4dotnet

DAPR and .NET Aspire

A royal wedding

Florian van Dillen
Full-stack developer
Futuretech 2024
17/04/2024

Florian van Dillen

Full-stack developer

Building event-driven systems with .NET, Azure, Containers, DAPR and more! Interested in architectural concepts such as DDD, design patterns and scaling.

www.linkedin.com/in/florianvandillen
https://twitter.com/fvandillen
https://github.com/fvandillen

Building distributed apps can be hard

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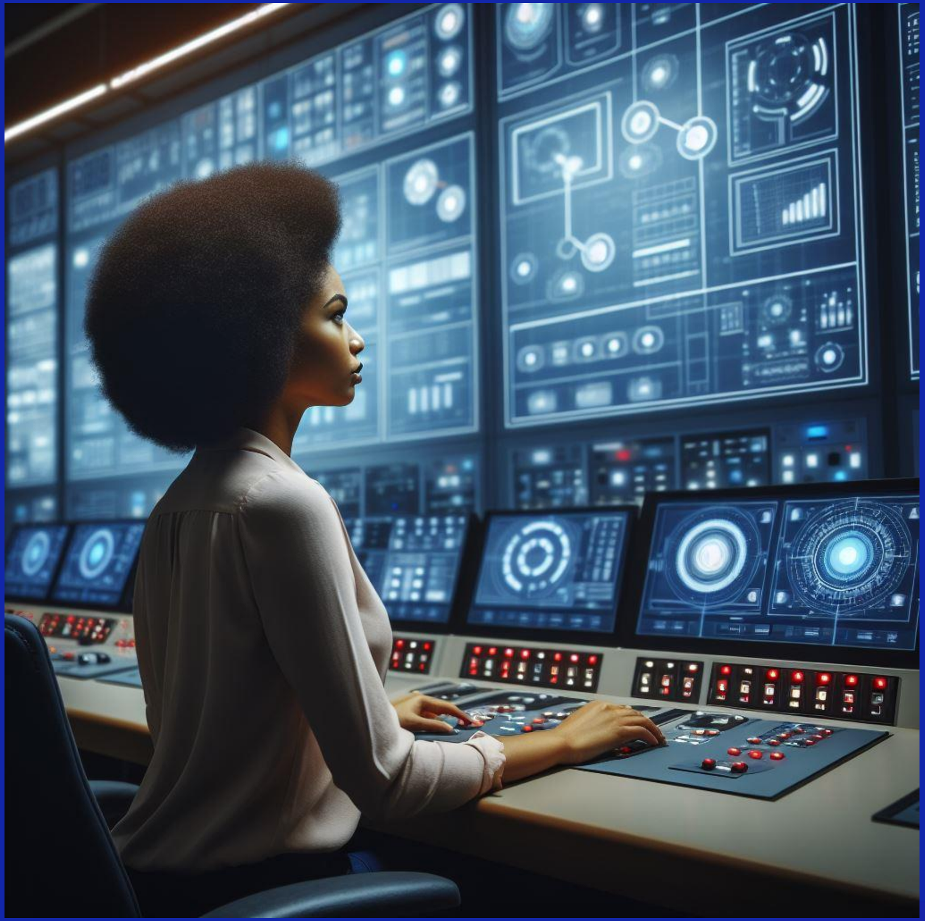
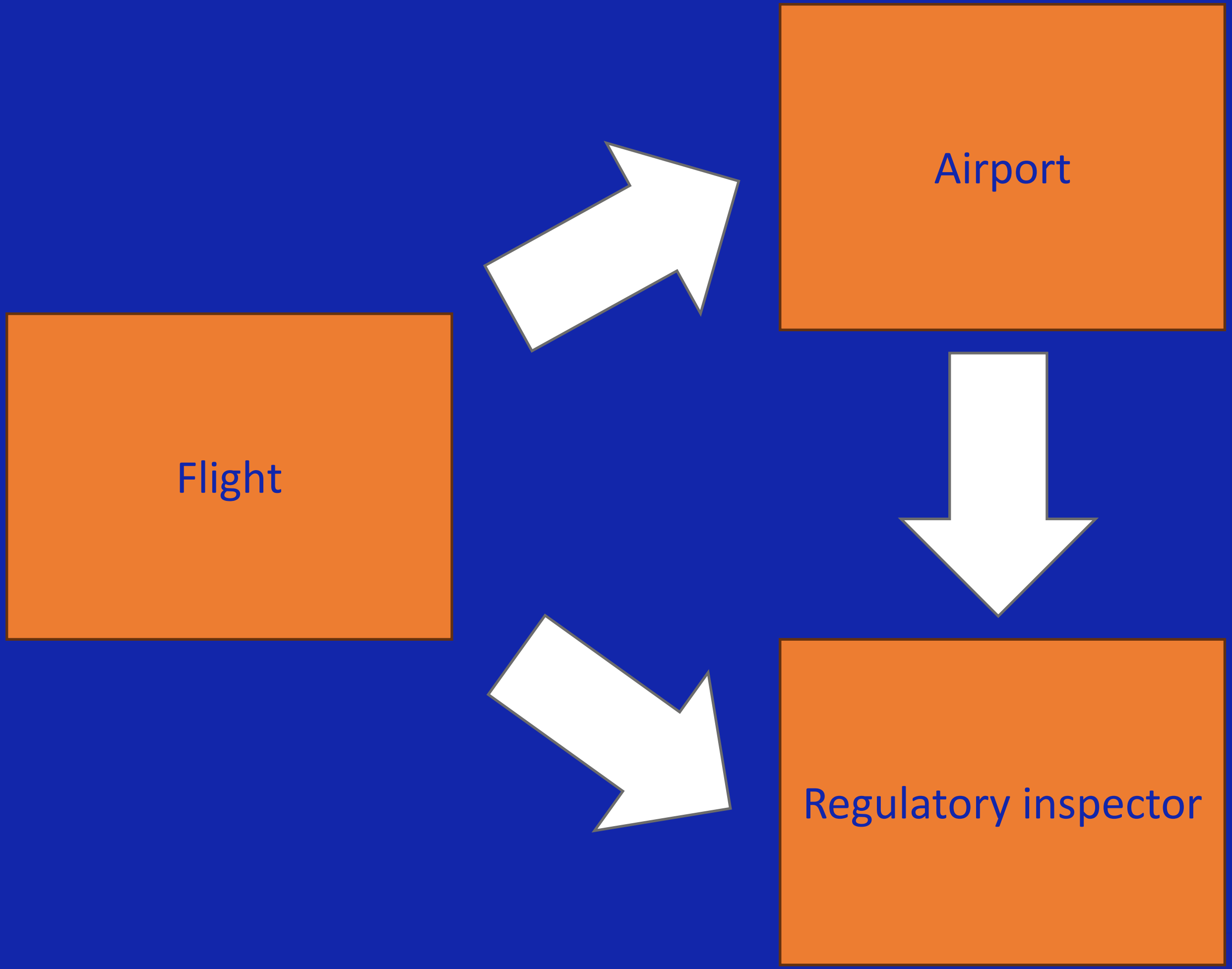


The local dev environment is important too!

