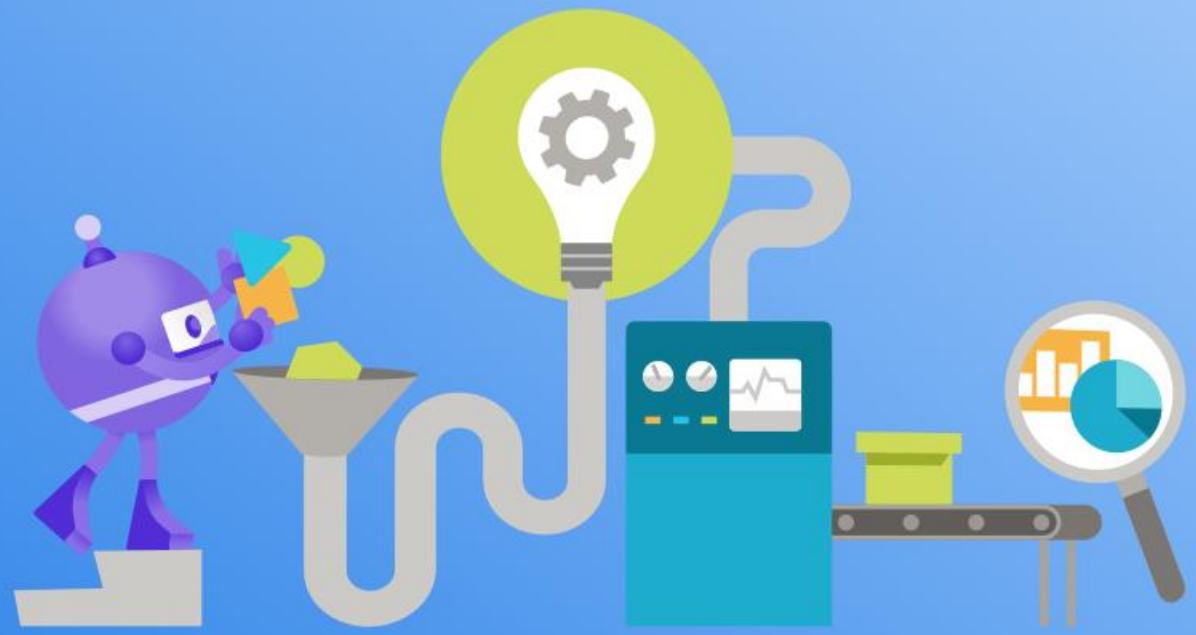


.NET Conf

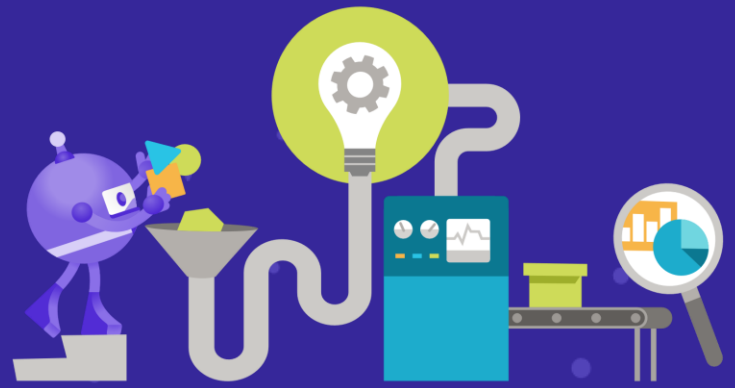
Focus on F#

July 29, 2021

focus.dotnetconf.net

Don teaches Guido some F#

Don Syme & Guido van Rossum



https://github.com/dsyme/guido-learns-fsharp

