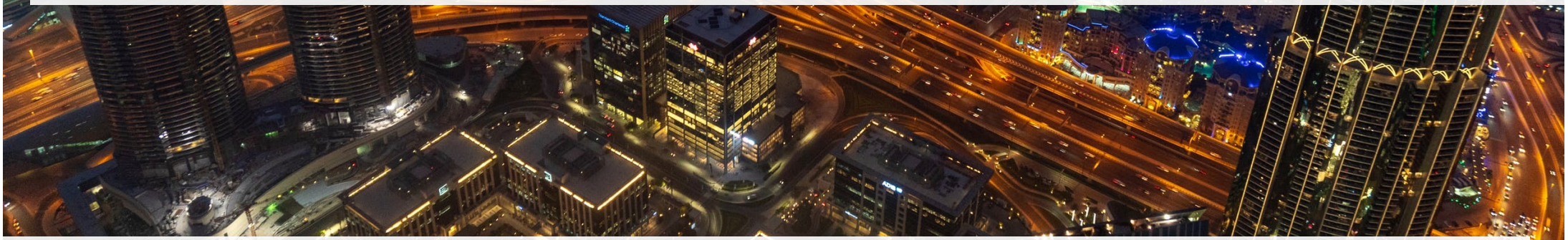
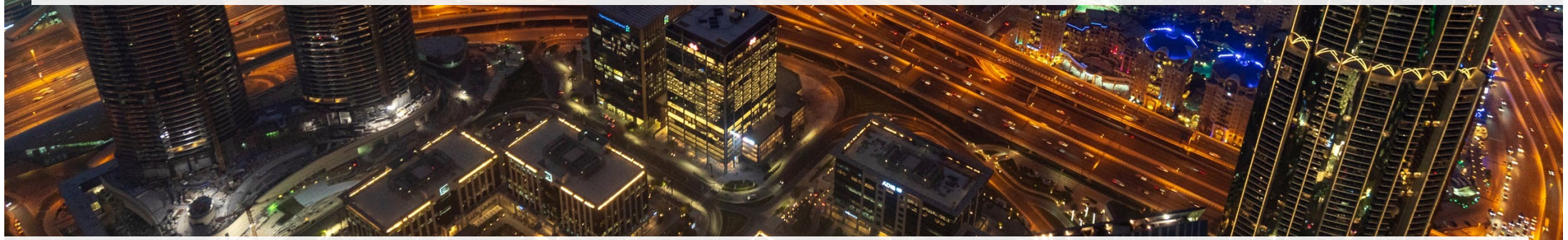

DWX
DEVELOPER WEEK '21
Why should you care about writing Reactive Mobile Apps?
Mark Allibone
Rey Technology
@mallibone


13:43
A-Z
Calculator
Calendar
Call
Camera
Chrome
Clock
Contacts
Daily Mail Online
Downloads
Drive
Dropbox
Duo
eBay
enjoy.now
Facebook
Files
Gmail
Google
Instagram
InstaSize

Most actions on a mobile app have a *reactive* nature.



What do you mean with *reactive*?



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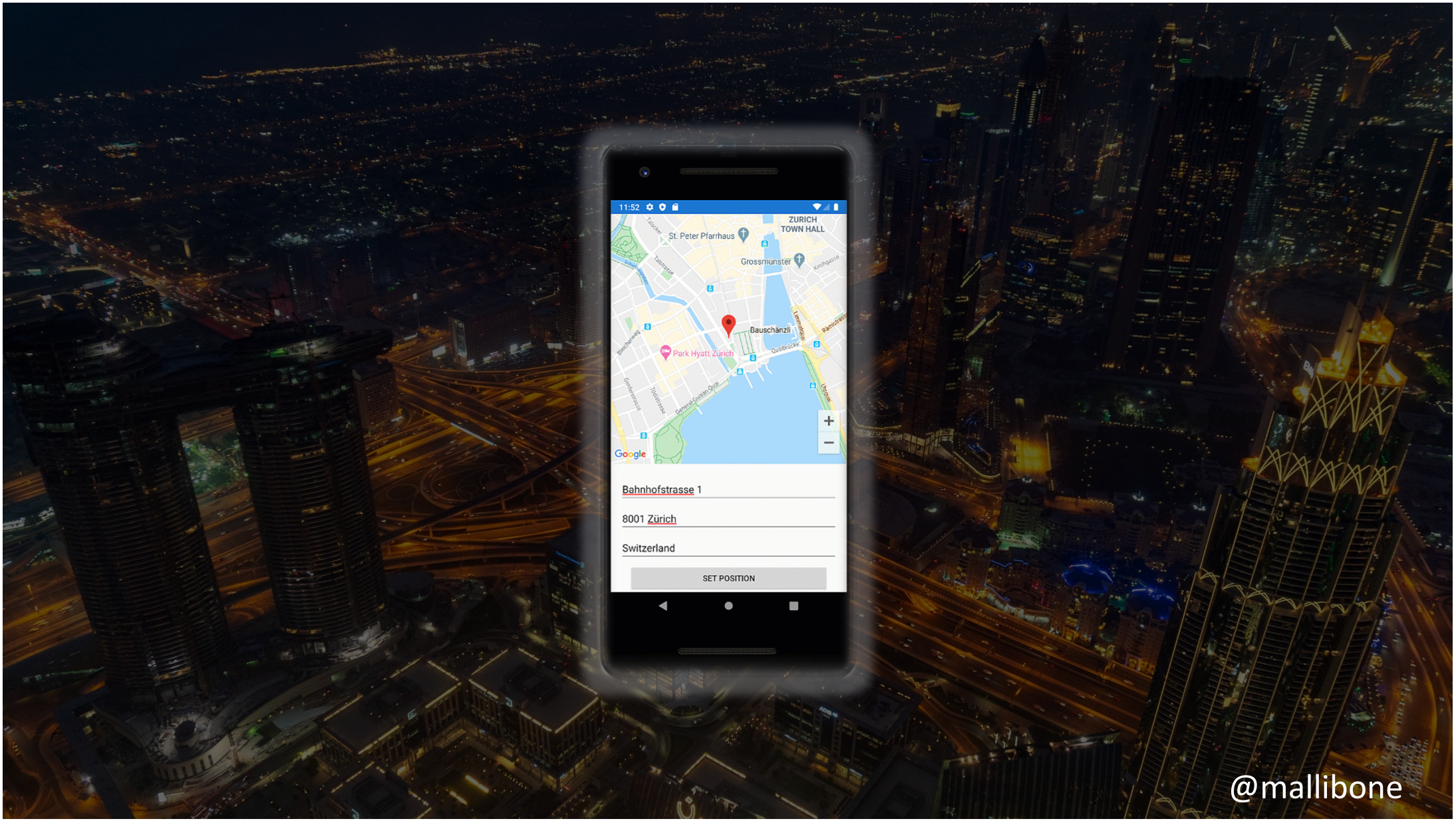
11:52
ZURICH
TOWN HALL
St. Peter Pfarrhaus
Grossmünster
Bauschänzli
Park Hyatt Zürich
Google
Bahnhofstrasse 1
8001 Zürich
Switzerland
SET POSITION
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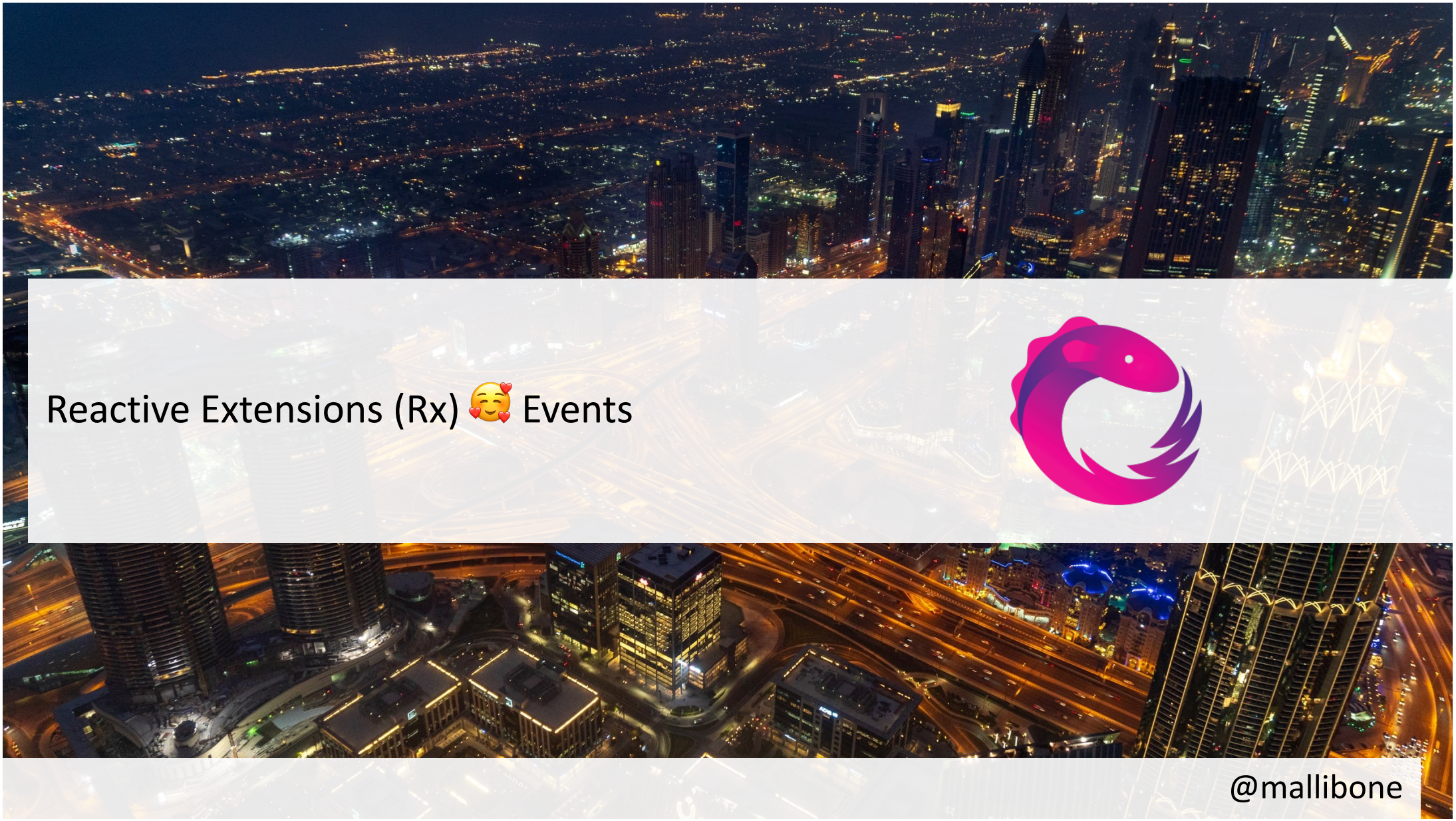
Bahnhofstrasse 1
8001 Zürich
Switzerland
SET POSITION
Tap
Tap
Tap
Tap
t
@mallibone



Reactive Extensions (Rx) 🥰 Events

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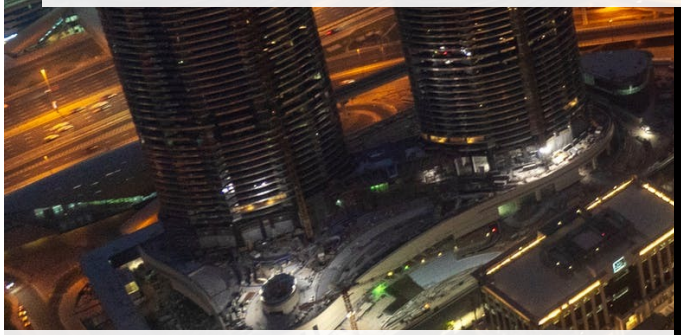
Rx = Observables + LINQ + Schedulers

Events*

Threads/Tasks*



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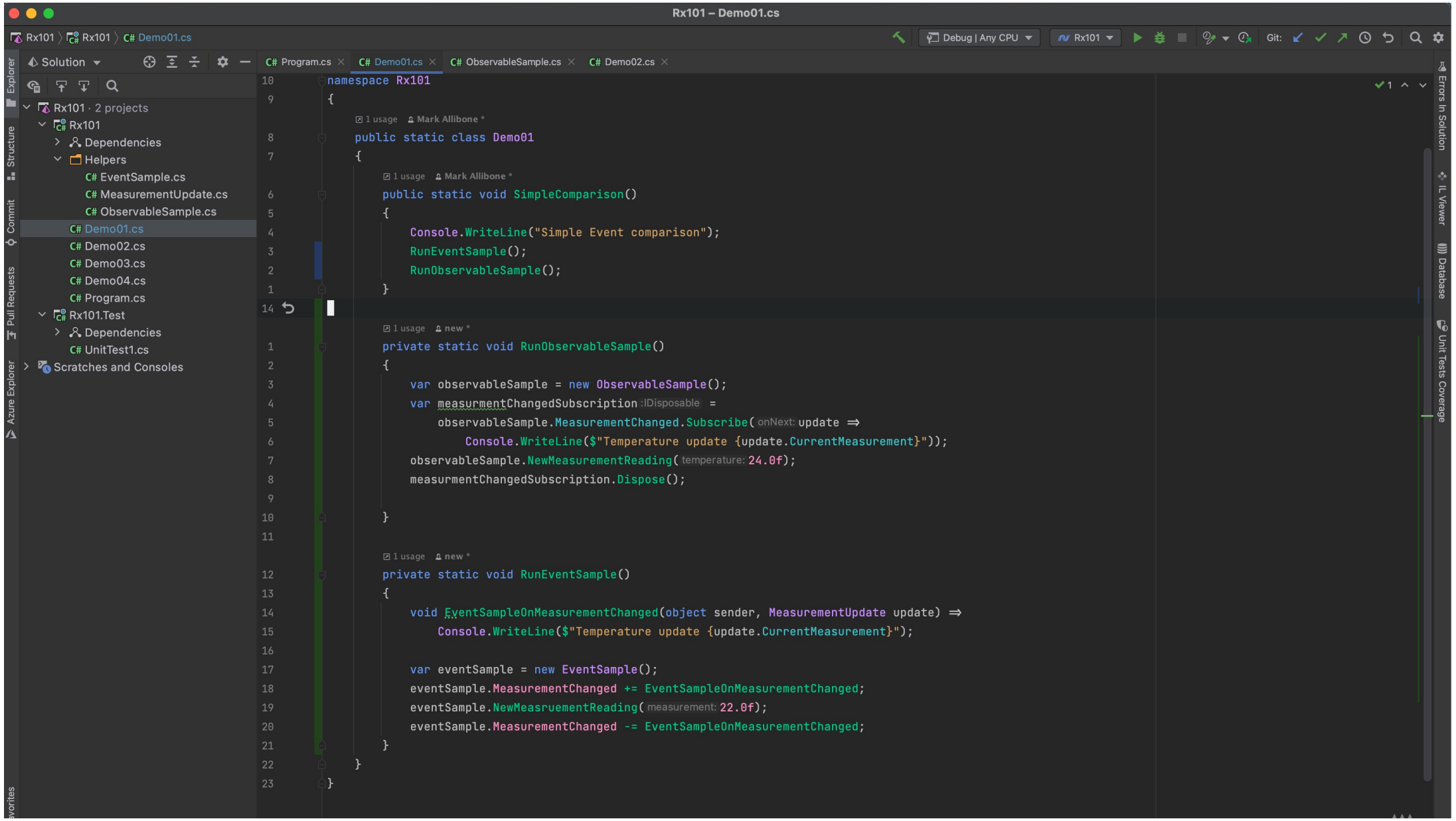
Rx101 – Demo01.cs
Rx101 〉 Rx101 〉 C# Demo01.cs
Debug | Any CPU
Rx101
Git:
Solution
Rx101 · 2 projects
Rx101
Dependencies
Helpers
EventSample.cs
MeasurementUpdate.cs
ObservableSample.cs
Demo01.cs
Demo02.cs
Demo03.cs
Demo04.cs
Program.cs
Rx101.Test
Dependencies
UnitTest1.cs
Scratches and Consoles
C# Program.cs
C# Demo01.cs
C# ObservableSample.cs
C# Demo02.cs
namespace Rx101
{
1 usage Mark Allibone *
public static class Demo01
{
1 usage Mark Allibone *
public static void SimpleComparison()
{
Console.WriteLine("Simple Event comparison");
RunEventSample();
RunObservableSample();
}
1 usage new *
private static void RunObservableSample()
{
var observableSample = new ObservableSample();
var measurmentChangedSubscription :IDisposable =
observableSample.MeasurementChanged.Subscribe(onNext: update =>
Console.WriteLine($"Temperature update {update.CurrentMeasurement}"));
observableSample.NewMeasurementReading(temperature: 24.0f);
measurmentChangedSubscription.Dispose();
}
1 usage new *
private static void RunEventSample()
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void EventSampleOnMeasurementChanged(object sender, MeasurementUpdate update) =>
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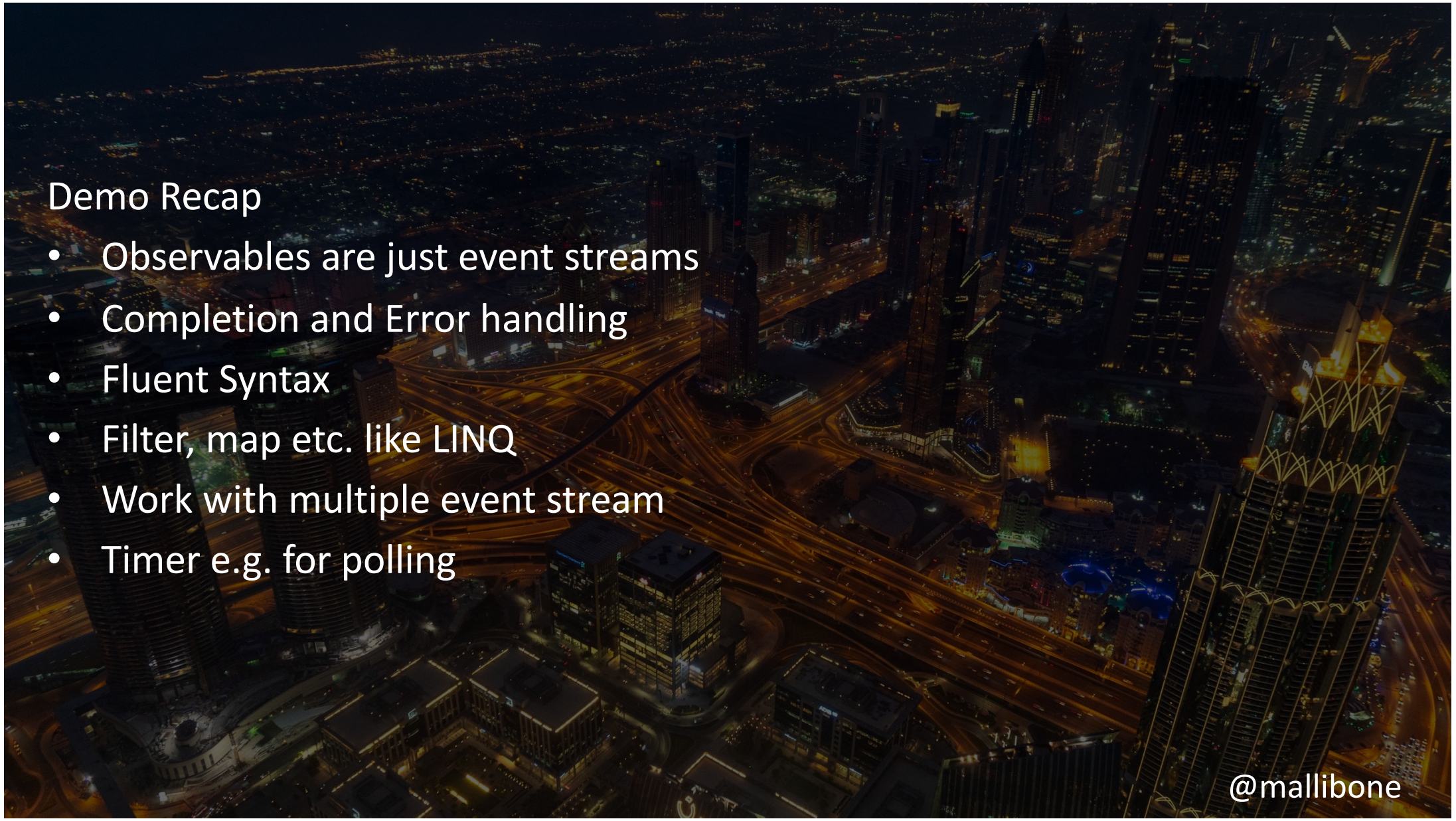
var eventSample = new EventSample();
eventSample.MeasurementChanged += EventSampleOnMeasurementChanged;
eventSample.NewMeasruementReading(measurement: 22.0f);
eventSample.MeasurementChanged -= EventSampleOnMeasurementChanged;
}
}
}
Errors In Solution
IL Viewer
Database
Unit Tests Coverage