Our demo app



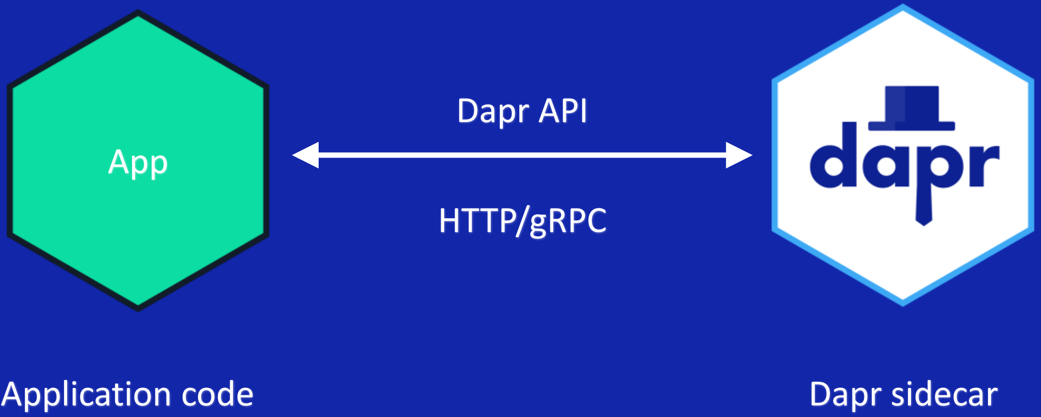
Introducing Dapr

- APIs for building **secure** and **reliable** microservices
- Serves as the **glue** between your services

Dapr goals

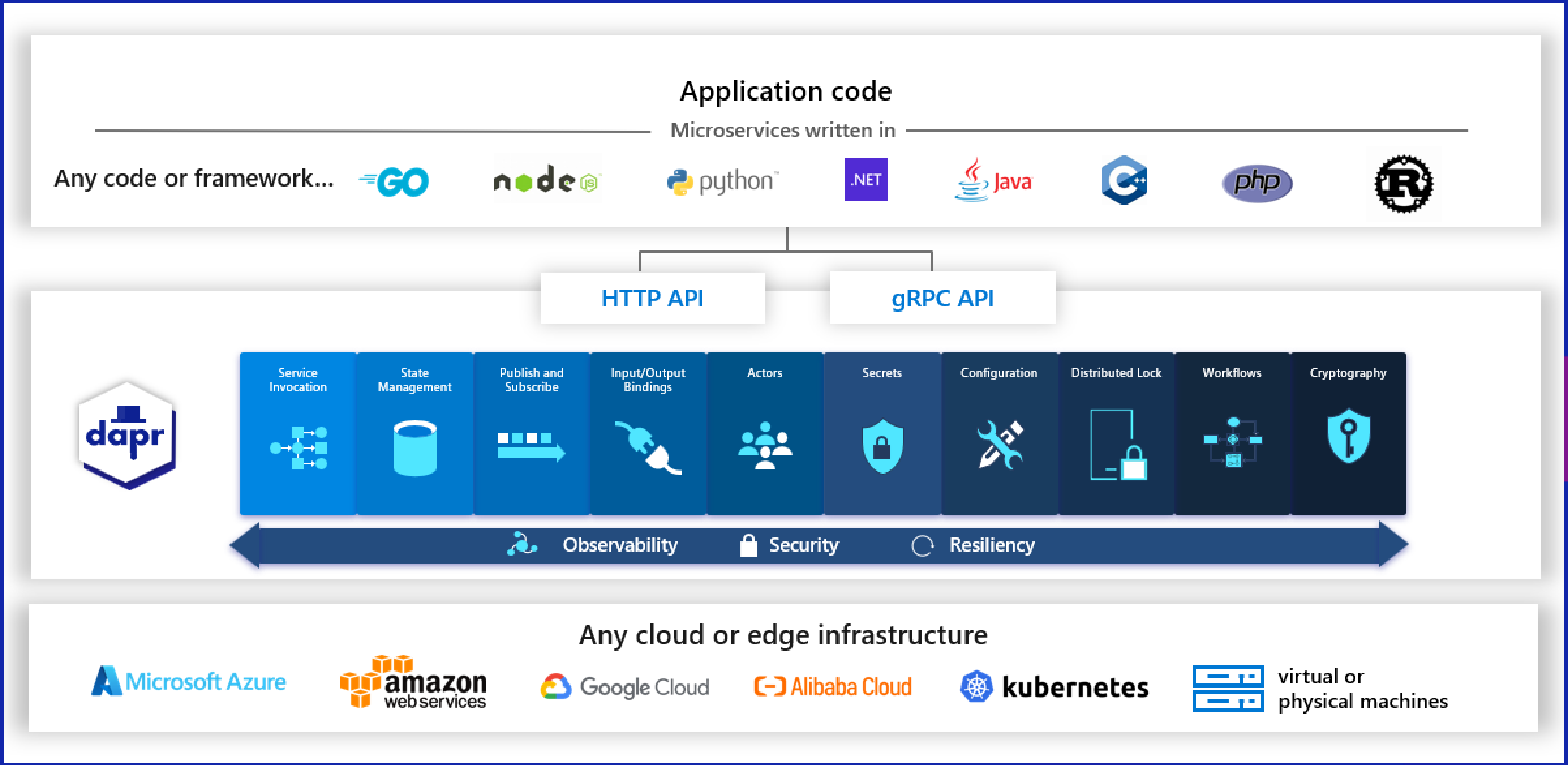
- Provide an integrated set of APIs
- Includes best practices & standards
- Extensible and pluggable
- Any language or framework
- Platform agnostic
- Community driven, vendor neutral

