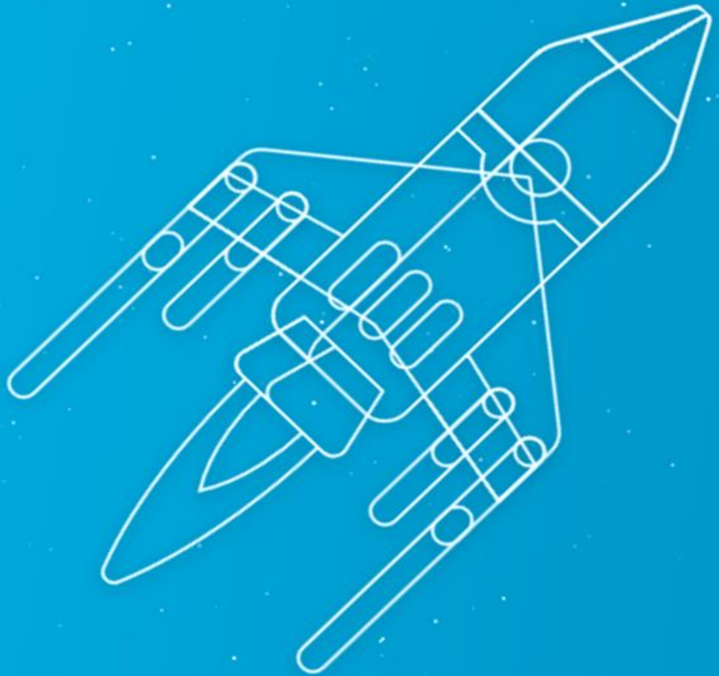
Serverless Side-by-Side Extensions with Azure Durable Functions

When stateful meets stateless



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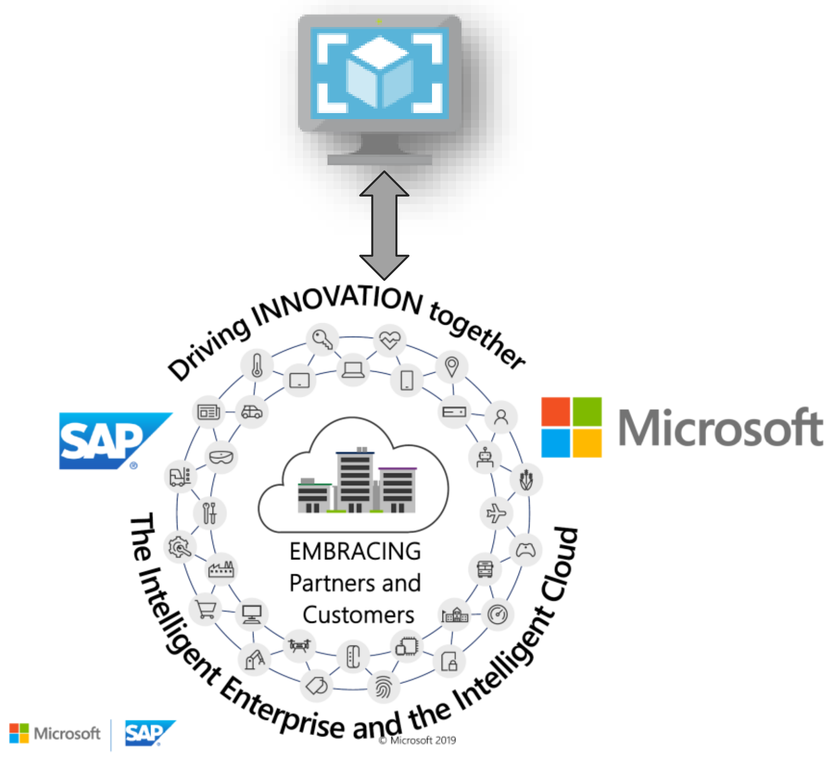
About me

- Heading the Microsoft Azure team@minnosphere
- In the SAP ecosystem since 2005
- Kind of active in the community
- Focus Topics: Extensibility, Cloud Native Development, Serverless

@lechnerc77

Why should we care about Microsoft at all?

Lift
Enabling Data First Execution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EMBRACING Partners and Customers
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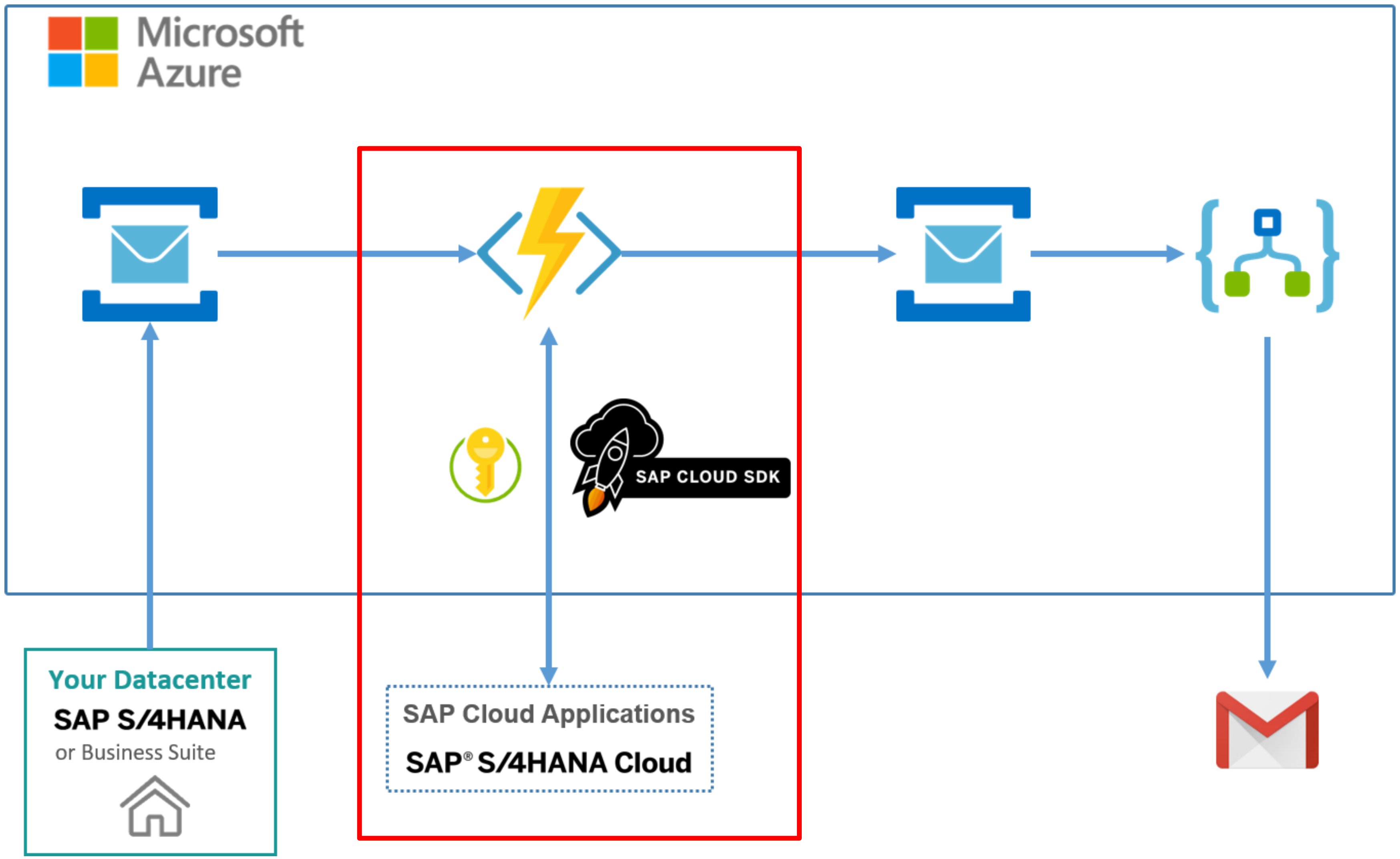
Reshape
Enhancing Processes with Intelligence and Automation

