long
Running



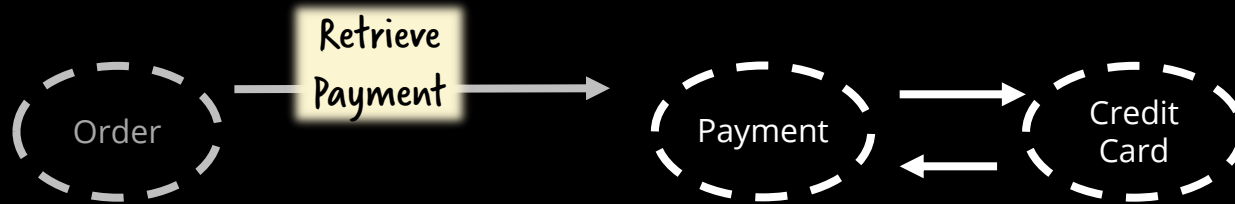
Technical



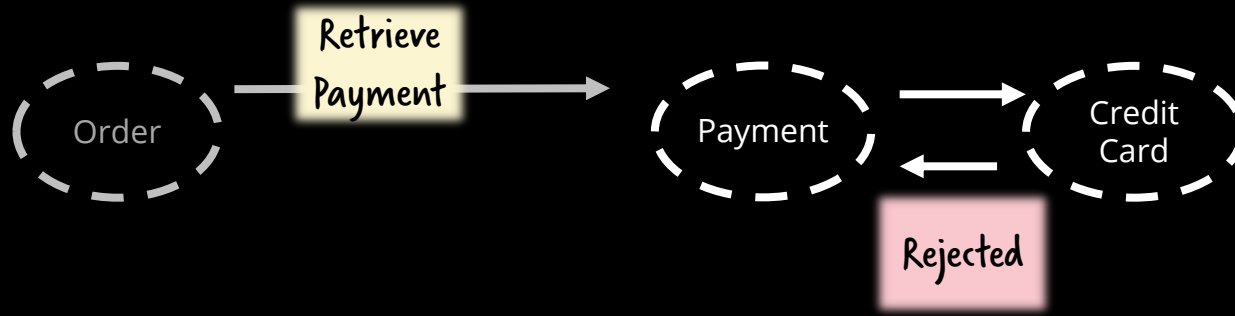
Business



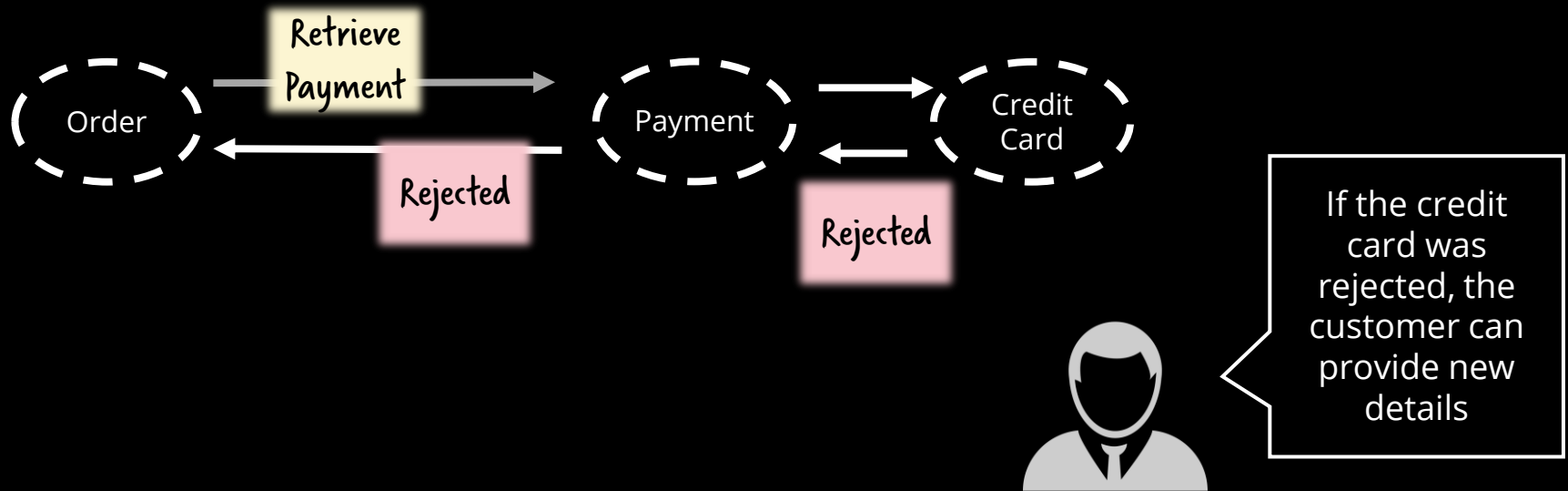
Example



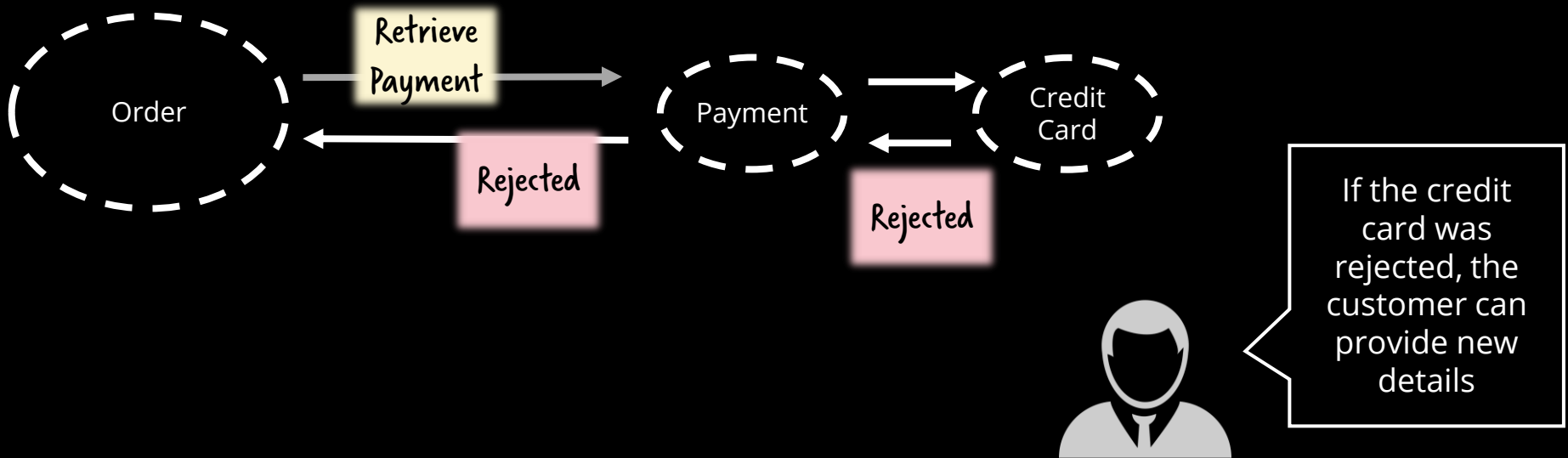