Sidecar architecture

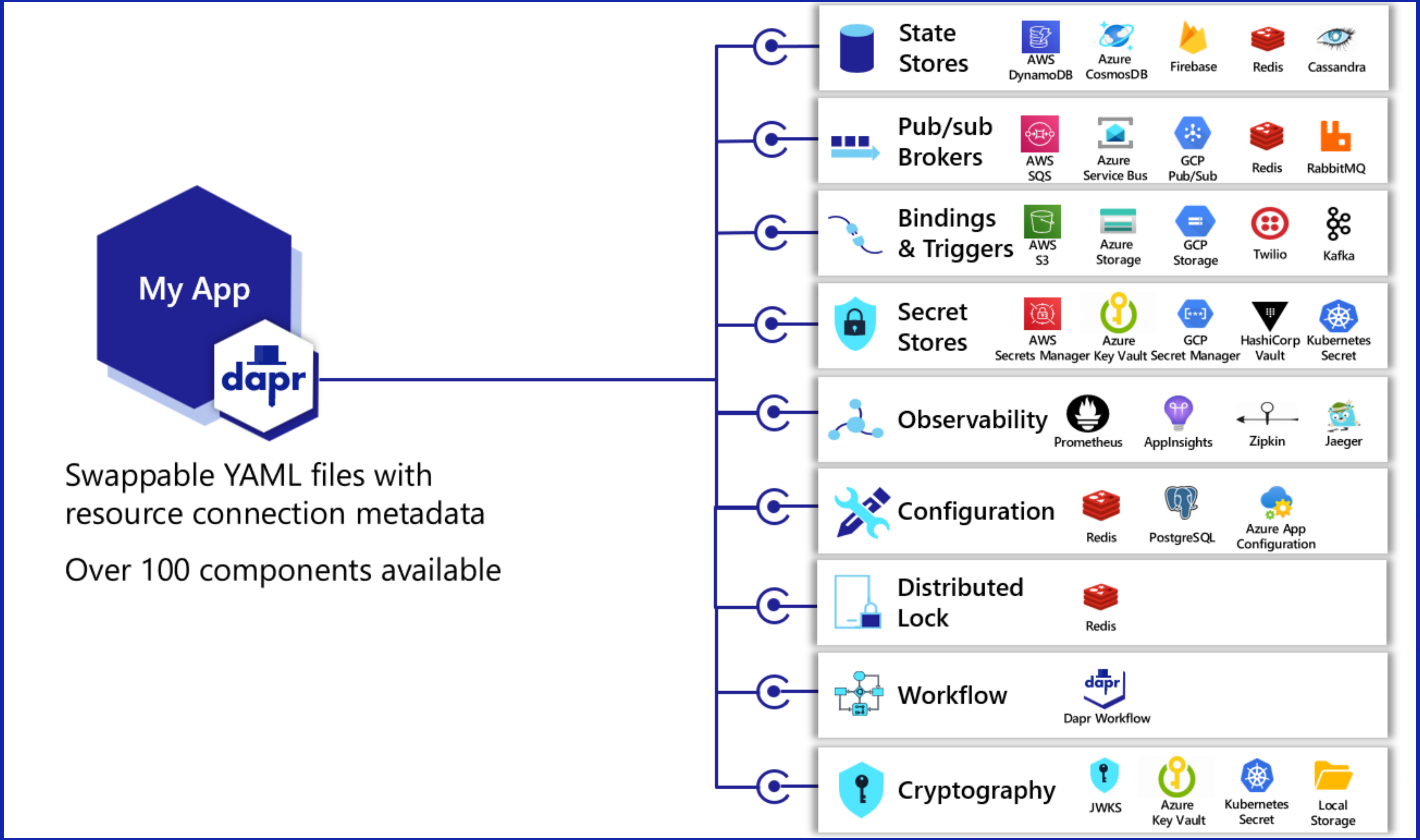


POST	http://localhost:3500/v1.0/**invoke**/cart/method/order
GET	http://localhost:3500/v1.0/**state**/inventory/item50
POST	http://localhost:3500/v1.0/**publish**/mybroker/order-messages
GET	http://localhost:3500/v1.0/**secrets**/vault/dbaccess
POST	http://localhost:3500/v1.0-beta1/**workflows**/dapr/businessprocess/start