Setup

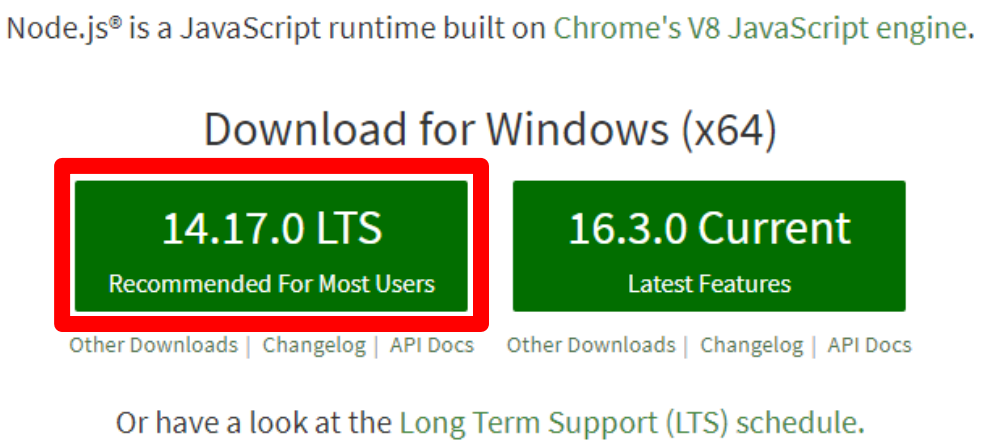
.NET SDK

https://dotnet.microsoft.com/download

Setup

Node.js and npm

https://nodejs.org/en/

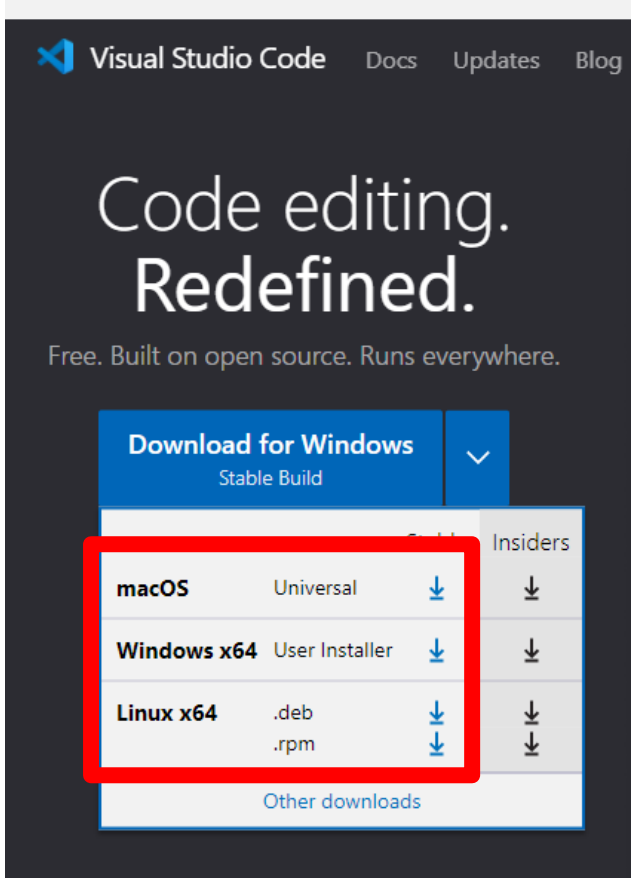


Setup

VS Code