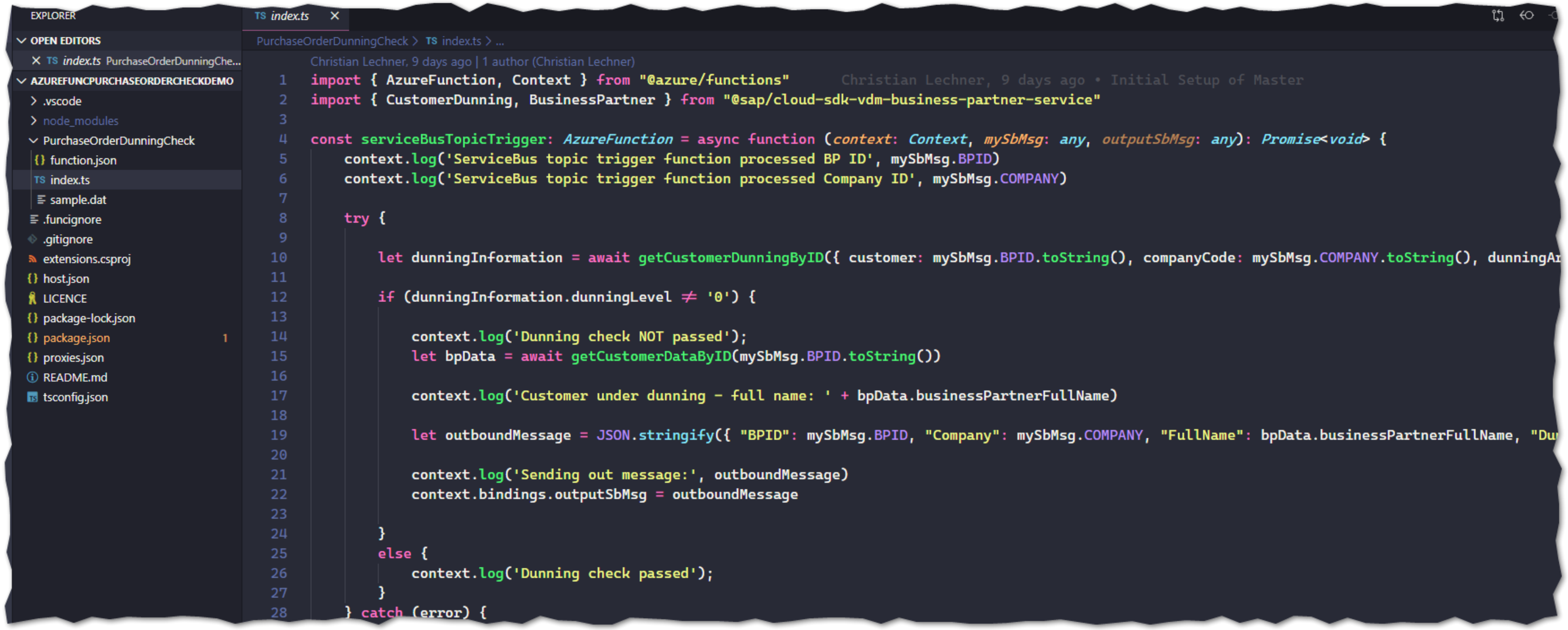
Create
Creating Experiences with New Business Models

Scenario – Serverless Extension of SAP



https://blogs.sap.com/2019/12/09/a-serverless-extension-story-from-abap-to-azure/

Azure Functions 101


EXPLORER
OPEN EDITORS
index.ts PurchaseOrderDunningChe...
AZUREFUNCPURCHASEORDERCHECKDEMO
.vscode
node_modules
PurchaseOrderDunningCheck
function.json
index.ts
sample.dat
.funcignore
.gitignore
extensions.csproj
host.json
LICENCE
package-lock.json
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proxies.json
README.md
tsconfig.json
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PurchaseOrderDunningCheck > index.ts > ...
Christian Lechner, 9 days ago | 1 author (Christian Lechner)
Christian Lechner, 9 days ago • Initial Setup of Master

```typescript
import { AzureFunction, Context } from "@azure/functions"
import { CustomerDunning, BusinessPartner } from "@sap/cloud-sdk-vdm-business-partner-service"

const serviceBusTopicTrigger: AzureFunction = async function (context: Context, mySbMsg: any, outputSbMsg: any): Promise<void> {
    context.log('ServiceBus topic trigger function processed BP ID', mySbMsg.BPID)
    context.log('ServiceBus topic trigger function processed Company ID', mySbMsg.COMPANY)

    try {

        let dunningInformation = await getCustomerDunningByID({ customer: mySbMsg.BPID.toString(), companyCode: mySbMsg.COMPANY.toString(), dunningAr

        if (dunningInformation.dunningLevel ≠ '0') {

            context.log('Dunning check NOT passed');
            let bpData = await getCustomerDataByID(mySbMsg.BPID.toString())

            context.log('Customer under dunning - full name: ' + bpData.businessPartnerFullName)

            let outboundMessage = JSON.stringify({ "BPID": mySbMsg.BPID, "Company": mySbMsg.COMPANY, "FullName": bpData.businessPartnerFullName, "Du

            context.log('Sending out message:', outboundMessage)
            context.bindings.outputSbMsg = outboundMessage

        }
        else {
            context.log('Dunning check passed');
        }
    } catch (error) {
```