Example



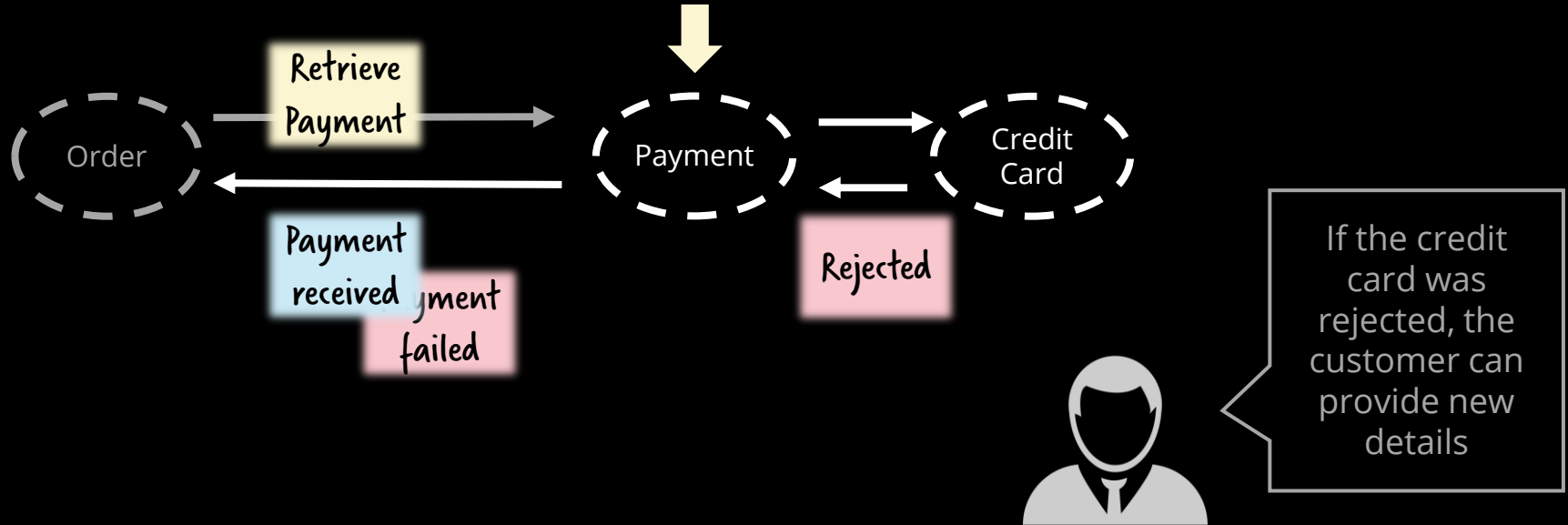
Example



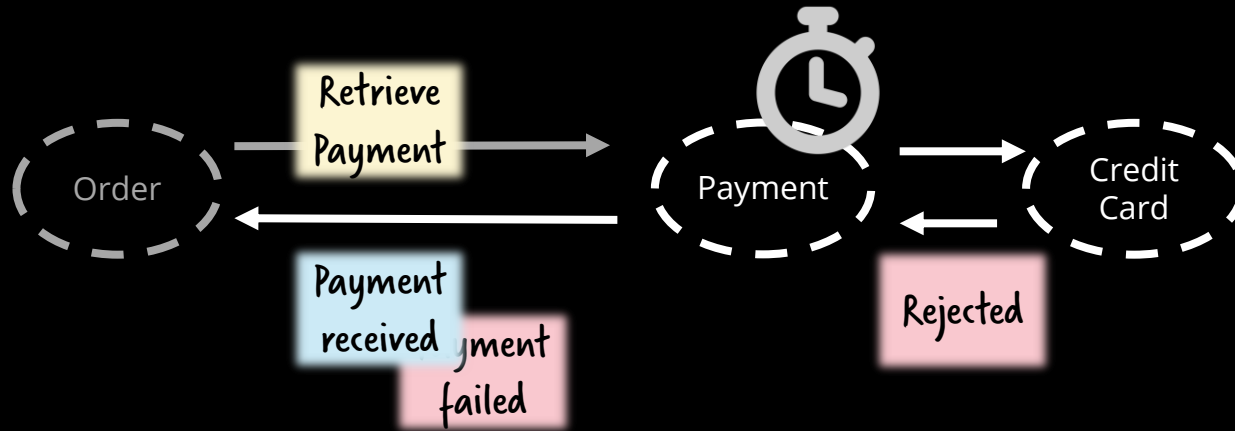
Example



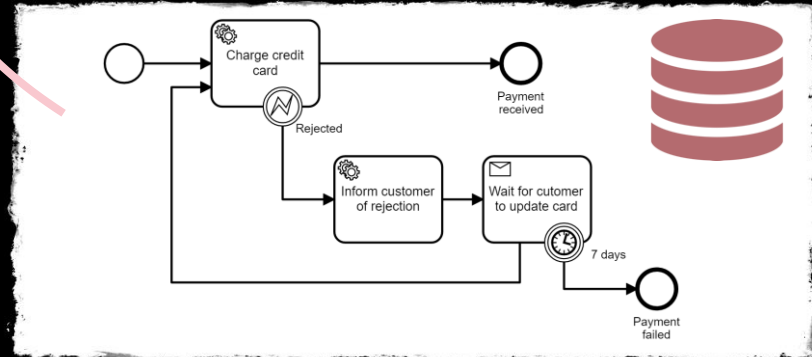
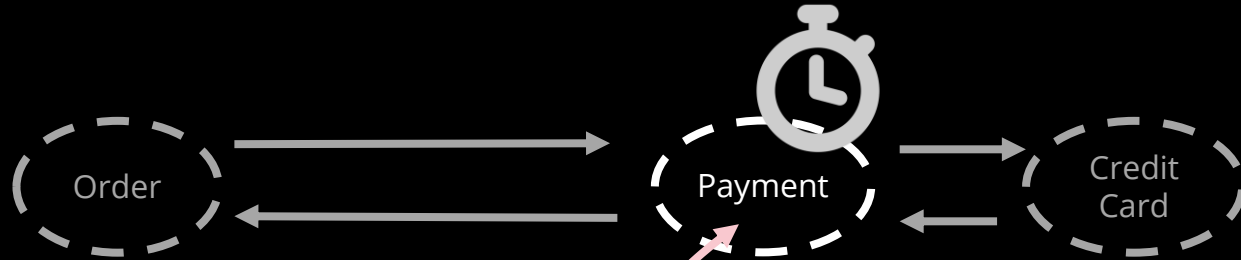
Who is responsible?



