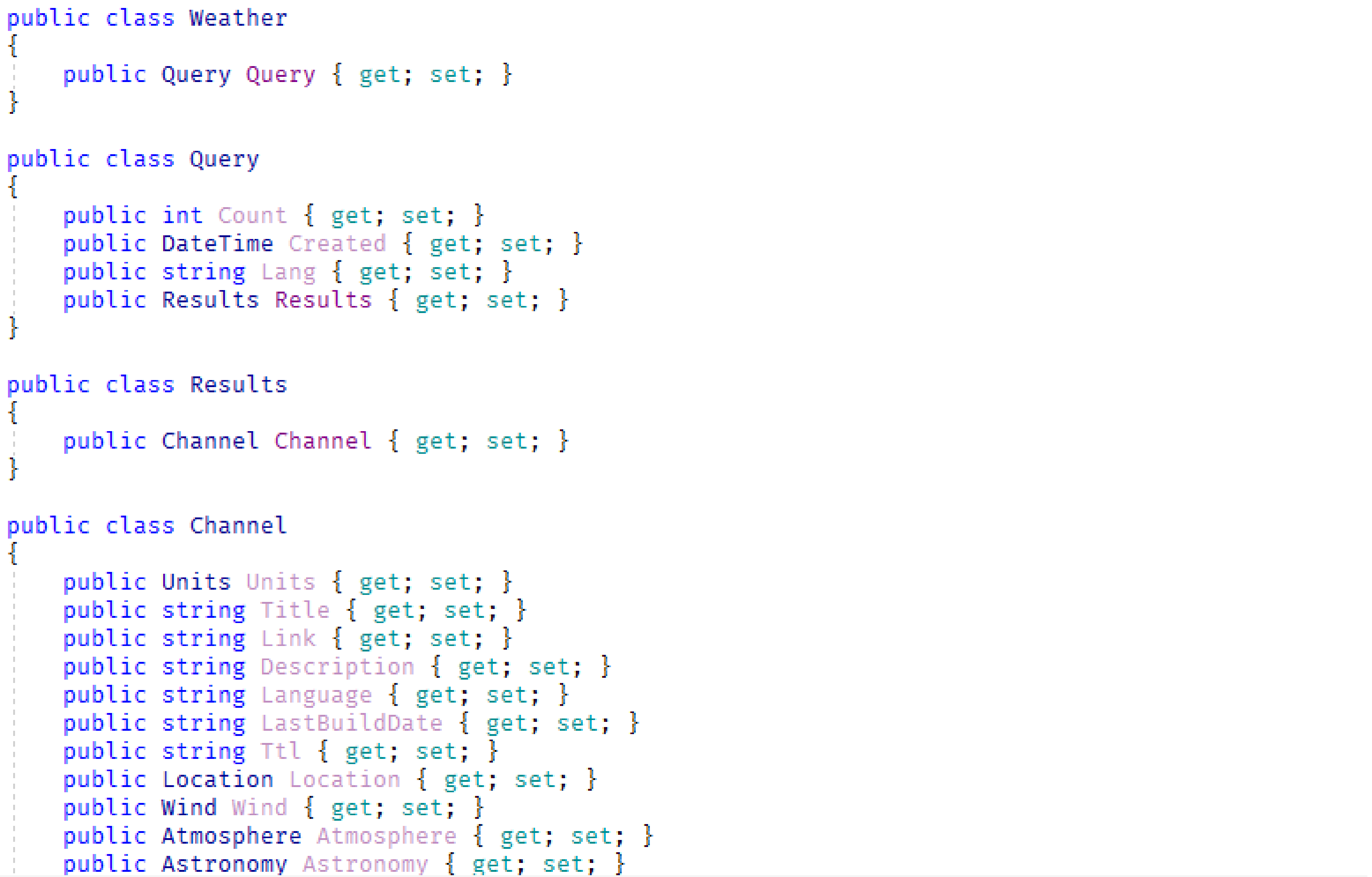
F#

20/05/18

Demo

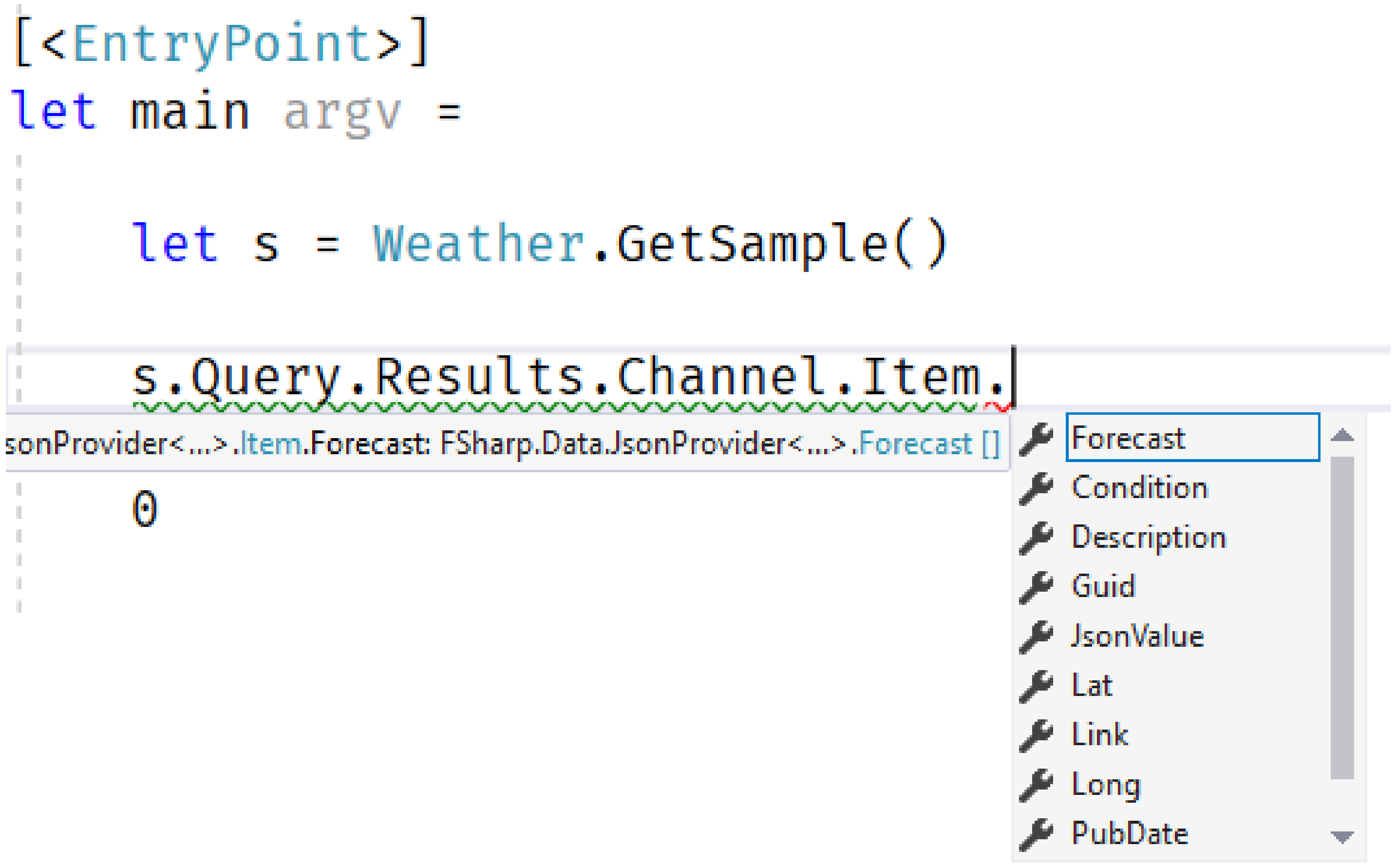
Type Provider

```
{
 "query": {
  "count": 1,
  "created": "2018-05-09T15:52:58Z",
  "lang": "ru-RU",
  "results": {
   "channel": {
    "units": {
     "distance": "km",
     "pressure": "mb",
     "speed": "km/h",
     "temperature": "C"
    },
    "title": "Yahoo! Weather - Yekaterinburg, Sverdlovsk Oblast, RU",
    "link": "http://us.rd.yahoo.com/dailynews/rss/weather/Country__Country/*https://weather.yahoo.com/co
    "description": "Yahoo! Weather for Yekaterinburg, Sverdlovsk Oblast, RU",
    "language": "en-us",
    "lastBuildDate": "Wed, 09 May 2018 08:52 PM YEKT",
    "ttl": "60",
    "location": {
     "city": "Yekaterinburg",
     "country": "Russia",
     "region": " Sverdlovsk Oblast"
    },
    "wind": {
     "chill": "39",
     "direction": "293",
     "speed": "28.97"
    },
    "atmosphere": {
     "humidity": "59",
     "pressure": "33017.30",
     "rising": "0",
     "visibility": "25.91"
    },
    "astronomy": {
```