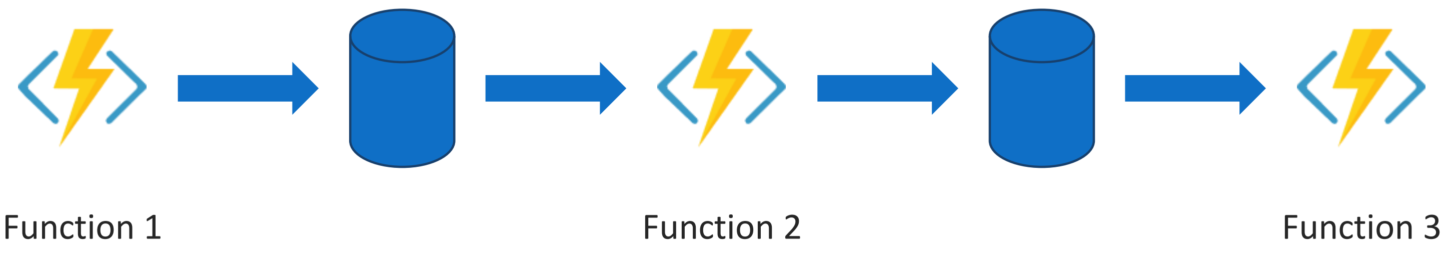
Serverless is great … but Functions as a Service come with “drawbacks”

Principles and Best Practices

- Functions must be stateless
- Functions must not call other functions
- Functions should do only one thing

How do we model “workflows” in a FaaS world?

Function Chaining to achieve State



Problems

- Unclear relation between functions
- Queues are a necessary evil
- Context must be stored in a DB
- Error handling becomes very complex

Durable Functions for the Rescue

- **Extension** to the Azure Functions Framework
- Preserves local state via **Event Sourcing**
- **Heavy work happens** behind the curtain
- Supports you in front of the curtain with **additional features**

How does this work?

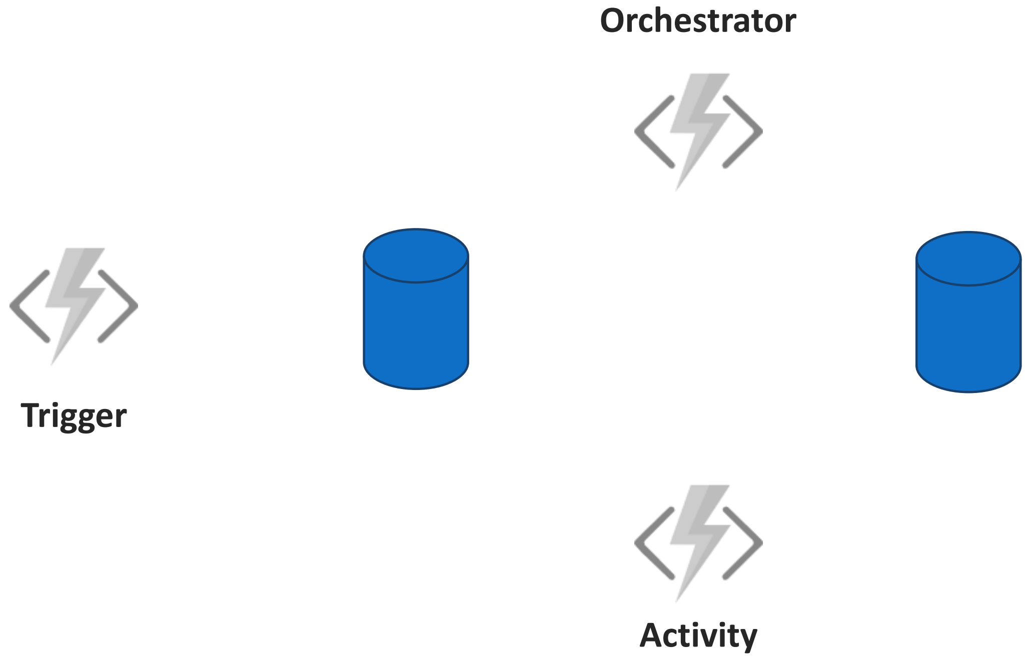
Tasks in orchestrator

1. `let x = await ctx.CallActivityAsync(“F1”)`
2. `let y = await ctx.CallActivityAsync(“F2”, x)`
3. `return await ctx.CallActivityAsync(“F3”, y)`

How does this work?

Tasks in orchestrator

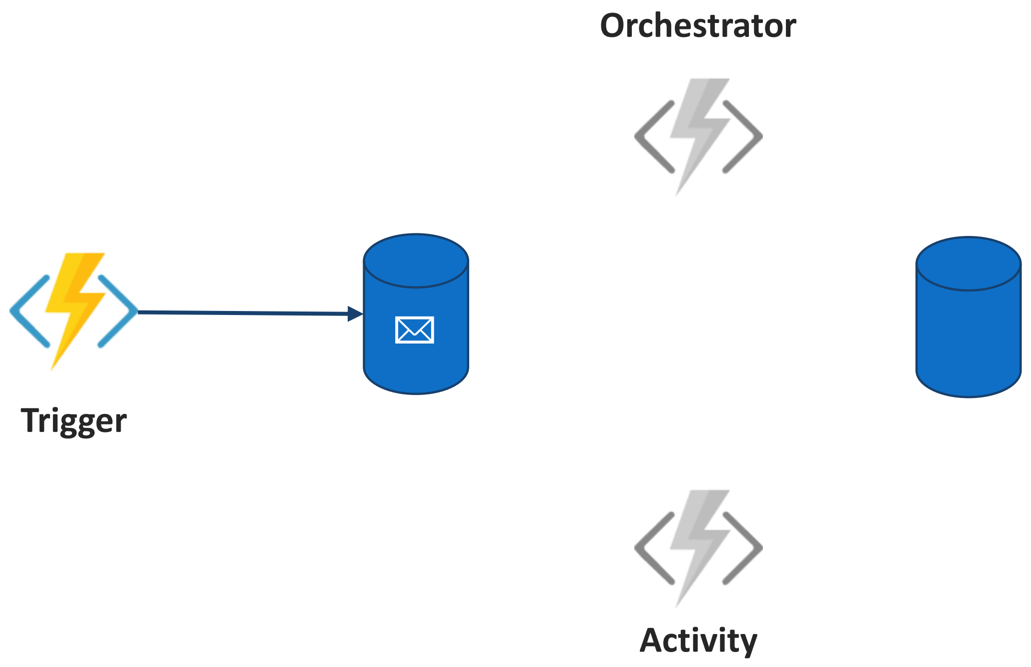
```
1.  let x = await ctx.CallActivityAsync("F1")
2.  let y = await ctx.CallActivityAsync("F2", x)
3.  return await ctx.CallActivityAsync("F3", y)
```