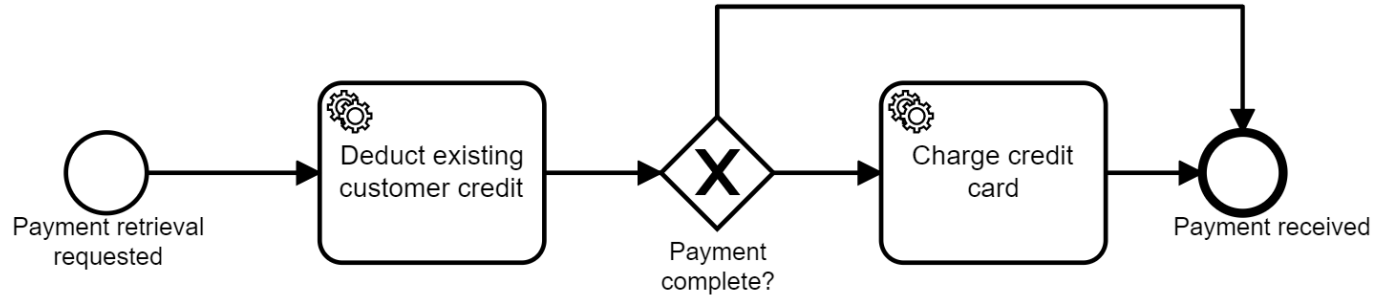
Long running services



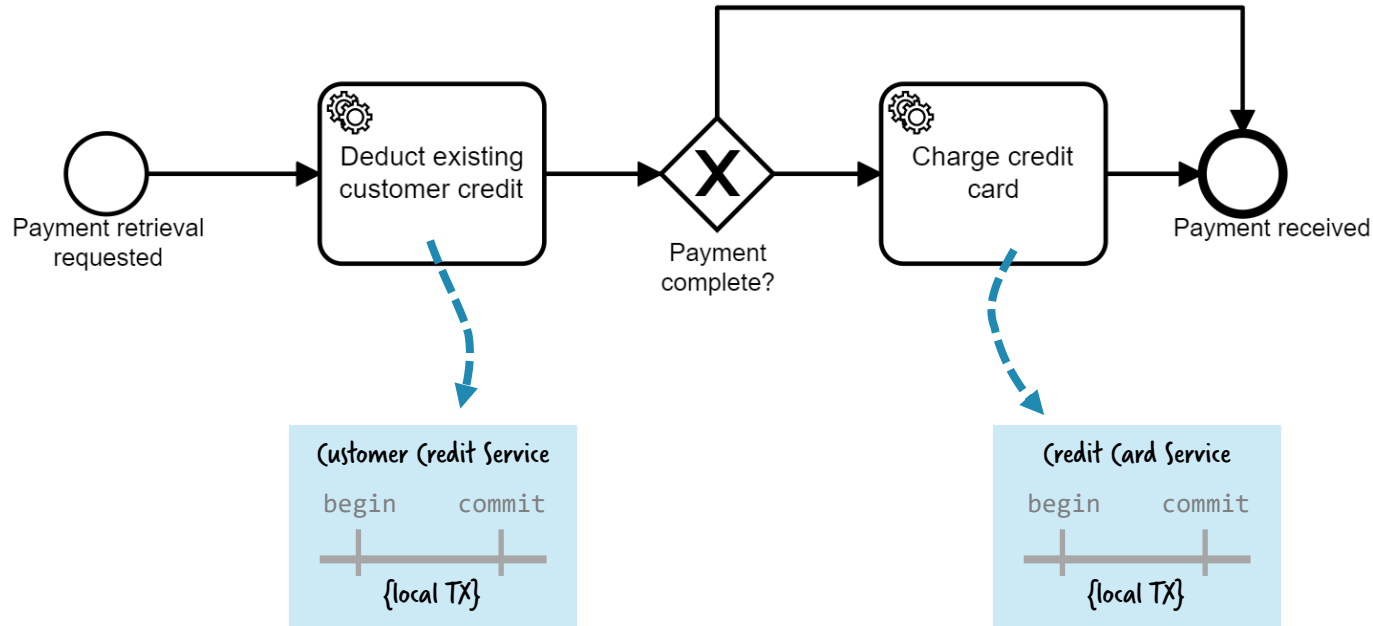
Long running services



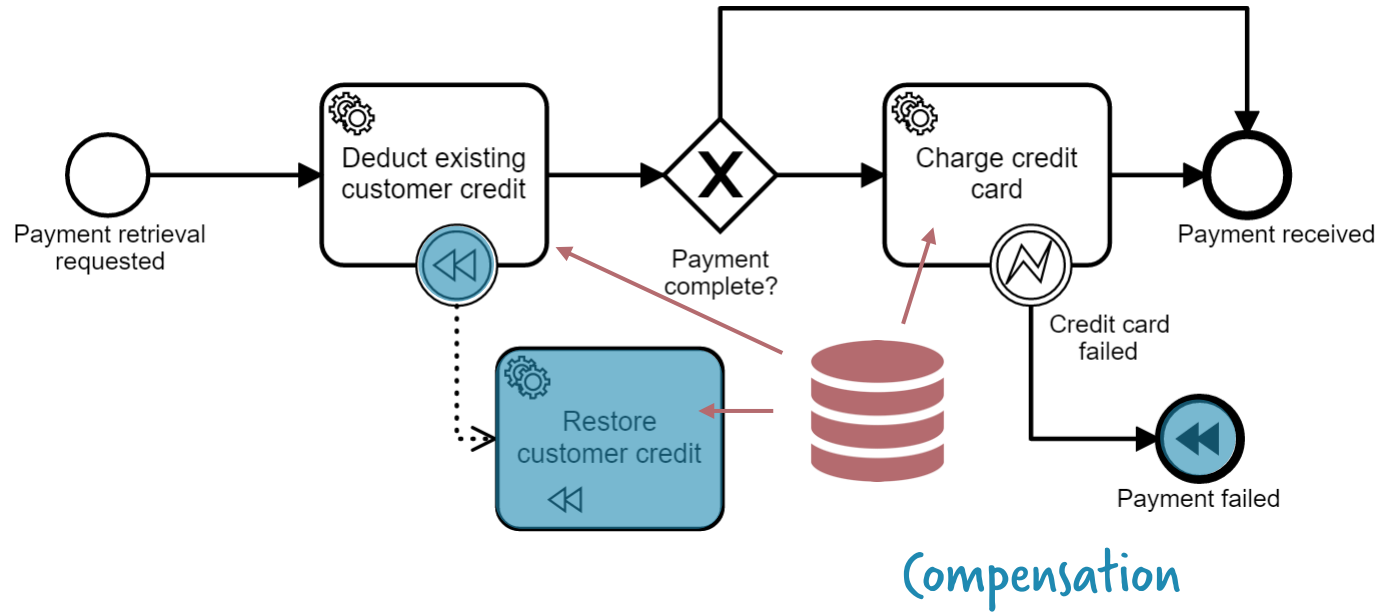
Extending Payment options



Extending Payment options

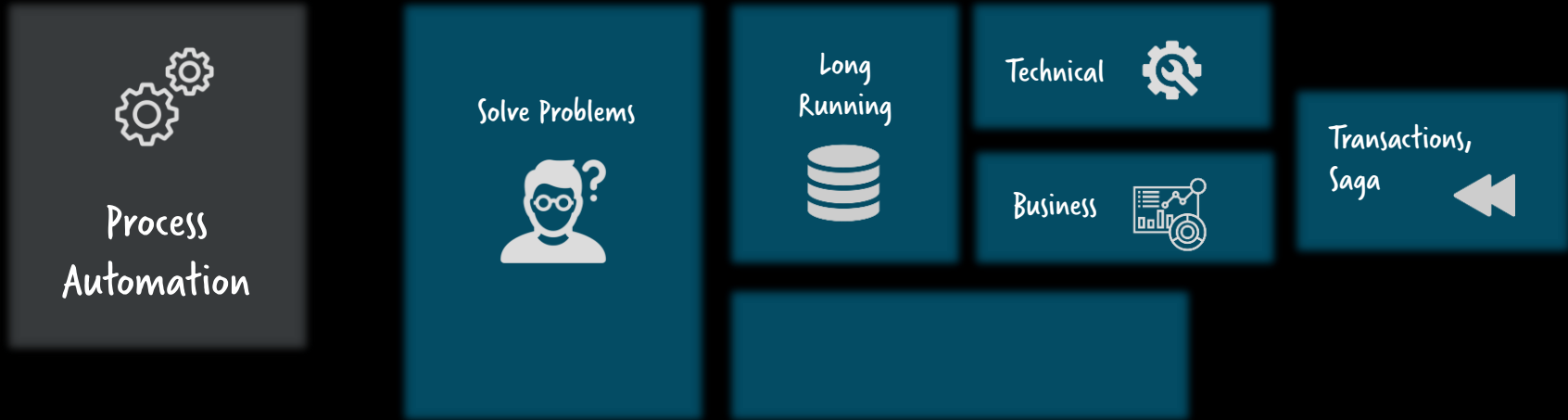