The bigger picture



Swappable components

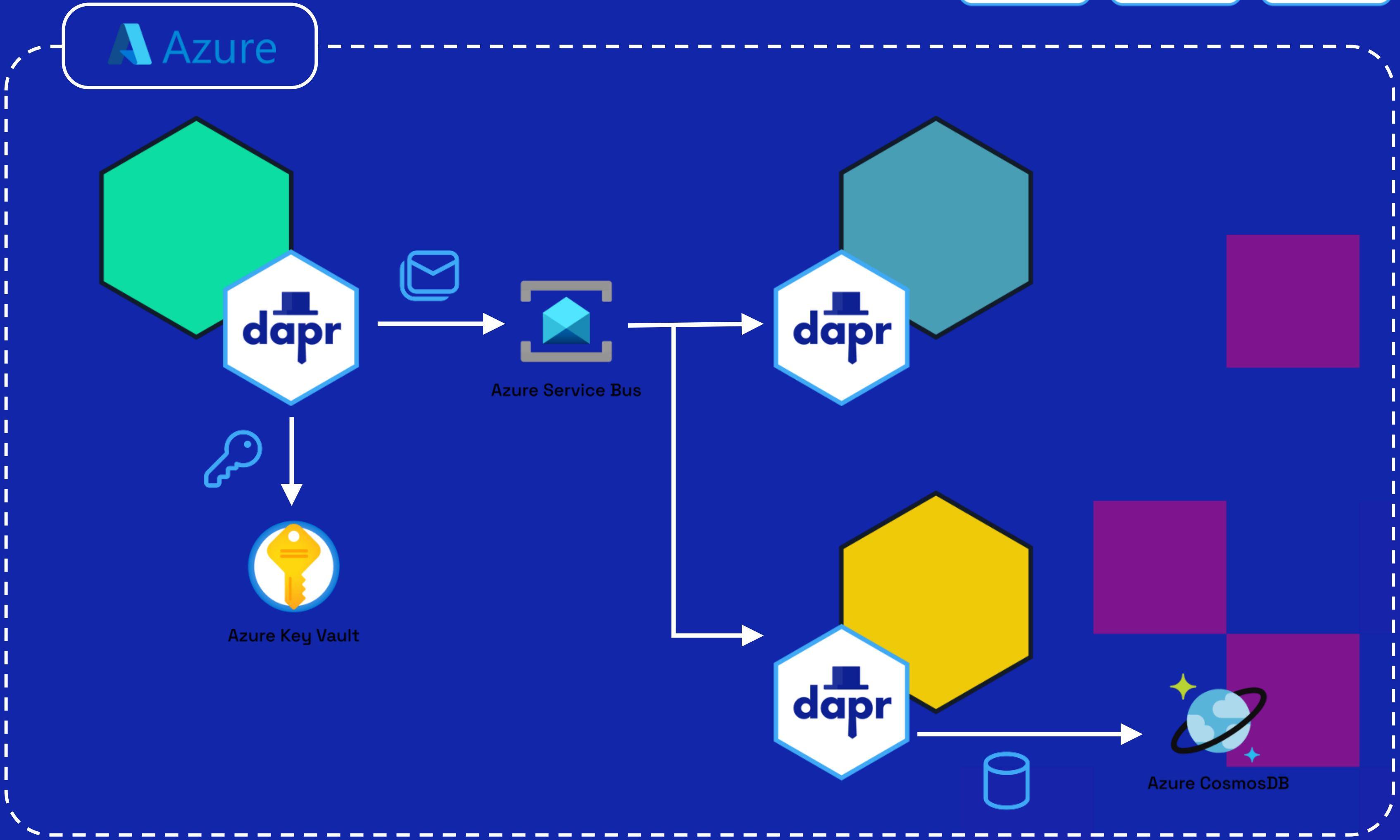


Swappable YAML files with resource connection metadata

Over 100 components available

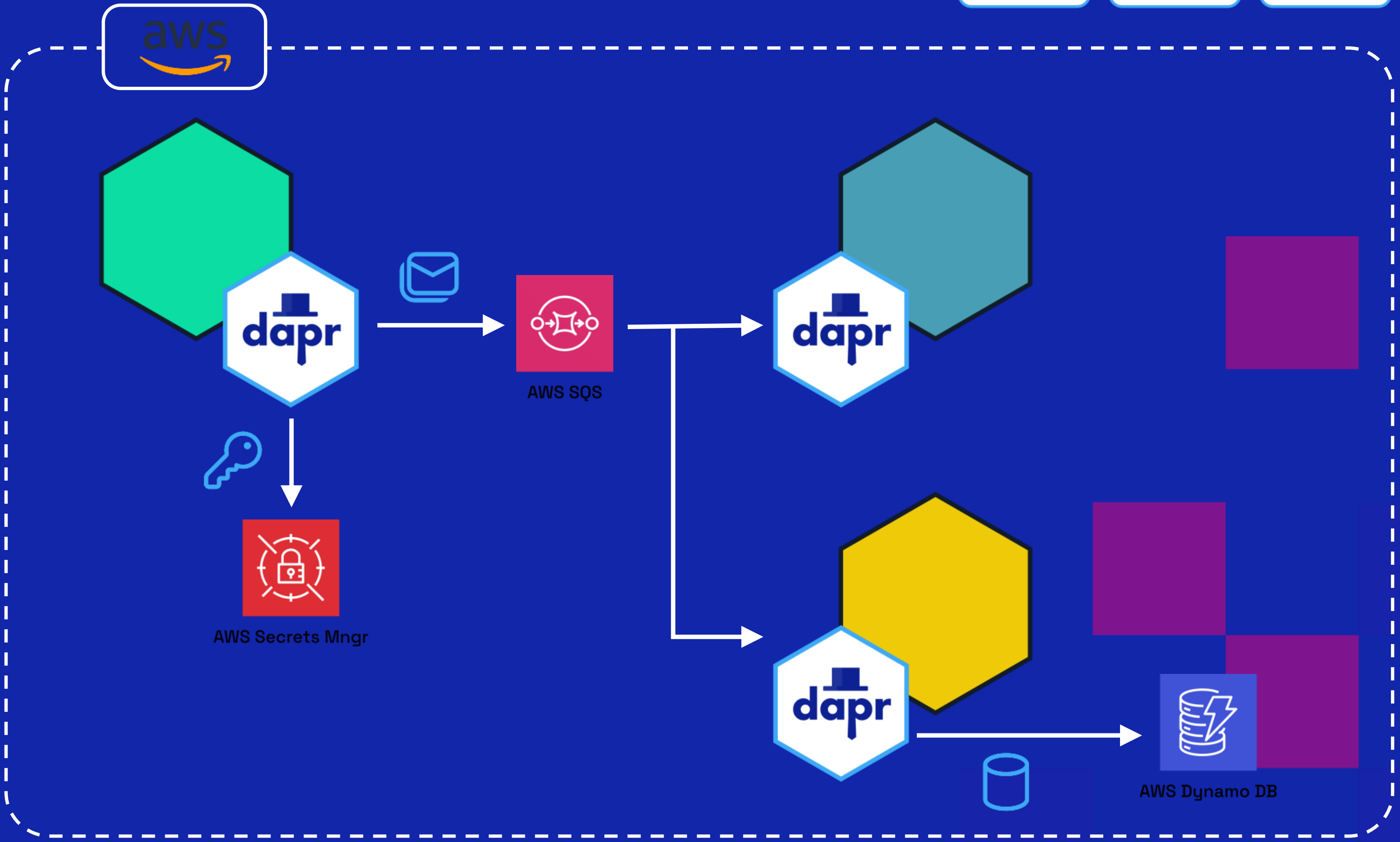
Swappable components (2)

Secrets
Publish / Subscribe
State Management

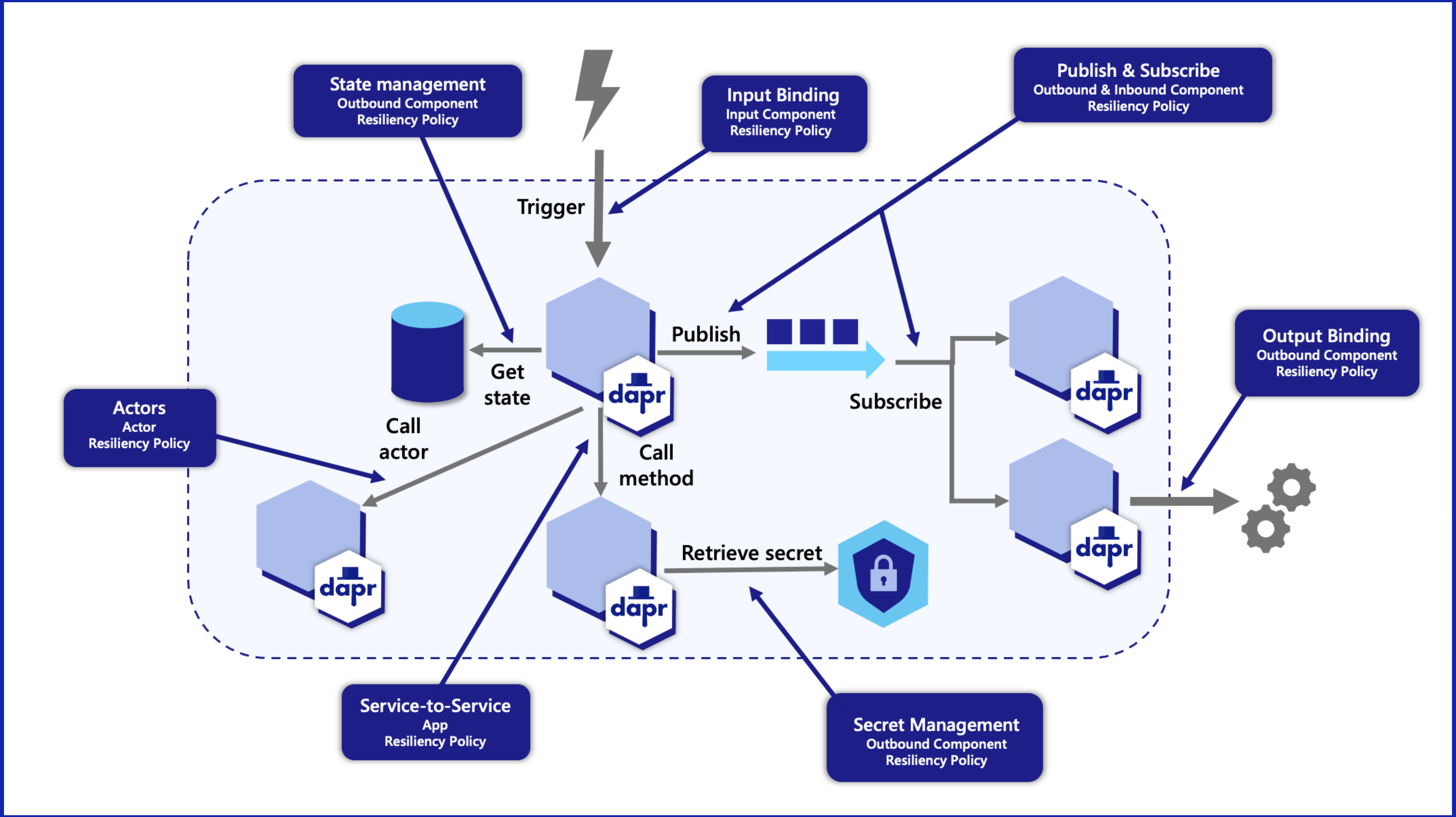


Swappable components (3)