Step 1 - Trigger

Tasks in orchestrator

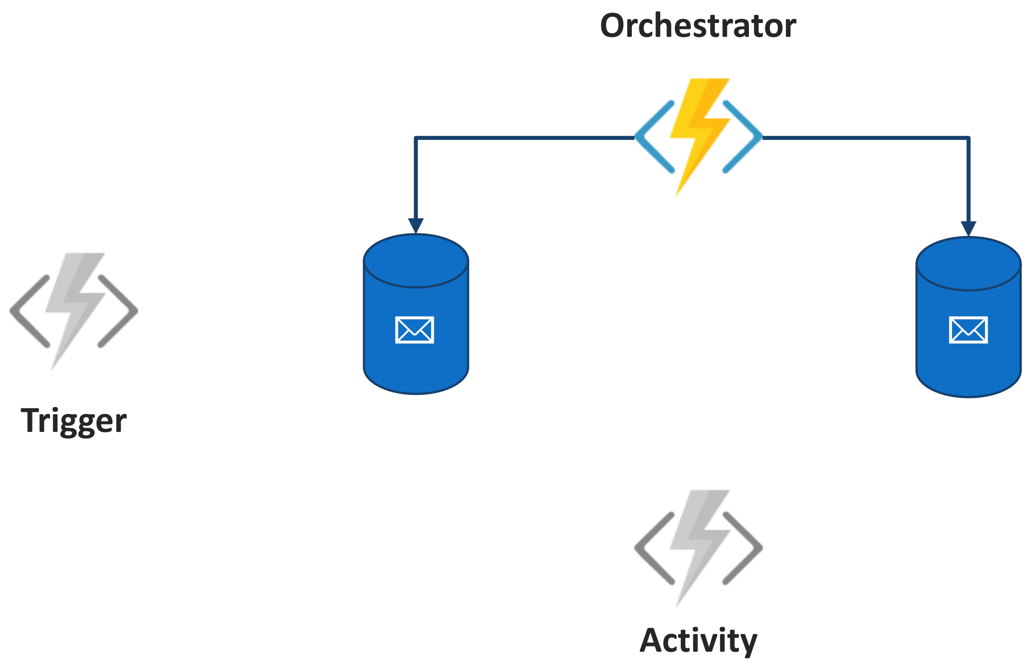
```
1.  let x = await ctx.CallActivityAsync("F1")
2.  let y = await ctx.CallActivityAsync("F2", x)
3.  return await ctx.CallActivityAsync("F3", y)
```



Step 2 – Orchestrator fetches event & schedules task for F1

Tasks in orchestrator

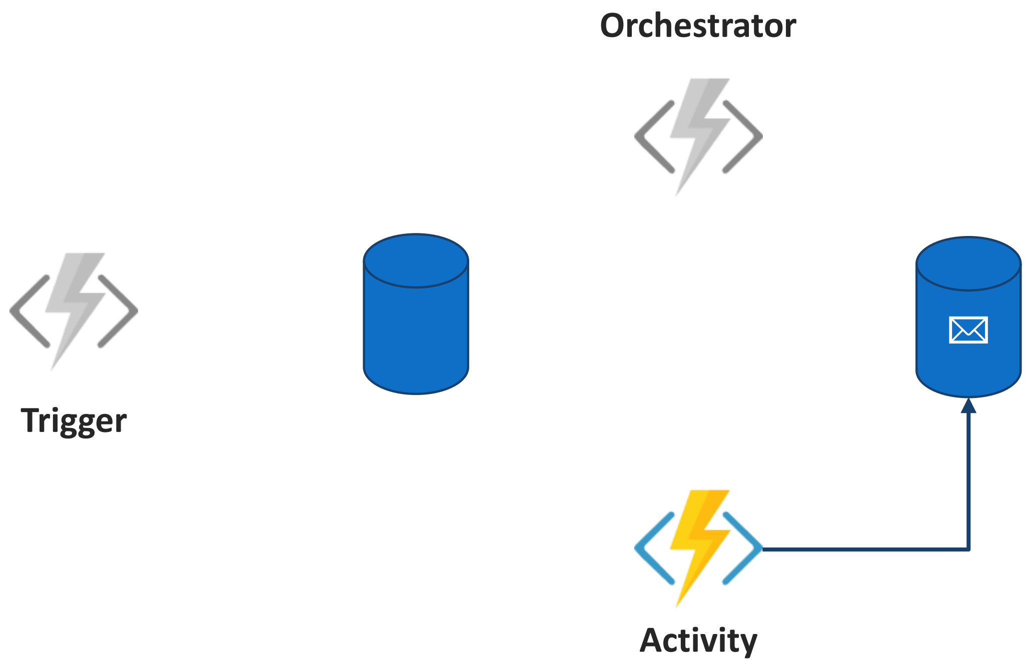
```
1.  let x = await ctx.CallActivityAsync(“F1”)
2.  let y = await ctx.CallActivityAsync(“F2”, x)
3.  return await ctx.CallActivityAsync(“F3”, y)
```



