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Dev Ops @ Work 2020

The art of Azure Functions (unit) testing and monitoring

Massimo Bonanni

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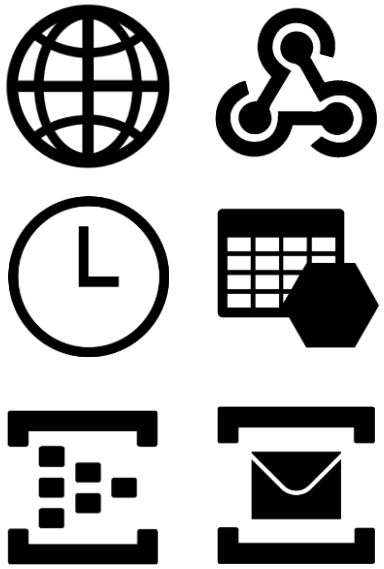
@massimobonanni

THE ISSUE….

If you want to use **Azure Functions** as components of your **Enterprise solutions,** you **must** to test and monitor them!!!

WHAT ARE AZURE FUNCTIONS

Events



React to timers, HTTP, or events from your favorite Azure services, with more on the way

Code

Author functions in C#, F#, Node.JS, Java, Powershell, and more

Outputs

Send results to an ever-growing collection of services

WHAT IS A UNIT TEST

In a **unit test** you invoke a piece of your code with a set of parameters and you checks the correctness its behavior.

In a **unit test** you should substitute all your external reference with a **mock** or **stub**.

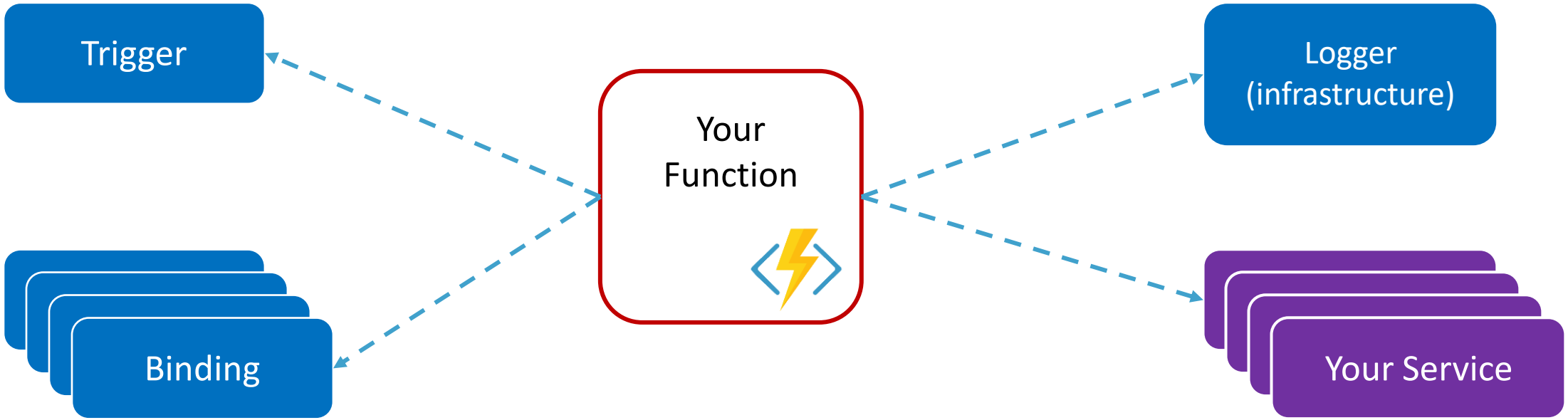
Mock *is for the software what a* ***dummy*** *is for a car crash test (you don't test a car with a human being inside…I Hope!!)*

AZURE FUNCTIONS & UNIT TESTING

You **should test** only the code in your Azure Functions!

You **should implement** your Azure Function to allow you to use mock/stub for all external reference!

The solution is ***Explicit Dependencies Principle***!!