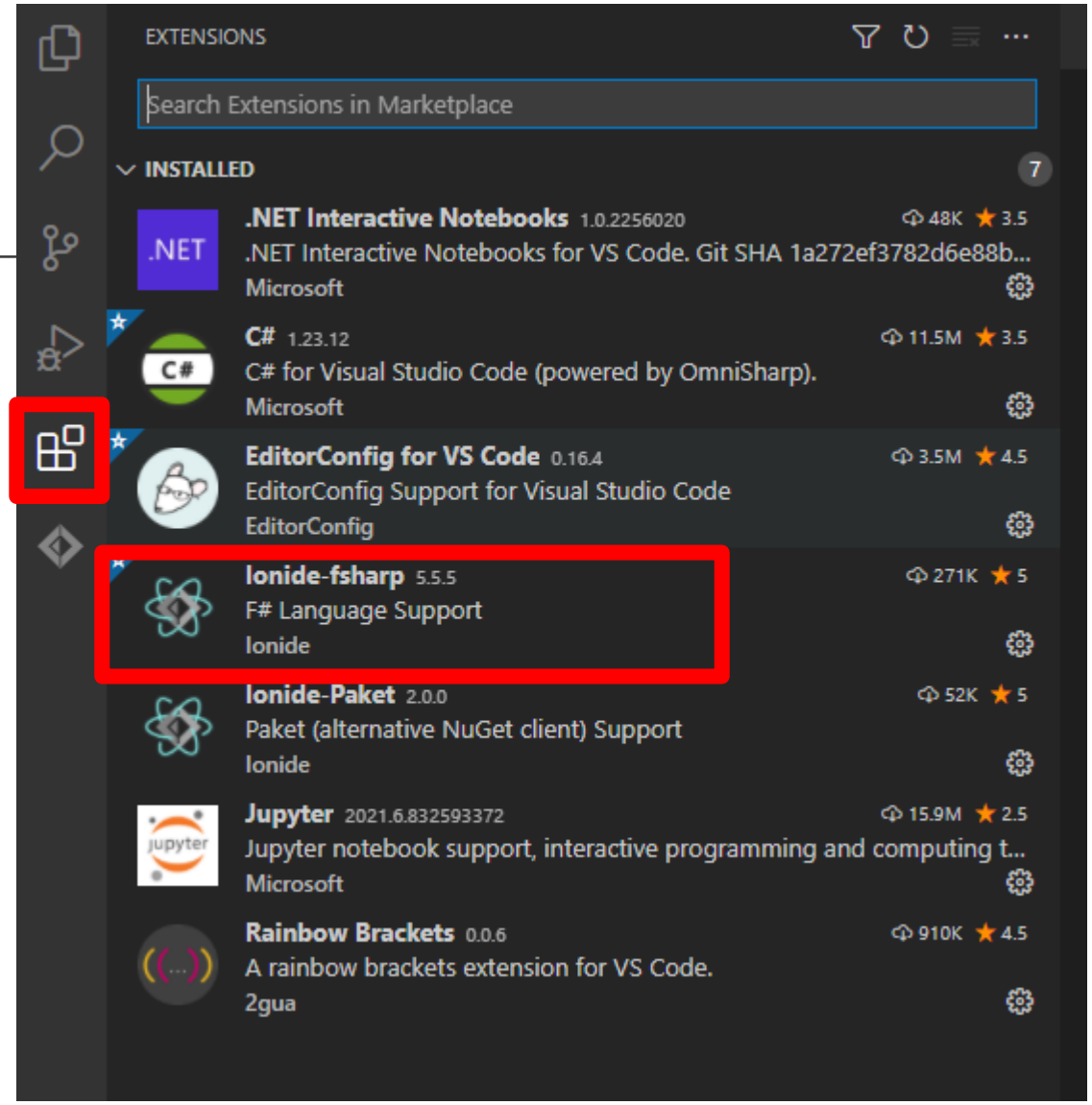
https://code.visualstudio.com/

ON LINUX, DON'T USE SNAP



Setup - VS Code Extensions

- Ionide



Now do Tasks 1.*

Language Lessons from Tasks 1.*

You've learned or seen all of the following:

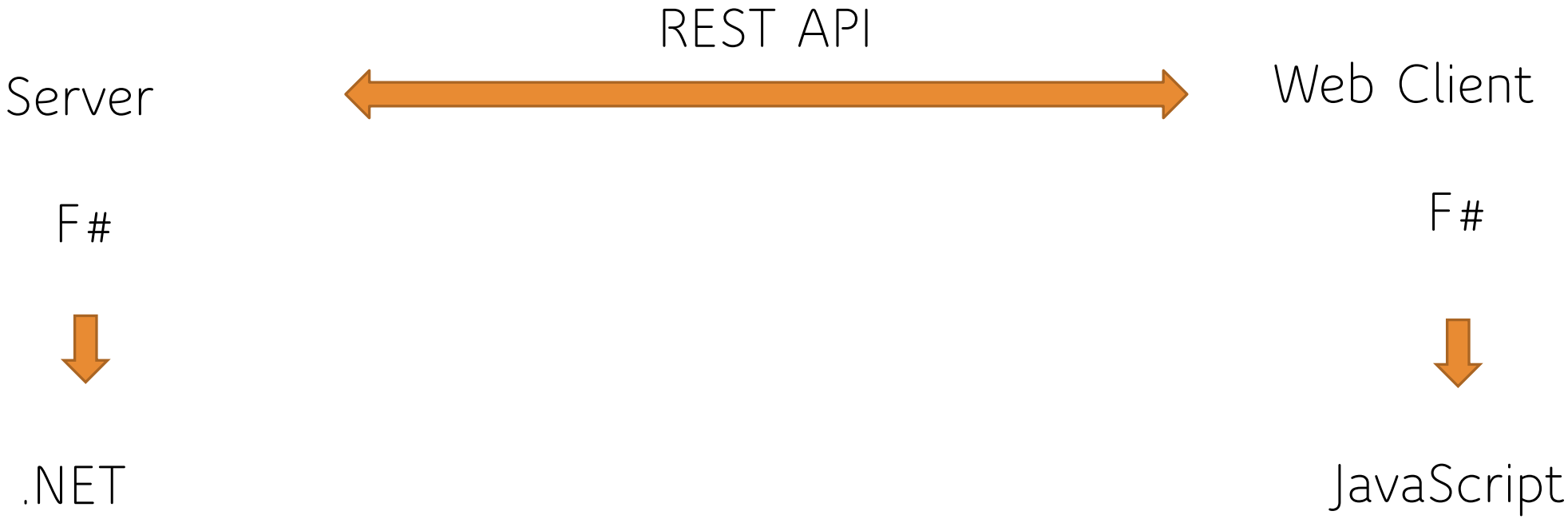
1. let let let let (function definitions and values)
2. match for pattern matching and strings
3. dot notation. F# supports object programming
4. strings, including interpolated strings
5. F# is strongly typed. The IDE knew your types and checks on the fly
6. F# knows how symbols resolve: rename, goto-definition etc.

The aim of F# is three things

Succinctness (like Python)
Performance (like C#/Java)
Robustness   (like strongly typed functional programming)

(also interop, cross-platform, community, reach etc.)

