100 XP

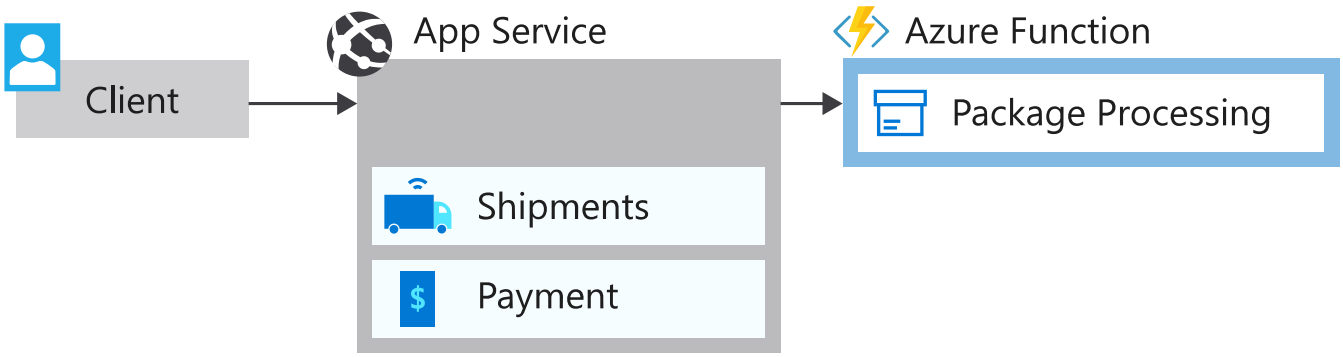
Exercise - Refactor a service within the monolith as a microservice

10 minutes

Sandbox activated! Time remaining: **1 hr 32 min**

You have used 1 of 10 sandboxes for today. More sandboxes will be available tomorrow.

Now that Fabrikam has analyzed their application, they're ready to start the refactoring process to move services out of their monolithic architecture into microservices. Let's modify the application to move the package processing service into a microservice.



Refactor the application

Before we deploy the updated application, let's take a look at how it was updated. The monolithic app has a service to process packages, *PackageProcessor.cs*. After the performance of the application was analyzed, this service was identified as a performance bottleneck. As customers increase the demand for drone deliveries, this service becomes heavily loaded while it handles the scheduling and logistics for drone deliveries. This service is fully managed by a dedicated team. Moving this service to a microservice helps with performance and provides improved development agility.

Let's look closer at the changes that were made.

Drone delivery before

The core functionality of the package processing is handled by the `PackageProcessor` class in the *PackageProcessor.cs* file. In this example, it performs some work that is resource intensive.

A real-world scenario might include calculating delivery times and delivery routes and updating data sources with this information.

C# Copy

```
public class PackageProcessor : IPackageProcessor
    {
        public Task<PackageGen> CreatePackageAsync(PackageInfo packageInfo)
        {
            //Uses common data store e.g. SQL Azure tables
            Utility.DoWork(100);
            return Task.FromResult(new PackageGen { Id = packageInfo.PackageId });
        }
    }
```

As requests for this service increase, resource utilization increases and is capped at the physical resources allocated to the monolithic application. If this service is deployed on Azure App Service, we can scale it up and out. Ideally, you want this heavily used resource to scale independently to optimize performance and costs. In this scenario, we use Azure Functions to do just that.

Drone delivery after

If you take a look at the DroneDelivery-after application code that we will deploy shortly, you see that the `PackageProcessor` class was changed to a `PackageServiceCaller` class. It still implements the IPackageProcessor interface, but instead it makes an HTTP call to the microservice.