AZURE FUNCTION … UNTESTABLE!!

```
public static class MortgageFunctions
{
    private static readonly IMortgageCalculator mortgageCalculator =
            new MortgageCalculator(null);

    [FunctionName(FunctionNames.MortgageCalculatorFunction + "STATIC")]
    0 references | Massimo Bonanni, 168 days ago | 2 authors, 2 changes
    public static async Task<IActionResult> Run(
        [HttpTrigger(AuthorizationLevel.Function, "get", Route = null)] HttpRequest req,
        [Table("executionsTable", Connection = "StorageAccount")] ICollector<ExecutionRow> outputTable,
        ILogger log)
    {
        log.LogInformation($"{FunctionNames.MortgageCalculatorFunction} start");

        // Retrieve loan, interest and numberOfPayments from HTTP Request
        [ Retrieve request parameters ]

        var calculatorResult =
            await mortgageCalculator.CalculateMontlyRateAsync(loan, interest, nPayments);

        [ Create the response ]

        if (calculatorResult.Succeed)
        {
            return new OkObjectResult(calculatorResult.Result);
        }

        return new BadRequestObjectResult(calculatorResult.Error.Message);
    }

    [ Private Methods ]
}
```

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        }
```

Trigger

You can mock it because the trigger payload is a POCO class

AZURE FUNCTION … UNTESTABLE!!

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```

Binding

You can mock it because the binding payload is an interface

AZURE FUNCTION … UNTESTABLE!!

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    {
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        [ Create the response ]

        if (calculatorResult.Succeed)
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```

Logger
(infrastructural stuffs)
You can mock it because the logger is an interface

AZURE FUNCTION … UNTESTABLE!!

```
public static class MortgageFunctions
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        }
```

External service

You **cannot** substitute it with your mock because it is created inside the Azure Function and you **haven't a way** to substitute it

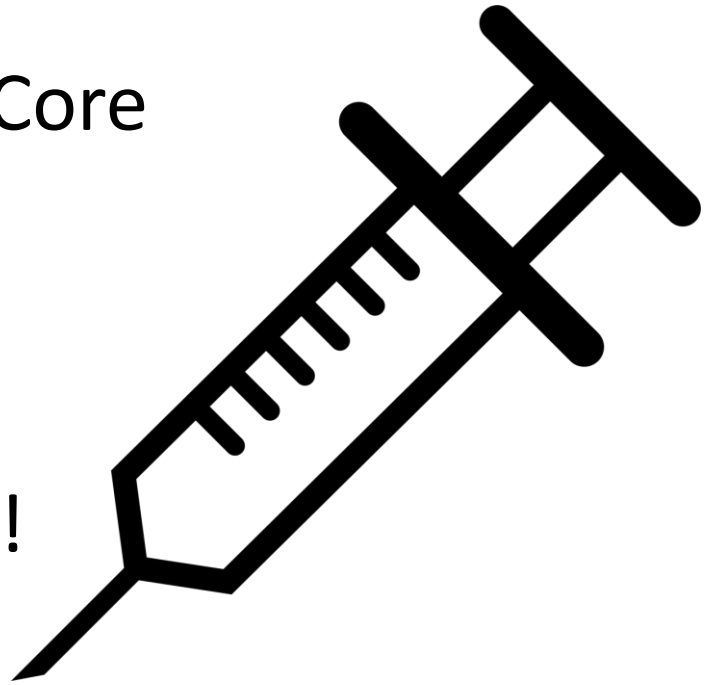
MAKE YOUR AZURE FUNCTION TESTABLE!!!

The solution of your problem is: **Dependency Injection !!**

Azure Functions Runtime is based on .NET Core.

Azure Functions support the same ASP.NET Core Dependency Injection!!!

Using Dependency Injection you provide a way to substitute your Services with a mock!



AZURE FUNCTION … TESTABLE!!

