GROUND UP SERIES

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Syed Awase earned his PhD from University of Zurich in GIS, supported by EU V Framework Scholarship from SPIRIT Project (www.geo-spirit.org). He currently provides consulting services through his startup www.territorialprescience.com and www.sycliq.com . He empowers the ecosystem by sharing his technical skills worldwide, since 2008.

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Slide Version Updates

Last Updated	Version	Release Date	Updated by	Code Plays Done @

Program Agenda

DAY 1	DAY 2	DAY 3	DAY 4

DAY 5	DAY 6	DAY 7	DAY 8

SYED AWASE KHIRNI

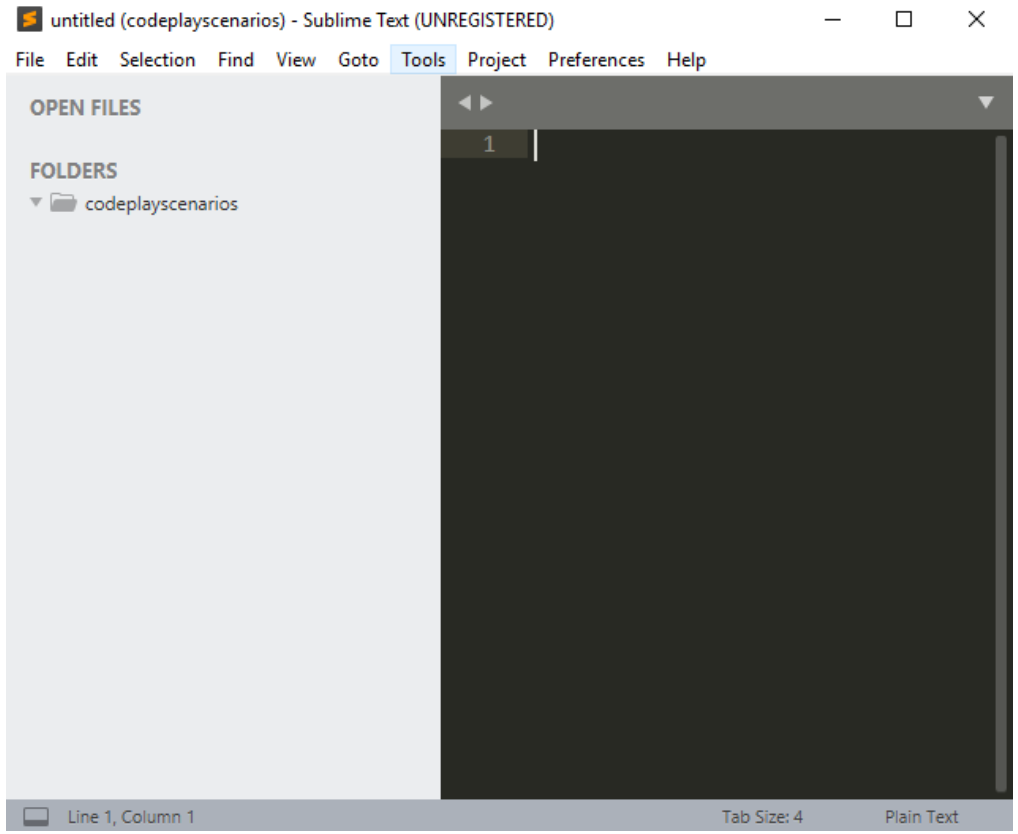
ELM

Original Series

- A Typed functional programming language with focus on immutability and reactive programming for creating web-browser apps.
- Designed by Evan Czaplicki in 2012.
- https://elm-lang.org
- Application Development Framework