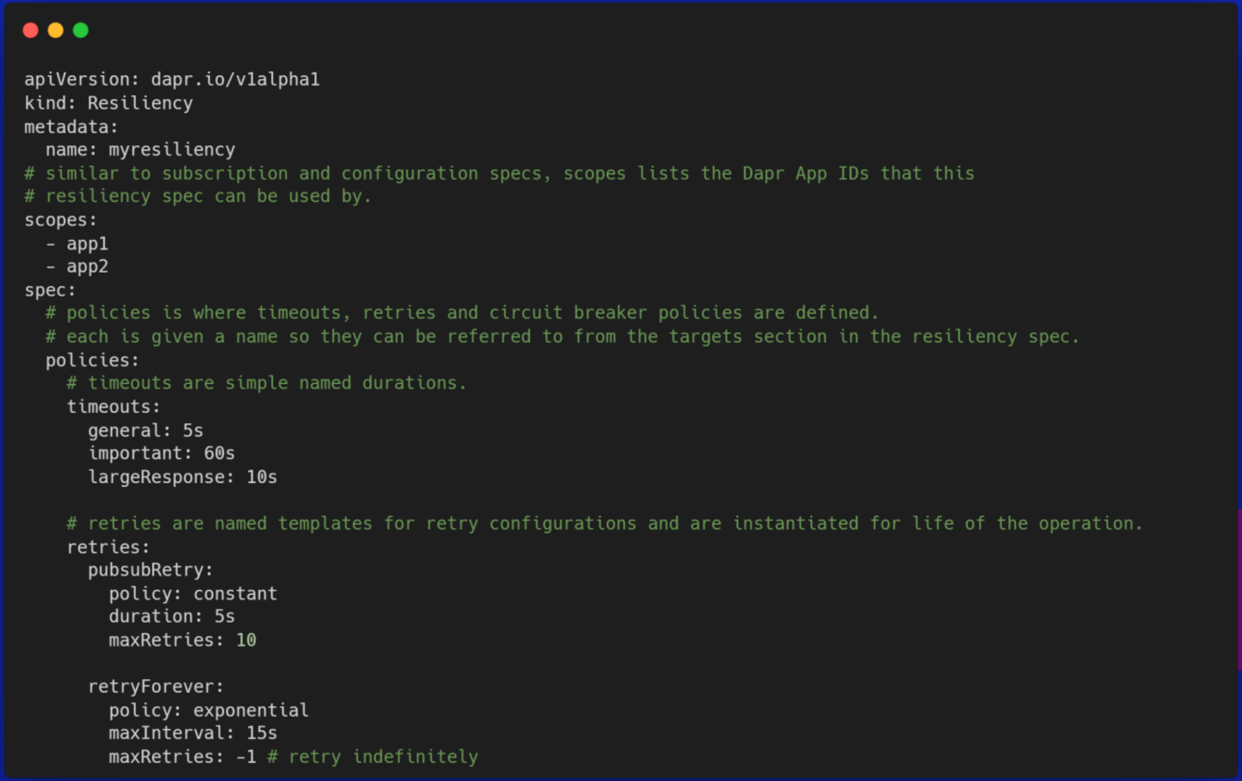
Secrets
Publish / Subscribe
State Management



Resiliency

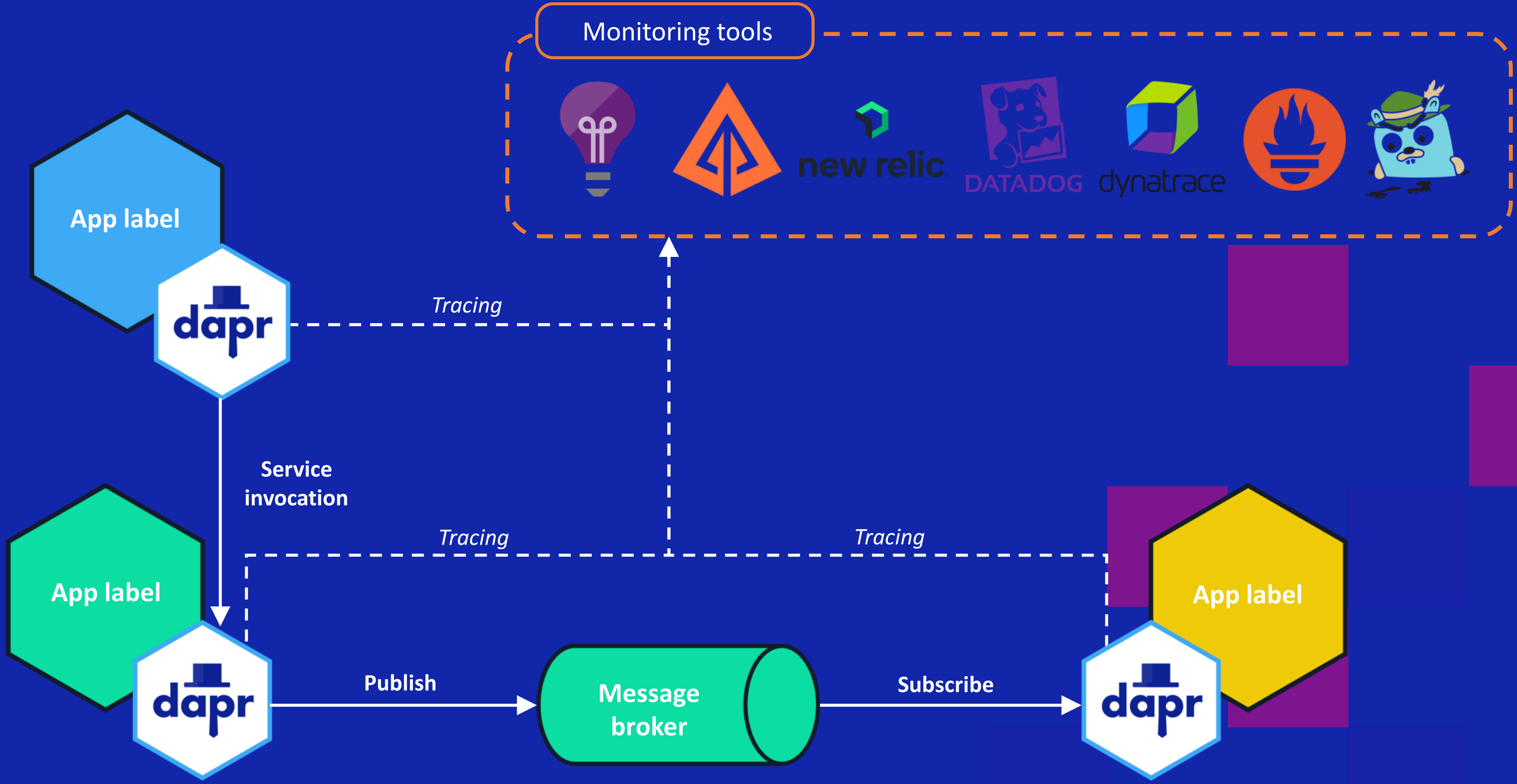

State management
Outbound Component
Resiliency Policy
Input Binding
Input Component
Resiliency Policy
Publish & Subscribe
Outbound & Inbound Component
Resiliency Policy
Trigger
Get state
Publish
Subscribe
Actors
Actor
Resiliency Policy
Call actor
Call method
Output Binding
Outbound Component
Resiliency Policy
Retrieve secret
dapr
Service-to-Service
App
Resiliency Policy
Secret Management
Outbound Component
Resiliency Policy