```
public class MortgageFunctions
{
    private readonly IMortgageCalculator mortgageCalculator;

    0 references | Massimo Bonanni, 197 days ago | 1 author, 1 change
    public MortgageFunctions(IMortgageCalculator mortgageCalculator)
    {
        if (mortgageCalculator == null)
            throw new ArgumentNullException(nameof(mortgageCalculator));

        this.mortgageCalculator = mortgageCalculator;
    }

    [FunctionName(FunctionNames.MortgageCalculatorFunction)]
    0 references | Massimo Bonanni, 168 days ago | 2 authors, 4 changes
    public async Task<IActionResult> Run(
        [HttpTrigger(AuthorizationLevel.Function, "get", Route = null)] Ht
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        [ Retrieve request parameters ]

        var calculatorResult =
            await this.mortgageCalculator.CalculateMontlyRateAsync(loan, i
```

Constructor Injection

You can choose what kind of actual service you want to use when you instantiate the function.

In a test you can substitute it with a mock!!

AZURE FUNCTION … TESTABLE!!

```
public class MortgageFunctions
{
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        [ Retrieve request parameters ]

        var calculatorResult =
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        [ Create the response ]

        if (calculatorResult.Succe
        {
            return new OkObjectRes
        }

        return new BadRequestObjec
    }

    [ Private Methods ]
}
```

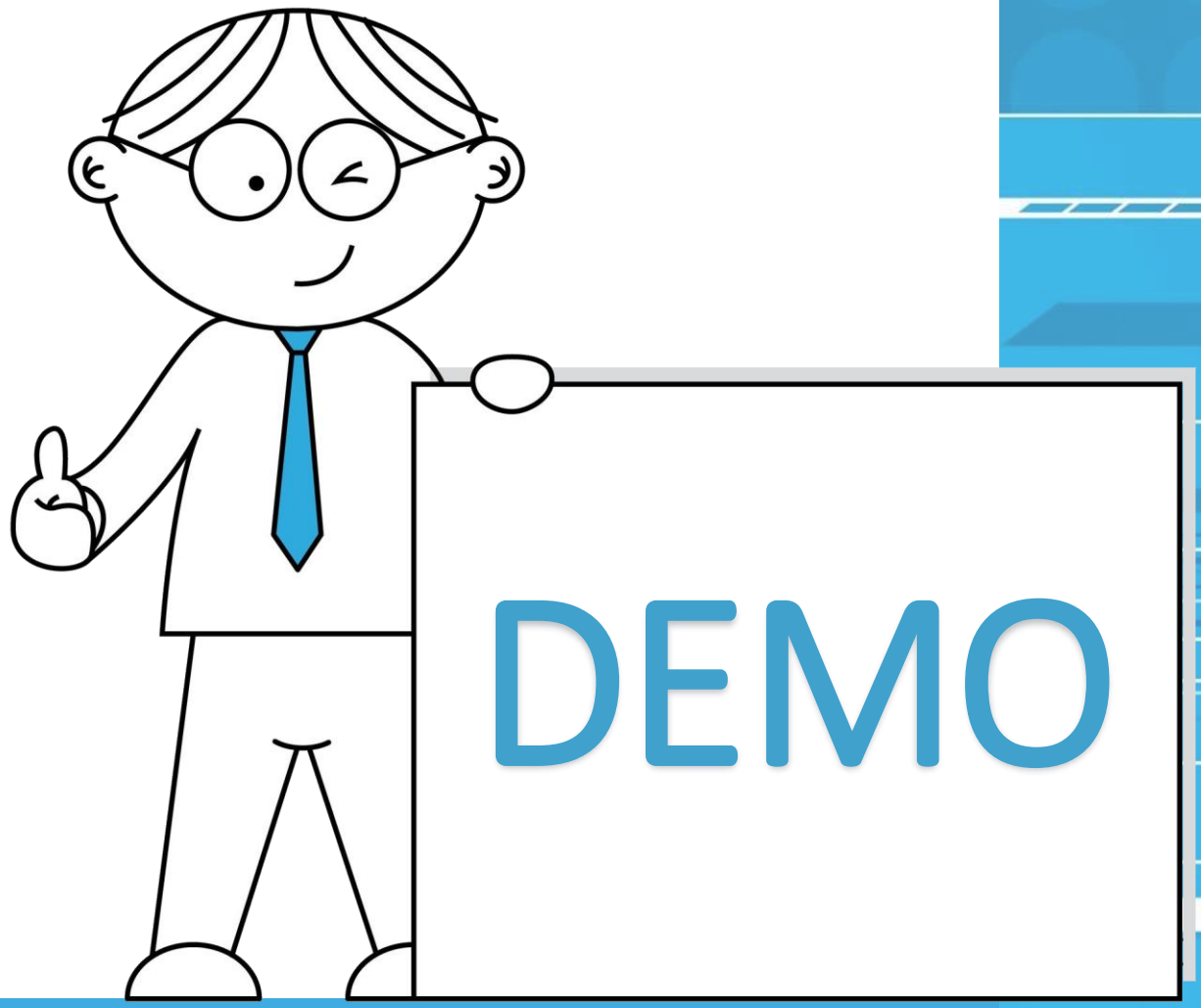
Mock

Create a mock to use in the test!!