C# Copy

```
public class PackageServiceCaller : IPackageProcessor
    {
        private readonly HttpClient httpClient;

        public static string FunctionCode { get; set; }

        public PackageServiceCaller(HttpClient httpClient)
        {
            this.httpClient = httpClient;
        }

        public async Task<PackageGen> CreatePackageAsync(PackageInfo packageInfo)
        {
            var result = await httpClient.PutAsJsonAsync($"
{packageInfo.PackageId}?code={FunctionCode}", packageInfo);
            result.EnsureSuccessStatusCode();

            return new PackageGen { Id = packageInfo.PackageId };
```

```
        }
    }
```

The microservice will be deployed on an Azure function. Its code can be found in *PackageServiceFunction.cs* and contains the following code.

C# Copy

```
public static class PackageServiceFunction
    {
        [FunctionName("PackageServiceFunction")]
        public static Task<IActionResult> Run(
            [HttpTrigger(AuthorizationLevel.Function, "put", Route =
"packages/{id}")] HttpRequest req,
            string id, ILogger log)
        {
            log.LogInformation("C# HTTP trigger function processed a request.");

            //Uses common data store e.g. SQL Azure tables
            Utility.DoWork(100);
            return Task.FromResult((IActionResult)new
CreatedResult("http://example.com", null));
        }
    }
```

By putting this code on Azure Functions, this service can scale independently as user load increases. You can keep the services for the remaining application code optimized for the rest of the application. The package service scales out as more requests for drone deliveries come in to the system.

Now let's redeploy the application. First, we deploy our refactored service on Azure Functions. Then we deploy the refactored application on App Service, and point it to the function.

Deploy the function app

1. Run this command to set up environment variables pointed to our services.

Azure CLI Copy

```
APPSERVICENAME="$(az webapp list \
                    --resource-group learn-bdae2072-cd38-4abb-9e0a-
04f5d380f25a \
                    --query '[].name' \
                    --output tsv)"
FUNCTIONAPPNAME="$(az functionapp list \
                    --resource-group learn-bdae2072-cd38-4abb-9e0a-
04f5d380f25a \
```

```
                    --query '[].name' \
                    --output tsv)"
```

2. Let's build and zip up the application code for the function app.

```bash
cd ~/mslearn-microservices-architecture/src/after
dotnet build ./PackageService/PackageService.csproj -c Release
cd PackageService/bin/Release/netcoreapp2.2
zip -r PackageService.zip .
```

3. Run this command to push the code to the function app.

```azure-cli
az functionapp deployment source config-zip \
    --resource-group learn-bdae2072-cd38-4abb-9e0a-04f5d380f25a \
    --name $FUNCTIONAPPNAME \
    --src PackageService.zip
```

Deploy the updated Drone Delivery application

Now that our service is running on Azure Functions, we need to point our drone application to that function app.

1. We first need to get the access code for the function app so that we can successfully call it from the application. Run the following commands to retrieve this code. You display the function app name and code for use in the next steps.

```azure-cli
RESOURCEGROUPID=$(az group show \
                    --resource-group learn-bdae2072-cd38-4abb-9e0a-
04f5d380f25a \
                    --query id \
                    --output tsv)
FUNCTIONCODE=$(az rest \
                    --method post \
                    --query default \
                    --output tsv \
                    --uri
"https://management.azure.com$RESOURCEGROUPID/providers/Microsoft.Web/sites/$
FUNCTIONAPPNAME/functions/PackageServiceFunction/listKeys?api-version=2018-
02-01")
echo "FunctionName - $FUNCTIONAPPNAME"
echo "FunctionCode - $FUNCTIONCODE"
```

2. In Azure Cloud Shell, run these commands to open *appsettings.json* in the code editor.

```bash
cd ~/mslearn-microservices-architecture/src/after
code ./DroneDelivery-after/appsettings.json
```

3. In the code editor, replace the values `PackageServiceUri` and `PackageServiceFunctionCode`. In `PackageServiceUri`, replace `<FunctionName>` with the name of your function app.