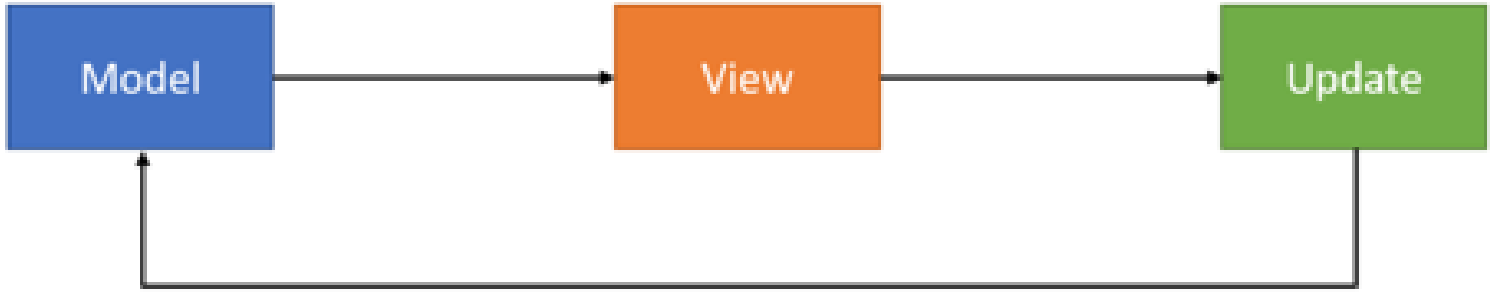
This is a typical Client/Server App



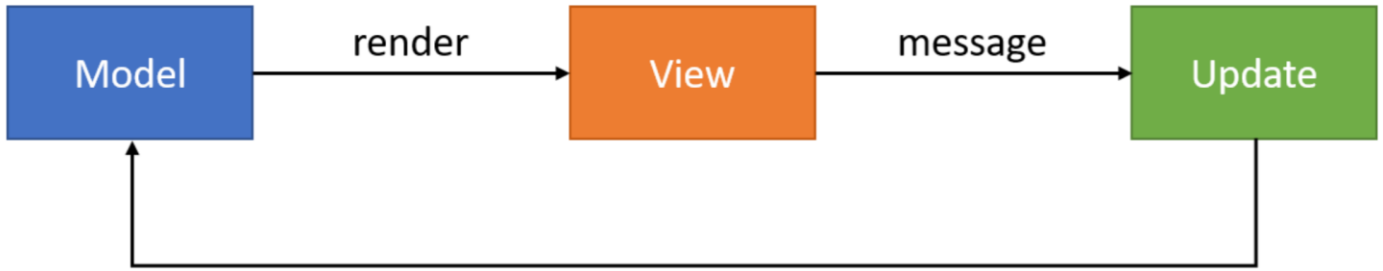
The Web Client uses “Model View Update” like React