```
var mortgageCalculator = new Mock<IMortgageCalculator>();
mortgageCalculator
    .Setup(c => c.CalculateMontlyRateAsync(mortgageLoan, annualInterest, numberOfPayments))
    .ReturnsAsync(new CalculatorResult() { Result = rate });

var target = new MortgageFunctions(mortgageCalculator.Object);
```

AZURE FUNCTIONS UNIT TESTING



MONITORING AZURE FUNCTIONS

Once you deploy your Azure Functions on Azure, you need to monitor them to check when something goes wrong.

The signature of an Azure Function Run method provides the instance of **ILogger** that you can use to log information about your code.

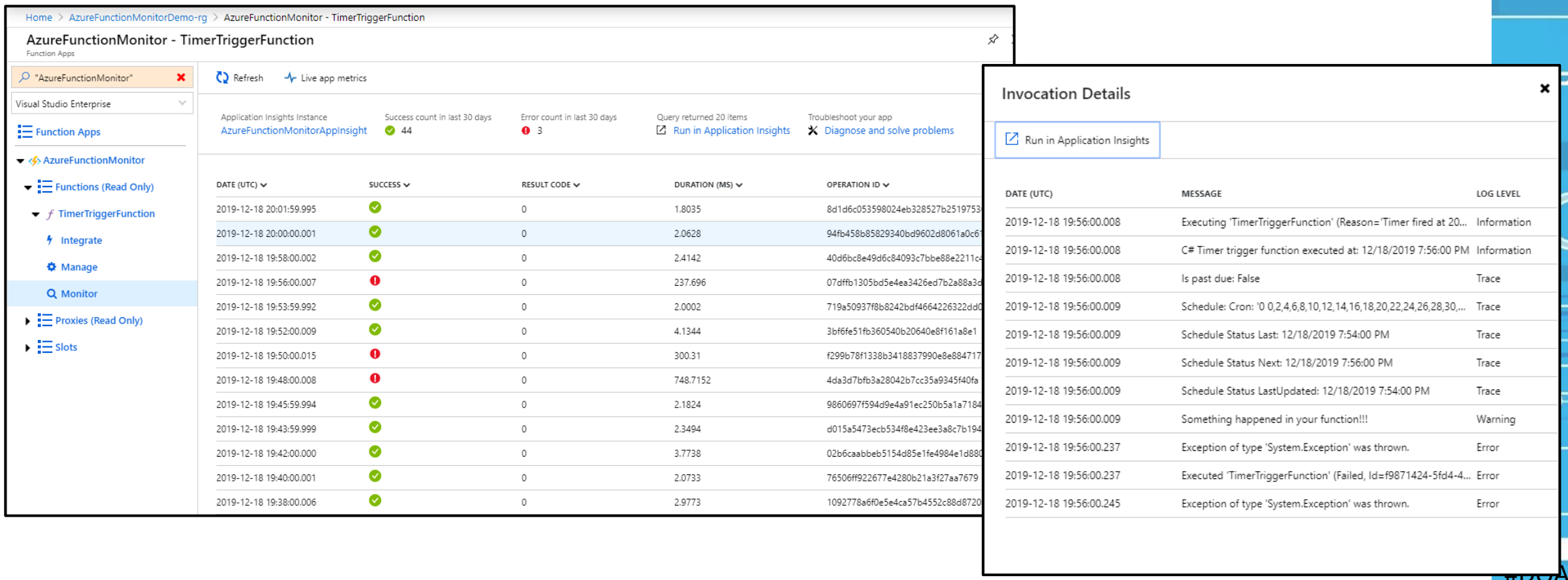
Using **ILogger**, you can collect information from your code execution to monitor and triage errors and exceptions.