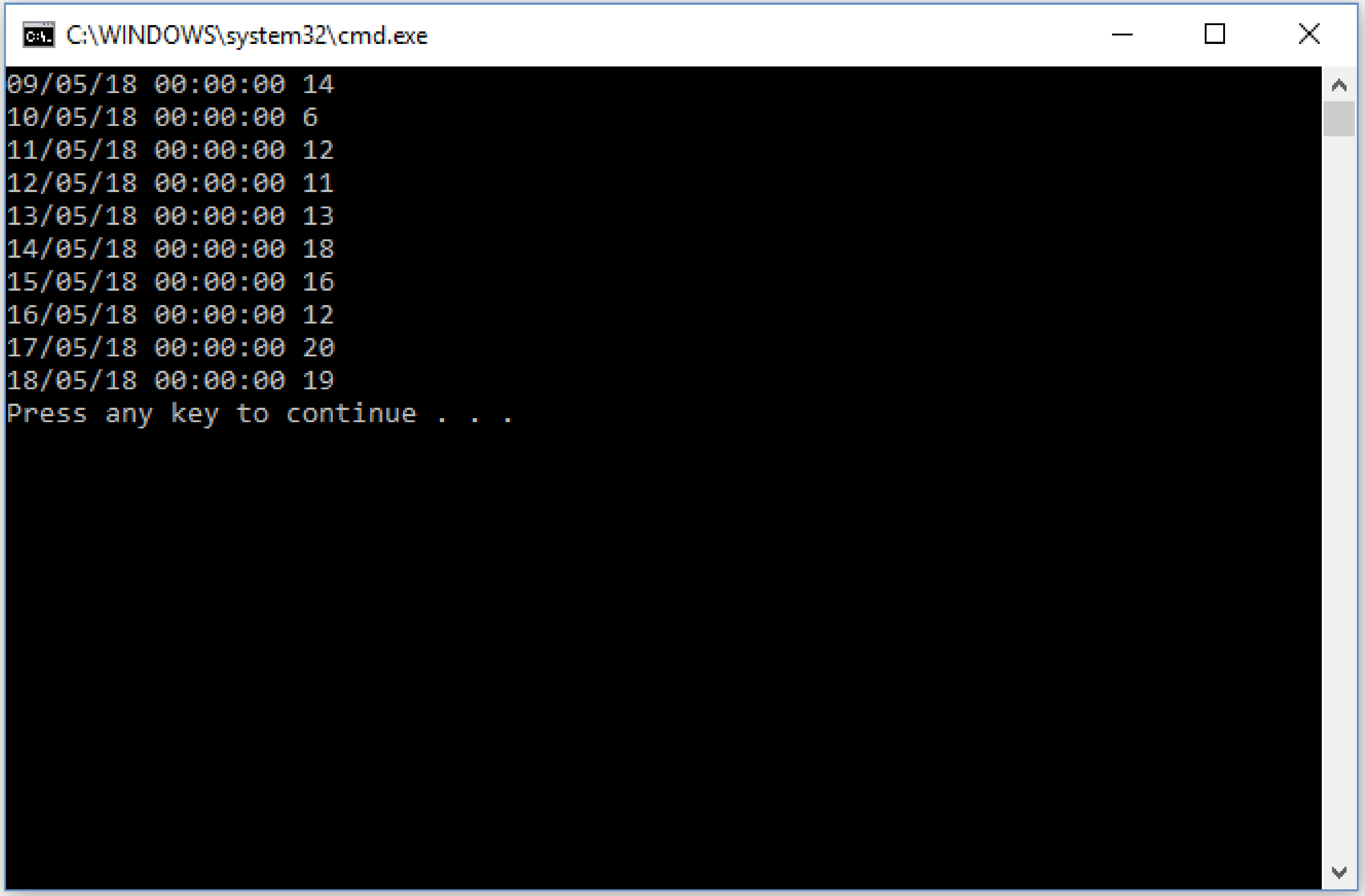
```
public class Weather
{
    public Query Query { get; set; }
}

public class Query
{
    public int Count { get; set; }
    public DateTime Created { get; set; }
    public string Lang { get; set; }
    public Results Results { get; set; }
}

public class Results
{
    public Channel Channel { get; set; }
}

public class Channel
{
    public Units Units { get; set; }
    public string Title { get; set; }
    public string Link { get; set; }
    public string Description { get; set; }
    public string Language { get; set; }
    public string LastBuildDate { get; set; }
    public string Ttl { get; set; }
    public Location Location { get; set; }
    public Wind Wind { get; set; }
    public Atmosphere Atmosphere { get; set; }
    public Astronomy Astronomy { get; set; }
```

```fsharp
type Weather = JsonProvider<"../weather.json">
```