Demo Recap
• Observables are just event streams
• Completion and Error handling
• Fluent Syntax
• Filter, map etc. like LINQ
• Work with multiple event stream
• Timer e.g. for polling
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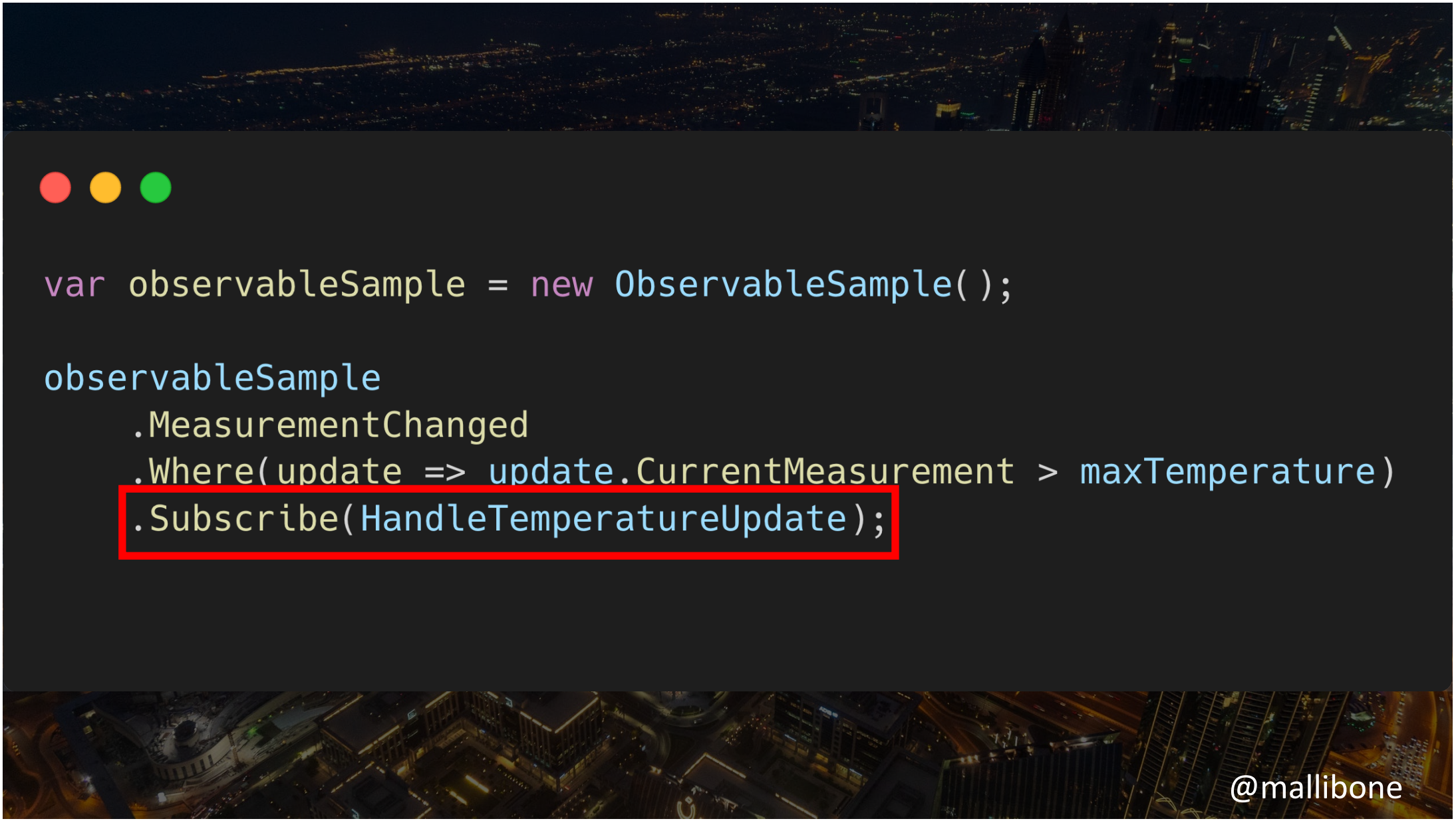
var observableSample = new ObservableSample();
observableSample
.MeasurementChanged
.Where(update => update.CurrentMeasurement > maxTemperature)
.Subscribe(HandleTemperatureUpdate);
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ONE DOES NOT FORGET TO
DISPOSE
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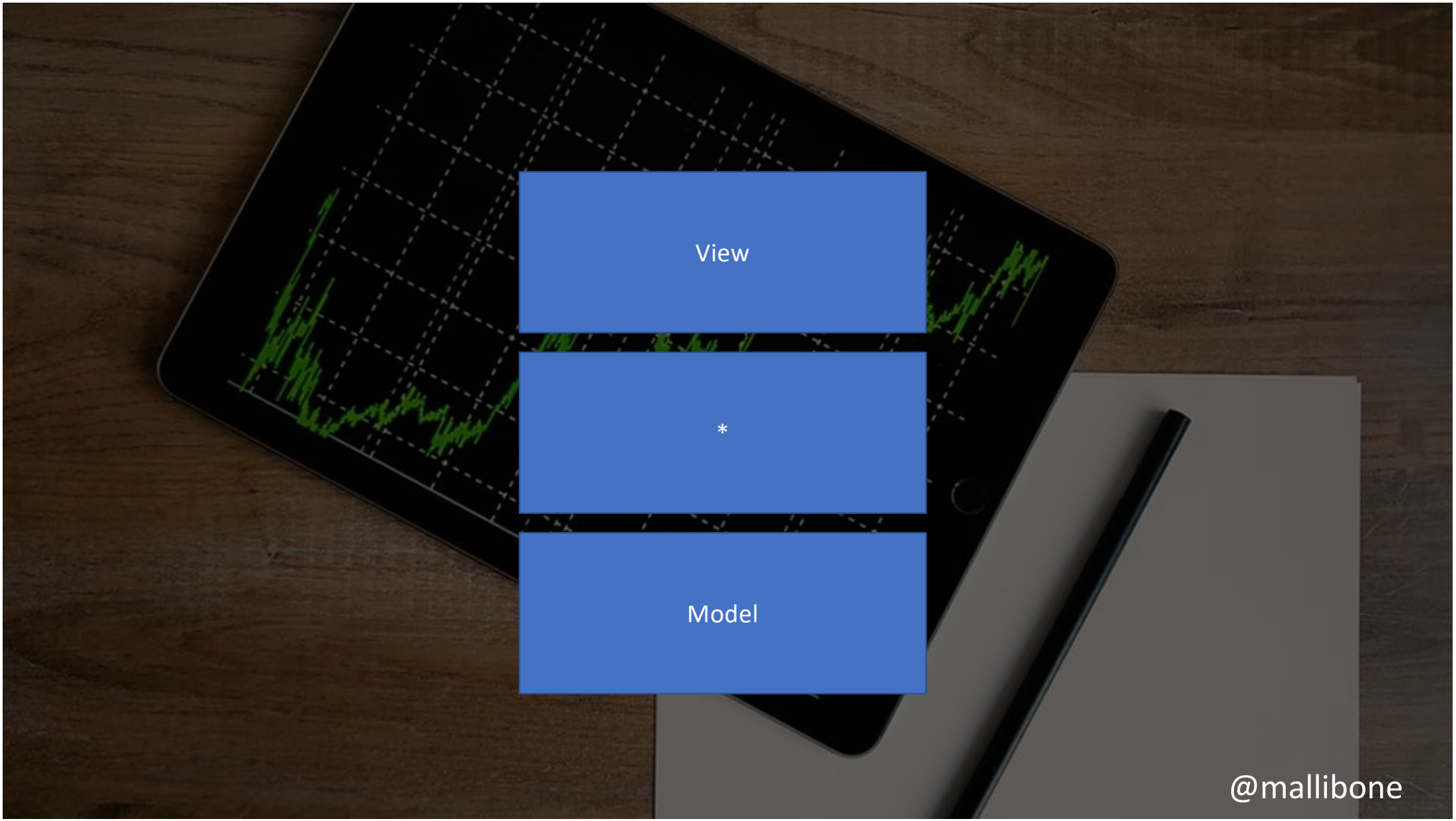
13:43
A-Z
Calculator
Calendar
Call
Camera
Chrome
Clock
Contacts
Daily Mail Online
Downloads
Drive
Dropbox
Duo
eBay
enjoy.now
Facebook
Files
Gmail
Google
Instagram
InstaSize