Step 3 – F1 executes task & returns result

Tasks in orchestrator

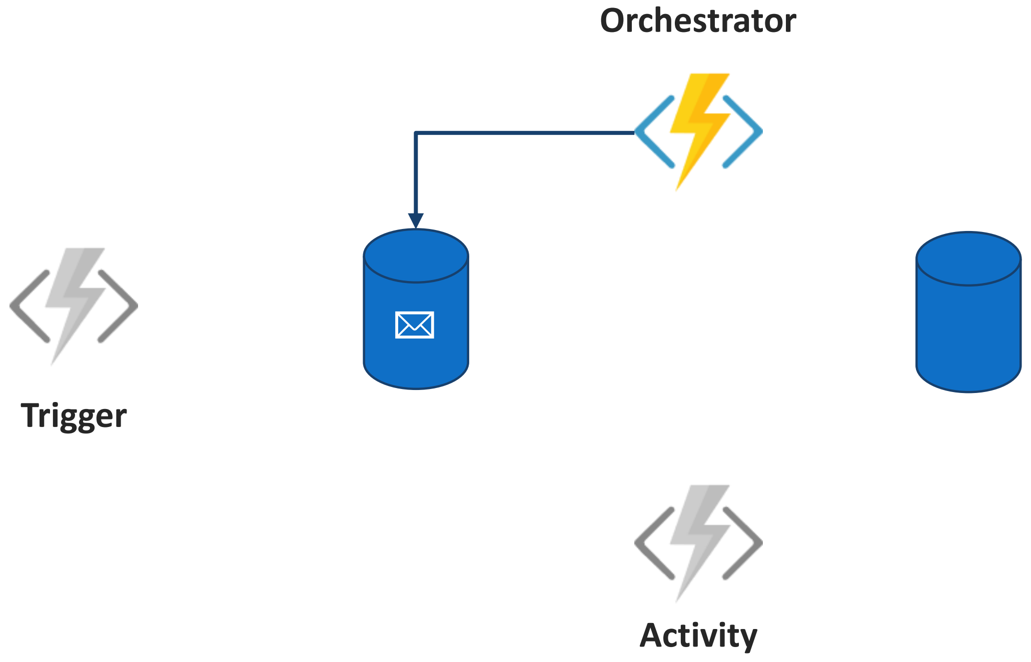
```
1.  let x = await ctx.CallActivityAsync("F1")
2.  let y = await ctx.CallActivityAsync("F2", x)
3.  return await ctx.CallActivityAsync("F3", y)
```



Step 4a – Orchestrator updates Event History

Tasks in orchestrator

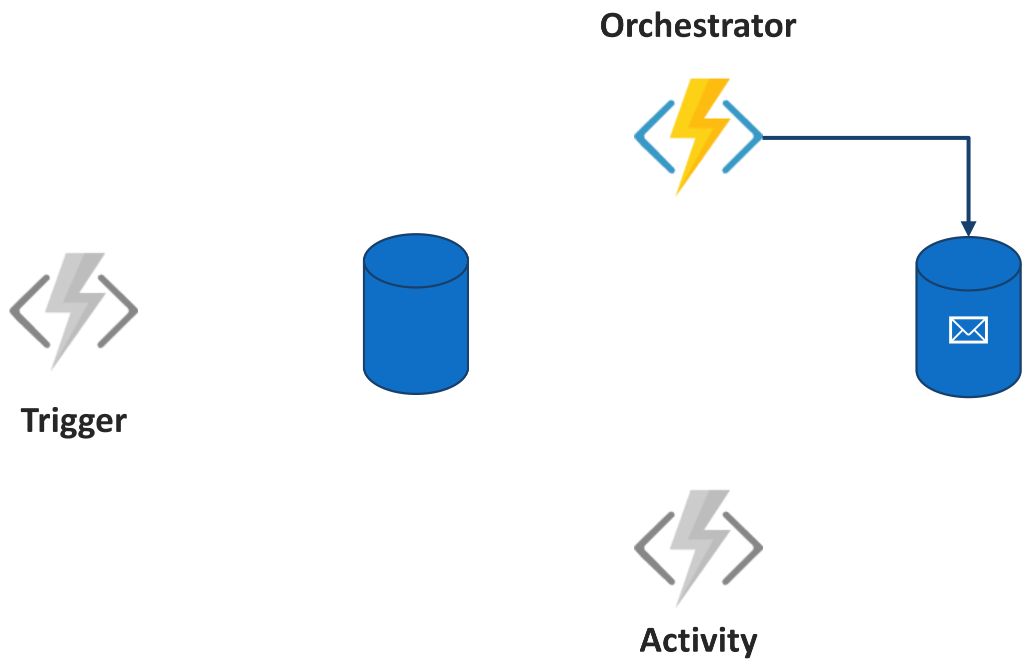
1. ✓ `let x = await ctx.CallActivityAsync("F1")`
2. `let y = await ctx.CallActivityAsync("F2", x)`
3. `return await ctx.CallActivityAsync("F3", y)`



Step 4b – Orchestrator schedules next task Event History

Tasks in orchestrator

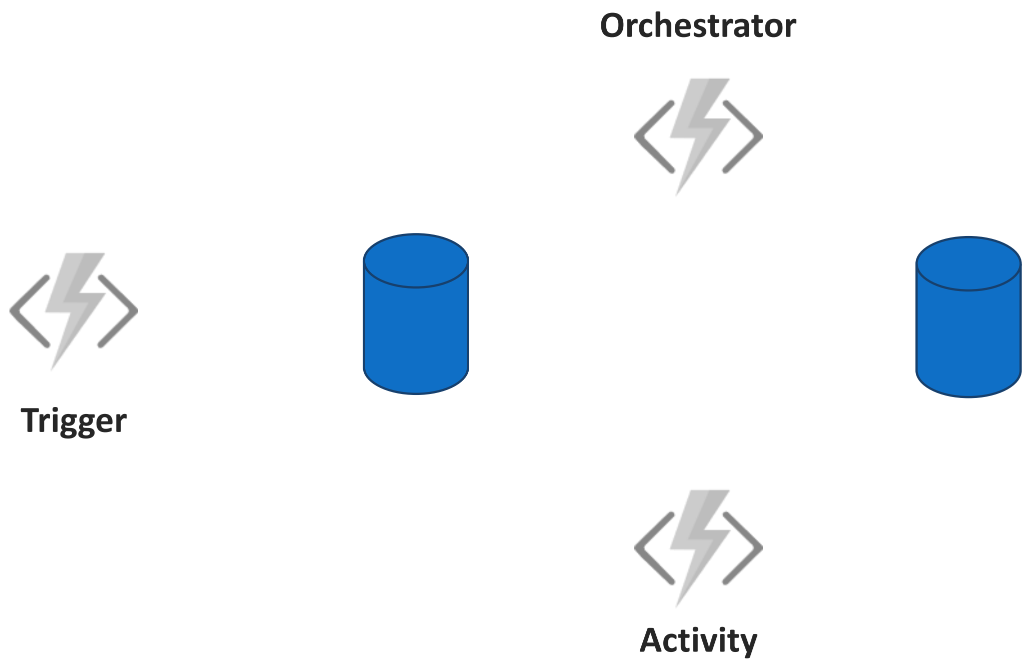
1. ✓ `let x = await ctx.CallActivityAsync(“F1”)`
2. `let y = await ctx.CallActivityAsync(“F2”, x)`
3. `return await ctx.CallActivityAsync(“F3”, y)`



Step 4b – Orchestrator schedules next task Event History

Tasks in orchestrator

```
✓ 1. let x = await ctx.CallActivityAsync(“F1”)
✓ 2. let y = await ctx.CallActivityAsync(“F2”, x)
✓ 3. return await ctx.CallActivityAsync(“F3”, y)
```