```
public static class MonitoringFunctions
{
    [FunctionName("TimerTriggerFunction")]
    0 references | Massimo Bonanni, 196 days ago | 1 author, 1 change
    public static void Run([TimerTrigger("0 */2 * * * *")]TimerInfo myTimer, ILogger log)
    {
        var executionTimestamp = DateTime.Now;
        log.LogInformation($"C# Timer trigger function executed at: {executionTimestamp}");
    }
}
```

AZURE FUNCTIONS MONITOR

Azure Functions provide out-of-the-box monitor feature.

For each Function, you can have info about every function execution.

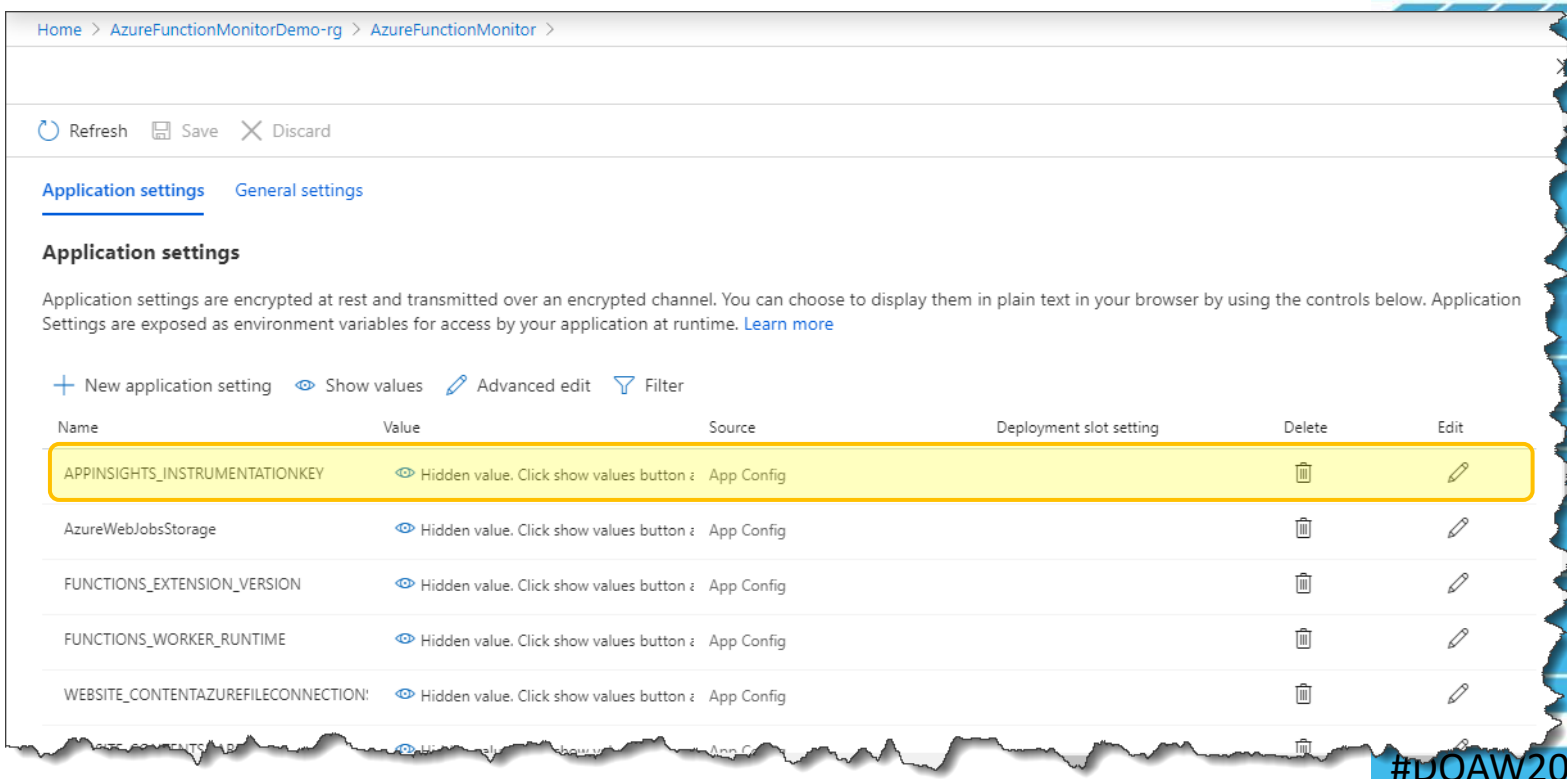


AZURE FUNCTIONS AND APPLICATION INSIGHT

The Azure Functions platform offers built-in integration with Azure Application Insights.

Application Insights gives you powerful analytic tools to aggregate log traces to have a better diagnostic experience.

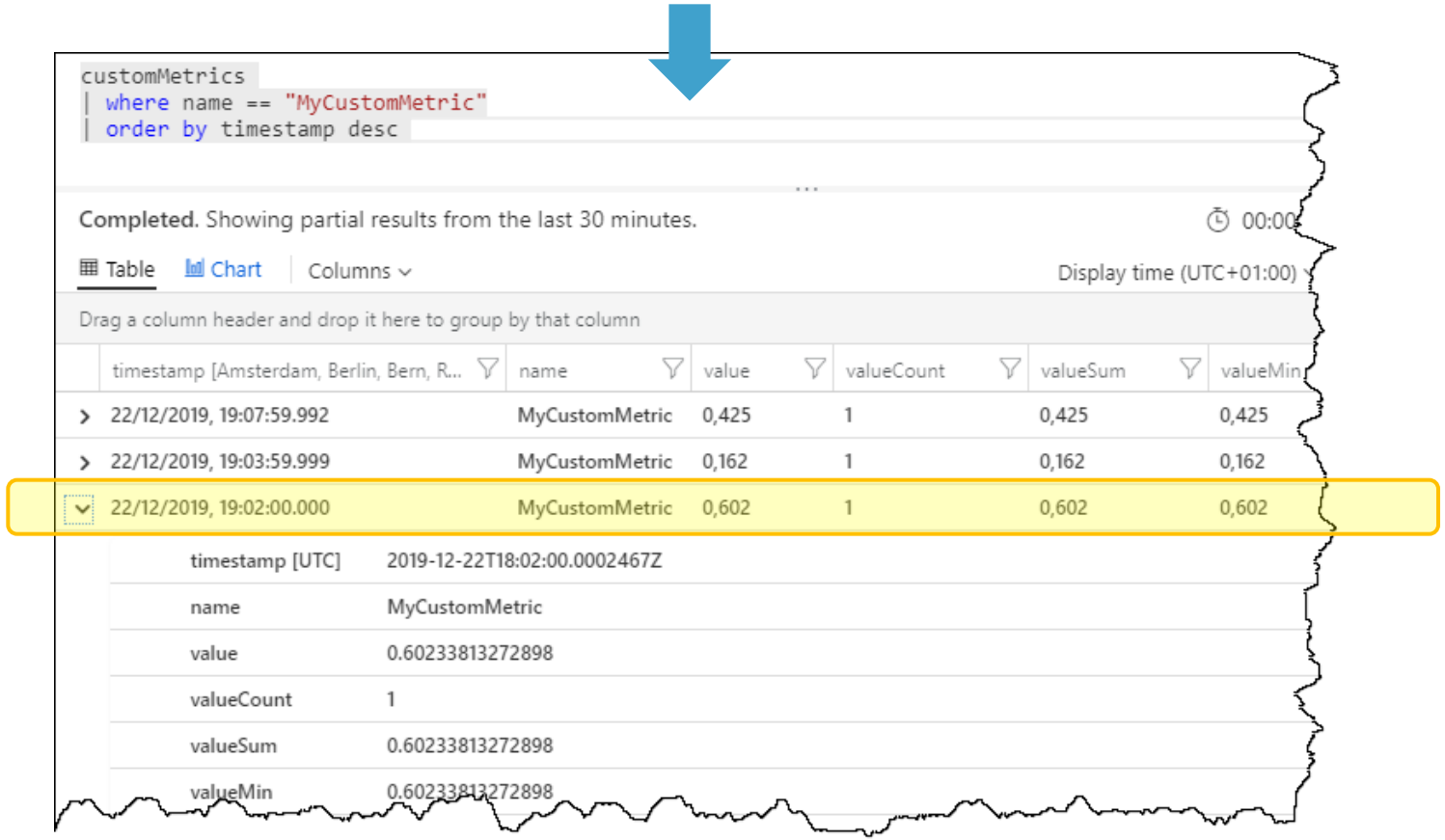
Put the Application Insights instrumentation key in the function app settings.



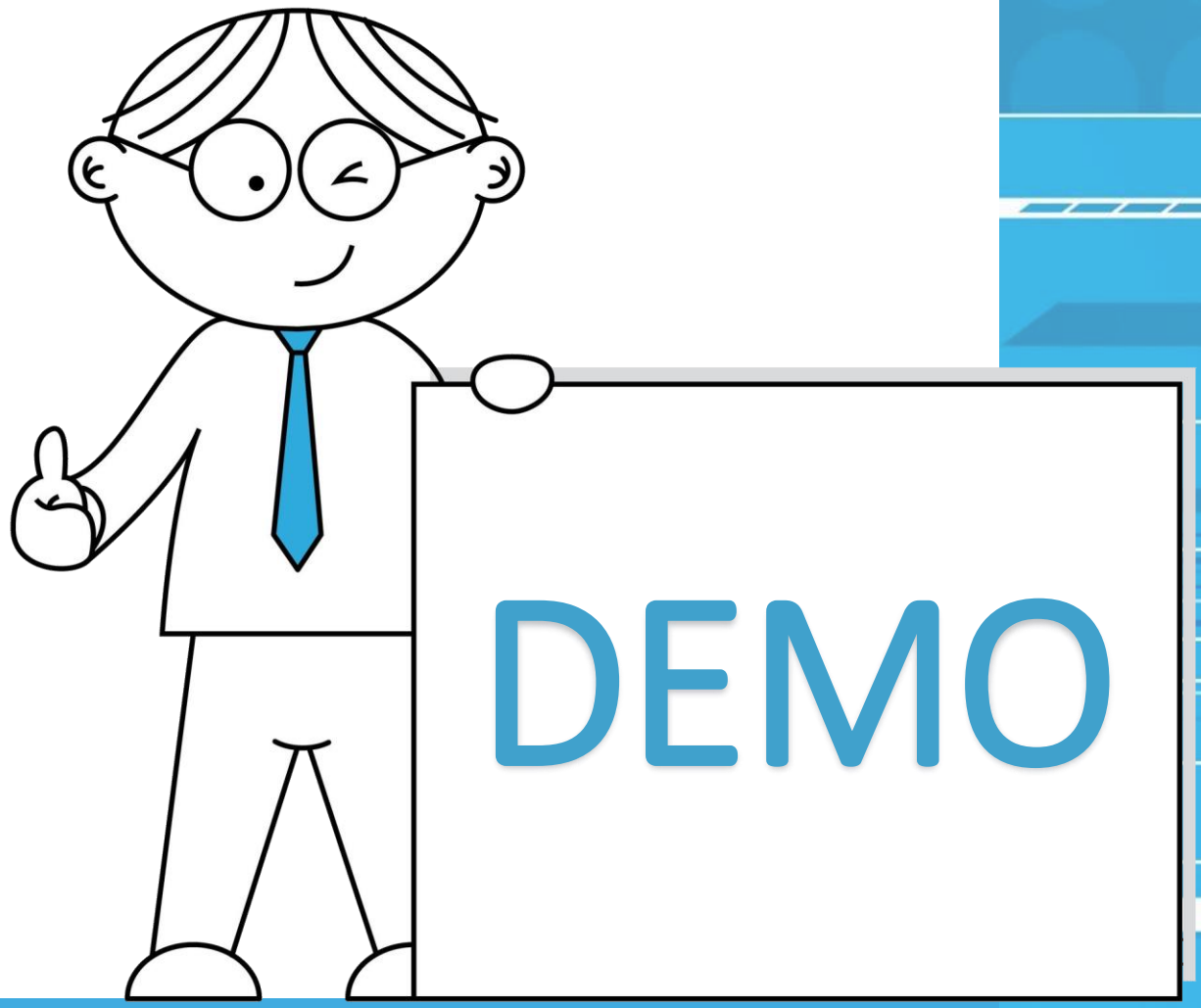
CUSTOM METRIC

Azure Function SDK provides you extension methods to log custom metrics.

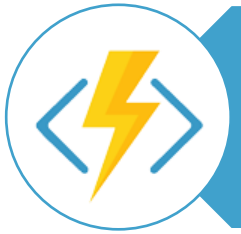