View
*
Model
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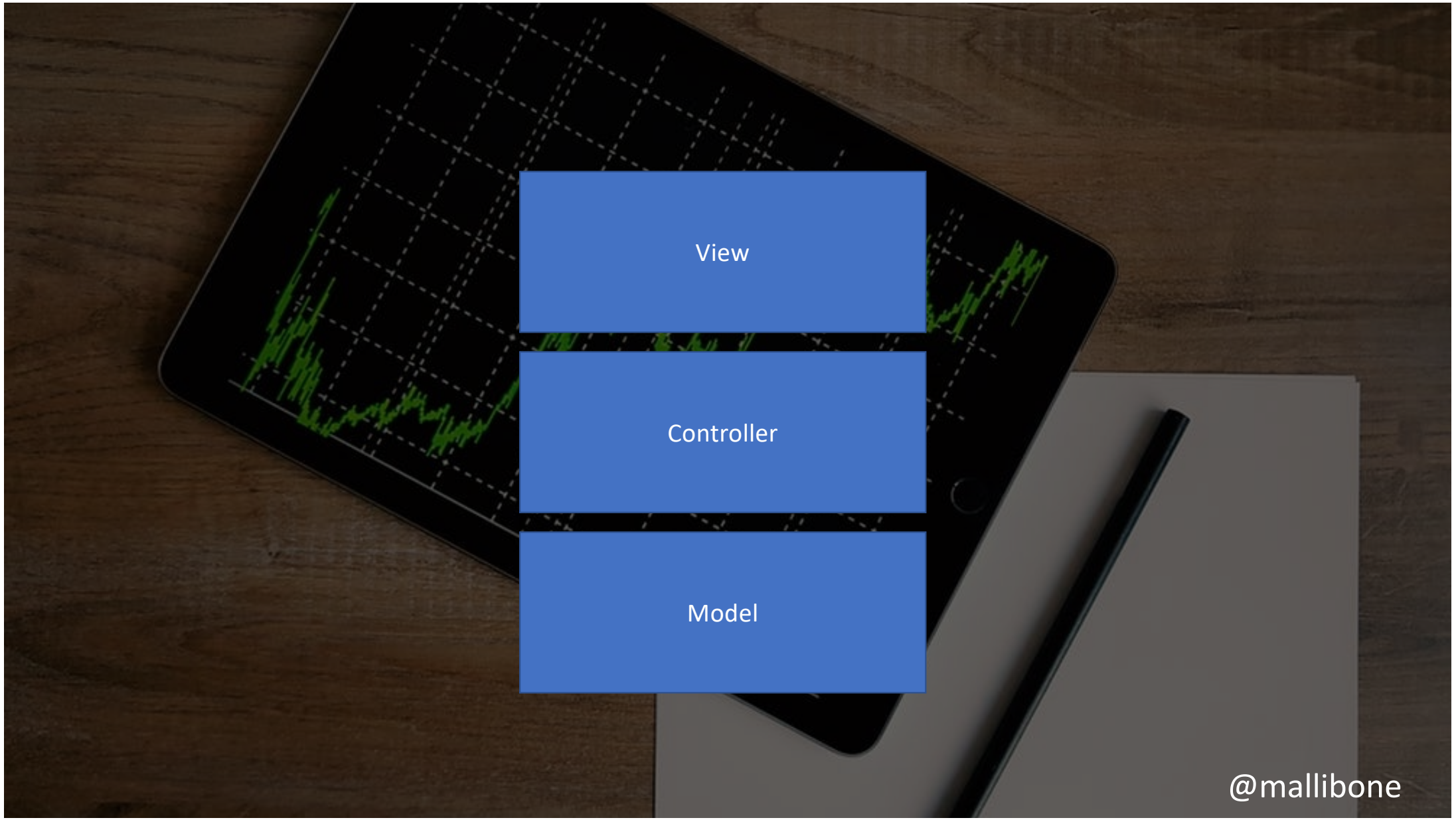
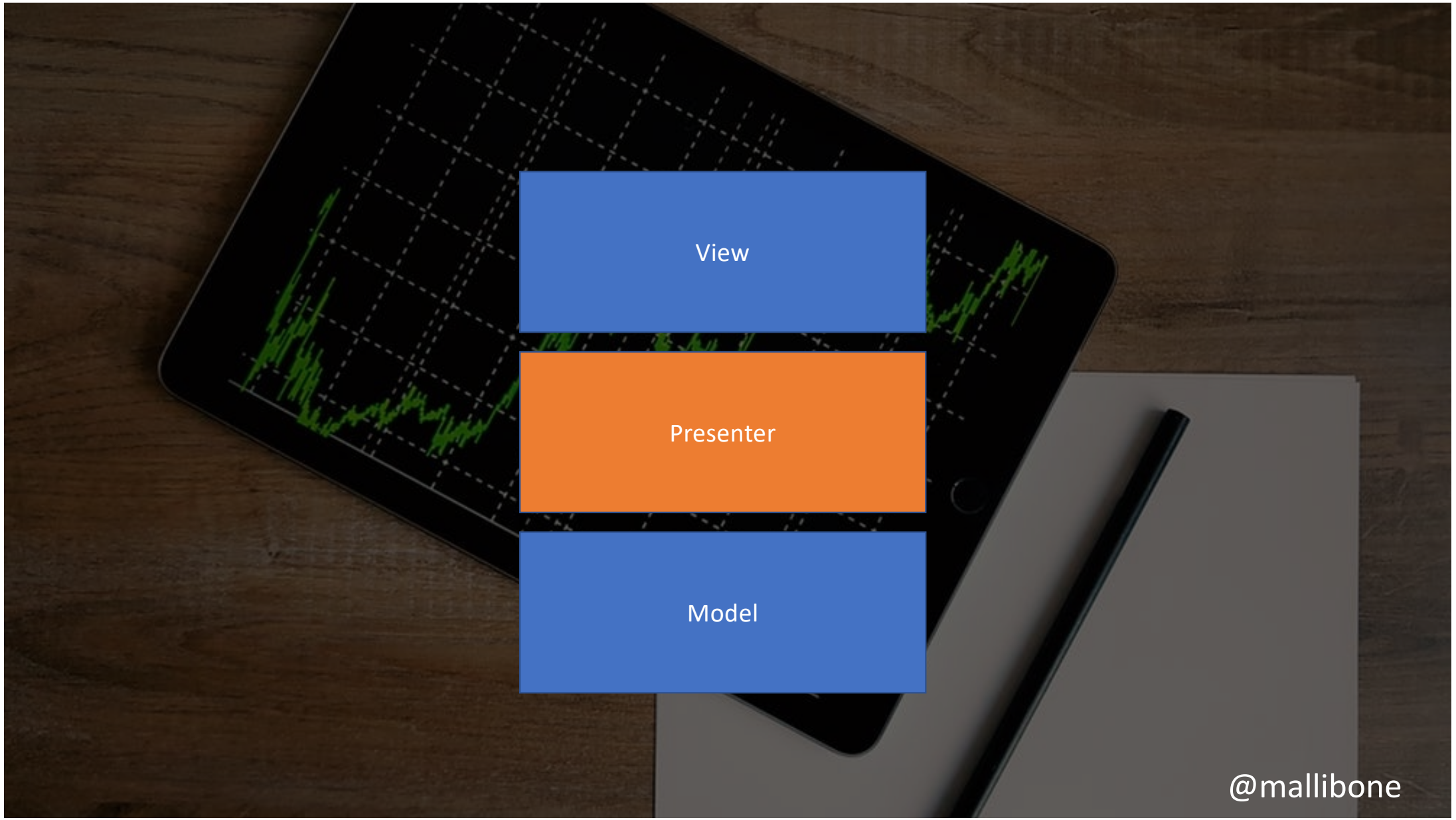
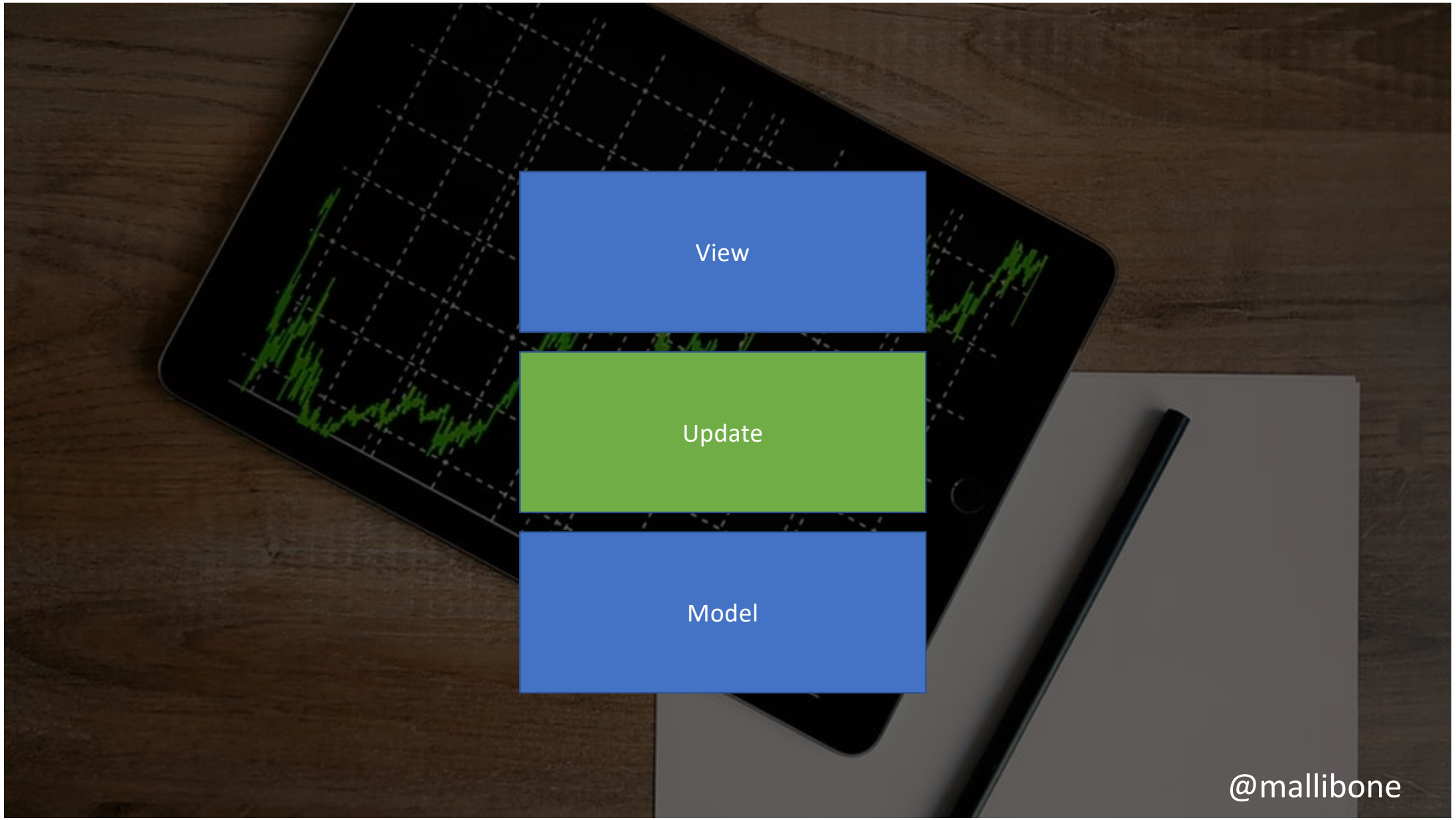
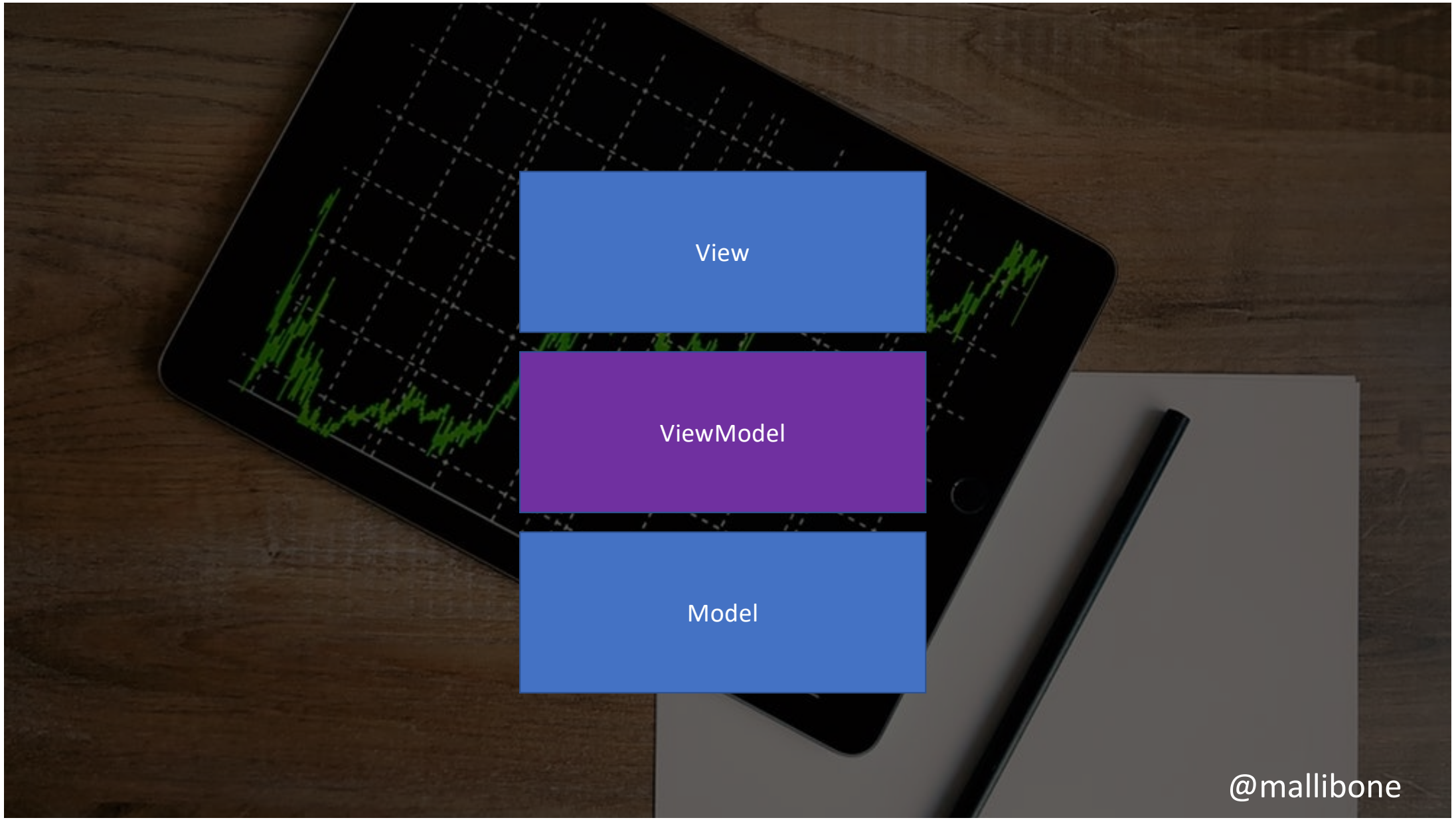

View
Controller
Model
@mallibone


View
Presenter
Model
@mallibone


View
Update
Model
@mallibone


View
ViewModel
Model
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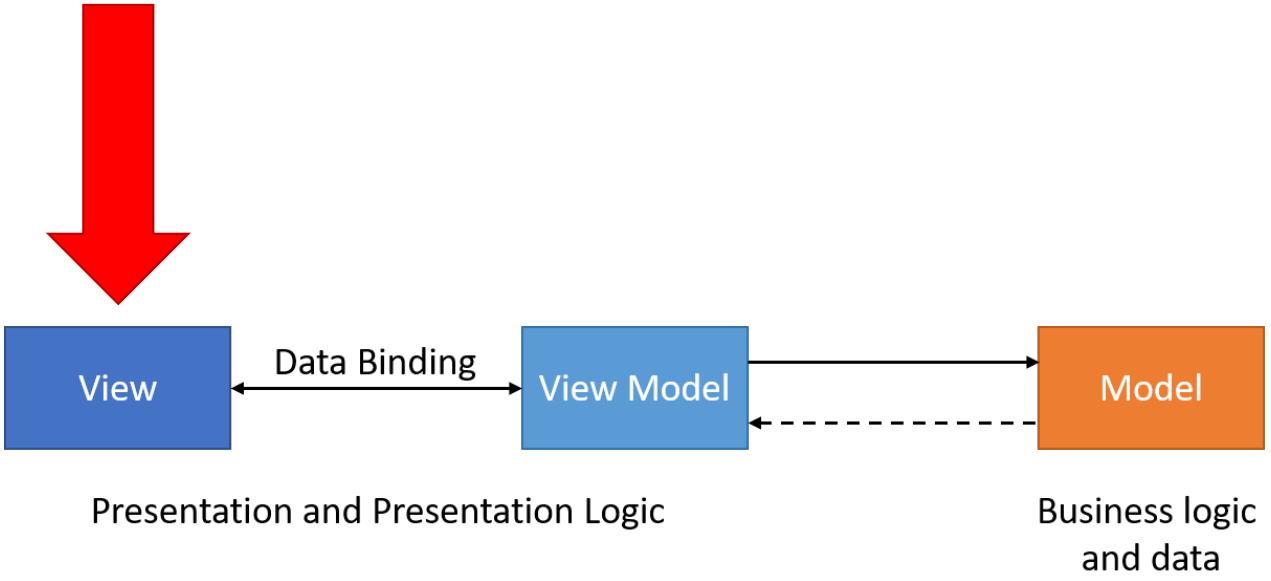
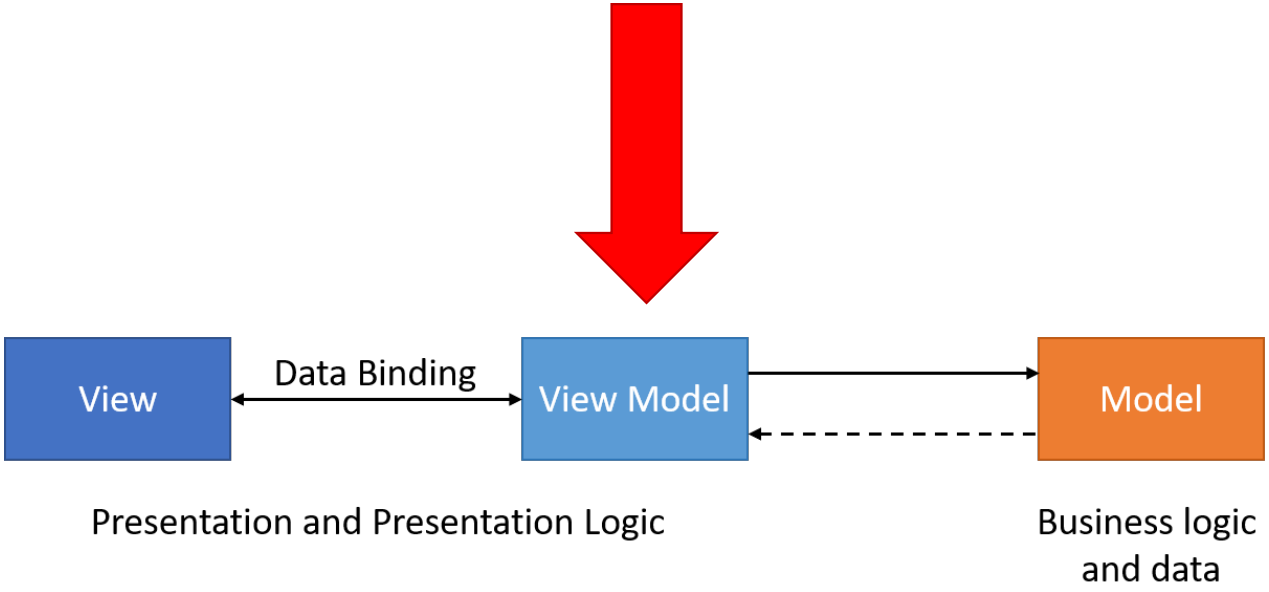
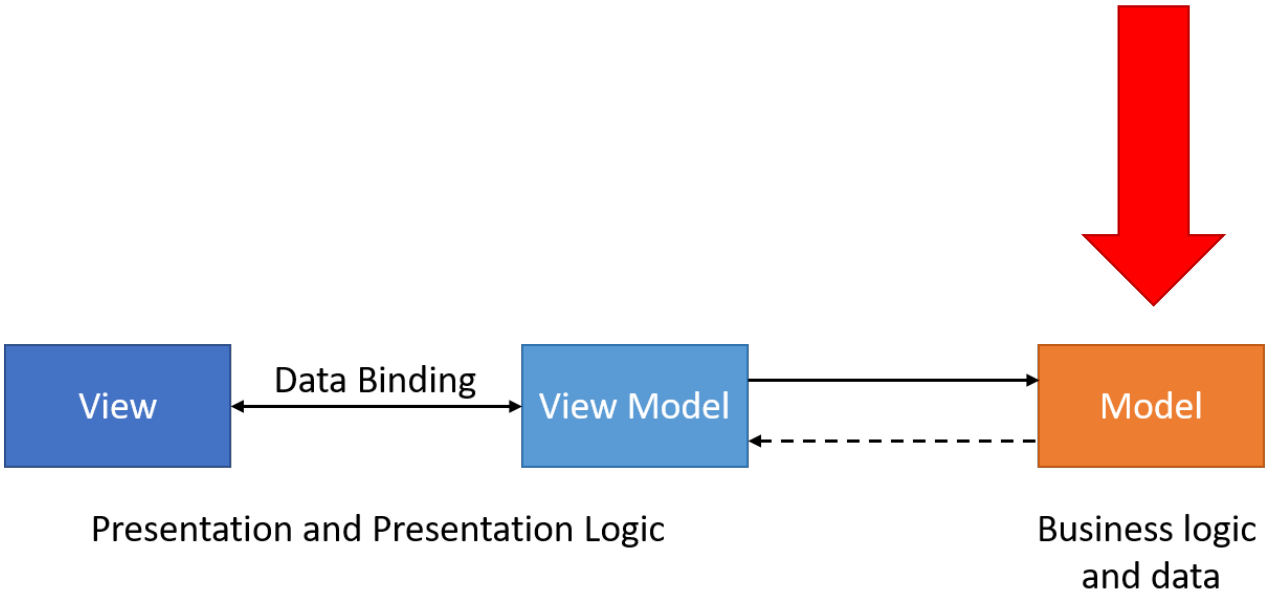
Model View View Model