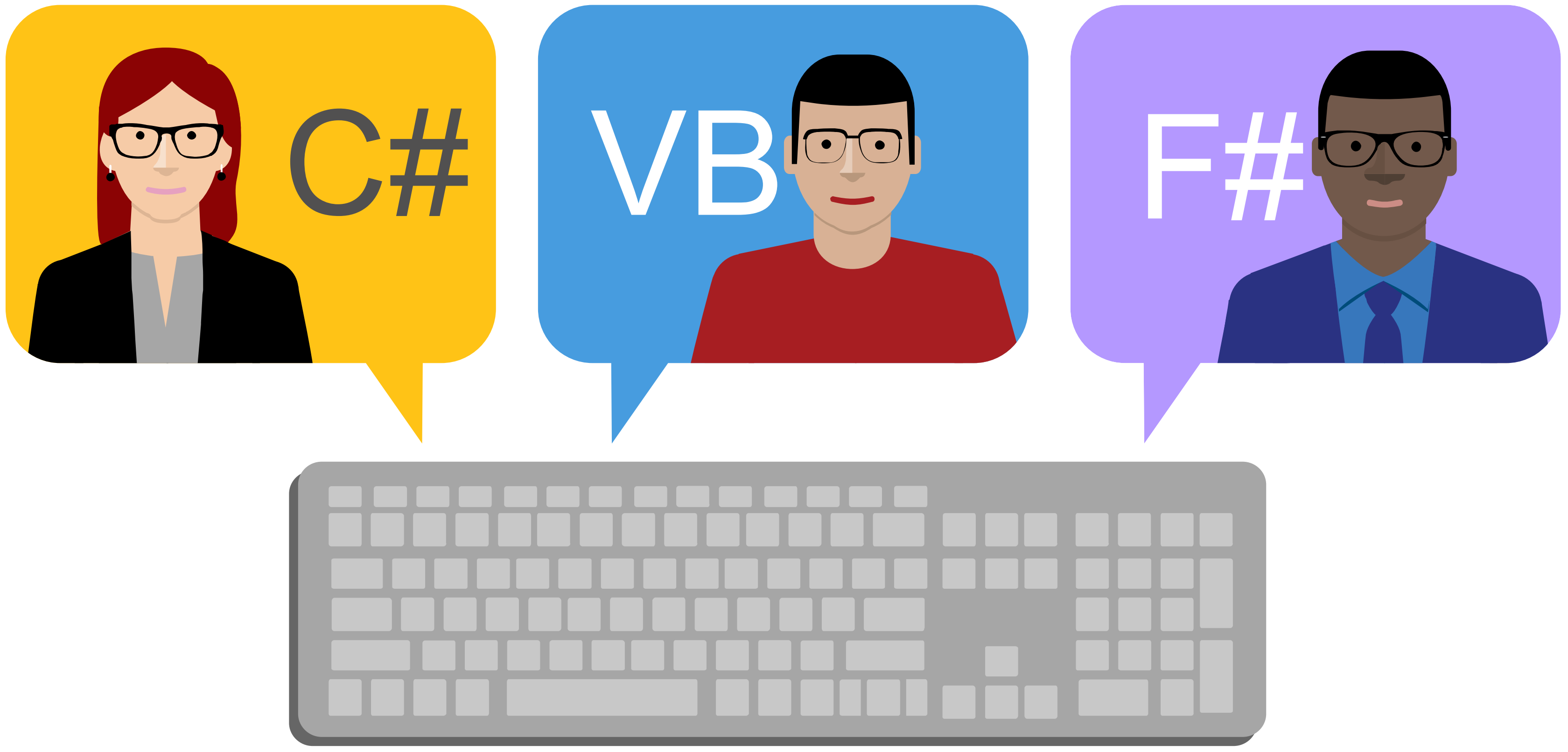


```
[<EntryPoint>]
let main argv =

    let s = Weather.GetSample()

    s.Query.Results.Channel.Item.
sonProvider<...>.Item.Forecast: FSharp.Data.JsonProvider<...>.Forecast []
    0
```

```fsharp
[<EntryPoint>]
let main argv =

    let s = Weather.GetSample()

    s.Query.Results.Channel.Item.Forecast
    |> Array.iter (fun f -> printfn "%A %d" f.Date f.High)

    0
```