Distributed transactions using compensation *

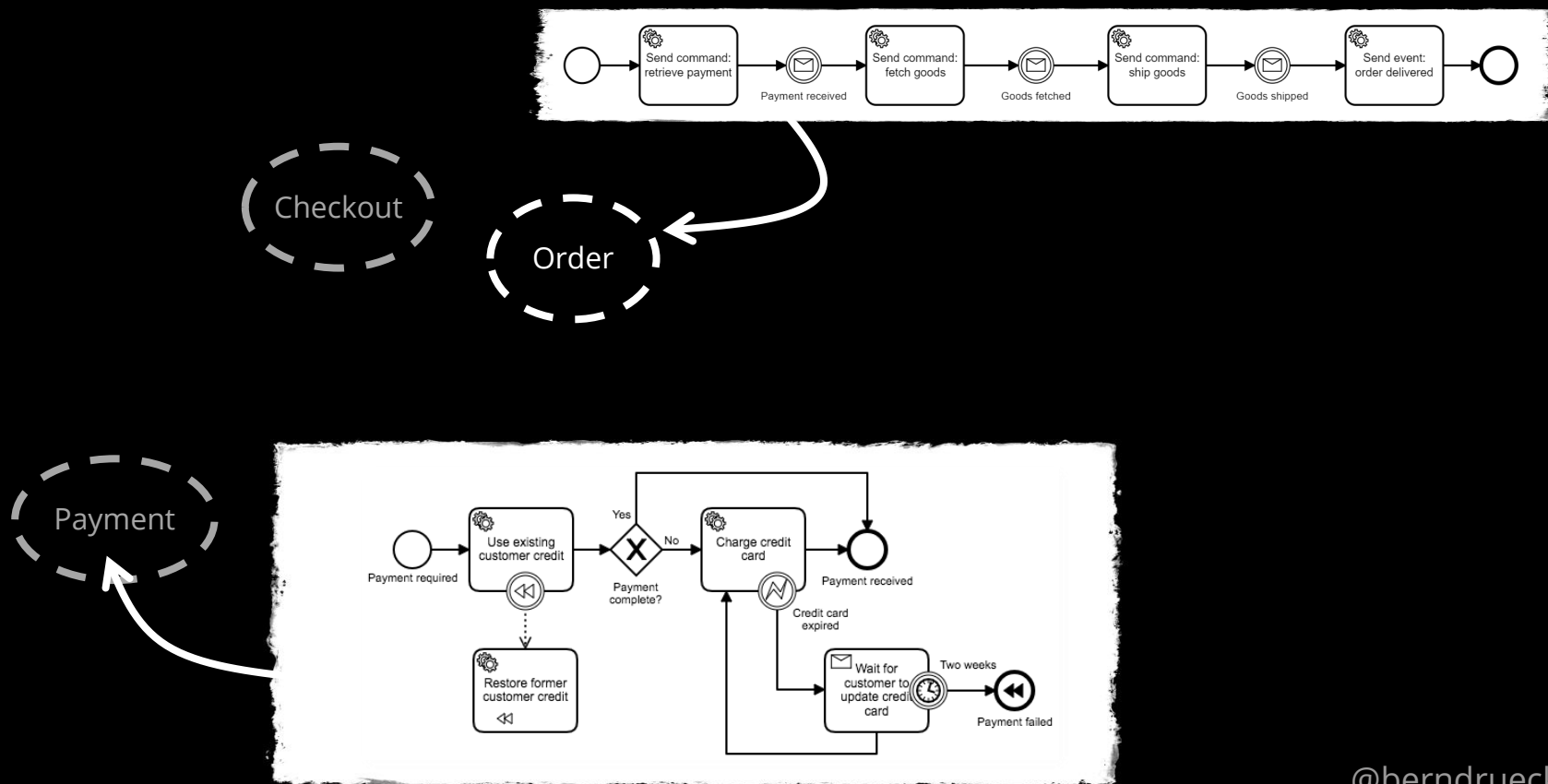


* aka Saga pattern

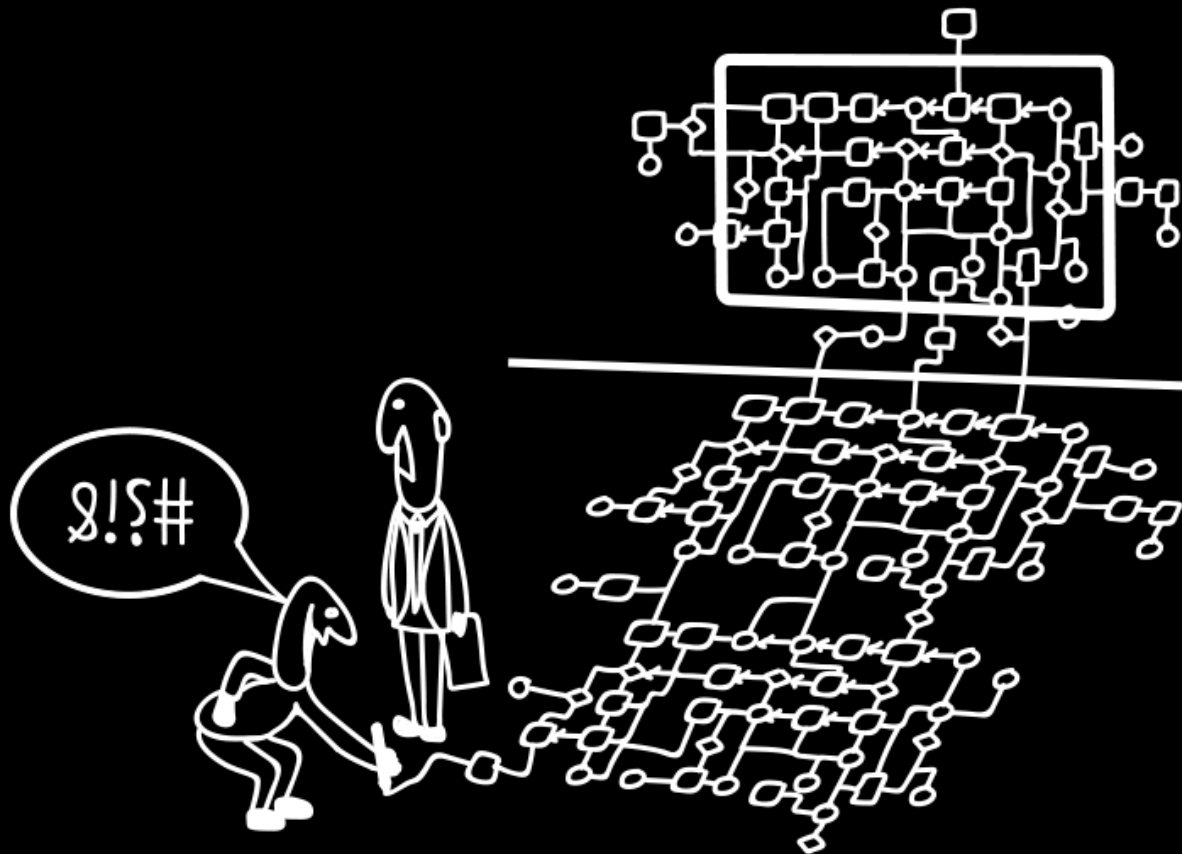
Long Running Capabilities



The workflow is domain logic as part of the service



Graphical models?