   In `PackageServiceFunctionCode`, replace the `<FunctionCode>` with the function code you retrieved. Your *appsettings.json* file should look similar to this:

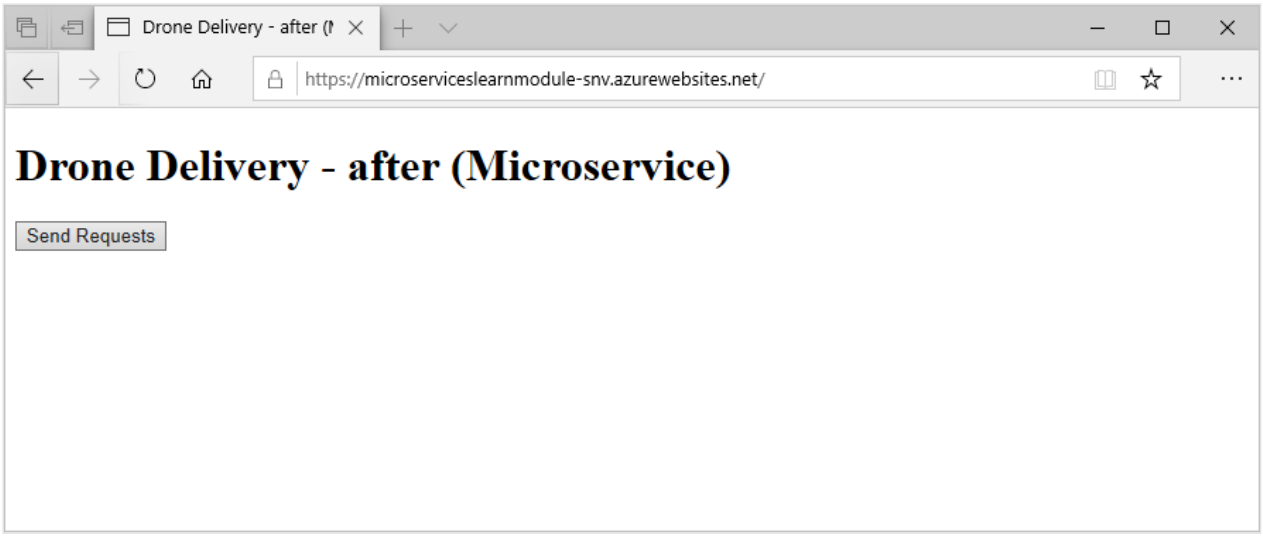
```json
{
    "Logging": {
    "LogLevel": {
        "Default": "Warning"
    }
    },
    "AllowedHosts": "*",
    "PackageServiceUri": "https://packageservicefunction-
abc.azurewebsites.net/api/packages/",
    "PackageServiceFunctionCode":
"SvrbiyhjXJUdTPXrkcUtY6bQaUf7OXQjWvnM0Gq63hFUhbH2vn6qYA=="
}
```

4. Select Ctrl+S to save the file, and select Ctrl+Q to close the code editor.

5. Run this command to deploy the updated application to App Service.

```bash
zip -r DroneDelivery-after.zip . -x \*/obj/\* \*/bin/\*
az webapp deployment source config-zip \
    --resource-group learn-bdae2072-cd38-4abb-9e0a-04f5d380f25a \
    --name $APPSERVICENAME \
    --src DroneDelivery-after.zip
```

6. With the site redeployed, refresh your page and you should see that it updated.



Test the performance of the new architecture

Now that we've moved the resource-constrained service to a microservice that runs on Azure Functions, let's see how this change affected application performance.

1. On the home page of your website, select **Send Requests**. This action submits requests from your monolithic app to the microservice that runs on an Azure function.

2. The first attempt might give similar results to the monolithic application. Refresh the page, and resubmit the request if prompted. Do this step several times, and you should see **100 messages sent in 1 second**.

The initial attempt was slower while the function app started up. After it was up and running, the response time was significantly better than when this code was running in the monolithic architecture.

This piece of the architecture can now be scaled out almost infinitely while it still provides the same performance. By moving this application code to a microservice, we've improved performance by 5 to 10 times. Because Fabrikam has a dedicated development team for this

service, they can also iterate on this microservice and realize the benefits of increased agility and feature releases.

Next unit: Summary

Continue >