Resiliency (2)



```
apiVersion: dapr.io/v1alpha1
kind: Resiliency
metadata:
  name: myresiliency
# similar to subscription and configuration specs, scopes lists the Dapr App IDs that this
# resiliency spec can be used by.
scopes:
  - app1
  - app2
spec:
  # policies is where timeouts, retries and circuit breaker policies are defined.
  # each is given a name so they can be referred to from the targets section in the resiliency spec.
  policies:
    # timeouts are simple named durations.
    timeouts:
      general: 5s
      important: 60s
      largeResponse: 10s

    # retries are named templates for retry configurations and are instantiated for life of the operation.
    retries:
      pubsubRetry:
        policy: constant
        duration: 5s
        maxRetries: 10

      retryForever:
        policy: exponential
        maxInterval: 15s
        maxRetries: -1 # retry indefinitely
```

Observability



Hosting modes

Self-hosted

Run **`dapr init`** to install Docker images.

Run any app with a Dapr side car using dapr run.

Virtual/Physical machines

Self-deploy Dapr control plane and Hashicorp Consul per machine.

Use the Dapr Installer Bundle for airgapped environments.

Run any app with a Dapr side car using **`dapr run`**.

Kubernetes

Run **`dapr init -k`** to install Dapr (or use Helm). Integrated Dapr control plane. Deploys placement, operator, sentry and injector pods.

Automatically injects a Dapr sidecar into all annotated pods.

Hosting modes (2)

Serverless

The Dapr side car is hosted by a provider.

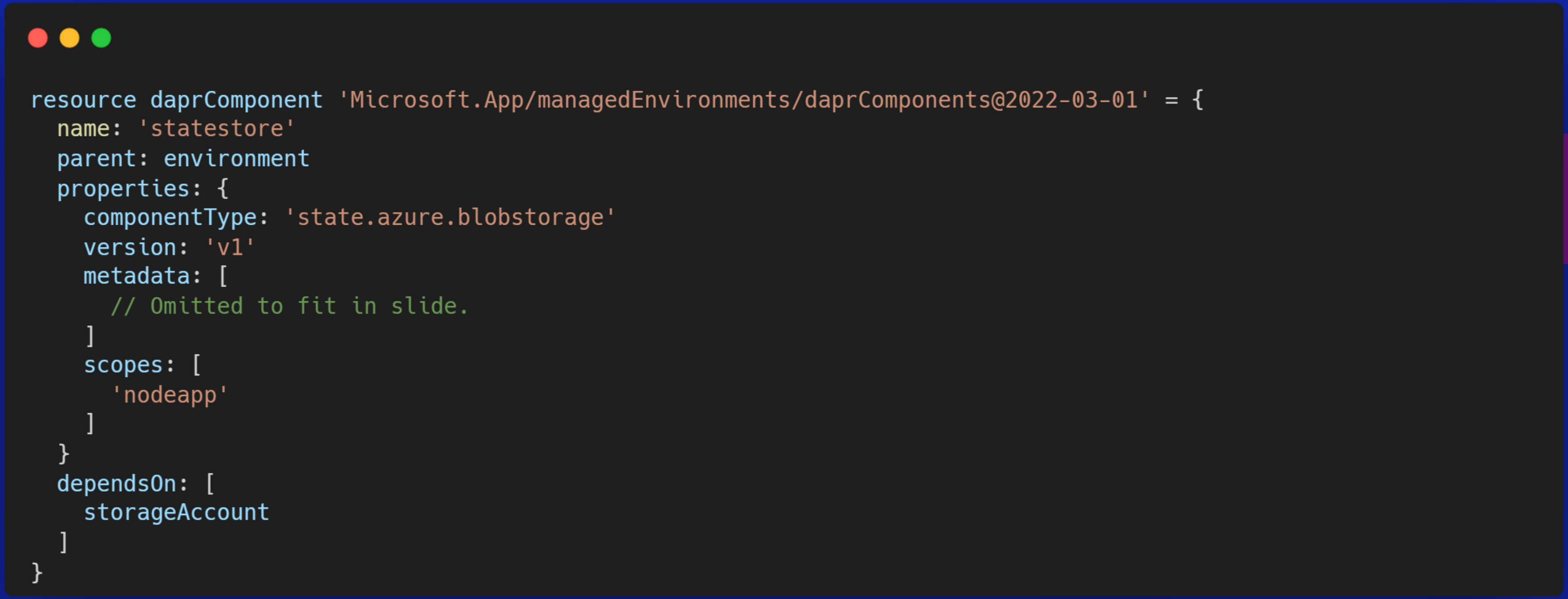
You only manage your applications.

Dapr installation (dev machine)

- Prerequisite: Docker
- Installing the Dapr CLI
- Running *dapr init*

Dapr in Azure container apps

- No management required of control plane!
- Just deploy Dapr components via Azure Portal or Bicep



```
resource daprComponent 'Microsoft.App/managedEnvironments/daprComponents@2022-03-01' = {
  name: 'statestore'
  parent: environment
  properties: {
    componentType: 'state.azure.blobstorage'
    version: 'v1'
    metadata: [
      // Omitted to fit in slide.
    ]
    scopes: [
      'nodeapp'
    ]
  }
  dependsOn: [
    storageAccount
  ]
}
```

Demo: Run a Dapr app

Demo: Dapr sidekick

Demo: Publish event from CLI

- You can send events from the command line!