Summing up: Durable Functions are like …

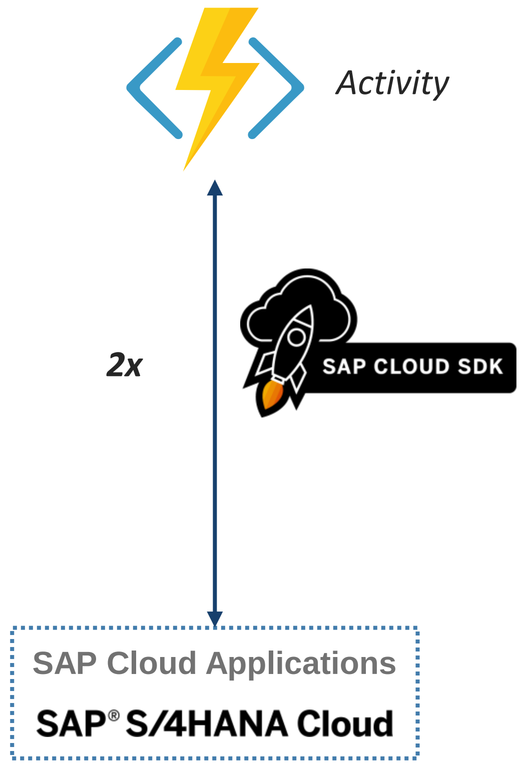
Let’s get local

- Azure Functions Runtime (https://docs.microsoft.com/en-US/azure/azure-functions/functions-run-local?tabs=windows)
- Azure Durable Functions Extension (npm install durable-functions)
- Microsoft SQL Server Express (https://www.microsoft.com/de-de/sql-server/sql-server-downloads)
- Microsoft Azure Storage Emulator (https://github.com/MicrosoftDocs/azure-docs/blob/master/articles/storage/common/storage-use-emulator.md)
- Optional: Microsoft Azure Storage Explorer (https://azure.microsoft.com/en-us/features/storage-explorer/)

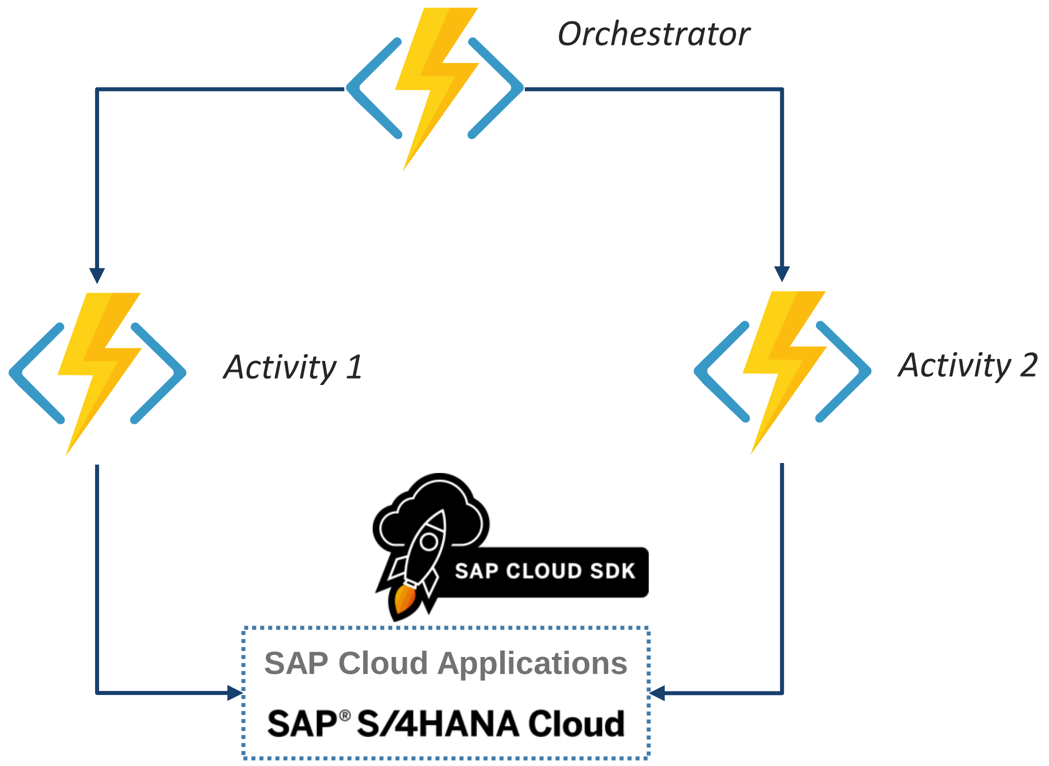
Walkthrough: https://youtu.be/HdhPC_K6cLo