C:\WINDOWS\system32\cmd.exe

```
09/05/18 00:00:00 14
10/05/18 00:00:00 6
11/05/18 00:00:00 12
12/05/18 00:00:00 11
13/05/18 00:00:00 13
14/05/18 00:00:00 18
15/05/18 00:00:00 16
16/05/18 00:00:00 12
17/05/18 00:00:00 20
18/05/18 00:00:00 19
Press any key to continue . . .
```



https://dot.net

Что пишет Microsoft?

F# (pronounced "F sharp") is a cross-platform, open-source, functional programming language for .NET. It also includes object-oriented and imperative programming.

https://www.microsoft.com/net/learn/languages

Про синтаксис

1. Отступы вместо скобок
2. ~~`f(a, b, c)`~~ `f a b c`
3. `|>` - pipe operator

```
f3 (f2 (f1 x))
x |> f1 |> f2 |> f3

f a b c
c |> f a b
```

#1

Type Providers

Type Provider

```
type Weather = JsonProvider<"../weather.json">
```

Создаёт типы на основе информации, полученной компилятором из источника данных

Type Provider

Примеры:

- JSON
- XML
- CSV
- SQL

…

- R

#2

Discriminated Unions

Result.cs

```csharp
public class None
{
    private None()
    {
    }
}

public struct Result<T>
{
    public Result(string error, T value = default(T))
    {
        Error = error;
        Value = value;
    }

    public bool IsSuccess => Error == null;
    public string Error { get; }
    internal T Value { get; }

    public T GetValueOrThrow() =>
        IsSuccess
            ? Value
            : throw new InvalidOperationException($"No value. Only Error {Error}");
}
```

Result.cs – что не так?

