



# FREE F# SEMINAR FOR DEVELOPERS

@ Skillshouse 2014-02-27

Mødegruppe for F#funktionelle Københavnerne  
(MF#K)





- About me
- F#unctional Copenhageners Meetup Group (MF#K)
- F# SEMINAR FOR DEVELOPERS
  - 17:00 – Short introduction to F# (sales pitch)
  - 17:30 – Hands-on:
    - First console app (with on-the-fly testing of code)
    - Expand the app so that it can load CSV, JSON, XML using TypeProviders and the data set as a schema
    - Rewrite the app in order to use all the processing power of the laptop
  - Q & A
  - 18:30 - We offer you some food and beverages



- Ramón Soto Mathiesen
- MSc. Computer Science from DIKU
- Managing Specialist | CTO of CRM Department @ Delegate A/S
  - ER-modeling, WSDL, OData (REST API)
- F# / C# / JavaScript / C++
- Blog: <http://blog.stermon.com/>



- F#unctional Copenhageners Meetup Group will try to get more and more software projects to be based on functional programming languages.
- We mainly focus on F# and Haskell, but other functional programming languages like Scala, Lisp, Erlang, Clojure, etc. are more than welcome.
- We expect to meet at least six times a year, if not more, to share experiences with regards of the use of functional programming languages in software projects that are in / or heading to production.



- Let's learn F# together @ Delegate A/S having *fun*



- *less code, error-free projects, only one code base, big data, parallelism, concurrency, asynchronous processes*



- Is an ***open-source, strongly typed, multi-paradigm*** programming language encompassing ***functional, imperative*** and ***object-oriented*** designed by Don Syme (MS Research Cambridge UK) and maintained by Microsoft, F# Software Foundation and open contributors
- It's a mature language that is part of Visual Studio and the .NET Framework
- Loved by the ***very talented*** who contribute to it for free with sometimes very usable projects:
  - Special mention to Tomas Petricek ([TomASP.NET](http://TomASP.NET))



- Conciseness
- Convenience
- Correctness
- Concurrency
- Completeness





```
let swap (x,y) = y,x
let foo = swap(42,0)
let bar = swap("42","0")
```

```
> val swap : x:'a * y:'b -> 'b * 'a
> val foo : int * int = (0, 42)
> val bar : string * string = ("0", "42")
```

- Conciseness:
  - F# is not cluttered up with coding noise such as curly brackets, semicolons and so on
  - You almost never have to specify the type of an object, thanks to a powerful ***type inference system***.
  - And, compared with C#, it generally takes ***fewer lines of code*** to solve the same problem



```
let f g x = g x
f (fun x -> x * x) 42
```

```
> val f : g:( 'a -> 'b ) -> x:'a -> 'b
> val it : int= 1764
```

- Convenience:
  - Many common programming tasks are much simpler in F#. This includes things like creating and using **complex type definitions**, doing **list processing**, **comparison and equality**, **state machines**, and much more
  - And because functions are first class objects, it is very easy to create powerful and reusable code by creating functions that have **other functions as parameters**, or that **combine existing functions** to create new functionality



```
[<Measure>] type DKK
[<Measure>] type USD
let rate : float<USD/DKK> = 0.2<USD/DKK>
let usd2dkk (amount: float<USD>) = amount / rate
type OpportunityDK = { Customer : string; Amount : float<DKK> }
type OpportunityUS = { Customer : string; Amount : float<USD> }
type Opportunities = | DK of OpportunityDK | US of OpportunityUS
let odk0 = { OpportunityDK.Customer = "Skillshouse A/S"; Amount = 42.<DKK> }
let odk1 = { OpportunityDK.Customer = "Microsoft Danmark ApS"; Amount = 42.<DKK> }
let ous2 = { OpportunityUS.Customer = "Microsoft Redmond HQ"; Amount = 42.<USD> }
[ DK(odk0); DK(odk1); US(ous2); ]
|> List.map(fun x -> match x with | DK y -> y.Amount | US y -> usd2dkk y.Amount)
|> List.reduce(+)
```

- Correctness:
  - F# has a **powerful type system** which prevents many common errors such as **null reference exceptions**.
  - Values are **immutable by default**, which prevents a large class of errors
  - In addition, you can often encode **business logic** using the **type system** itself in such a way that it is actually **impossible to write incorrect code** or mix up **units of measure**, greatly **reducing the need for unit tests**



```
[|0 .. 10 .. (1 <<< 16)|]  
|> Array.map(fun x -> x * x)  
[|0 .. 10 .. (1 <<< 16)|]  
|> Array.Parallel.map(fun x -> x * x)
```

- Concurrency:
  - F# has a number of built-in libraries to help when more than one thing at a time is happening. Asynchronous programming is **very easy**, as is parallelism. F# also has a built-in **actor model**, and excellent support for event handling and **functional reactive programming**
  - And of course, because **data structures are immutable by default**, **sharing state** and **avoiding locks** is much easier



```
open System
let ts () = DateTime.Now.ToString("o")           // ISO-8601
let ts' () = (ts()).Replace(":", String.Empty) // Filename safe
let cw (s:string) = Console.WriteLine(s)
let cew (s:string) = Console.Error.WriteLine(s)
```

- Completeness:
  - Of course, ***F# is part of the .NET ecosystem***, which ***gives you seamless access to all the third party .NET libraries and tools***.
  - Finally, ***it is well integrated with Visual Studio***, which means you get a great IDE with ***IntelliSense support, a debugger***, and many plug-ins for unit tests, source control, and other development tasks
  - Although it is a functional language at heart, F# does support other styles which are not 100% pure, which makes it much easier to interact with the non-pure world of web sites, databases, other applications, and so on. In particular, F# is designed as a hybrid functional/OO language, ***so it can do virtually everything that C# can do except ...***



**David Tchepak** @davetchepak 21 Mar  
What can C# do that F# can't? So far I've only found: flags  
enums, extension methods on Object. #fsharp

**Tomas Petricek** @tomaspetricek [Follow](#)  
> @davetchepak "What can C# do that F# cannot?"  
NullReferenceException :-)  
11:52 PM - 21 Mar 2013

68 RETWEETS 15 FAVORITES



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- VS Project containing two subprojects
  - App (.exe)
    - Console app (cmd args as parameters)
  - Lib (.dll)
    - F# Scripts
    - Modules, signatures, pre-Unit Tests, ...
- Two external data sources (no data schemas):
  - US Zip Codes (CSV):
    - <http://download.geonames.org/export/zip/US.zip>
  - Yahoo Weather API (JSON):
    - <http://query.yahooapis.com/v1/public/yql?q=>
    - select item from weather.forecast where location = “US Postal Code”
    - &format=json
- Execute:
  - Sequentially
  - Parallel
  - Async (web) + Parallel (local)
- **Remark:** Yeah, I already created the solution in order to give this talk, so I might jump back and forth between solutions, please bare with me 😊





Questions?



- Code will be available @ <https://github.com/gentauro>
- Slides will be available @ [MF#K \(Files\)](#)
- Sign up @ [MF#K](#) for:
  - More *fun*
  - Hands-on:
    - [Let's learn F# together – 3](#) (TBD)
    - [Phillip Trelford F#-hands-on-session](#) (2014-04-17)
    - [F# GRUNDKURSUS](#) (2014-05-08)
  - Talks:
    - In the pipeline talks about: *Erlang, Haskell, Rust, Idris, ...*
      - Up next: Erlang in general and Haskell with CUDA (March month)
- MF#K would like to thank our sponsors:

