Dapr Environment Setup, Tooling & State Management

This modules demonstrates how to code & debug a Dapr based microservices as well as to deploy it to Azure Container Apps. It is based on the Dapr quickstarts.

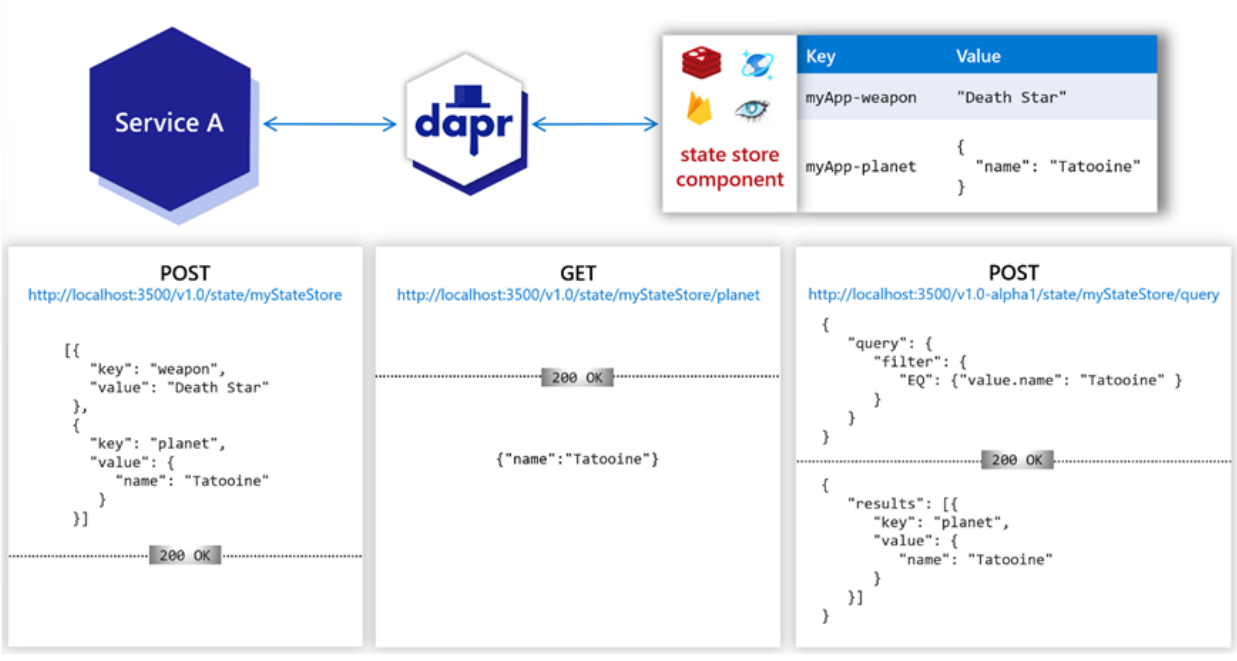
It contains two projects:

- `food-dapr-backend` - A .NET Core Web API project that uses State Management to store and retrieve state. in a other demos it will be used to demonstrate features like Secrets, Publish & Subscribe as well as Observability and Distributed tracing.
- `food-dapr-frontend` - A .NET MVC project that consumes the backend.

Configuration of of Dapr components is stored in the ./components folder. During development it will use `Redis` as the default state store. When deploying it will use Azure Blob Storage. We could also use Azure Cosmos DB as a state store just by changing the state store configuration.

- `statestore.yaml` - Configures the state store to use Azure Blob Storage.

```
componentType: state.azure.blobstorage
version: v1
metadata:
- name: accountName
value: aznativedev
- name: accountKey
value: account-key
- name: containerName
value: food-dapr-backend
secrets:
- name: account-key
value: "<ACCOUNT_KEY>"
```



Docs & Resources

Dapr Overview

Dapr CLI

Dapr Visual Studio Code extension

Developing Dapr applications with Dev Containers

Dapr on YouTube

Getting started, Basic State & Deployment to Azure Container Apps

> Note: This demo assumes that you have created an Azure Container Regestry and Azure Container Apps environment. If you haven't done so, please follow the instructions to provision the required Azure Ressources using Azure CLI or Bicep.