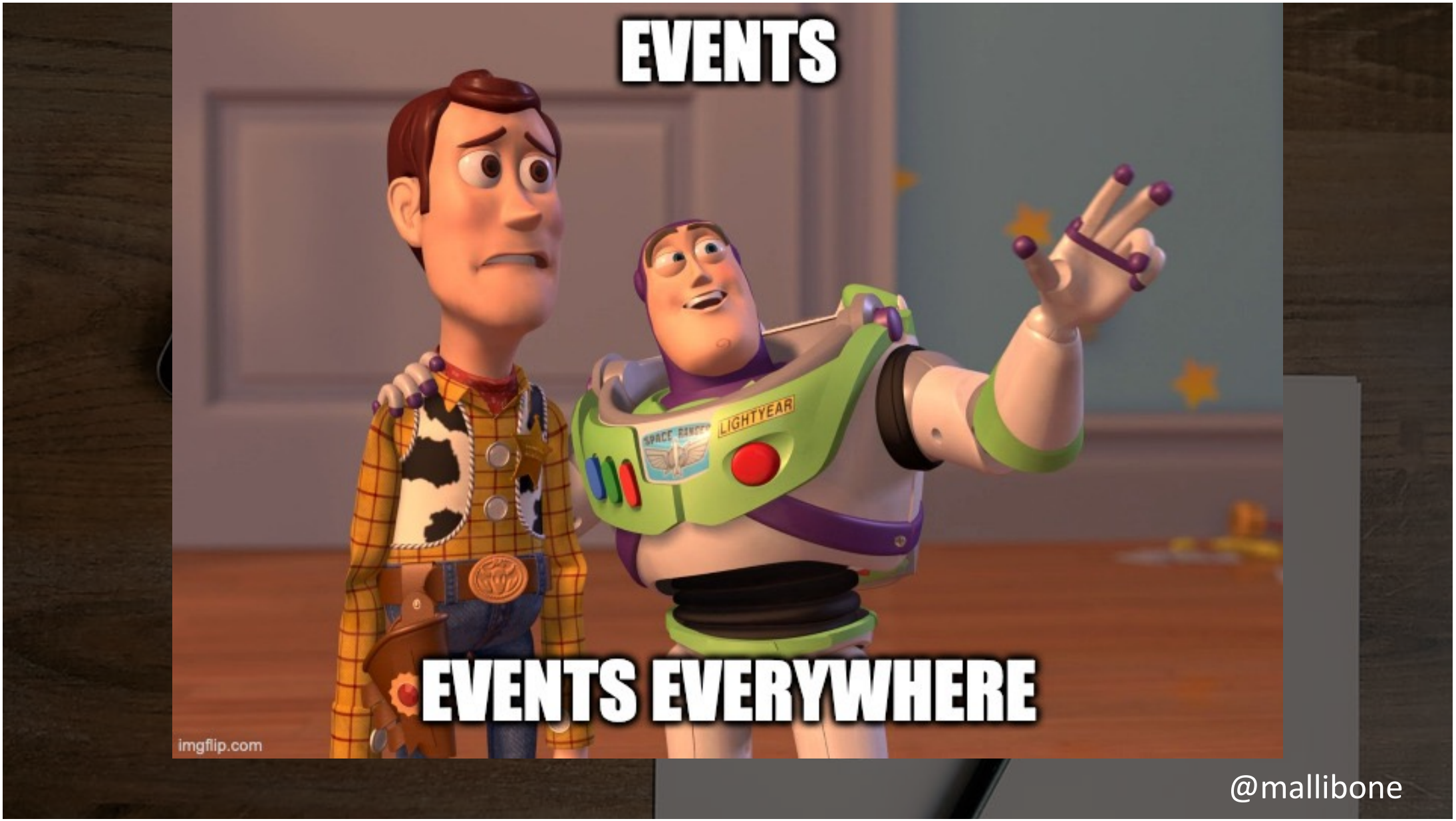


Model View View Model



Model View View Model





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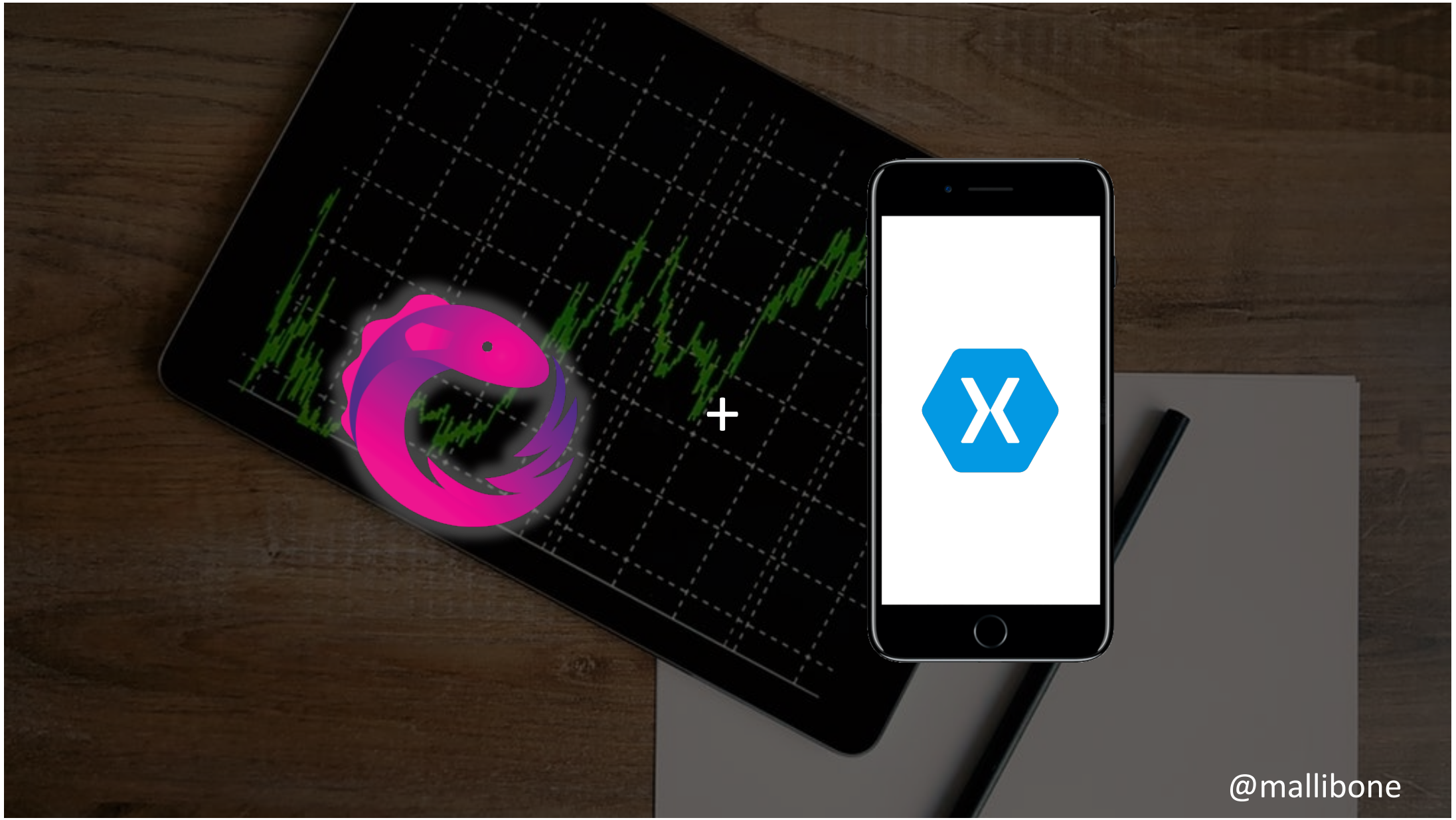
+
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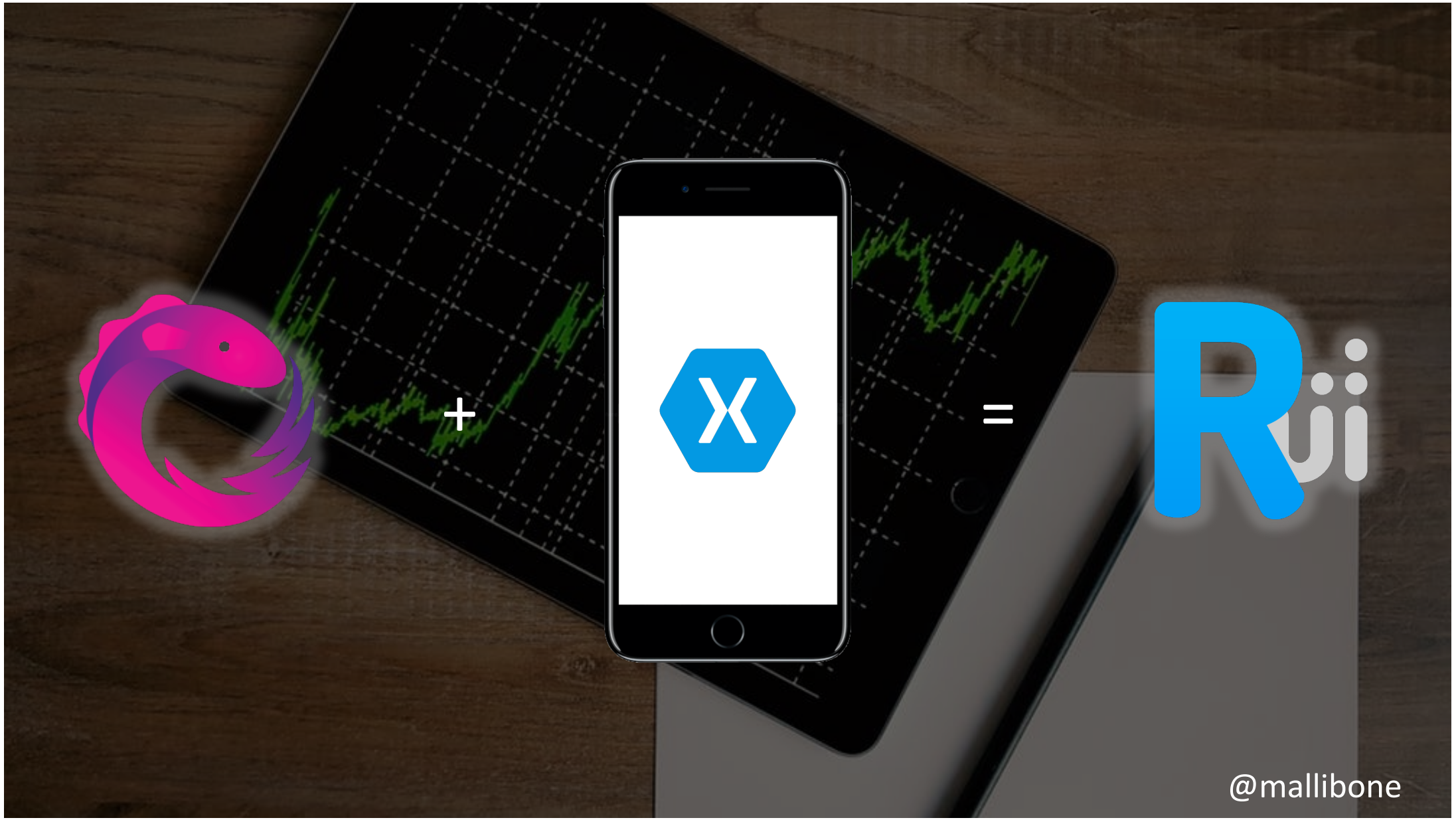
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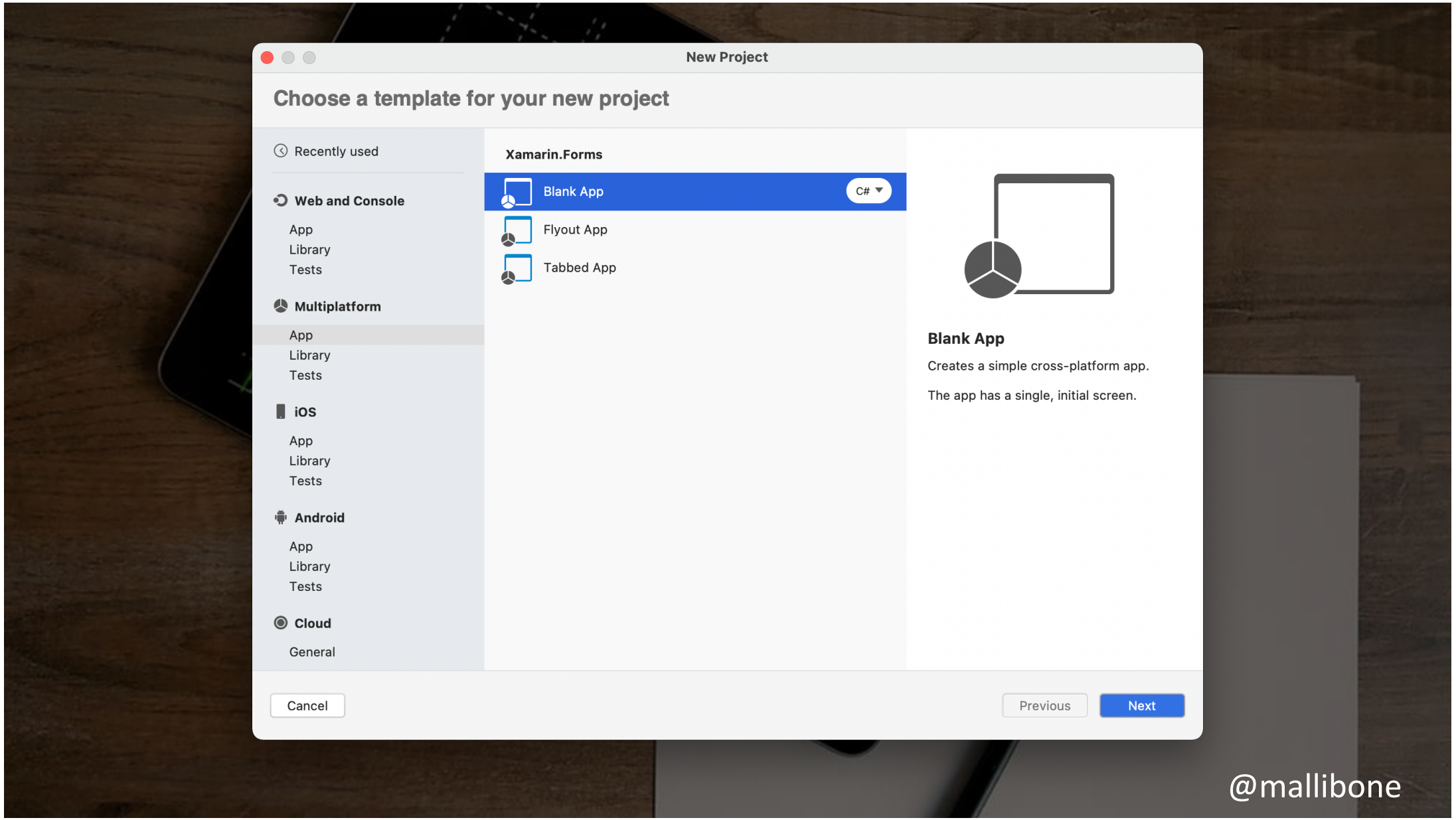
New Project
Choose a template for your new project
Recently used
Web and Console
App
Library
Tests
Multiplatform
App
Library
Tests
iOS
App
Library
Tests
Android
App
Library
Tests
Cloud
General
Xamarin.Forms
Blank App
C#
Flyout App
Tabbed App
Blank App
Creates a simple cross-platform app.
The app has a single, initial screen.
Cancel
Previous
Next
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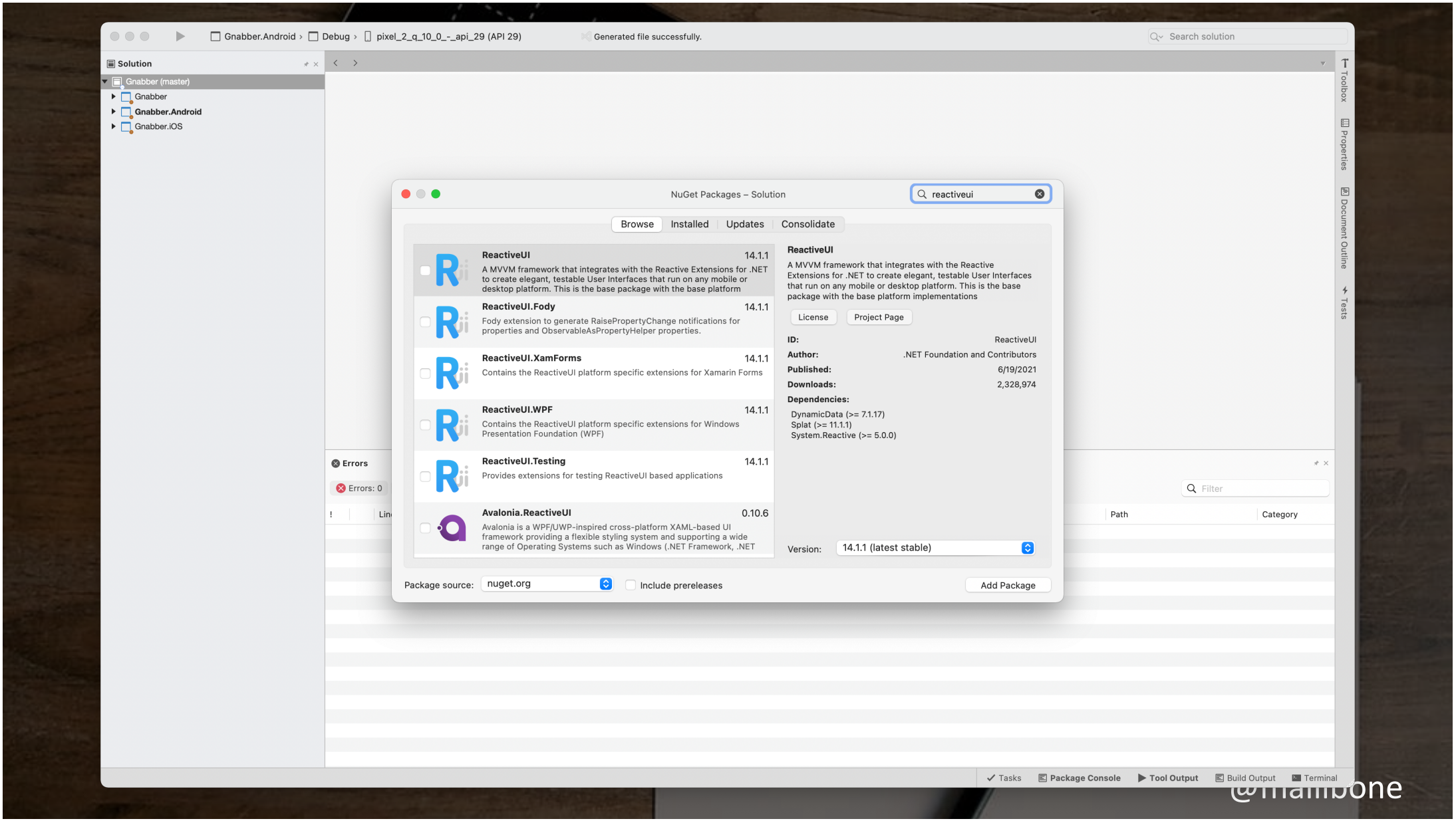
Gnabber.Android › Debug › pixel_2_q_10_0_-_api_29 (API 29)
Generated file successfully.
Search solution
Solution
Gnabber (master)
Gnabber
Gnabber.Android
Gnabber.iOS
NuGet Packages – Solution
reactiveui
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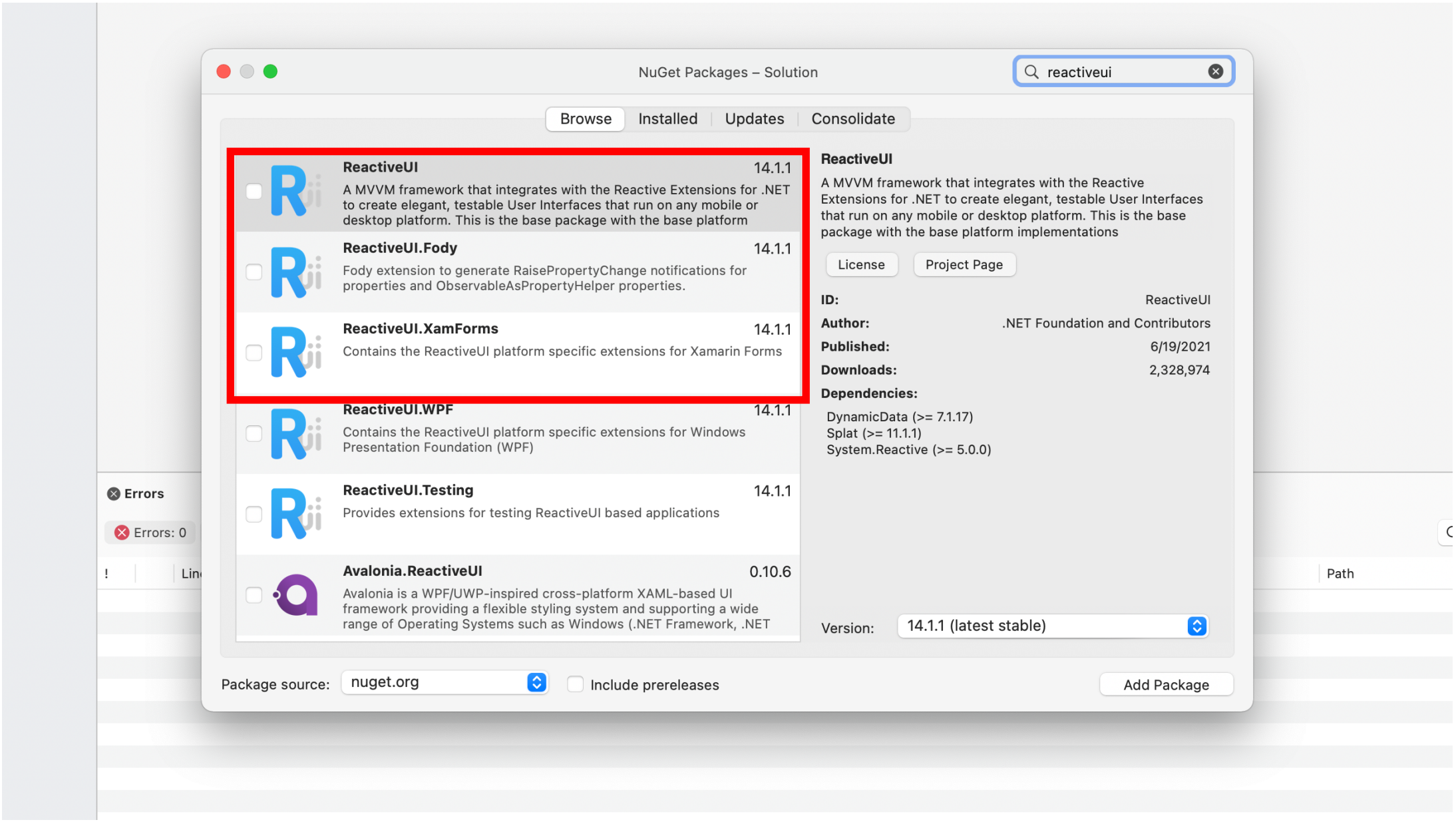
ReactiveUI 14.1.1
A MVVM framework that integrates with the Reactive Extensions for .NET to create elegant, testable User Interfaces that run on any mobile or desktop platform. This is the base package with the base platform
ReactiveUI.Fody 14.1.1
Fody extension to generate RaisePropertyChange notifications for properties and ObservableAsPropertyHelper properties.
ReactiveUI.XamForms 14.1.1
Contains the ReactiveUI platform specific extensions for Xamarin Forms
ReactiveUI.WPF 14.1.1
Contains the ReactiveUI platform specific extensions for Windows Presentation Foundation (WPF)
ReactiveUI.Testing 14.1.1
Provides extensions for testing ReactiveUI based applications
Avalonia.ReactiveUI 0.10.6
Avalonia is a WPF/UWP-inspired cross-platform XAML-based UI framework providing a flexible styling system and supporting a wide range of Operating Systems such as Windows (.NET Framework, .NET
ReactiveUI
A MVVM framework that integrates with the Reactive Extensions for .NET to create elegant, testable User Interfaces that run on any mobile or desktop platform. This is the base package with the base platform implementations
License
Project Page
ID: ReactiveUI
Author: .NET Foundation and Contributors
Published: 6/19/2021
Downloads: 2,328,974
Dependencies:
DynamicData (>= 7.1.17)
Splat (>= 11.1.1)
System.Reactive (>= 5.0.0)
Version: 14.1.1 (latest stable)
Package source: nuget.org
Include prereleases
Add Package
Errors
Errors: 0
Filter
Path
Category
Toolbox
Properties
Document Outline
Tests
Tasks
Package Console
Tool Output
Build Output
Terminal