Challenge 1 – Decompose Single Function into Orchestrator and Activities

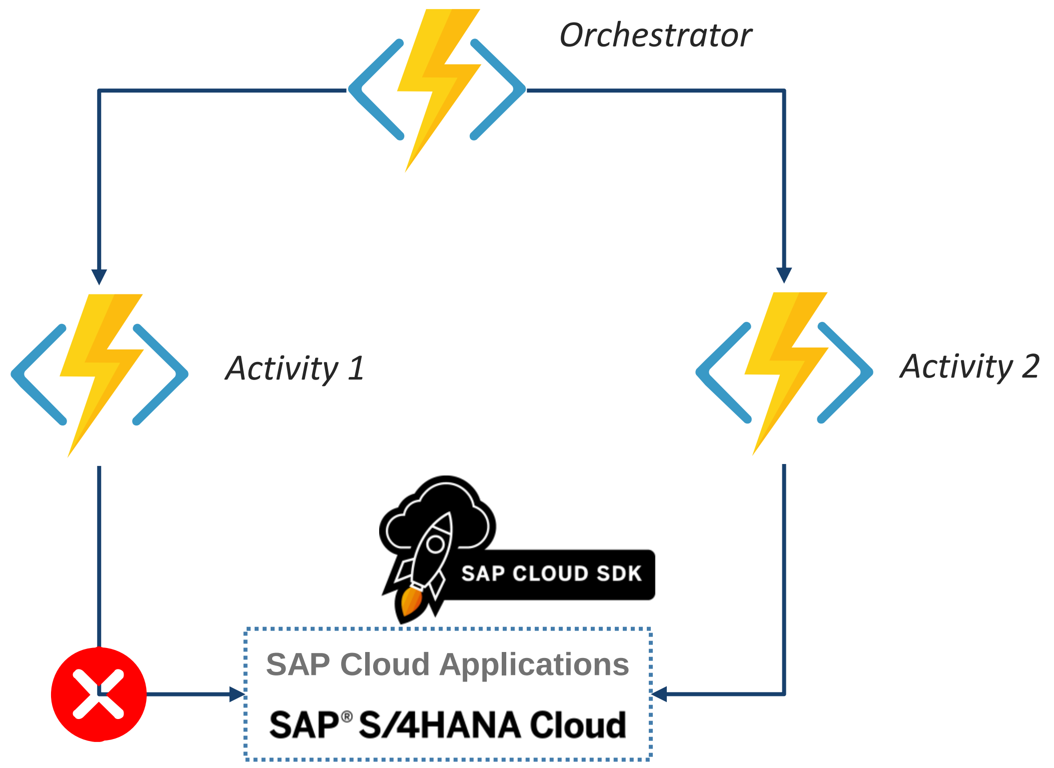
Current State



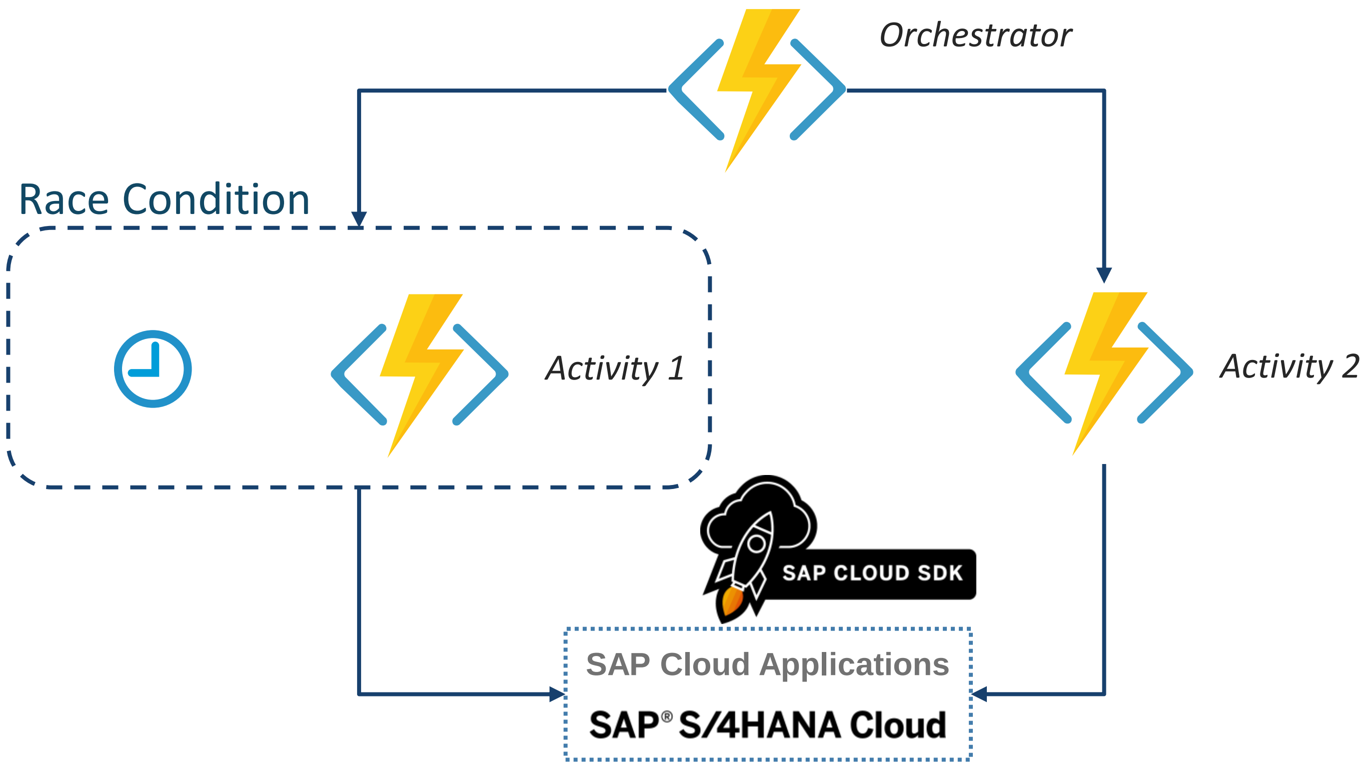
Target State



Challenge 2 – Handle Errors in Activity Calls (Retry)