- Нужен тип None
- Дублирование ☹
- Нужны вспомогательные методы

```
public static Result<None> Ok()
public static Result<T> Ok<T>(T value)
public static Result<T> Fail<T>(string e)
```

- Можно написать

```
var fail = Result.Fail<int>("epic fail");
var value = fail.GetValueOrThrow();
```

Discriminated Union

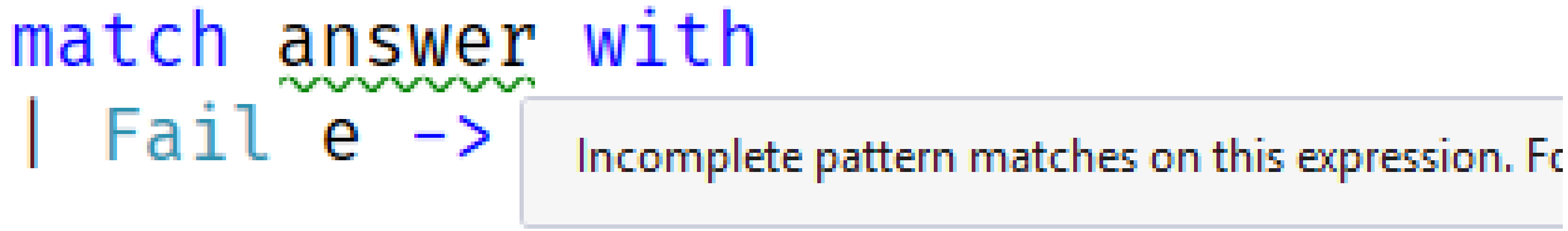
```
type Result<'a> =
    | Ok of 'a
    | Fail of string

let ok = Ok 42
let fail = Fail "epic fail"
```

Demo

Discriminated Union

```fsharp
let ``The Ultimate Question of Life, the Universe, and Everything``() =
    if sevenMillionYearsPassed
    then Ok 42
    else Fail "calculating..."

let answer = ``The Ultimate Question of Life, the Universe, and Everything``()
```

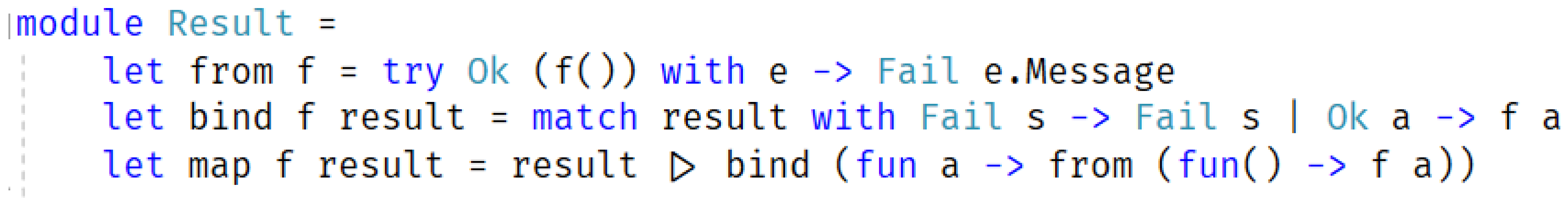
```fsharp
match answer with
| Fail e -> printfn "%s" e
```