Dapr Environment Setup & Debugging

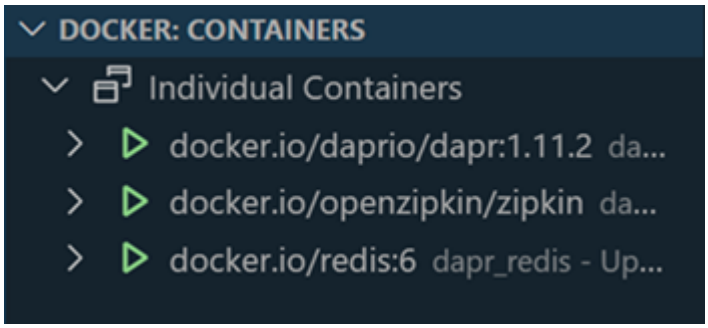
- Install Dapr CLI

```
Set-ExecutionPolicy RemoteSigned -scope CurrentUser
powershell -Command "iwr -useb
https://raw.githubusercontent.com/dapr/cli/master/install/install.ps1 | iex"
```

> Note: Restart the terminal after installing the Dapr CLI

- Initialize default Dapr containers and check running containers:

```
dapr init
```



> Note: To remove the default Dapr containers run `dapr uninstall`

- Run project `food-dapr-backend`

```
cd food-dapr-backend
dapr run --app-id food-backend --app-port 5001 --dapr-http-port 5010 dotnet
run --launch-profile https
```

- Test the API by invoking `http://localhost:5000/food` several times using the dapr sidecar. The sidecar is listening on port `5010` and the app is listening on port `5000`. The sidecar that listens to port `5010` forwards the request to the app. The sidecar is also responsible for service discovery and pub/sub.

```
GET http://localhost/<dapr-http-port>/v1.0/invoke/<app-id>/method/<method-name>
GET http://localhost:5010/v1.0/invoke/food-backend/method/food
```

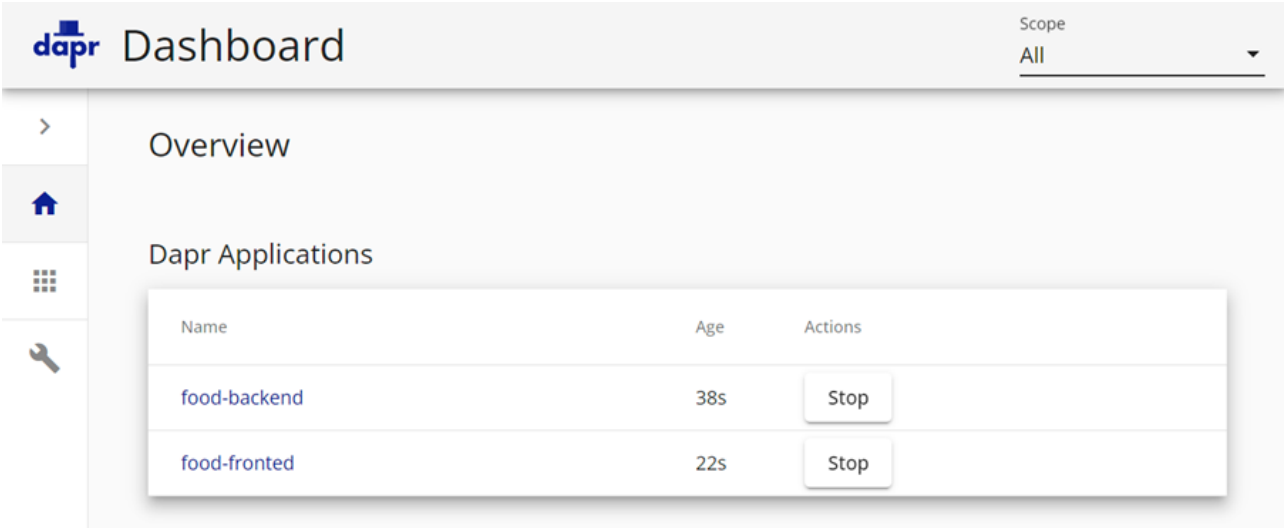
- Run project `food-dapr-fronted`

```
cd food-dapr-fronted
dapr run --app-id food-fronted --app-port 5002 --dapr-http-port 5011 dotnet run
```

- Show Dapr Dashboard

```
dapr dashboard
```

- Examine Dapr Dashboard on http://localhost:8080:



Running multiple microservices with Tye

- Install Tye. Project Tye is an experimental developer tool that makes developing, testing, and deploying microservices and distributed applications easier

```
dotnet tool install -g Microsoft.Tye --version "0.11.0-alpha.22111.1"
```

- Create a `tye.yaml` file in the root of the solution by running:

```
tye init
```

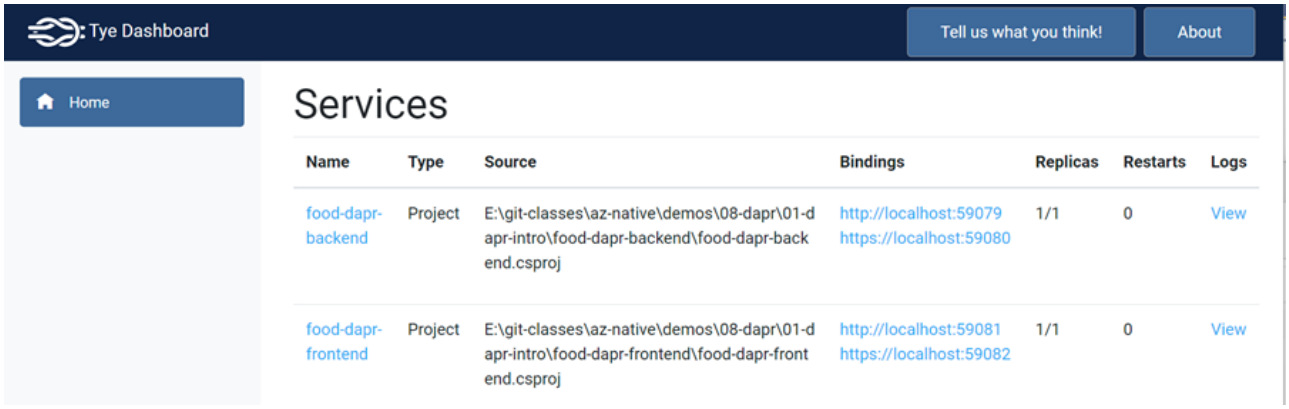
> Note: You can skip this step as the `tye.yaml` file is already included in the solution.

- A typical tye file could look like this:

```
name: dapr-services
services:
- name: food-dapr-backend
project: food-dapr-backend/food-dapr-backend.csproj
bindings:
- port: 5000
- name: food-dapr-frontend
project: food-dapr-frontend/food-dapr-frontend.csproj
bindings:
- port: 5002
```

- Run the two projects with Tye

```
tye run
```



Using Default State Store

- Add DaprClient to `Program.cs`

```
var builder = WebApplication.CreateBuilder(args);
...
// Add DaprClient to the ioc container
builder.Services.AddDaprClient();
```

- Examine `CountController.cs` and call `getCount()` multiple times to increment the counter and receive its current value:

```
public CountController(DaprClient daprClient)
{
    client = daprClient;
}

[HttpGet("getCount")]
public async Task<int> Get()
{
    var counter = await client.GetStateAsync<int>(storeName, key);
    await client.SaveStateAsync(storeName, key, counter + 1);
    return counter;
}
```

- To increment the counter you can use the pre-configured REST calls in test-backend.http which is using the Rest Client for Visual Studio Code Extension.

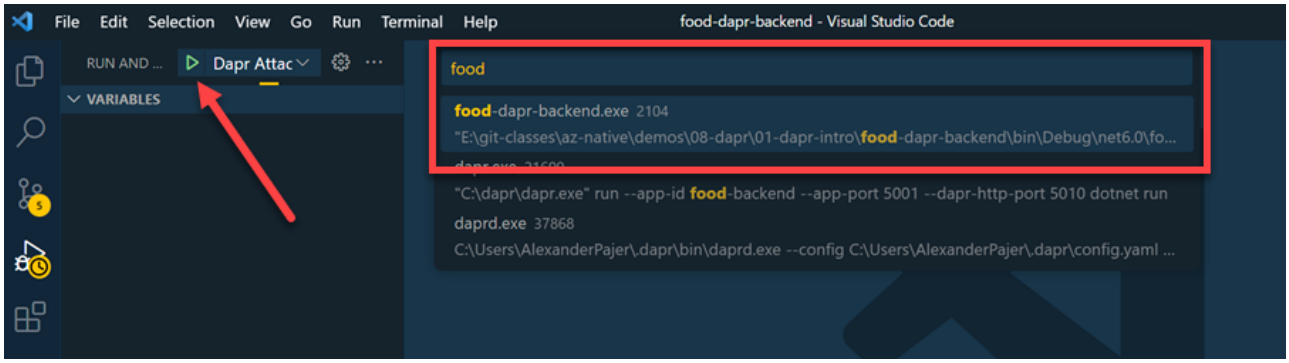
```
@baseUrl = http://localhost:5000
### Get the count and icrement it by 1
GET {{baseUrl}}/count/getcount HTTP/1.1
```

- Check the state store data in the default state store - Redis:

```
dapr state list --store-name statestore
```

- Examine the `Dapr Attach` config in `launch.json` and use it to attach the debugger to the `food-dapr-backend` process and debug the state store code:

```
{
    "name": "Dapr Attach",
    "type": "coreclr",
    "request": "attach",
    "processId": "${command:pickProcess}"
}
```



Deploy to Azure Container Apps

- Build the food-dapr-backend image

```
env=dev
grp=az-native-$env
loc=westeurope
acr=aznative$env
imgBackend=food-dapr-backend:v1
az acr build --image $imgBackend --registry $acr --file dockerfile .
```

- Create a storage account to be used as state store

```
stg=aznative$env
az storage account create -n $stg -g $grp -l $loc --sku Standard_LRS
```

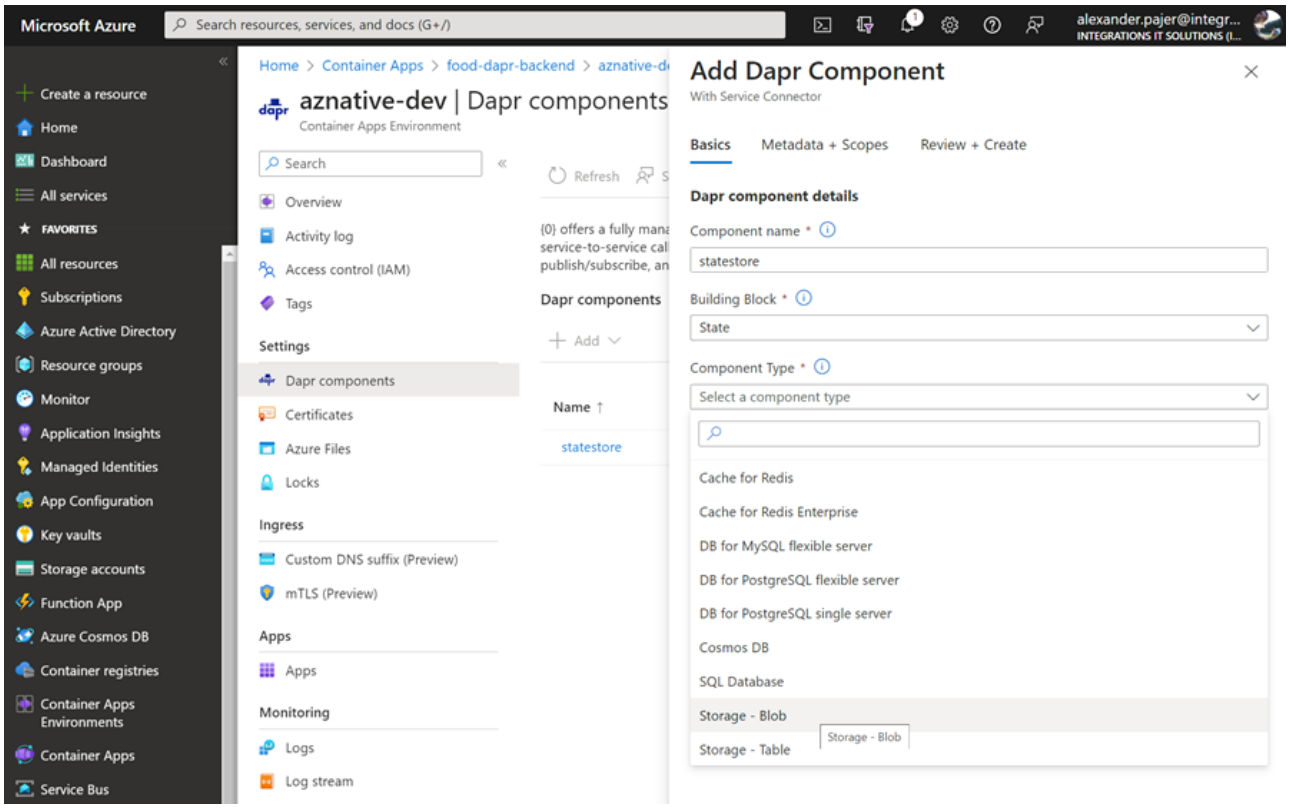
- Update its values in `components/statestore.yml`

```
apiVersion: dapr.io/v1alpha1
kind: Component
metadata:
name: statestore
spec:
type: state.azure.blobstorage
metadata:
    - name: storageAccount
    value: aznative$env
    - name: storageAccessKey
    value: <storage-account-key>
```