Clemens Vasters
Architect at Microsoft



Clemens Vasters
@clemensvasters

- Twitter
- Facebook
- LinkedIn
- GitHub
- Medium
- Stack Overflow
- YouTube
- Instagram
- Google Plus
- SoundCloud
- Spotify
- Nextdoor
- Slack
- Telegram
- Discord
- Signal
- WhatsApp
- Skype
- Line

Sagas

10/10 minutes read

Today has been a fairly day in some parts of the "Tutternator" debaring the Saga pattern. In it stands, there are a few frameworks for "Sagas" but none that use the term "Saga" for some framework implementation of a saga capable or variation. Thanks to that, not where a Saga is a saga is a failure management pattern.

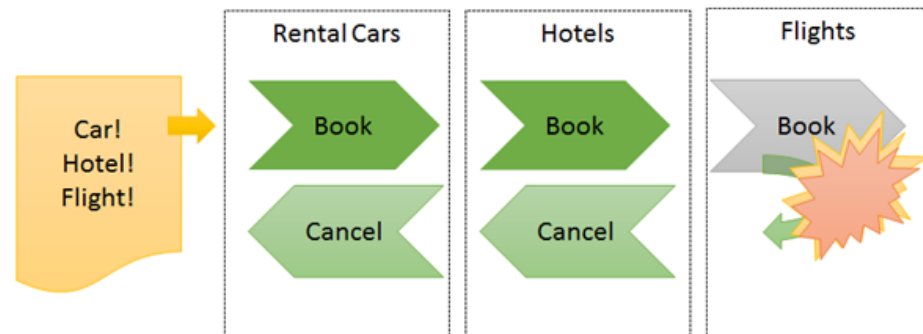
Sagas come out of the realization that particularly long-lived transactions (originally even just in the database), but also for distributed transactions across location and/or trust boundaries can't easily be handled using the distributed 2PC model with 2-Phase commit and holding back for the duration of the work instead. A Saga splits work into individual transactions whose affairs can be committed, reversed after work has been performed and admitted.



The picture shows a single Saga. If you book a travel itinerary you want a car and a hotel and a flight. If you can't get all of them, it's probably not worth going. It's also very certain that you can't undo all of those previous steps a distributed 2PC transaction. Instead, you have an ability for booking rental cars that knows both how to perform a reservation and also how to cancel it and one for a hotel and one for flights.