NuGet Packages – Solution
reactiveui
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Installed
Updates
Consolidate
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Package source: nuget.org
Include prereleases
Add Package
Errors
Errors: 0
Path

ViewModels 101

- Properties
- Commands
- Stuff

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ViewModels 101

- **Properties**
- Commands
- Stuff

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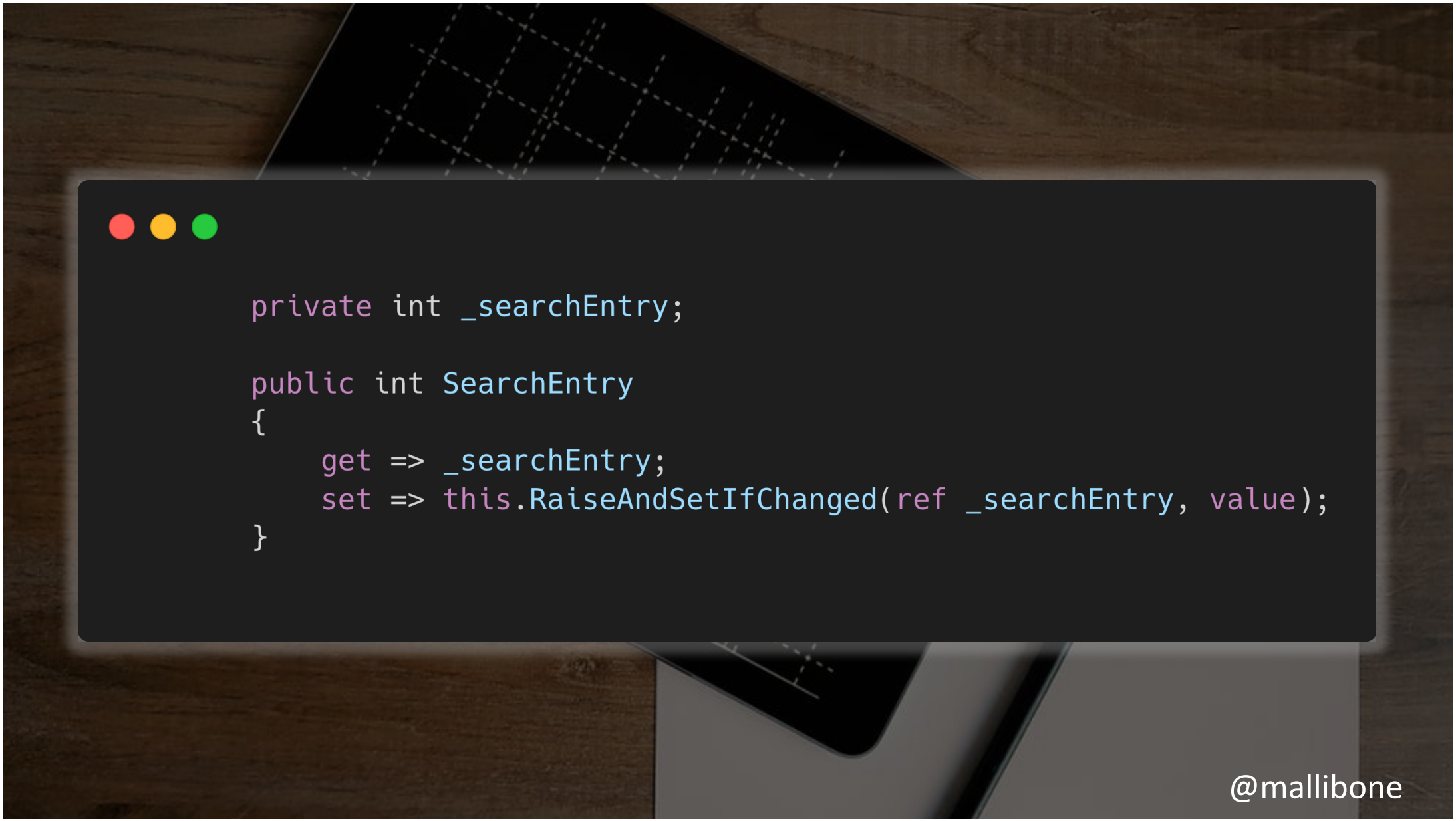
private int _searchEntry;
public int SearchEntry
{
get => _searchEntry;
set => this.RaiseAndSetIfChanged(ref _searchEntry, value);
}
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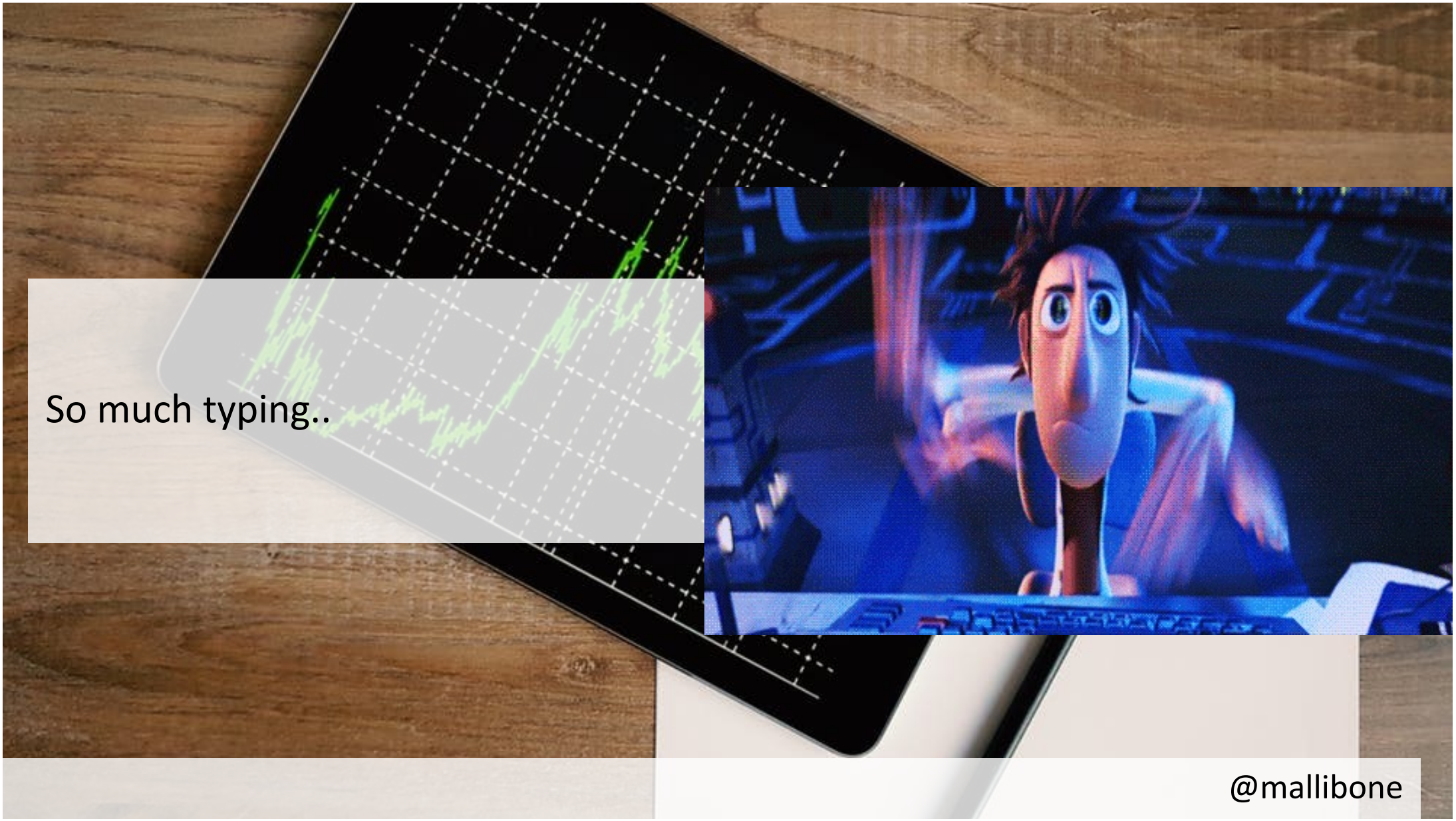
So much typing..
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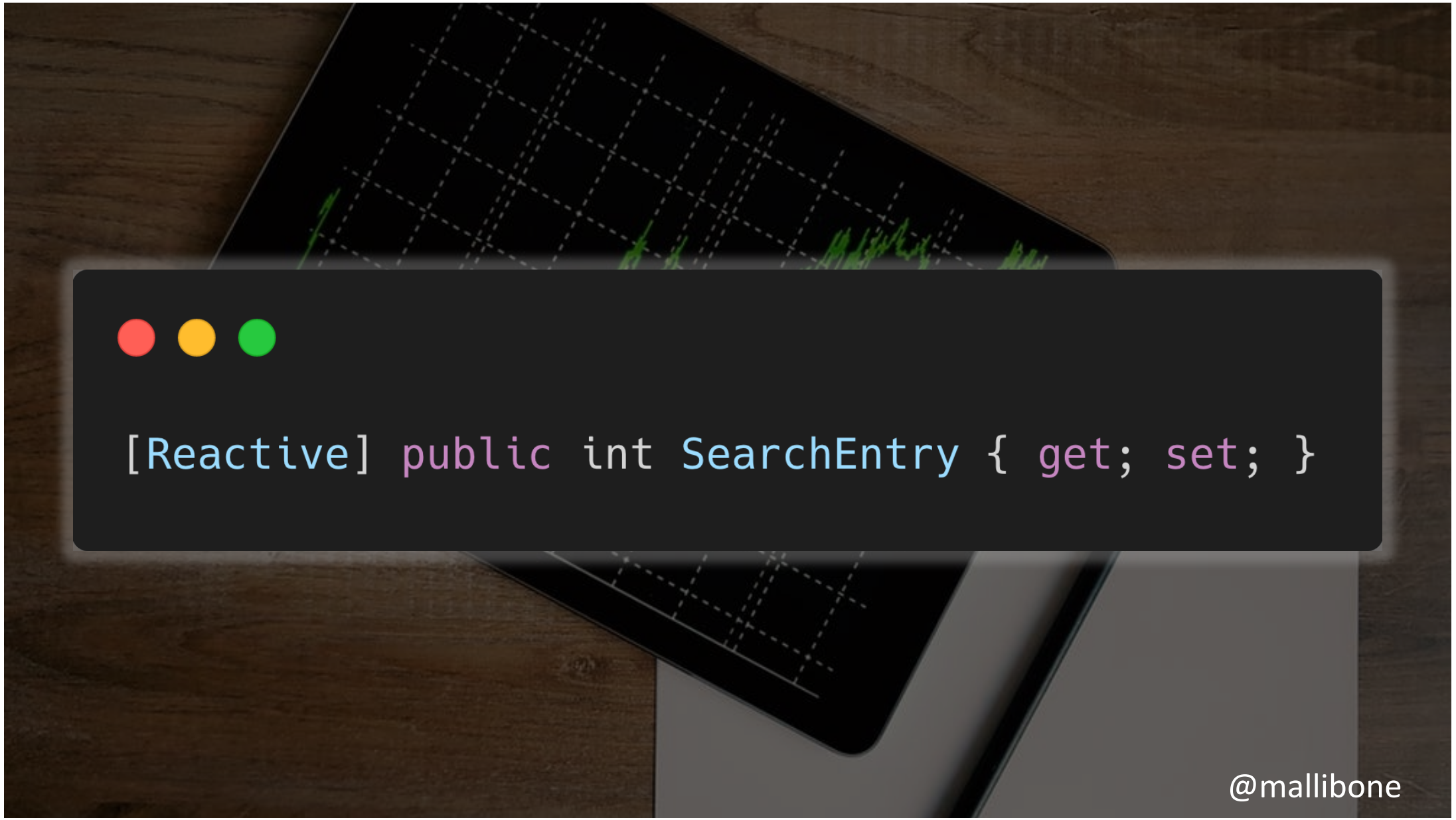
[Reactive] public int SearchEntry { get; set; }
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ViewModels 101