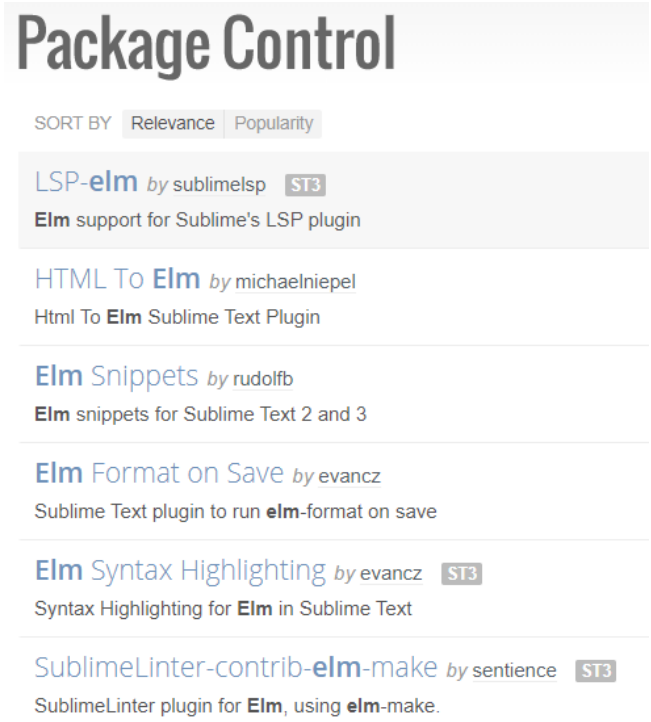
ELM INSTALLATION

Sublime Editor



Editor Plugins

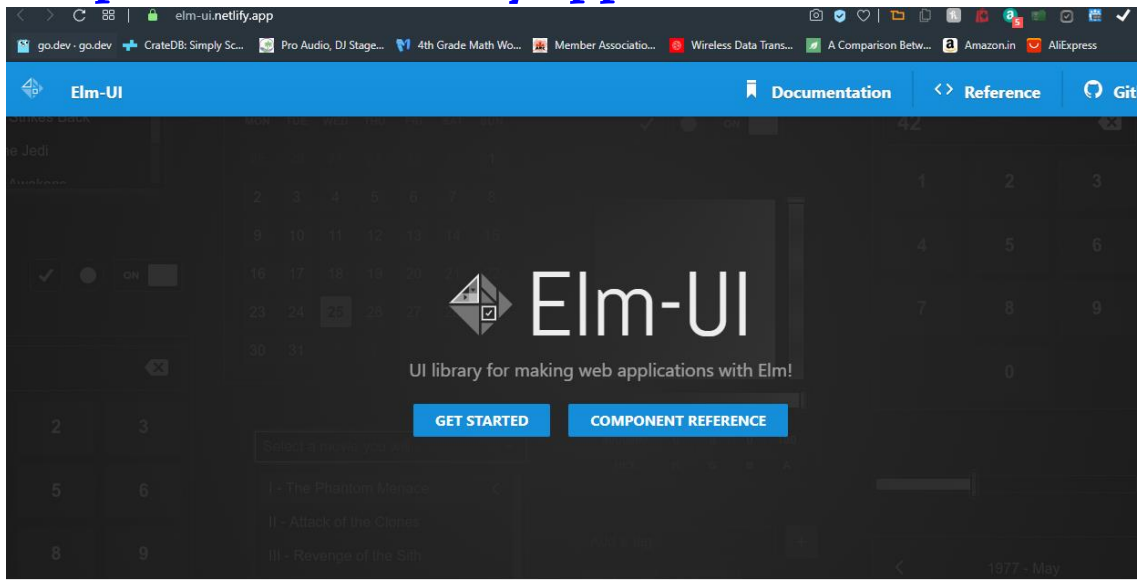
https://packagecontrol.io/search/elm



ELM

- Typed **pure functional** programming language
- Static type checking
- Automatic Semantic Versioning
- Immutable
- Interoperability with javascript
- Virtual DOM used to update the state
- Rich Error Messages
- Zero Runtime Exceptions
- No javascript fatigue.
- Having ELM compile to WebAssembly as a target could improve the application performance.

https://elm-ui.netlify.app



ELM ARCHITECTURE

Every ELM program will breakup into 3 cleanly separated parts:

- Model : canonical state of the application
- Update: a way to update the state of the application.
- View: a way to render view state as HTML (projecting the state)

WEB ASSEMBLY

https://webassembly.org

- WebAssembly is a binary instruction format for a stack-based virtual machine.
- It is designed as a portable target for compilation of high-level languages like C/C++/Rust, enabling deployment on the web for client and server application.s