- Add the Dapr component to the Azure Container Apps environment

```
az containerapp env dapr-component set -n $acaenv -g $grp \
--dapr-component-name statestore \
--yaml './components/statestore.yml'
```

> Note. In Azure Portal you can also create the Dapr component in the Azure Container Apps environment. It allows you to choose between Redis, Azure Blob Storage, Azure Cosmos DB and others as a state store. The interaction with the specifics of the state store is abstracted away by Dapr:



- Execute deploy-app.azcli to create the container app

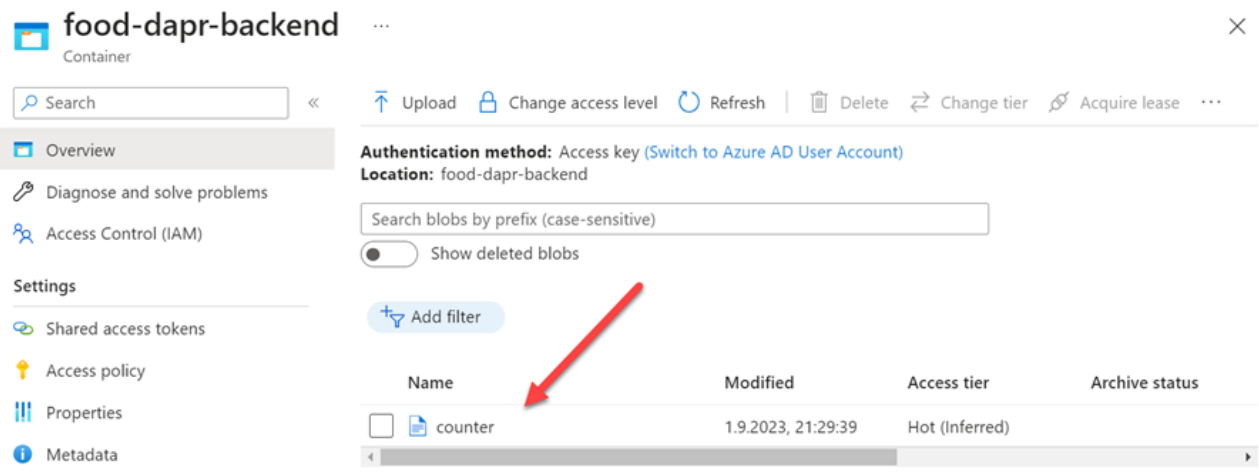
```
az containerapp create -n $appBackend -g $grp \
--image $imgBackend \
--environment $acaenv \
--target-port 80 --ingress external \
--min-replicas 0 --max-replicas 1 \
--enable-dapr \
--dapr-app-port 80 \
--dapr-app-id $appBackend \
--registry-server $loginSrv \
--registry-username $acr \
--registry-password $pwd
```

> Note: Accessing ACR could also done using a managed identity. Check the documentation for more details.

- Execute the /count/getCount method multiple times to increment the counter

```
curl -X GET "http://<URL>.$loc.azurecontainer.io/count/getCount" -H
"accept: text/plain"
```

- Examine the storage account to see the state store data


food-dapr-backend
Container
Search
Overview
Diagnose and solve problems
Access Control (IAM)
Settings
Shared access tokens
Access policy
Properties
Metadata
Upload
Change access level
Refresh
Delete
Change tier
Acquire lease
Authentication method: Access key (Switch to Azure AD User Account)
Location: food-dapr-backend
Search blobs by prefix (case-sensitive)
Show deleted blobs
Add filter
Name
Modified
Access tier
Archive status
counter
1.9.2023, 21:29:39
Hot (Inferred)