```
log.LogMetric("MyCustomMetric", CalculateMyCustomMetric());
```



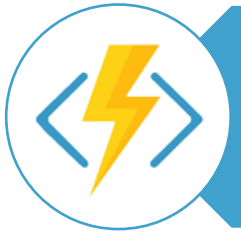
AZURE FUNCTIONS MONITORING



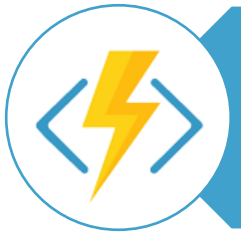
TAKE AWAY



Azure Functions are **simple**!



Testing Azure Functions is **simple**!



Monitoring Azure Functions is **simple**!

…. and then ….

KEEP CALM AND USE AZURE FUNCTIONS

Thanks for your attention!!!!

Massimo Bonanni

Azure Technical Trainer @Microsoft

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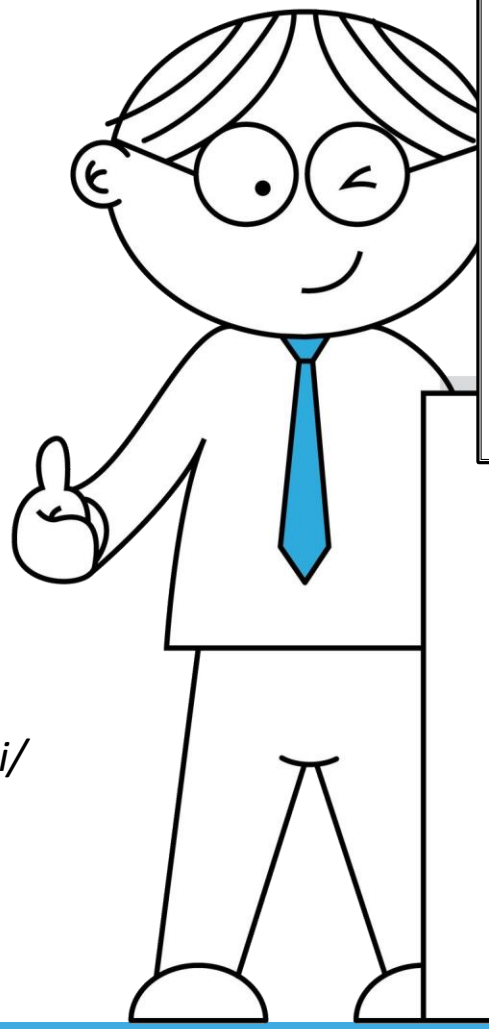
https://www.linkedin.com/in/massimobonanni/

http://bit.ly/MasteringServerless



Q&A

REFERENCES

- **Azure Functions Documentation**

  https://docs.microsoft.com/en-US/azure/azure-functions/

- **Azure Functions Code Samples**

  https://azure.microsoft.com/en-us/resources/samples/?service=functions&sort=0

- **Azure Updates**

  https://azure.microsoft.com/en-us/roadmap/?category=compute

- **Demo MortgageCalculator – GitHub**

  http://bit.ly/TestAZFunc

- **Demo Monitor Azure Functions – GitHub**

  http://bit.ly/MonitorAZFunc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