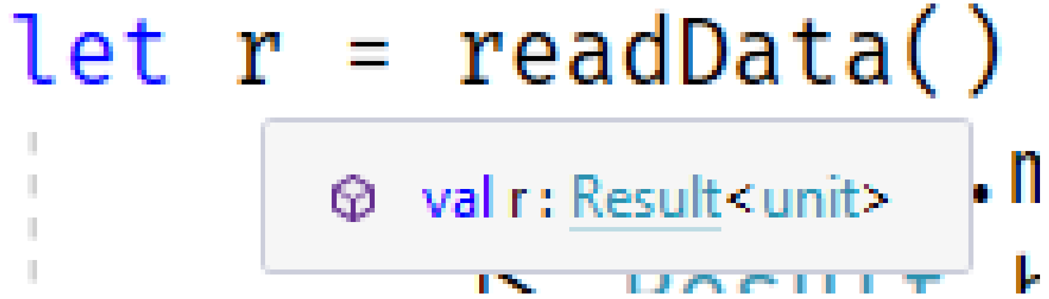
```
match answer with
| Fail e ->
```

Incomplete pattern matches on this expression. Fo

```
match answer with
| Fail e -> printfn "%s" e
| Ok x -> printfn "Found! %d" x
```



```
module Result =
    let from f = try Ok (f()) with e -> Fail e.Message
    let bind f result = match result with Fail s -> Fail s | Ok a -> f a
    let map f result = result ▷ bind (fun a -> from (fun() -> f a))
let readData() = Ok 5
let writeData x = Result.from(fun() -> printfn "%d" x)

let r = readData()
        ▷ Result.map (fun i -> i + 2)
        ▷ Result.bind writeData

printfn "%A" r
```



```
let r = readData()
```

```
val r : Result<unit>
```

#3

Computation Expressions

Что общего?

- `yield return 1;`

- `await Task.Run(1000);`

-
  ```
  var squares = from item in items
                select item * item;
  ```

Computation Expression: seq

```
let f() = seq {
    yield 1
    yield 2
    yield 3
}
```

Computation Expression: async

```
let f() = async {
    do! Async.Sleep 1000
}
```

Computation Expression: async

```
let fetchUrlAsync url = async {
    let req = WebRequest.Create(Uri(url))
    use! resp = req.AsyncGetResponse()
    use stream = resp.GetResponseStream()
    use reader = new IO.StreamReader(stream)
    let! html = reader.ReadToEndAsync() |> Async.AwaitTask
    printfn "finished downloading %s" url
    return html
}
```

Computation Expression: query

```
let items = [1;2;3]

let squares = query {
    for item in items do
    select (item * item)
}
```

Custom Computation Expression: result

```
let readFromDb id =
    if id < 8
    then Ok (id + 2)
    else Fail (sprintf "Value %d is not available" id)

let calculate() = result {
    let x = 3
    let! y = readFromDb x
    let! z = readFromDb (x + y)
    return x + y + z
}
```

#4

Records

Immutable class

```
class Song {
    public Song(string author, string name) {
        Author = author;
        Name = name;
    }
    public string Author { get; }
    public string Name { get; }
}
```

Immutable class

```csharp
class Song : IEquatable<Song>
{
    public Song(string author, string name)
    {
        Author = author;
        Name = name;
    }

    public string Author { get; }
    public string Name { get; }

    public Song WithAuthor(string author) => new Song(author, Name);
    public Song WithName(string name) => new Song(Author, name);

    public override bool Equals(object obj) => Equals(obj as Song);

    public bool Equals(Song other) =>
        other != null &&
        Author == other.Author &&
        Name == other.Name;

    public override int GetHashCode() => HashCode.Combine(Author, Name);

    public override string ToString() =>
        $"Author: {Author}, Name: {Name}";
}
```

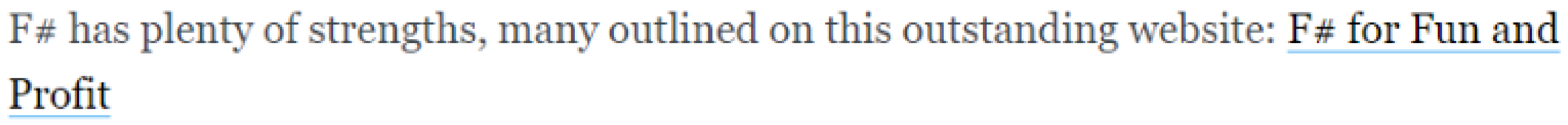
Record

```
type Song = { Author: string; Name: string }

let song1 = { Author="Queen"; Name="Bohemian Rhapsody" }
let song2 = { Author="Queen"; Name="Bohemian Rhapsody" }
printfn "%b" (song1=song2) // true

let song3 = { song2 with Name="We Are the Champions" }

let { Name=name } = song3 // name = song3.Name
printfn "%s" name // "We Are the Champions"
```

Инструменты

ionide.io

Где учить?


F# has plenty of strengths, many outlined on this outstanding website: F# for Fun and Profit

- из презентации Don Syme

- fsharpforfunandprofit.com

F# |>I❤

- fsharp.org/learn.html

Вопросы?

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