- Properties
- **Commands**
- Stuff

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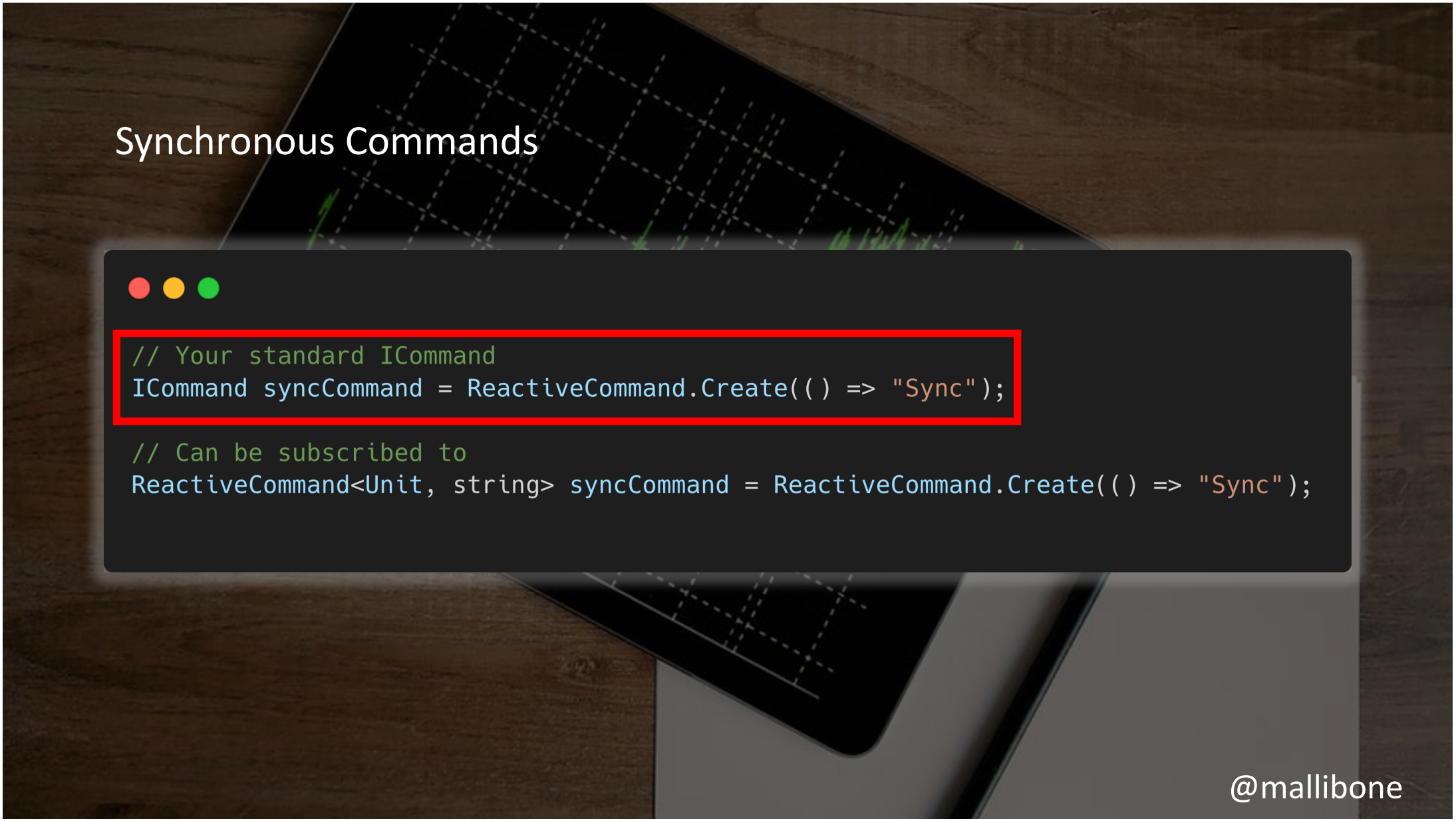
Synchronous Commands



```
// Your standard ICommand
ICommand syncCommand = ReactiveCommand.Create(() => "Sync");

// Can be subscribed to
ReactiveCommand<Unit, string> syncCommand = ReactiveCommand.Create(() => "Sync");
```

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Synchronous Commands

```
// Your standard ICommand
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// Can be subscribed to
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Synchronous Commands

```
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ICommand syncCommand = ReactiveCommand.Create(() => "Sync");

// Can be subscribed to
ReactiveCommand<Unit, string> syncCommand = ReactiveCommand.Create(() => "Sync");
```

Async Commands

```
// When you await a task
var asyncCommand = ReactiveCommand.CreateFromTask(() => Task.FromResult("Hello"));

// When you start working with observables
var observableCommand = ReactiveCommand.CreateFromObservable(() => Observable.Return("There"));
```

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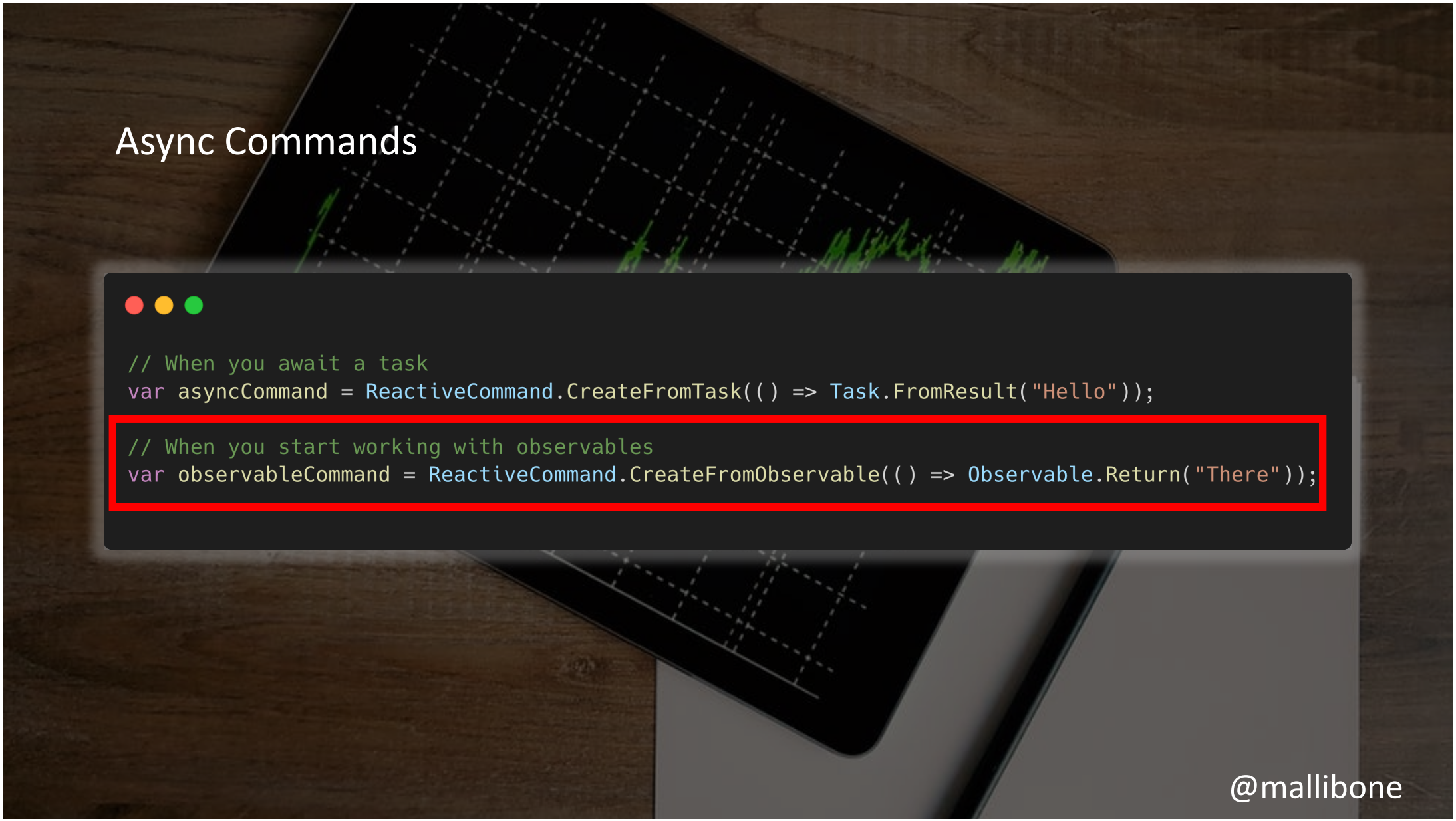
Async Commands



```
// When you await a task
var asyncCommand = ReactiveCommand.CreateFromTask(() => Task.FromResult("Hello"));

// When you start working with observables
var observableCommand = ReactiveCommand.CreateFromObservable(() => Observable.Return("There"));
```

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Combined Commands

```
// List of Commands
var commands = List<ReactiveCommand<Unit, string>>{asyncCommand, observableCommand, syncCommand};