The activities are grouped in a composite job (routing slip) that's handed along the activity chain. If you want, you can design the routing slip items so that they can only be understood and manipulated by the intended receiver. When an activity completes, it also a means of the completion to the routing slip along with information on where the compensating operation can be resolved (e.g. via a Queue). When an activity fails, it drops up locally and then sends the routing slip backwards to the last.

```
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Clemens Vasters
Architect at Microsoft

<http://vasters.com/archive/Sagas.html>

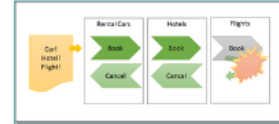


Sagas

(12 minutes read)

Today has been a busy day in some of the "Tuttorians" delecting the Saga pattern. I get it, and there are a few frameworks for "Sagas" out there that use the term "Saga" for some framework implementation of a state machine or workflow. Trouble is, that's not what a Saga is. Saga is a failure management pattern.

Sagas come out of the realization that particularly long-lived transactions (originally even just in the database), but also for distributed transactions across location and/or multiple boundaries can't easily be handled using the classic 2PC model with 2-Phase commit and halting before the duration of the work item. A Saga often involves multiple transactions whose affairs can be committed, retried, or even have work have been performed and admitted.



The pattern allows a single Saga. If you book a travel itinerary you want a car and a hotel and a flight. If you can't get all of them, it's probably not worth going. It's also very certain that you can't undo all of those previous steps if a distributed 2PC transaction. Instead, you have an ability for booking rental cars that knows how to perform a reservation and also how to email it and one for a hotel and one for flights.