ELM Users

http://builtwithelm.co

noredink

gizra

CircuitHub

TruQu

Prezi

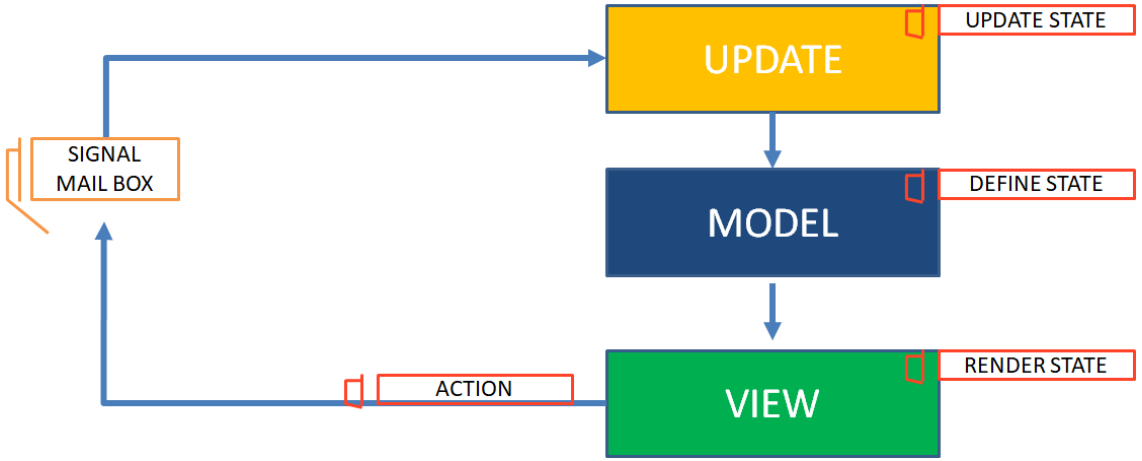
futurice

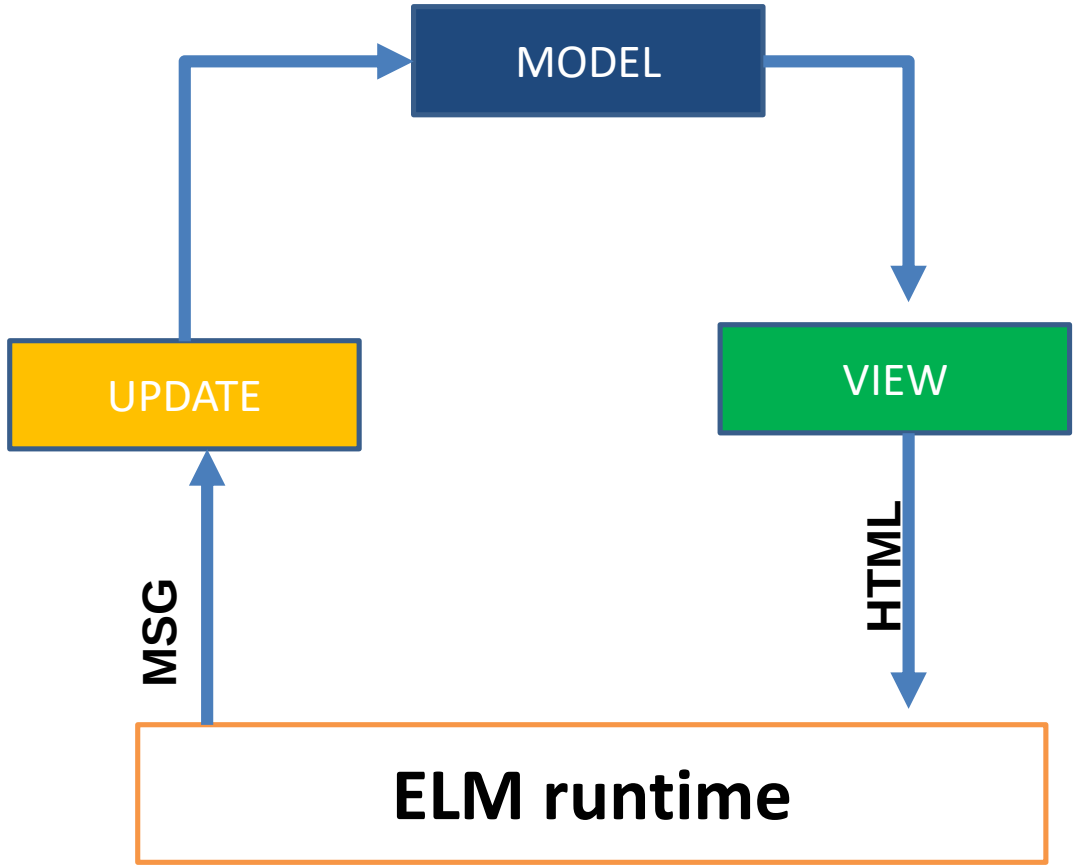
BEAUTIFUL DESTINATIONS

ELM RESOURCE

RESOURCE	DESC	Example
Elm-repl	REPL or ELM console	$elm-repl
Elm-reactor	Development Compiler and server	$elm-reactor –address=0.0.0.0
Elm-make	Elm compiler	$ elm Main.elm –output =main.html
Elm-package	Elm package manager	$elm-package install elm-lang/http
Online editor	Elm online editor	https://elm-lang.org/try