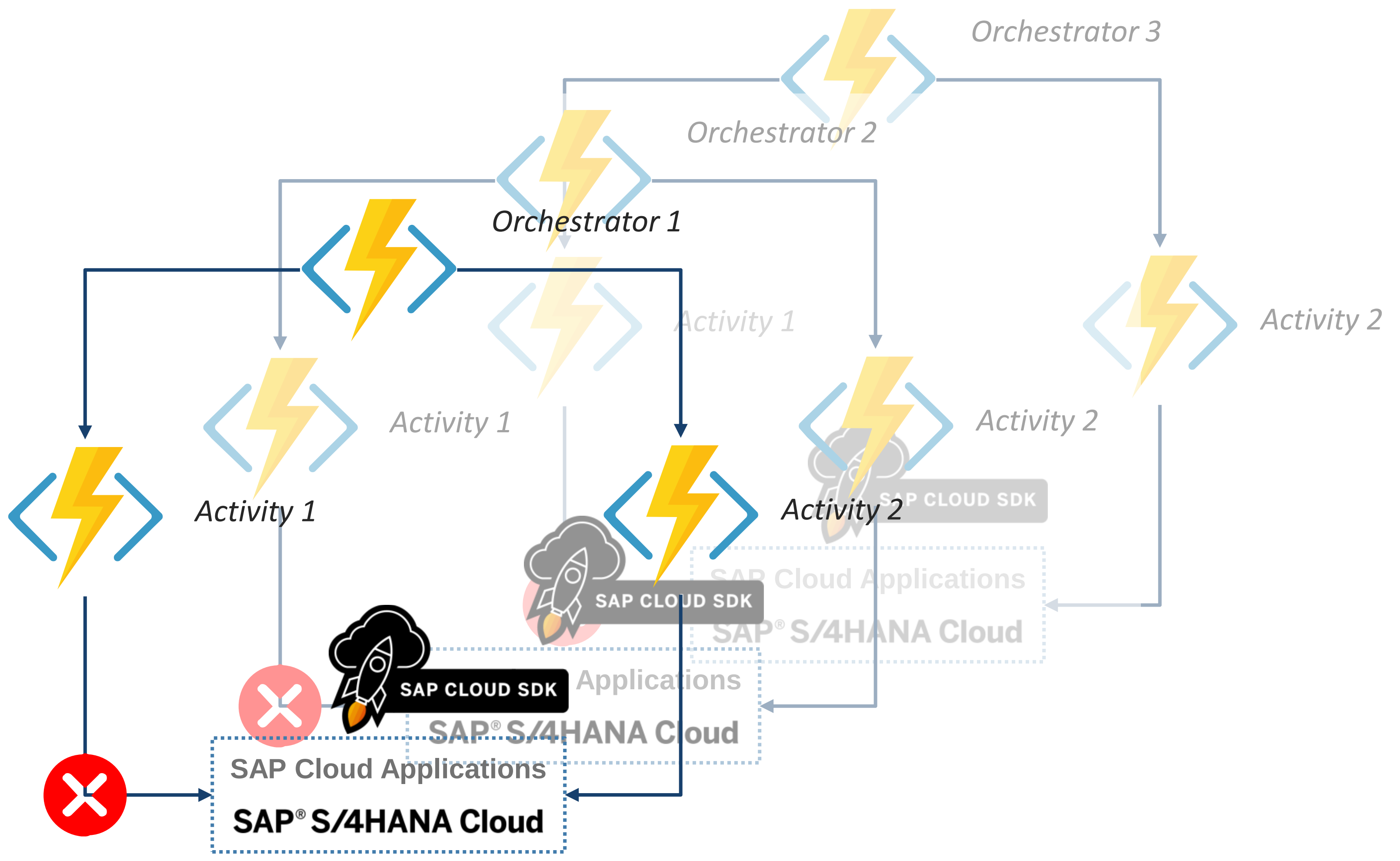


Challenge 3 – Handle Timeouts in Activity Calls



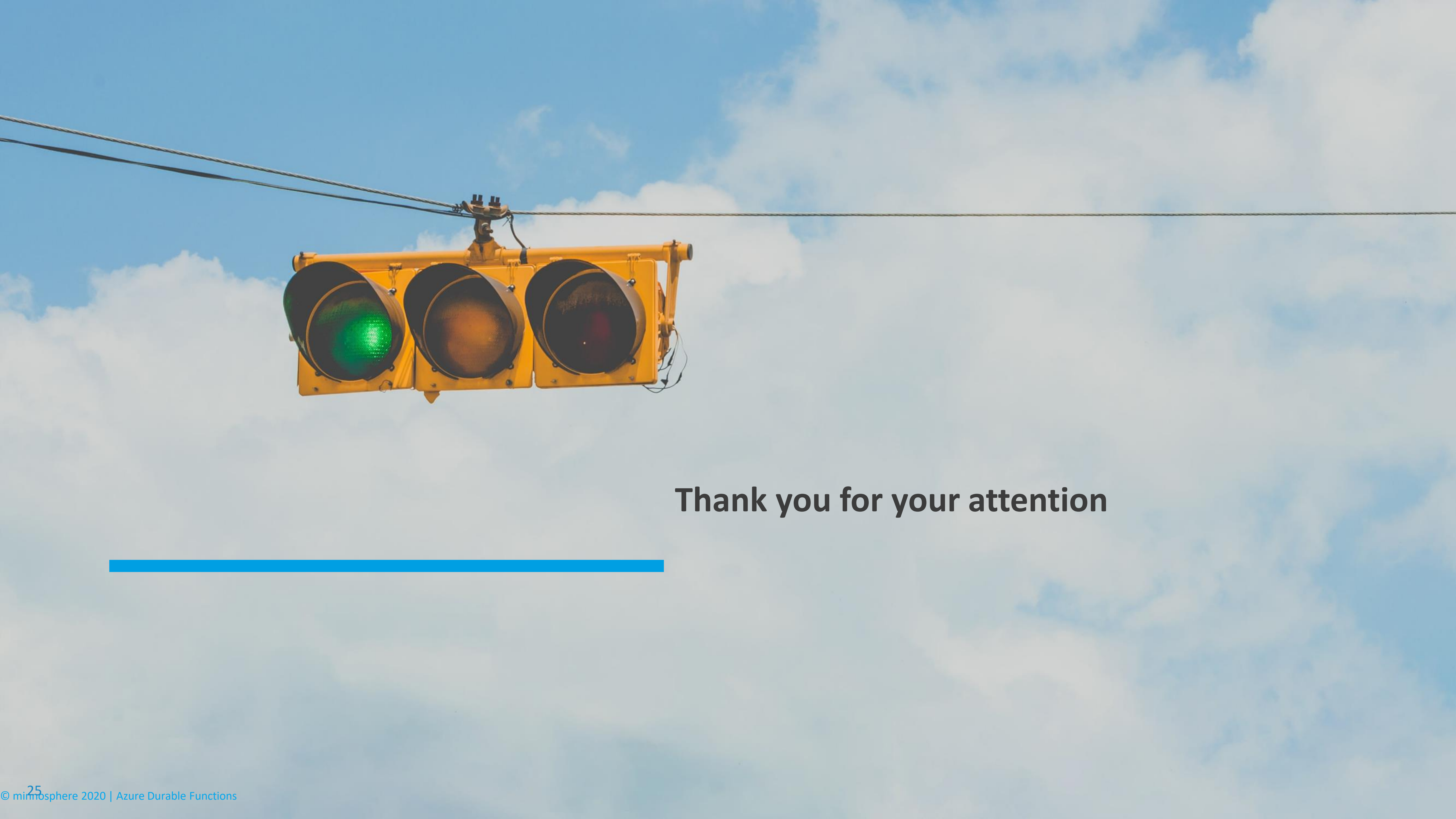
Challenge 4 – Scale Out … Do we have an external State?

Circuit Breaker



Summary - Durable Functions

- … are a great AddOn to Azure Functions
- … allow the modelling of complex scenarios without losing the benefits of FaaS
- … manage state for you
- … low entry barrier due to support of local development
- … open up new options in the context of side-by-side extensibility



Thank you for your attention

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Additional Resources

SAP Embrace – my 5 cent

- https://blogs.sap.com/2020/01/29/my-thoughts-on-sap-embrace-part-1/
- https://blogs.sap.com/2020/01/29/my-thoughts-on-sap-embrace-part-2/

Serverless Extensions with Microsoft Azure

- https://blogs.sap.com/2019/12/09/a-serverless-extension-story-from-abap-to-azure/
- https://blogs.sap.com/2020/02/17/a-serverless-extension-story-ii-bringing-state-to-the-stateless/

GitHub Repo

- https://github.com/lechnerc77/AzureFuncPurchaseOrderCheckDemo

Walk Through Local Development with Azure Durable Functions:

- https://youtu.be/HdhPC_K6cLo