REST API

Web Client

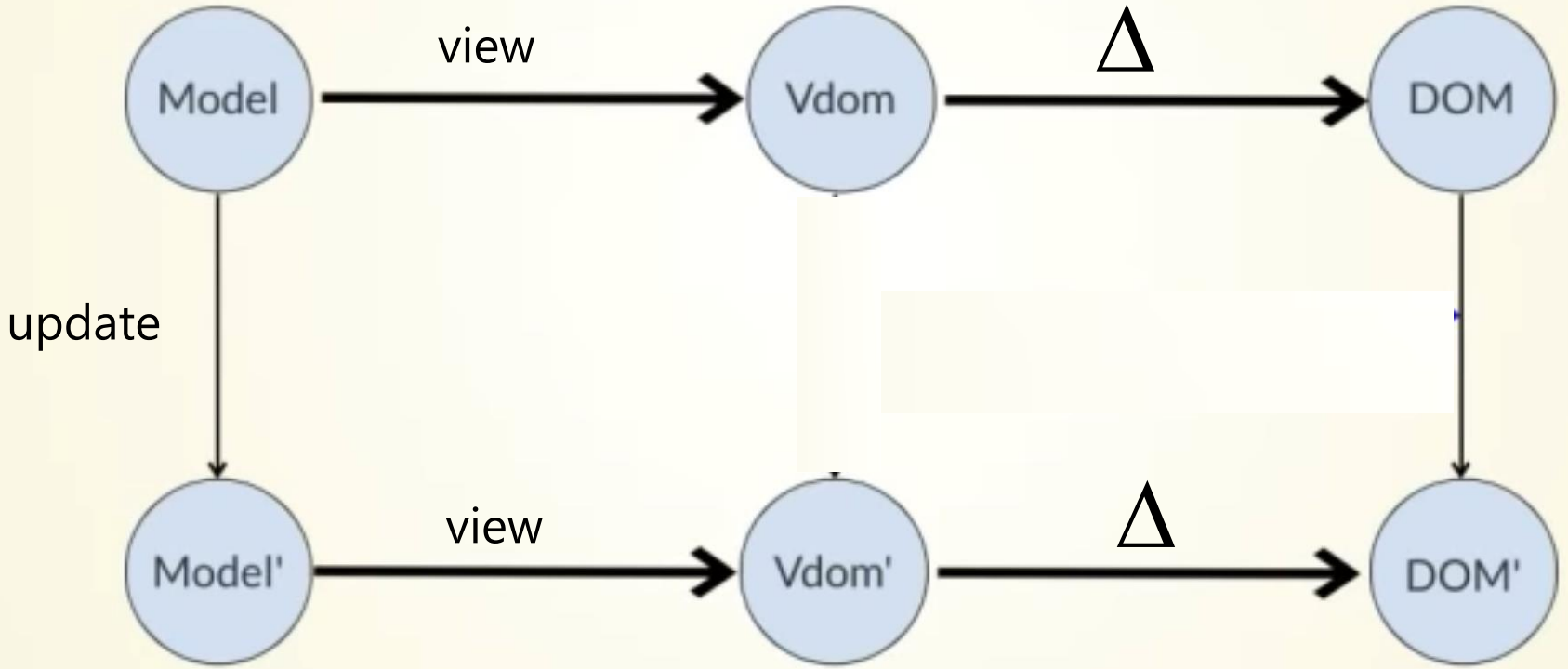


Model View Update



Your UI as an Incremental Computation

Your UI as an Incremental Computation



Now do Tasks 2.*

Lessons from Tasks 2.*

You've learned or seen all of the following:

1. In this app, display views are functional data
2. The view is recalculated and applied to the actual DOM
3. The functional view uses computed list expressions,
   a super-powerful form of list comprehensions
4. tuples and helper functions

Now do Tasks 3.*

Lessons from Tasks 3.*

You've learned or seen all of the following:

1. “let” and “type” all day long
2. pipelining with |>
3. record types - cheap and cheerful functional data
4. async programming for server requests
5. strongly typed string interpolation

Now do Tasks 4.*

Lessons from Tasks 4.*

You've learned or seen all of the following:

1. discriminated union types for messages in a web UI
2. pattern matching and completeness checks
3. functional objects with method/property members
4. dispatching a new message in this UI architecture

Now do Tasks 5.*

Lessons from Tasks 5.*

You've learned or seen all of the following:

1. evaluating code in the F# REPL
2. referencing a package with a strong version
3. using FSharp.Data with a sample from a REST API
4. exploring the data in preparation for adding a backend service

Further discussion points! ☺

Other F# Language Discussion Points

1. let mutable
2. box/unbox
3. reflection
4. performance
5. namespace and modules for code organization
6. F# is not lazy by default (see ‘lazy’ expressions)
7. Bi-directional .NET and Javascript interop
8. Fable now includes an F# to Python transpiler. If Python gives us metadata, we will interop smoothly with Python

Python GCN

```
def train(epoch):
    t = time.time()
    model.train()
    optimizer.zero_grad()
    output = model(features, adj)
    loss_train = F.nll_loss(output[idx_train], labels[idx_train])
    acc_train = accuracy(output[idx_train], labels[idx_train])
    loss_train.backward()
    optimizer.step()

    if not args.fastmode:
        # Evaluate validation set performance separately,
        # deactivates dropout during validation run.
        model.eval()
        output = model(features, adj)

    loss_val = F.nll_loss(output[idx_val], labels[idx_val])
    acc_val = accuracy(output[idx_val], labels[idx_val])
```

F# GCN

```
let train epoch =
    let t = DateTime.Now
    model.Module.Train()
    optimizer.zero_grad()
    let output = model.forward(features)
    let loss_train = nll_loss(output.[ idx_train], labels.[idx_train])
    let acc_train = accuracy(output.[idx_train], labels.[idx_train])
    loss_train.backward()
    optimizer.step()

    let output =
        if fastmode then
            output
        else
            model.Module.Eval()
            model.forward(features)

    let loss_val = nll_loss(output.[idx_val], labels.[idx_val])
    let acc_val = accuracy(output.[idx_val], labels.[idx_val])
```

https://www.linkedin.com/pulse/graph-convolutional-network-model-strongly-typed-faisal-waris-phd/

Thank you Guido!