ELM ARCHITECTURE





ELM Commands

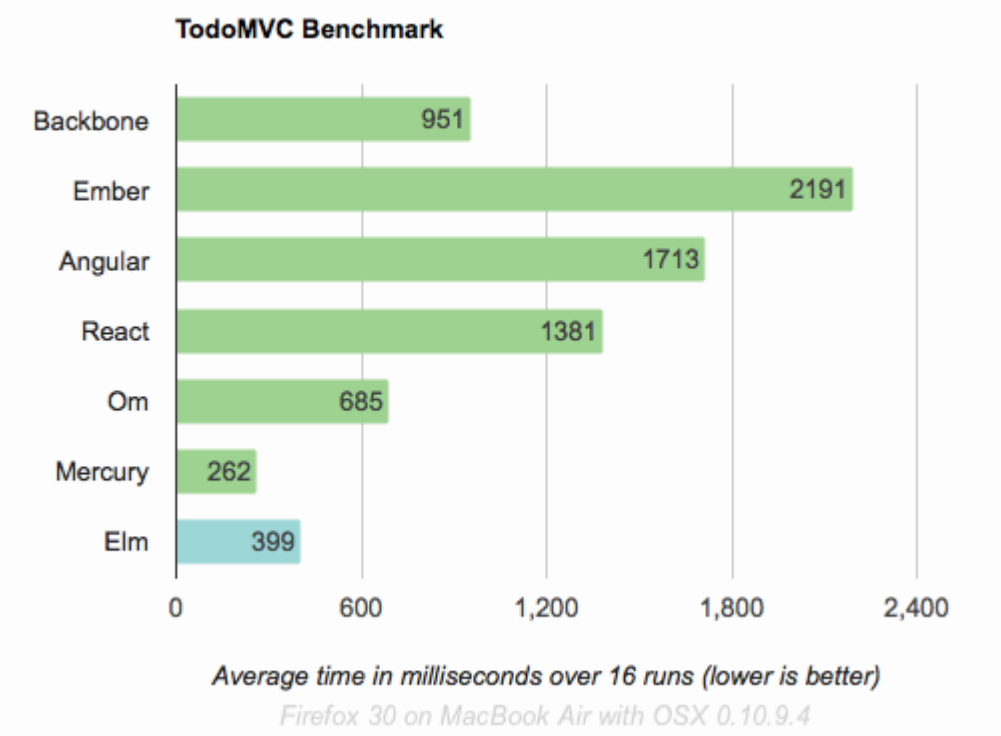
Elm.exe init	
Elm.exe repl	
Elm.exe reactor	https://github.com/elm-lang/elm-reactor
Elm.exe make	
Elm.exe bump	
Elm.exe diff	
Elm.exe publish	

ELM PRIMITIVES: DATA TYPES

TYPES	DESCRIPTION	EXAMPLE
String	string data type	“Syed Awase Khirni”
Integer	Integer data type	12368
Float	Float data type	6.626070
List	List data type	[123,36,37,28]
Tuple	Tuple data type	(383,2.48,”Syed Awase Khirni”)
Record	Record data type	{wahid=1, ithana=2.0, tisa=3.0, araba=4.0}
Function	Function	isEven n = (n %2) == 1