// Combined Commands
CombinedReactiveCommand<Unit, string> combindedCommand = ReactiveCommand.CreateCombined(commands);
```

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Combined Commands

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// List of Commands
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// Combined Commands
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Combined Commands

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- Stuff

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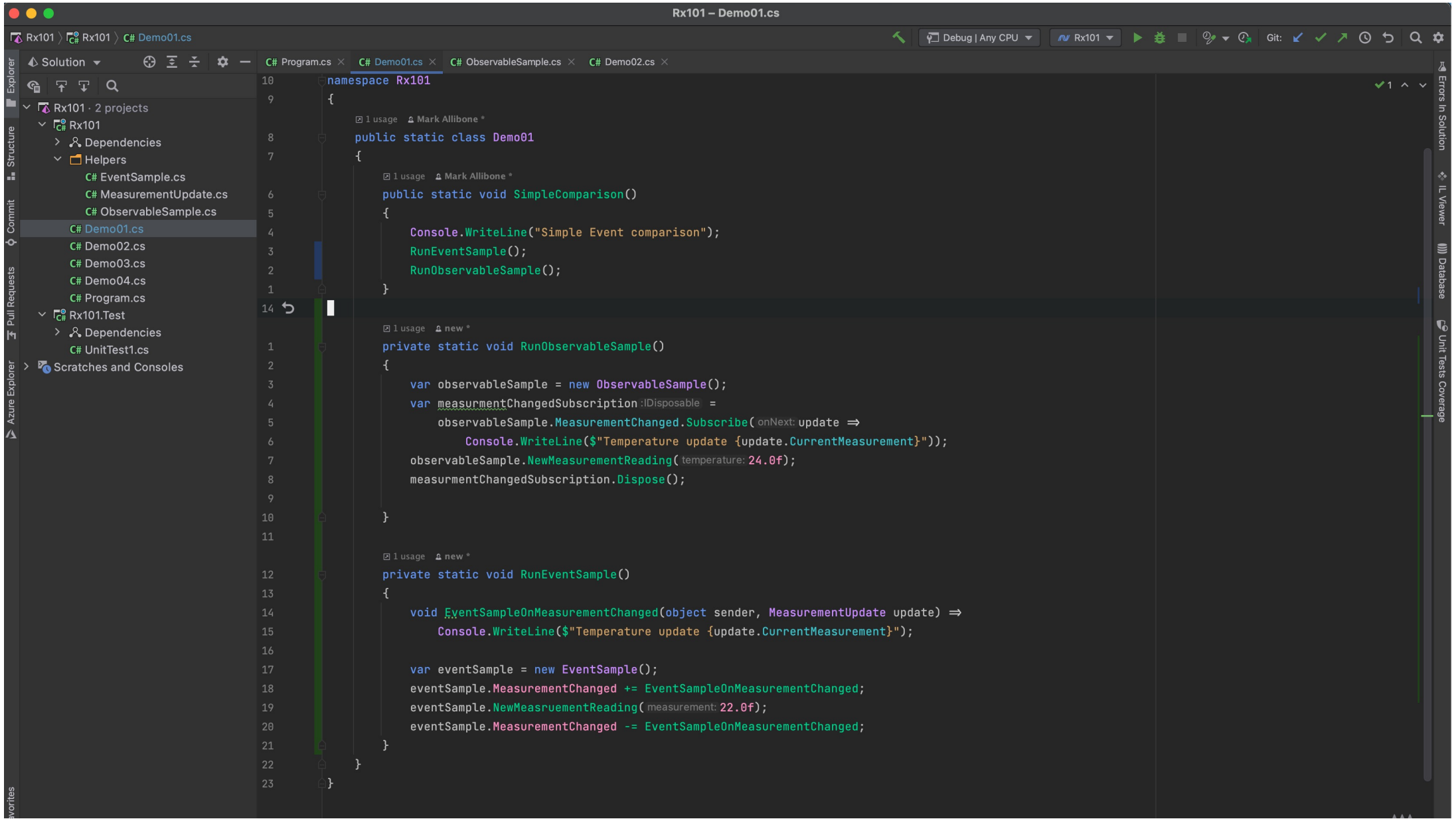
Rx101 – Demo01.cs
Rx101 〉 Rx101 〉 C# Demo01.cs
Debug | Any CPU
Rx101
Git:
Solution
Rx101 · 2 projects
Rx101
Dependencies
Helpers
EventSample.cs
MeasurementUpdate.cs
ObservableSample.cs
Demo01.cs
Demo02.cs
Demo03.cs
Demo04.cs
Program.cs
Rx101.Test
Dependencies
UnitTest1.cs
Scratches and Consoles
C# Program.cs
C# Demo01.cs
C# ObservableSample.cs
C# Demo02.cs
namespace Rx101
{
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public static class Demo01
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1 usage Mark Allibone *
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Console.WriteLine("Simple Event comparison");
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RunObservableSample();
}
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Console.WriteLine($"Temperature update {update.CurrentMeasurement}"));
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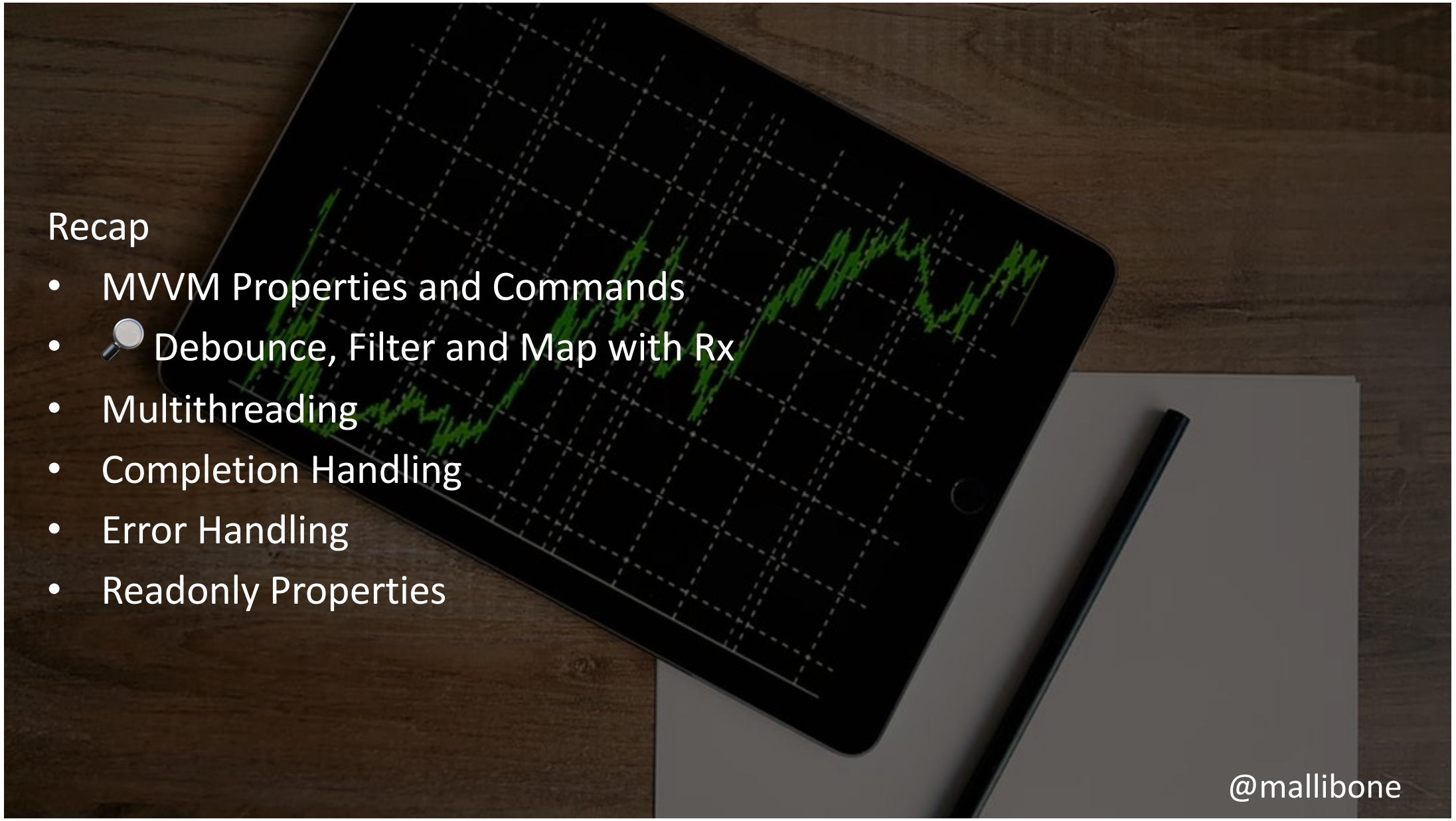
1 usage new *
private static void RunEventSample()
{
void EventSampleOnMeasurementChanged(object sender, MeasurementUpdate update) =>
Console.WriteLine($"Temperature update {update.CurrentMeasurement}");
var eventSample = new EventSample();
eventSample.MeasurementChanged += EventSampleOnMeasurementChanged;
eventSample.NewMeasruementReading(measurement: 22.0f);
eventSample.MeasurementChanged -= EventSampleOnMeasurementChanged;
}
}
}
Errors In Solution
IL Viewer
Database
Unit Tests Coverage


Recap
• MVVM Properties and Commands
• 🔎 Debounce, Filter and Map with Rx
• Multithreading
• Completion Handling
• Error Handling
• Readonly Properties
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Rui
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Validation
Navigation
Event Extensions
Auto Persistance
= Rx + MVVM + “a ton of helpers™
View Lifecycle
Dynamic Collections
DI Container
User Confirmation
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Criteria for Mobile Apps

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Criteria for Mobile Apps

- Don’t Crash
- Responsive
- Work Offline 😱
- 10’000 other points depending on preference etc.
  (like design and fluff)

How to build an App that works offline?

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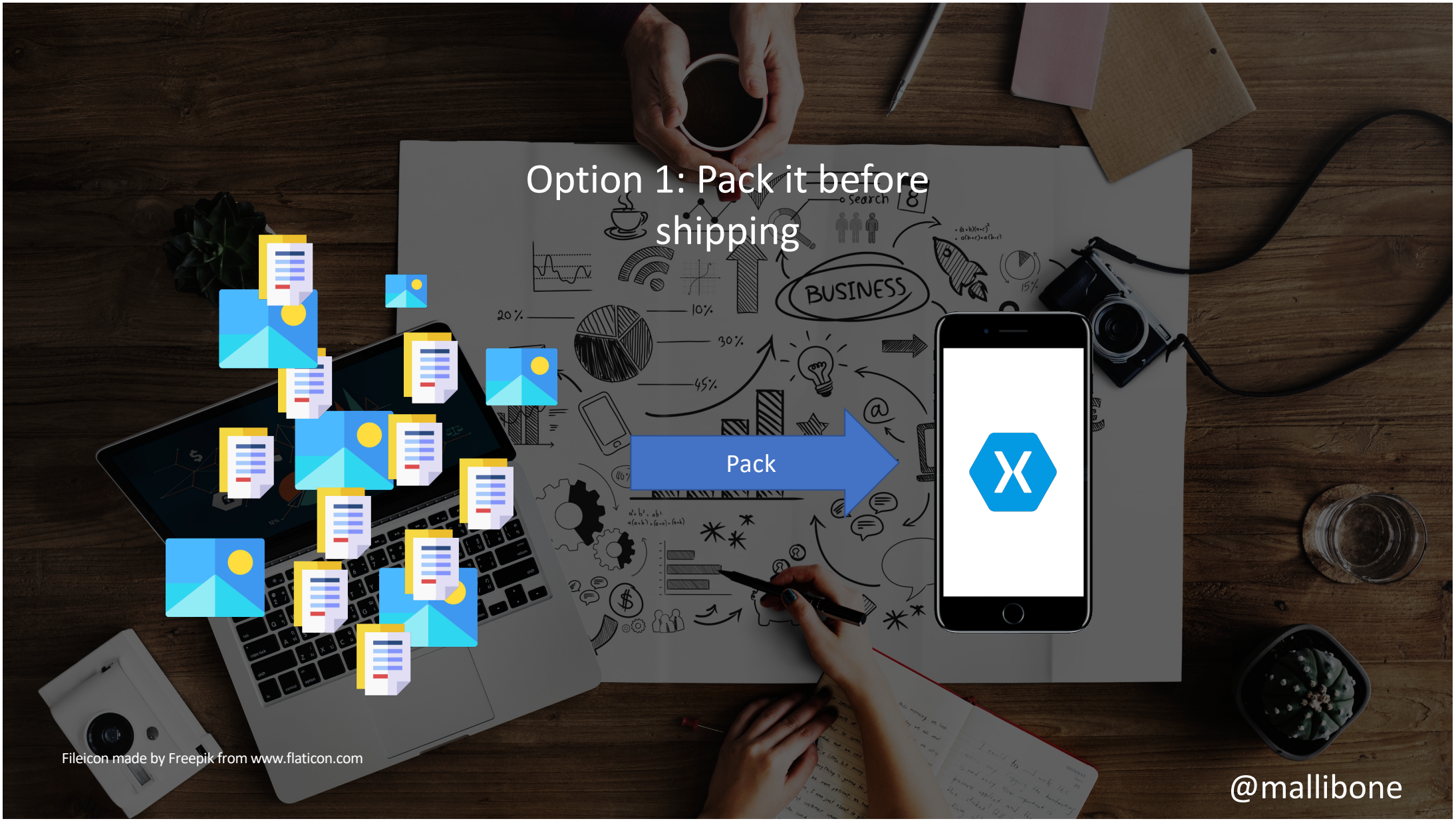
Option 1: Pack it before shipping
Pack
Fileicon made by Freepik from www.flaticon.com
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COULD YOU SHOW ME THE CURRENT WEATHER
THAT WOULD BE REALLY GREAT
imgflip.com
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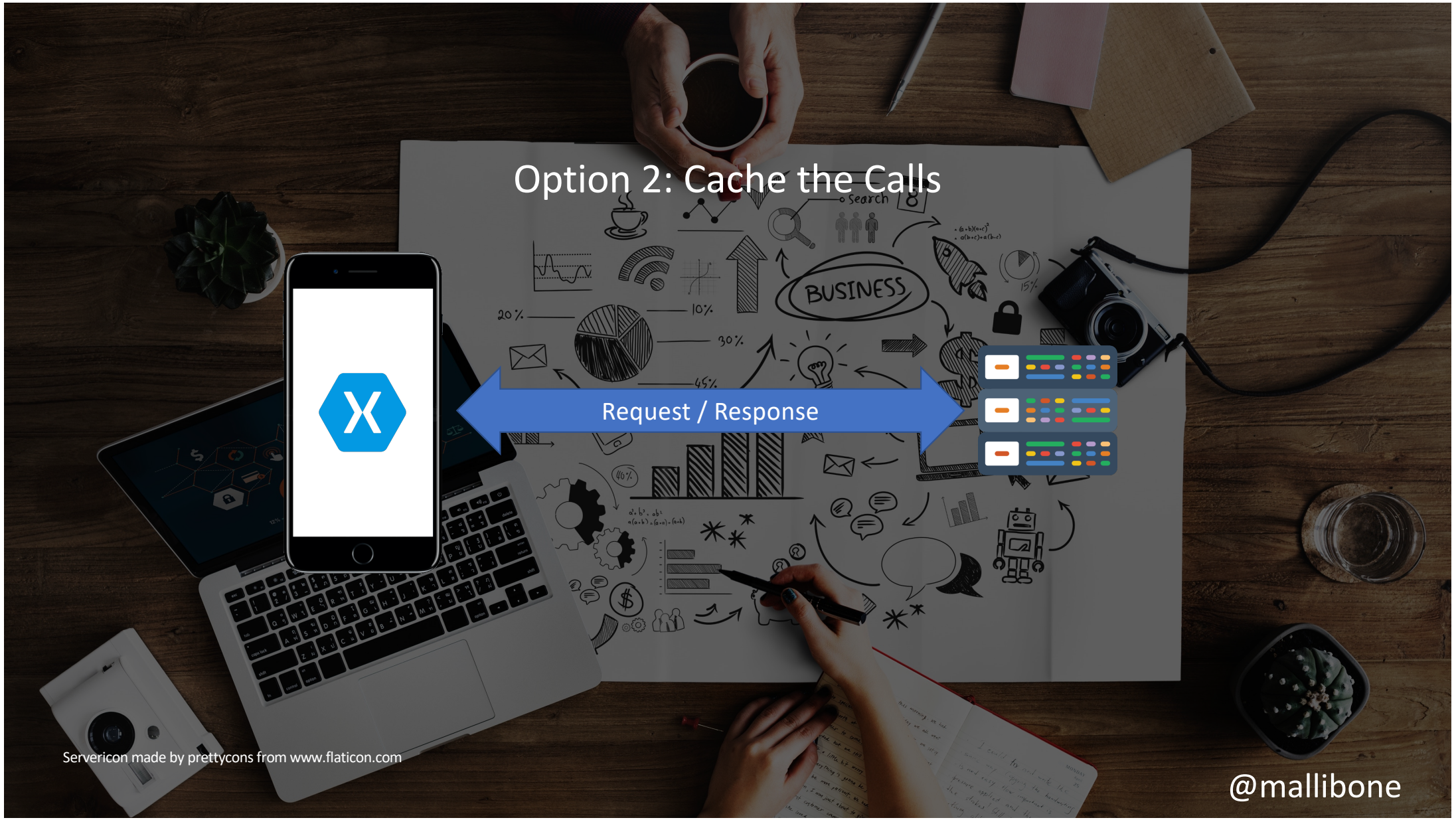
Option 2: Cache the Calls
Request / Response
Servericon made by prettycons from www.flaticon.com
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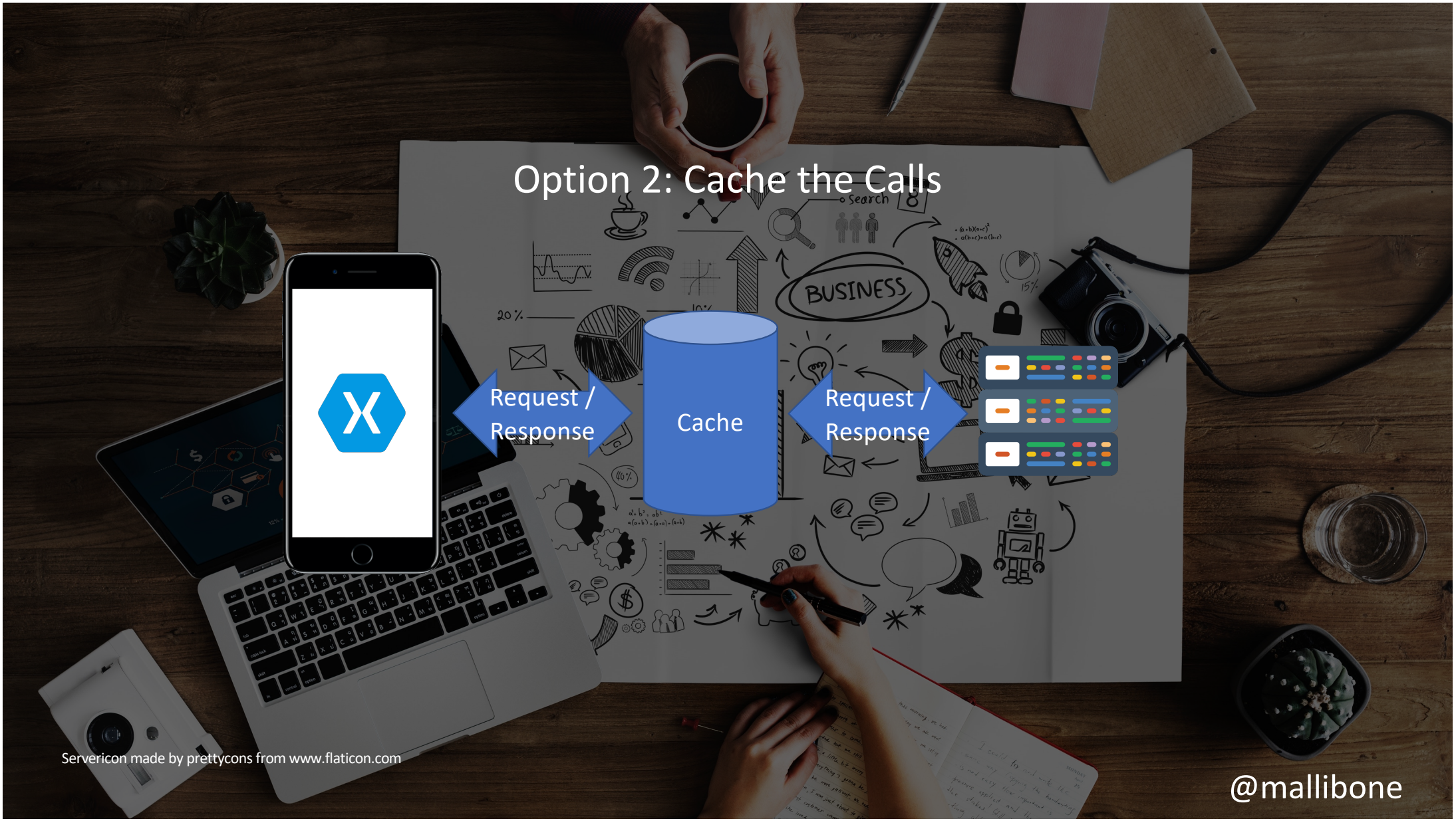
Option 2: Cache the Calls



Servericon made by prettycons from www.flaticon.com

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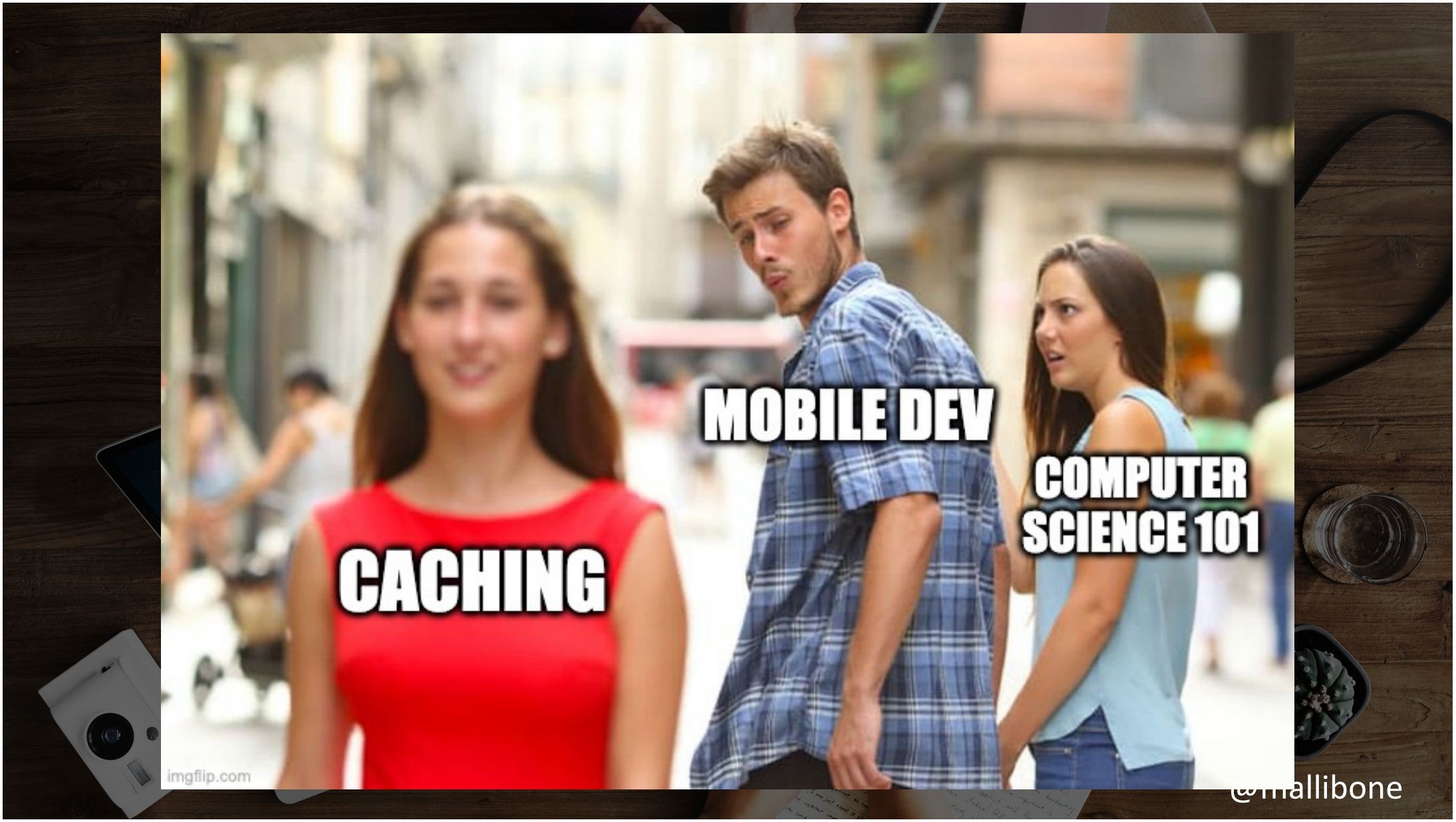

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When do we refresh the cache?

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Cache
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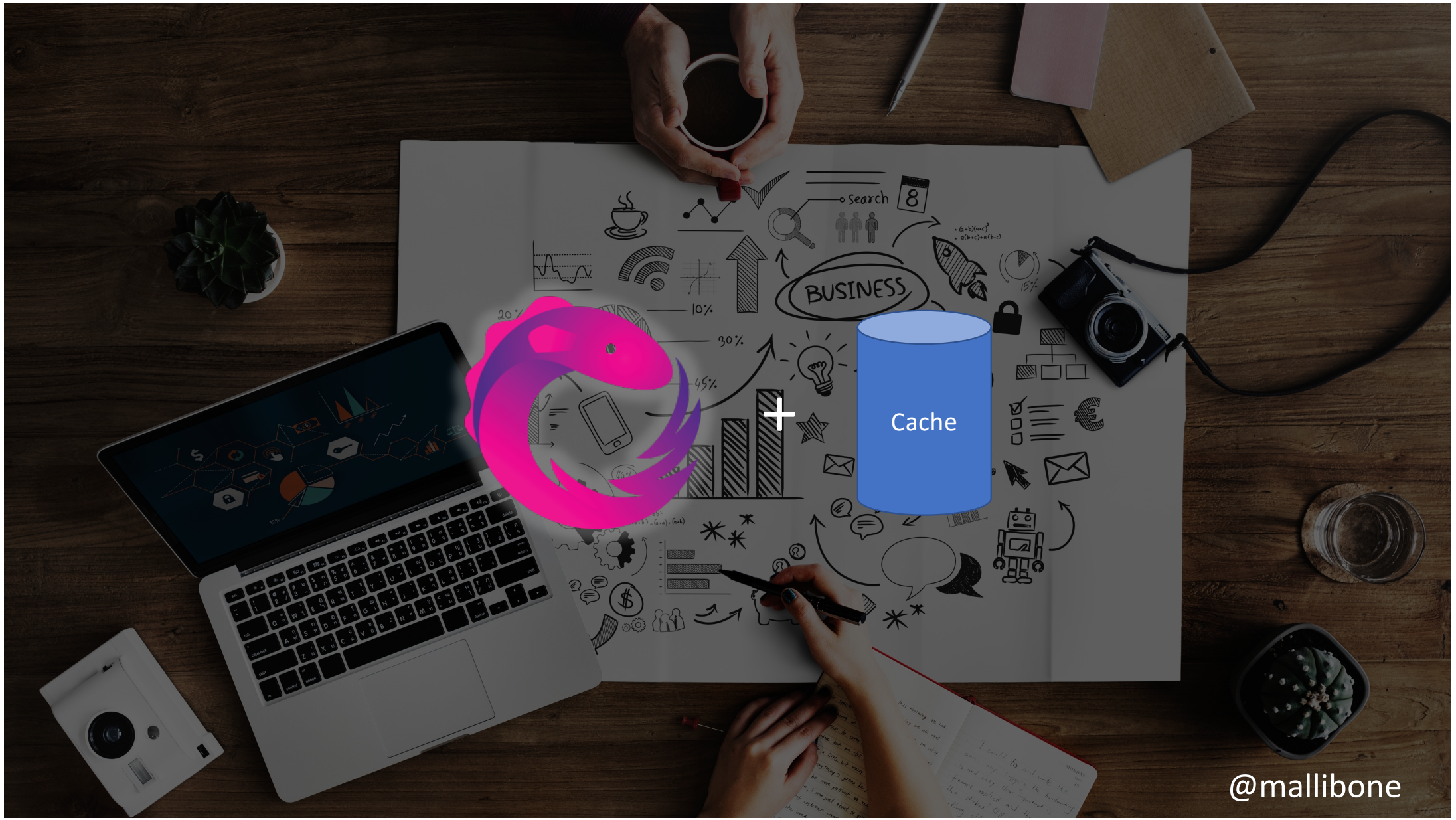
search
BUSINESS
10%
30%
45%
Cache
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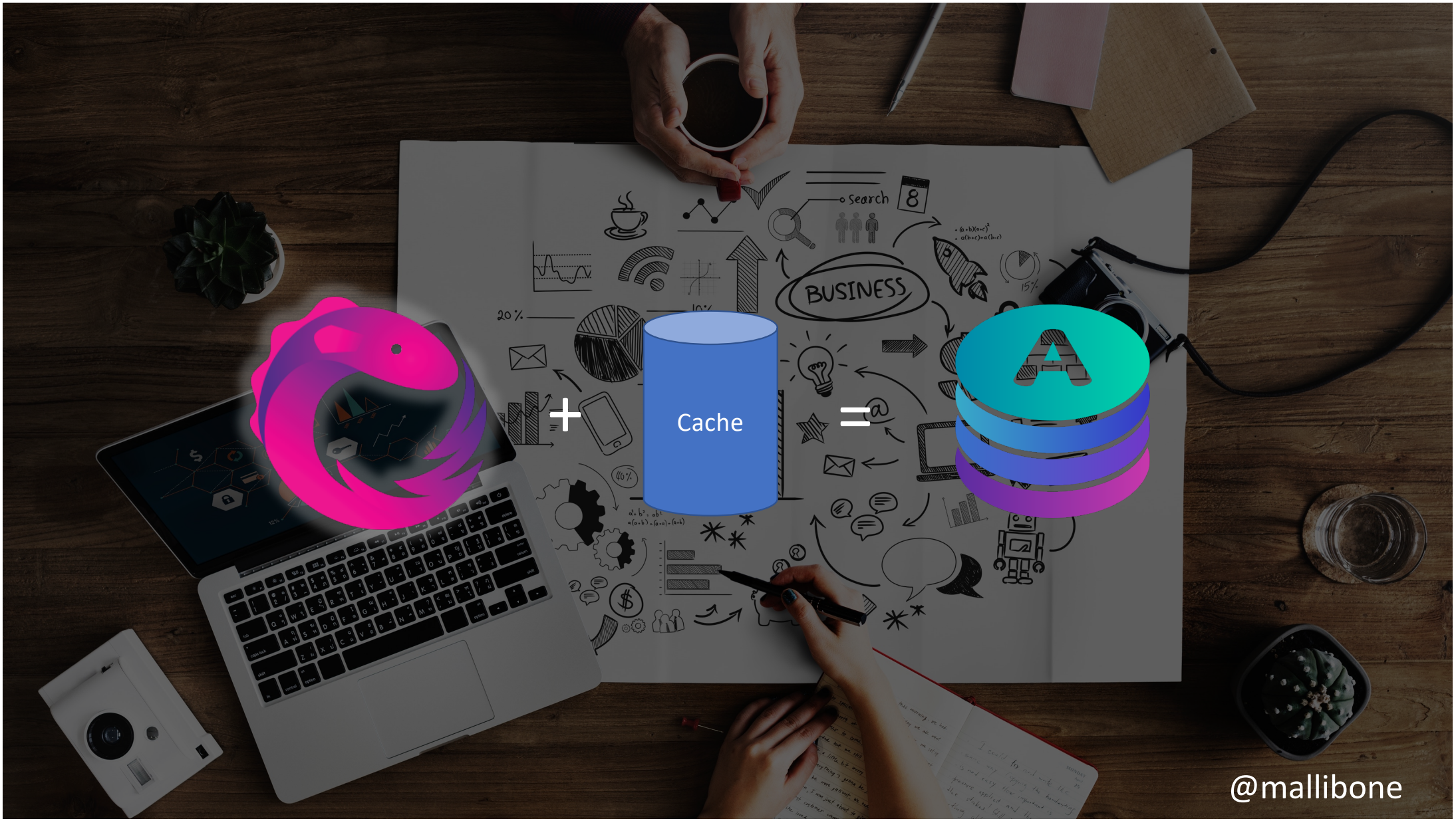
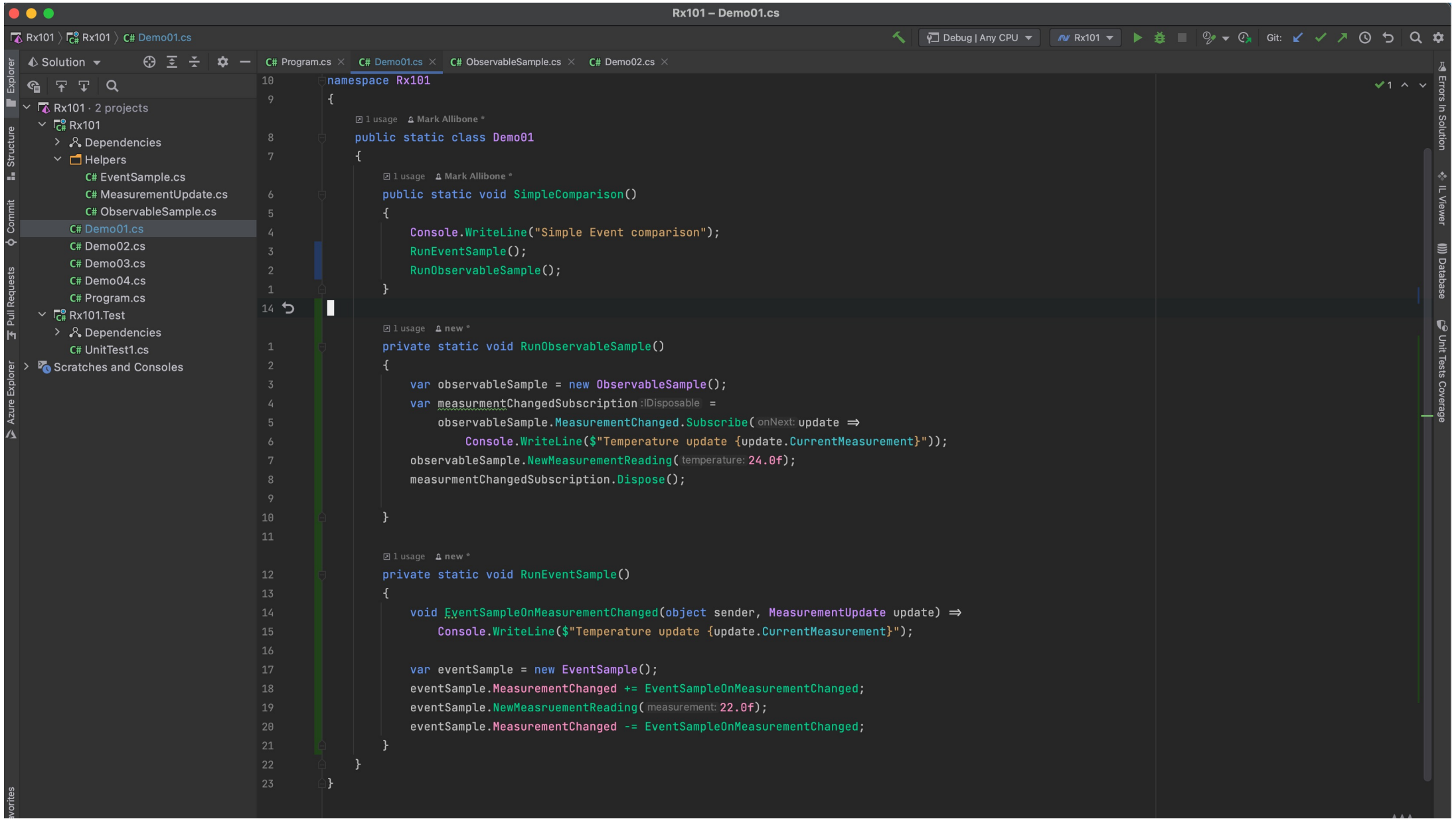
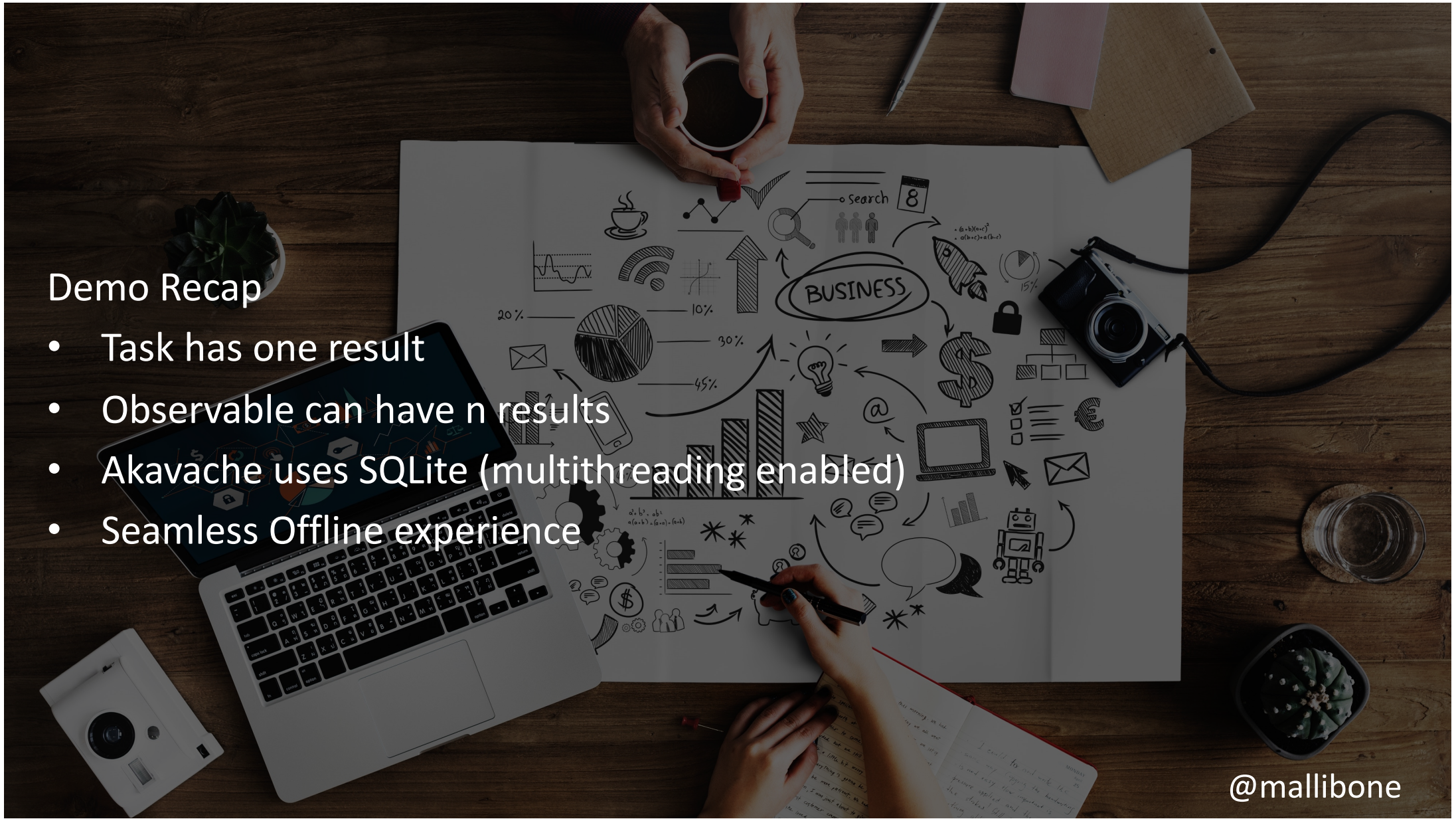

Search
BUSINESS
Cache
@mallibone


Rx101 – Demo01.cs
Rx101 〉 Rx101 〉 C# Demo01.cs
Debug | Any CPU
Rx101
Git:
Solution
Rx101 · 2 projects
Rx101
Dependencies
Helpers
EventSample.cs
MeasurementUpdate.cs
ObservableSample.cs
Demo01.cs
Demo02.cs
Demo03.cs
Demo04.cs
Program.cs
Rx101.Test
Dependencies
UnitTest1.cs
Scratches and Consoles
C# Program.cs
C# Demo01.cs
C# ObservableSample.cs
C# Demo02.cs
namespace Rx101
{
1 usage Mark Allibone *
public static class Demo01
{
1 usage Mark Allibone *
public static void SimpleComparison()
{
Console.WriteLine("Simple Event comparison");
RunEventSample();
RunObservableSample();
}
1 usage new *
private static void RunObservableSample()
{
var observableSample = new ObservableSample();
var measurmentChangedSubscription :IDisposable =
observableSample.MeasurementChanged.Subscribe(onNext: update =>
Console.WriteLine($"Temperature update {update.CurrentMeasurement}"));
observableSample.NewMeasurementReading(temperature: 24.0f);
measurmentChangedSubscription.Dispose();
}
1 usage new *
private static void RunEventSample()
{
void EventSampleOnMeasurementChanged(object sender, MeasurementUpdate update) =>
Console.WriteLine($"Temperature update {update.CurrentMeasurement}");
var eventSample = new EventSample();
eventSample.MeasurementChanged += EventSampleOnMeasurementChanged;
eventSample.NewMeasruementReading(measurement: 22.0f);
eventSample.MeasurementChanged -= EventSampleOnMeasurementChanged;
}
}
}
Errors In Solution
IL Viewer
Database
Unit Tests Coverage


Demo Recap
• Task has one result
• Observable can have n results
• Akavache uses SQLite (multithreading enabled)
• Seamless Offline experience
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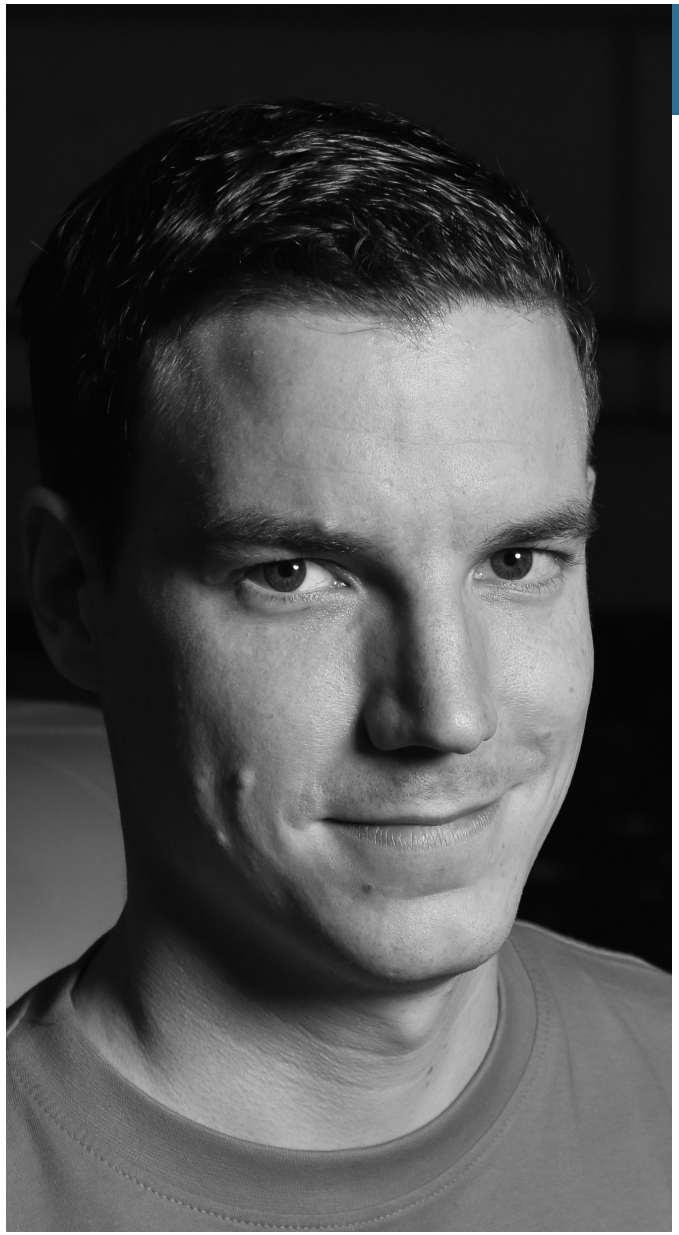
Takeaways

Takeaways

- Reactive Extensions (Rx)
  - Observables
  - LINQ
  - Schedulers
- Rx + UI → Reactive UI
- Caching with Akavache
- Don’t forget to `Subscribe` and `Dispose`



REY TECHNOLOGY

Thank you for your time!

Mark Allibone @mallibone

Rey Technology

https://mallibone.com

https://nullpointers.io

http://reactivex.io/

https://www.reactiveui.net/

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