Ask your questions live on Twitter #dotNETConf

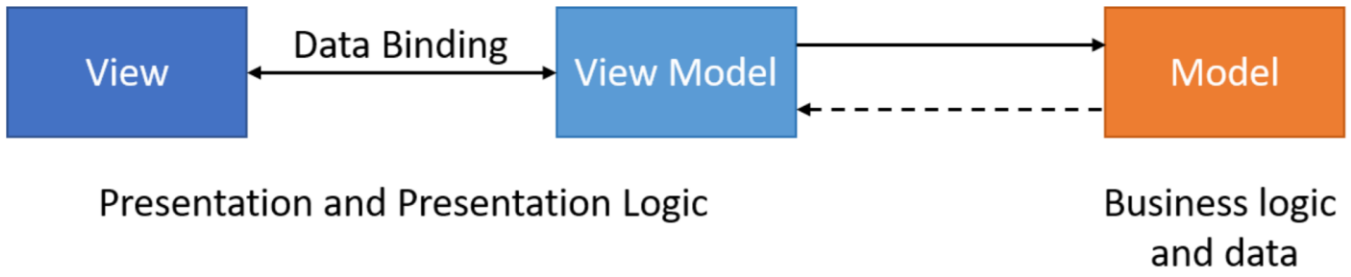
Thanks for joining!

Ask your questions live on Twitter #dotNETConf

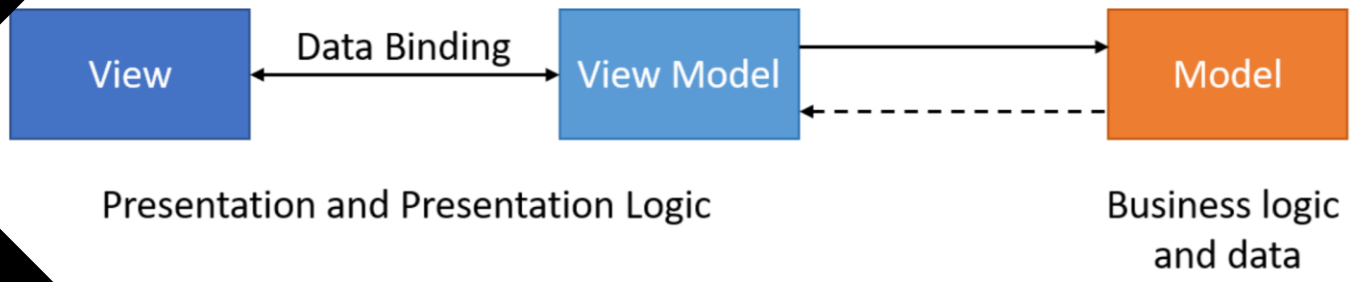
Other slides

FABLE
TRY ONLINE
GET STARTED
Fable is a compiler that brings F# into the JavaScript ecosystem

Model View View Model



Model Vie
View Mode



MVU

Calculate your views with functional programming

A Simple MVU App

```
type Model =
    { … }

type Msg =
    | …
    | …

let init() =
    { … }

let update msg model =
    match msg with
    | … -> { model with … }
    | … -> { model with … }

let view model dispatch =
    if model.IsPressed then
        …  dispatch msg …
    else
        … dispatch msg …
```

The model from which the view is generated

Messages which cause updates to the model

Initial state

Update the model

Compute the view

A Simple MVU App

```
type Model =
    { IsPressed: bool }

type Msg =
    | Pressed

let init() =
    { IsPressed=false }

let update (msg: Msg) (model: Model) =
    match msg with
    | Pressed -> { model with IsPressed = true }

let view (model: Model) dispatch =
    if model.IsPressed then
        View.Label(text="I was pressed!")
    else
        View.Button(text="Press Me!", command=(fun () -> dispatch Pressed))
```

The model from which the view is generated

Messages which cause updates to the model

Initial state

Update the model

Compute the view

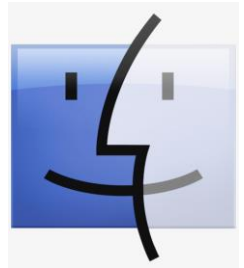
F# get started

```
dotnet new -lang F#

dotnet build
```

.NET

F# tools are part of the .NET SDK, available everywhere



F# for the backend

```
dotnet new -i "giraffe-template::*"

dotnet giraffe
```

A functional ASP.NET Core micro web framework for building rich web applications.

High perf, functional server-side programming

github.com/giraffe-fsharp/Giraffe

F# for the frontend (JS)

```
dotnet new -i "Fable.Template::*"

dotnet new fable
npm install
npm start
```

You can use F# as a JavaScript language

NOTE: See also WebSharper