Aspire

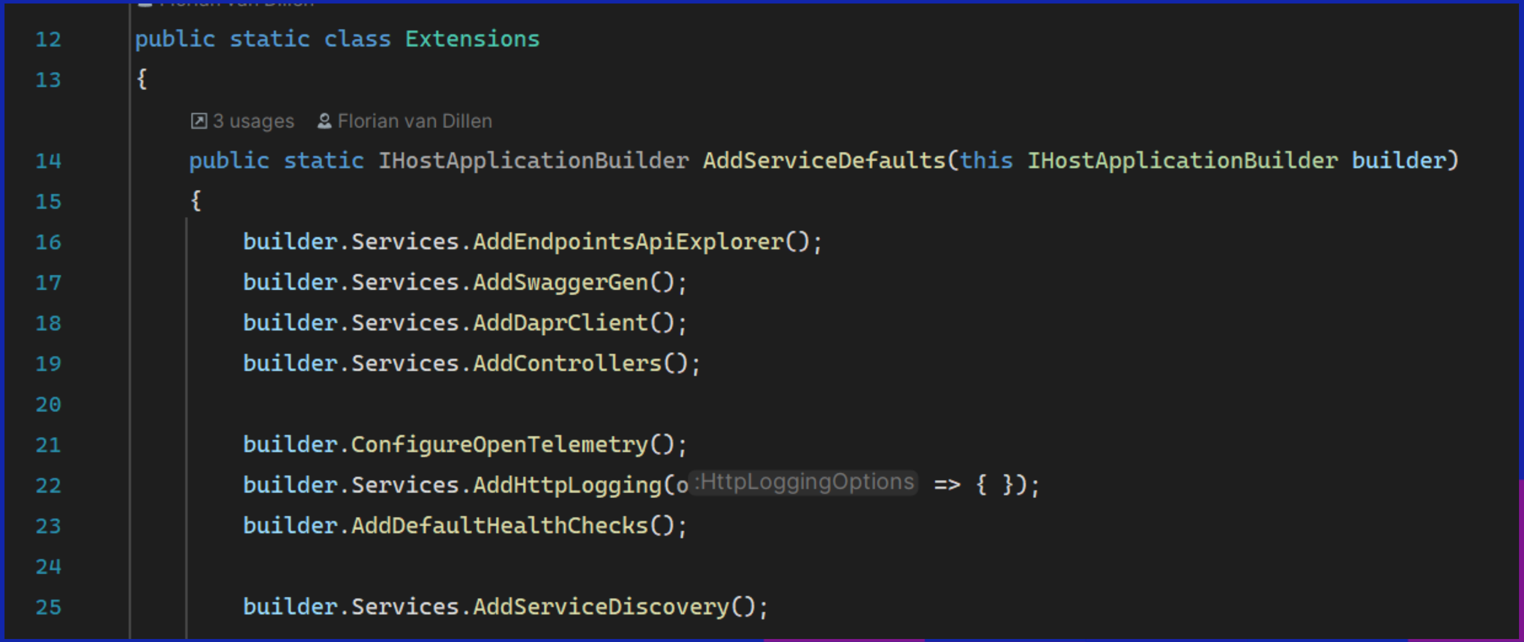
- Orchestrator for local development environment
- Run multiple services easily
- Spin up containers
- See telemetry

Aspire dashboard

- Developer control plane (DCP)
- Metrics, traces, structured logs
- Configuration
- Containers and services

Service defaults

- ***Opinionated*** startup
- ASPNET Core settings
- OpenTelemetry
- Health checks

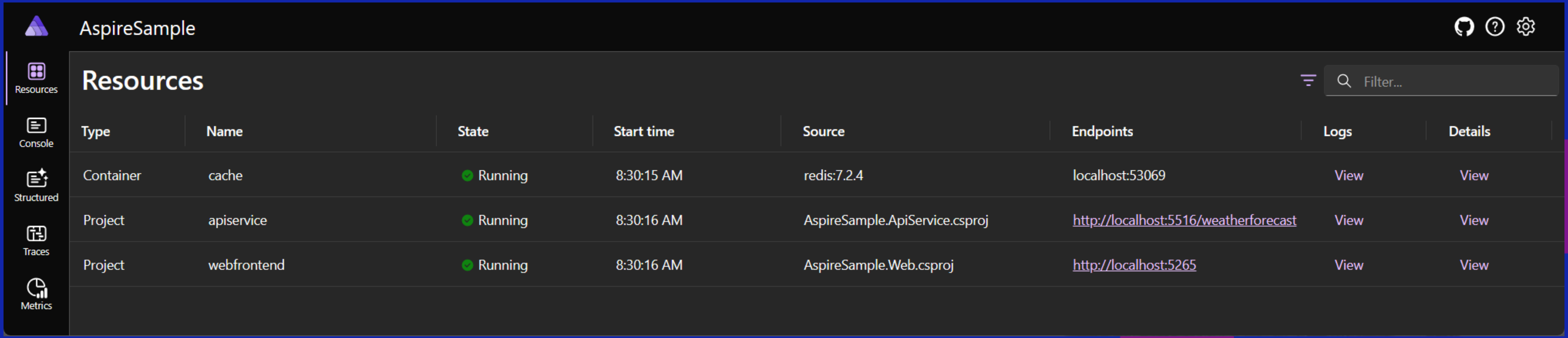


```
public static class Extensions
{
    3 usages   Florian van Dillen
    public static IHostApplicationBuilder AddServiceDefaults(this IHostApplicationBuilder builder)
    {
        builder.Services.AddEndpointsApiExplorer();
        builder.Services.AddSwaggerGen();
        builder.Services.AddDaprClient();
        builder.Services.AddControllers();

        builder.ConfigureOpenTelemetry();
        builder.Services.AddHttpLogging(o :HttpLoggingOptions  => { });
        builder.AddDefaultHealthChecks();

        builder.Services.AddServiceDiscovery();
```

AppHost

- Orchestrator
- We launch our Dapr sidecar from here!