The activities are grouped in a composite job (routing slip) that's handed along the activity chain. If you want you can design the routing slip items so that they can only be understood and manipulated by the immediate handler. When an activity completes, it also a means of the completion to the routing slip along with information on where the compensating operation can be resolved (e.g. via a Queue). When an activity fails, it doesn't notify and then sends the routing slip back to the last completed activity's compensating operation to undo the transaction outcome.

If you're a bit familiar with travel, you'll notice that the organized the steps via Reserving a rental car almost always successful. If you book a car, because the rental car company can't find more cars on-site of the high demand. Reserving a hotel is slightly more risky, but you can commonly book out of a reservation without penalty until 24 hours before the stay. Cancellations often come with a refund exception, as you'll find out as that too.

I created a Get an @Gmail that you can run as a console application. It illustrates the model in code. Mind that it's a hobby and not a framework (note this is less than 500 lines of code, so don't expect to reuse this).

The main program sets up an example routing slip (all the classes are in the one file) and creates three completely independent "processes" (activity handlers) that are each responsible for handling a particular kind of work. The "processes" are linked by a "memory" and each kind of activity has an address for forward progress and an address for compensation work. The memory resolution is illustrated by "Saga".

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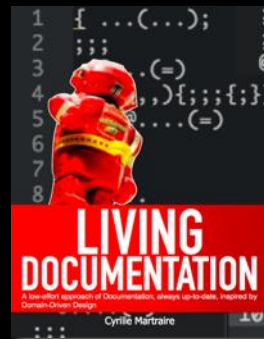
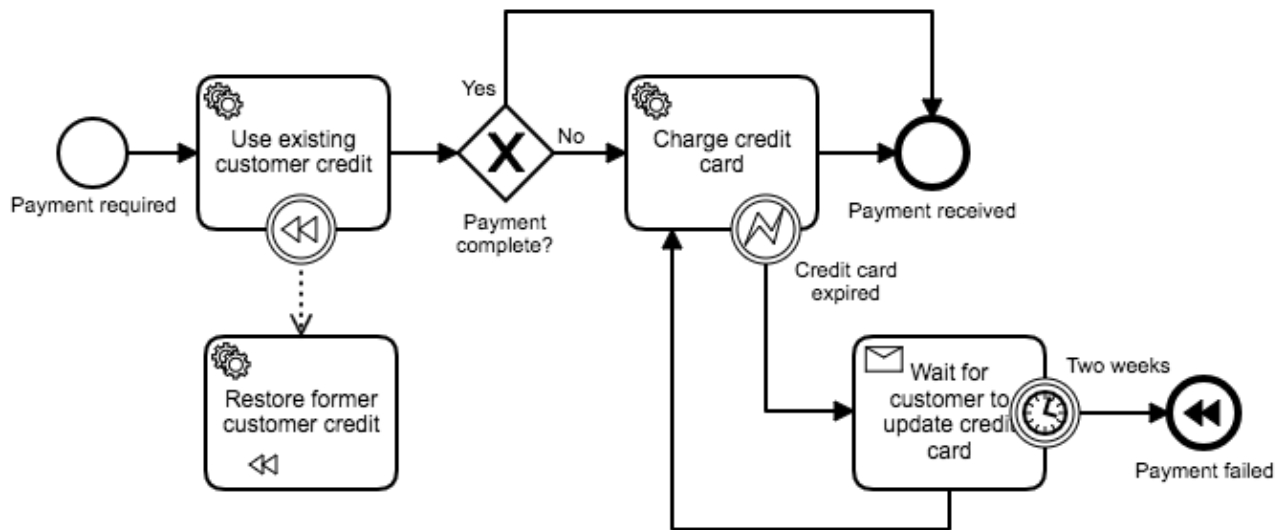
BPMN

Business Process
Model and Notation

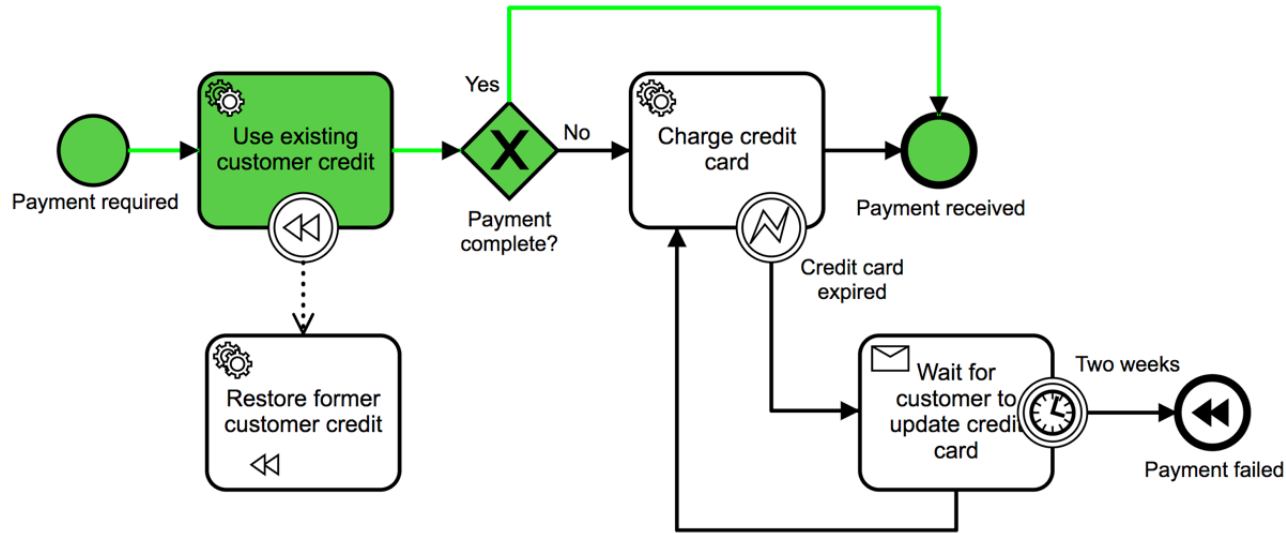
ISO Standard



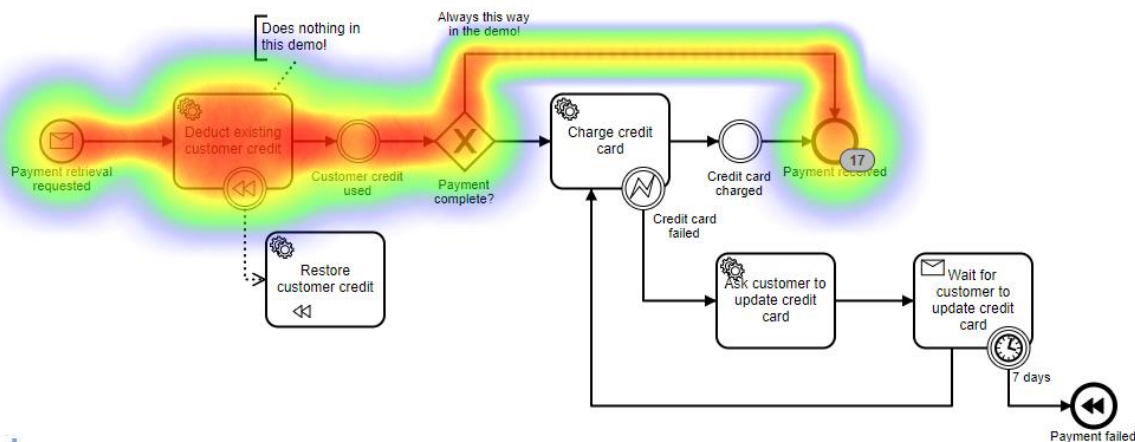
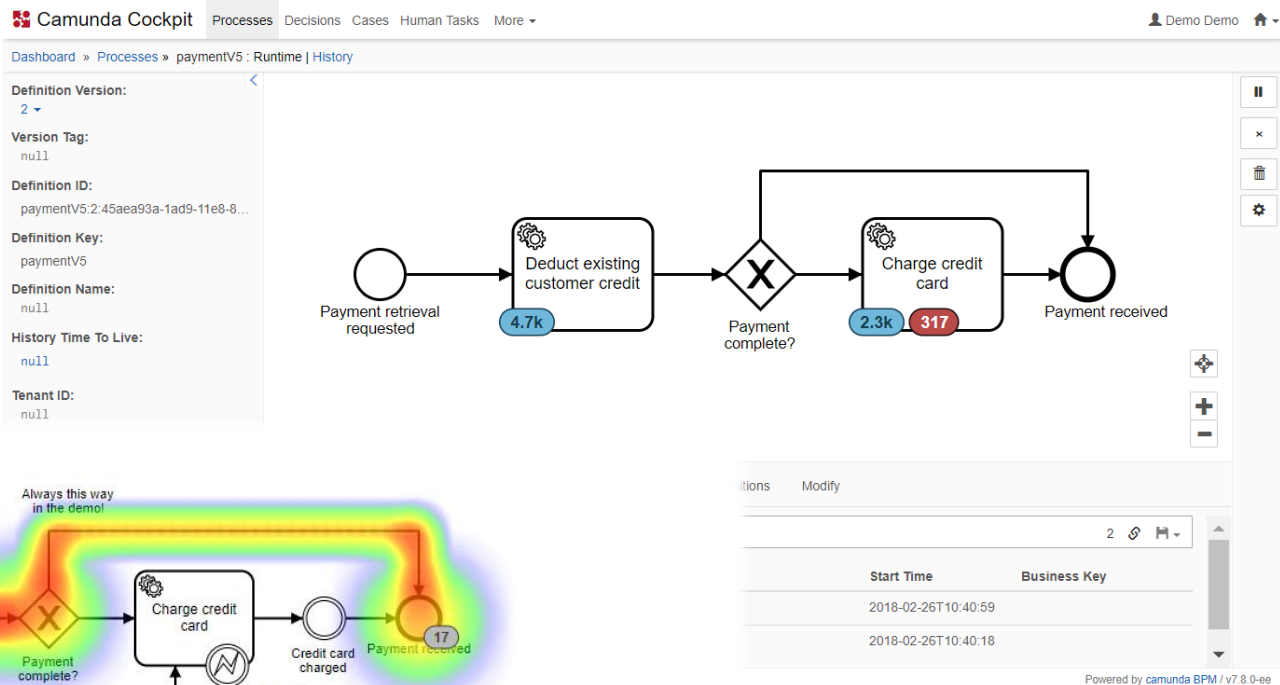
Living documentation for long-running behaviour



Visual HTML reports for test cases

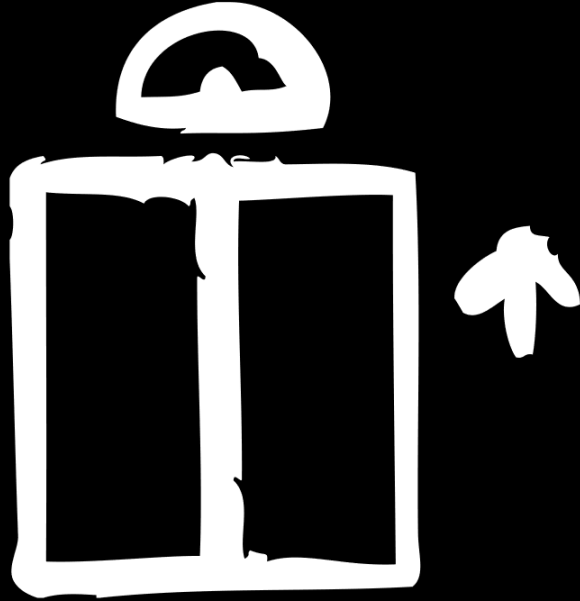


BizDevops



Long Running Capabilities

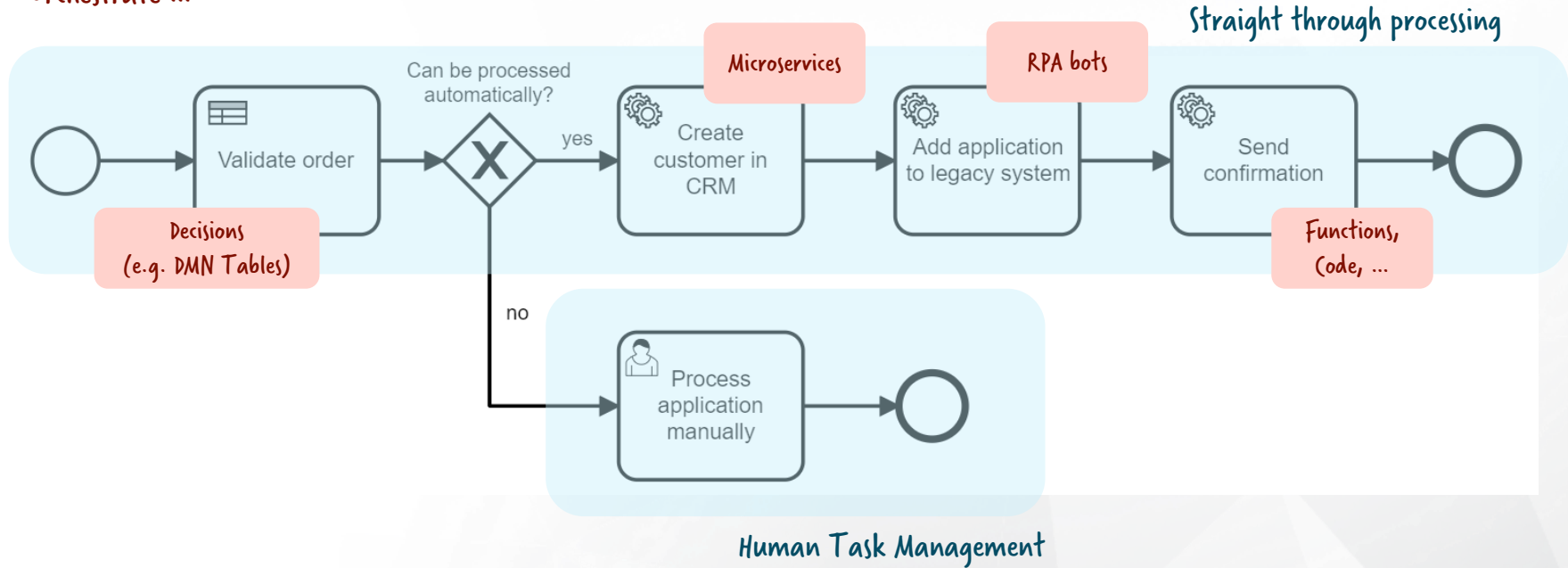




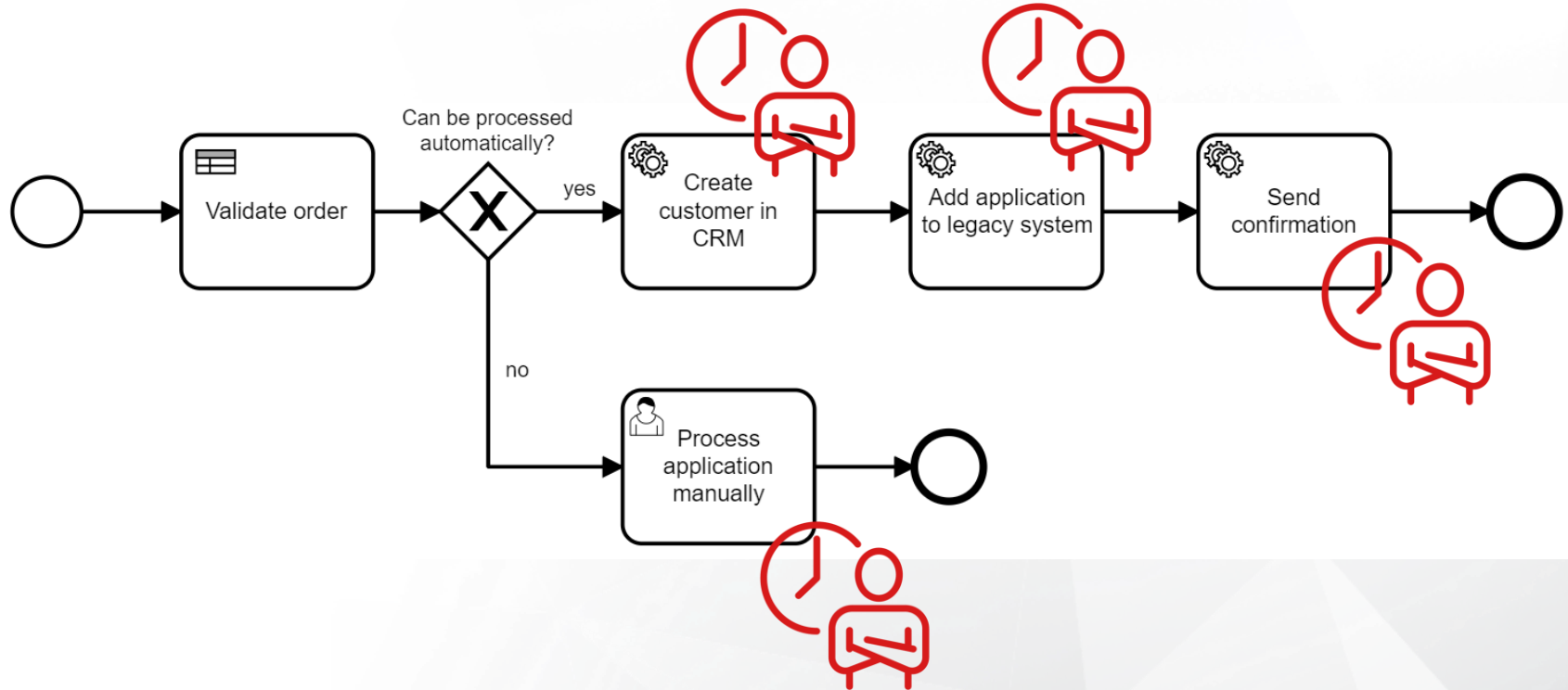
Process & consistency
decisions need to be
elevated to the
business level!

Recap: Workflow engines orchestrate anything

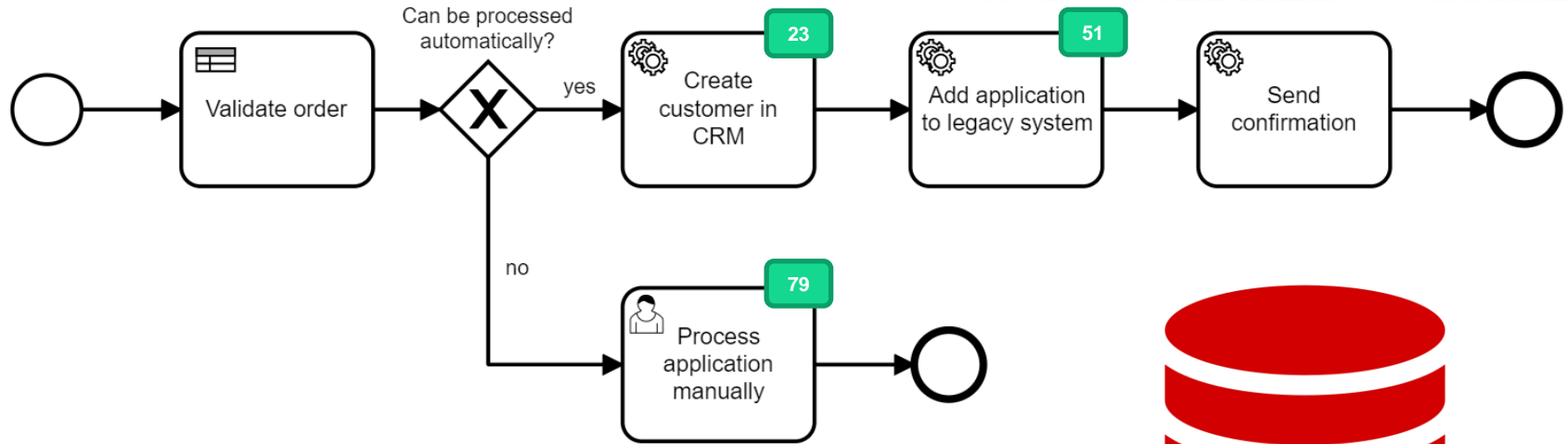
orchestrate ...



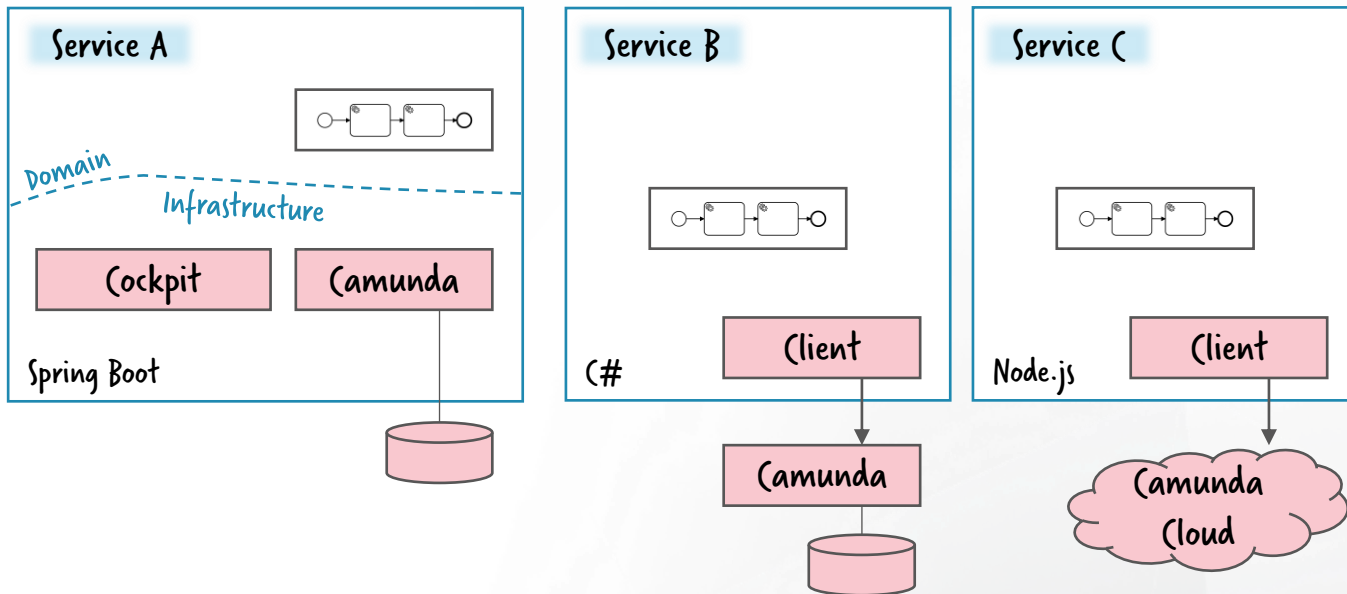
Recap: The challenge are long running tasks = waiting



Recap: A workflow engine persists state



Decentralized workflow engines with flexible architecture options

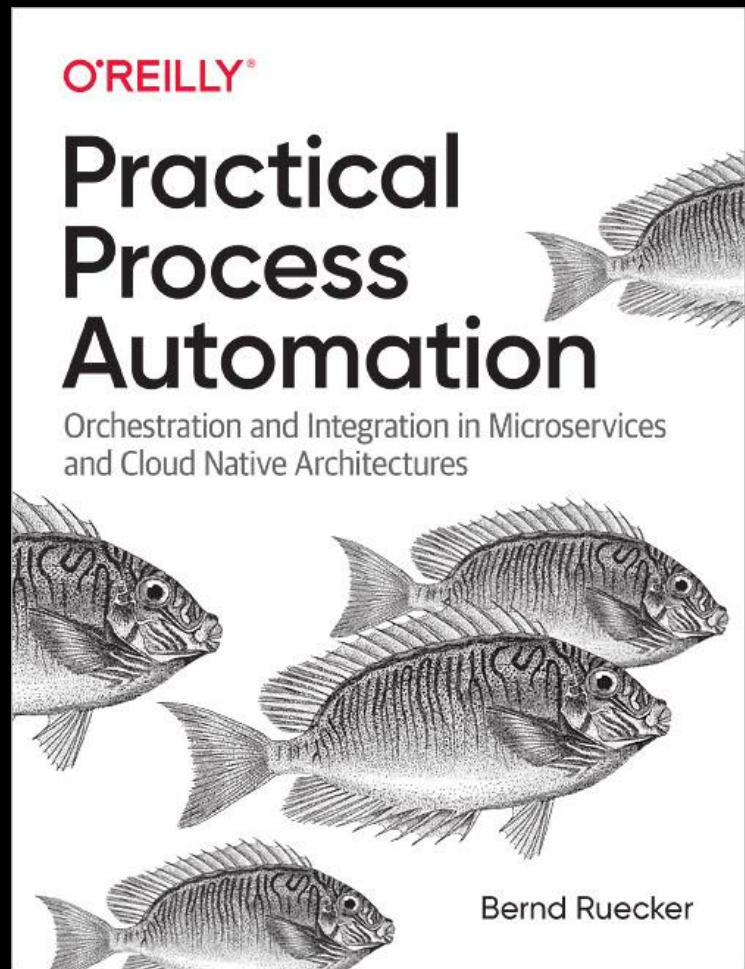


Recap

- You need capabilities for long running behavior for technical and business reasons
- Workflow engines are a great fit — make sure you use a developer friendly one
- Balance orchestration (coordination) and choreography (reactive)

Want to learn more?

<https://learning.oreilly.com/get-learning/?code=PPAER20>



Thank you!



Contact: mail@berndruecker.io
[@berndruecker](#)

Slides: <https://berndruecker.io>

Blog: <https://medium.com/berndruecker>

Code: <https://github.com/berndruecker>

InfoWorld
FROM IDG

<https://www.infoworld.com/article/3254777/application-development/3-common-pitfalls-of-microservices-integration-and-how-to-avoid-them.html>

InfoQ
ueue

<https://www.infoq.com/articles/events-workflow-automation>

THE NEW STACK

<https://thenewstack.io/5-workflow-automation-use-cases-you-might-not-have-considered/>