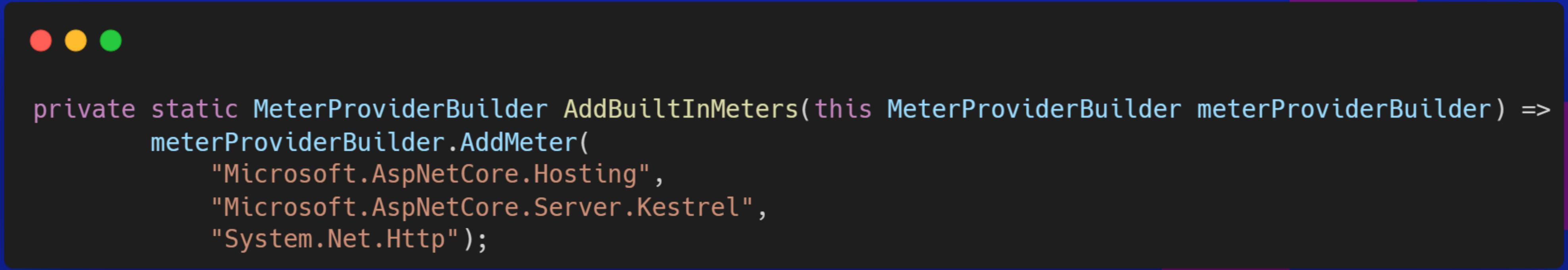
Demo: Aspire dashboard



Resources

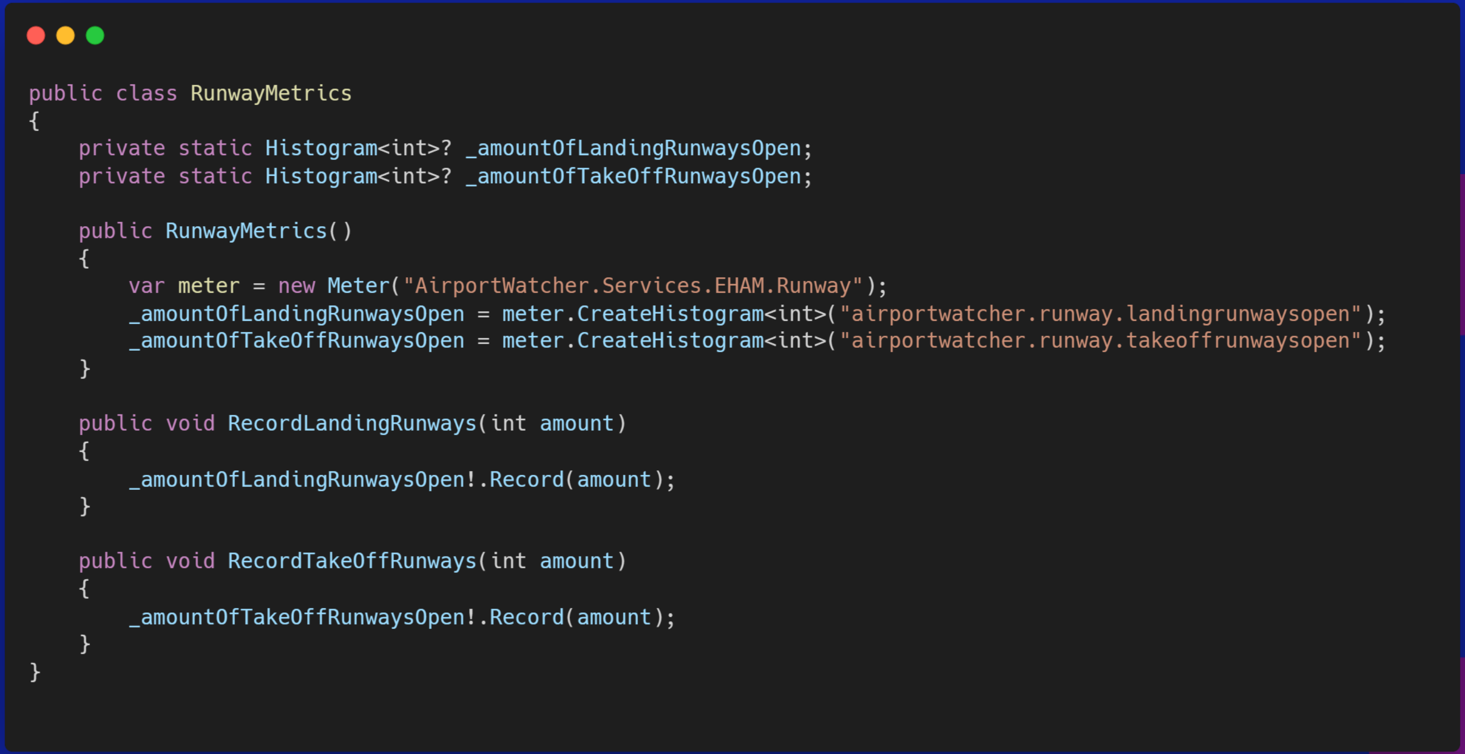
Type	Name	State	Start time	Source	Endpoints	Logs	Details
Container	cache	● Running	8:30:15 AM	redis:7.2.4	localhost:53069	View	View
Project	apiservice	● Running	8:30:16 AM	AspireSample.ApiService.csproj	http://localhost:5516/weatherforecast	View	View
Project	webfrontend	● Running	8:30:16 AM	AspireSample.Web.csproj	http://localhost:5265	View	View

Collecting metrics



```csharp
private static MeterProviderBuilder AddBuiltInMeters(this MeterProviderBuilder meterProviderBuilder) =>
        meterProviderBuilder.AddMeter(
            "Microsoft.AspNetCore.Hosting",
            "Microsoft.AspNetCore.Server.Kestrel",
            "System.Net.Http");
```

Demo: Creating custom metrics



```
public class RunwayMetrics
{
    private static Histogram<int>? _amountOfLandingRunwaysOpen;
    private static Histogram<int>? _amountOfTakeOffRunwaysOpen;

    public RunwayMetrics()
    {
        var meter = new Meter("AirportWatcher.Services.EHAM.Runway");
        _amountOfLandingRunwaysOpen = meter.CreateHistogram<int>("airportwatcher.runway.landingrunwaysopen");
        _amountOfTakeOffRunwaysOpen = meter.CreateHistogram<int>("airportwatcher.runway.takeoffrunwaysopen");
    }

    public void RecordLandingRunways(int amount)
    {
        _amountOfLandingRunwaysOpen!.Record(amount);
    }

    public void RecordTakeOffRunways(int amount)
    {
        _amountOfTakeOffRunwaysOpen!.Record(amount);
    }
}
```

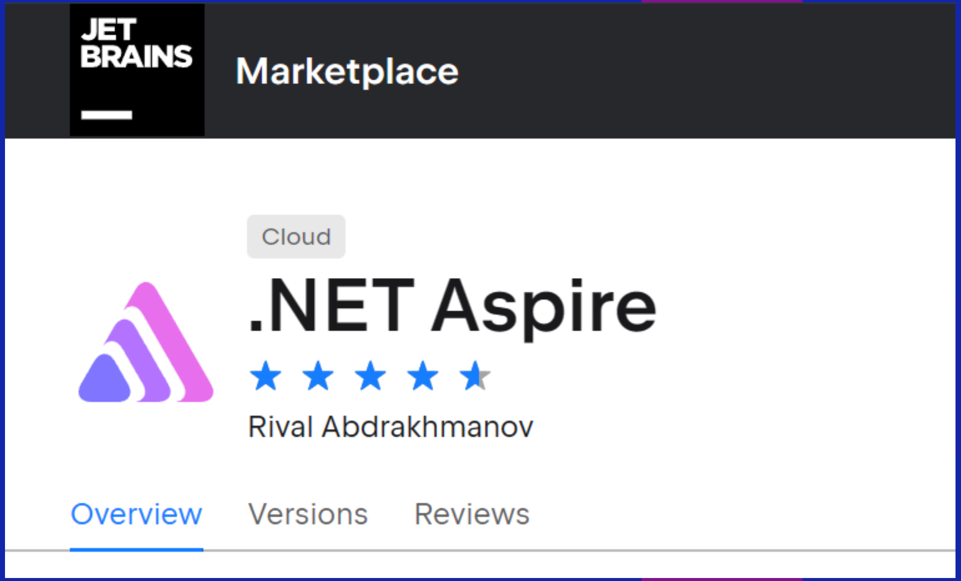
Demo: Adding SQL

Pitfalls to avoid

- Ensure your workload version is the same as the version in your project (*dotnet workload list*).
- Ensure Docker is running.

Pro tip

- Rider users can install an extension to easily run their Aspire projects with the debugger automatically attaching.
- Shows metrics.
- Shows trace diagram.
- Shows dashboard.



Interested in the code?

- https://github.com/fvandillen/futuretech-dapr-aspire