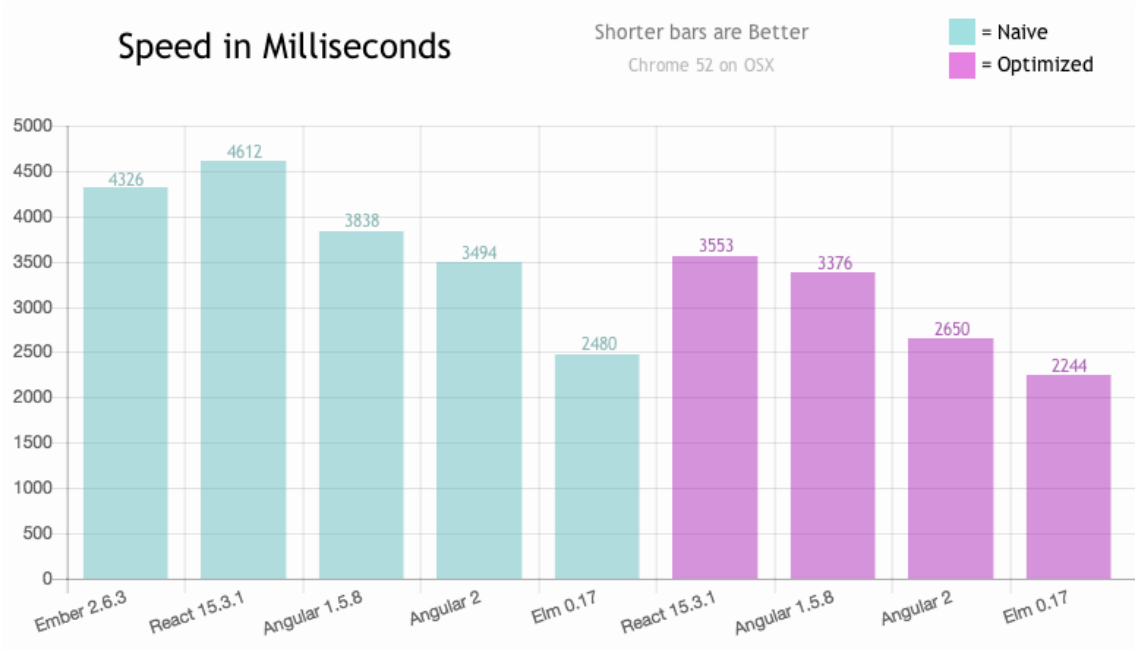
PERFORMANCE BENCHMARKS

[Evan Czaplicki](#) / 23 July 2014



https://elm-lang.org/news/blazing-fast-html

by [Evan Czaplicki](#) / 30 Aug 2016



https://elm-lang.org/news/blazing-fast-html-round-two

ELM OPERATIONS

DATA TYPE	OPERATION	EXAMPLE
String	concatenation	“I” ++ “love” ++ “You”
Integer	subtraction	-
Integer	Division	/
Integer	Integer division	//
Integer	exponentiation	^
Integer	Less than	<
Integer	Greater than	>
Integer	Equal to	==
Integer	Not Equal to	/=

ELM function construct

functionName : Float -> Float

functionName *argument* =

functionBody

Type definitions for function input and return type

Last statement in function body is return

```
1  import Html exposing (text)
2
3  main =
4   text (computeTax 75000 18)
5
6
7  printMessage =
8   "Hello! Syed Awase "
9
10
11 computeTax amount taxrate =
12  Debug.toString (amount * taxrate / 100)
13
```

Older versions of elm use toString while the newer version Debug.toString ()

ELM function construct


```
import Html exposing (text)

main =
 text (computeInterest 1000 3)

printMessage =
 "Hello! Syed Awase "


computeTax amount taxrate =
 Debug.toString (amount * taxrate / 100)

computeInterest amount interestrate =
 amount * interestrate / 100
 |> Debug.toString
```

```
import Html exposing (text)

main =
 computeInterest 1000 3
 |> text

printMessage =
 "Hello! Syed Awase "


computeTax amount taxrate =
 Debug.toString (amount * taxrate / 100)

computeInterest amount interestrate =
 amount * interestrate / 100
 |> Debug.toString
```

ELM function construct with type signatures

```
import Html exposing (text)

main =
 computeInterest 1000 3
 |> text

printMessage =
 "Hello! Syed Awase "

computeTax: Float -> Float -> String
computeTax amount taxrate =
 Debug.toString (amount * taxrate / 100)

computeInterest: Float -> Float -> String
computeInterest amount interestrate =
 amount * interestrate / 100
 |> Debug.toString


computeRatio: Float -> Float -> String
computeRatio divisor dividend =
 dividend / divisor
  |> Debug.toString


isdivisibleBy3: Float -> String
isdivisibleBy3 =
 computeRatio 3
```

Function currying

SECTION:

ELM CODE PLAY

SECTION:

EX01: SETTING UP VSCODE FOR ELM

Steps to create elm project

Setting up and Installing: Elm 0.19

EXERCISE DEMO: 1.1

LEARNING OUTCOMES

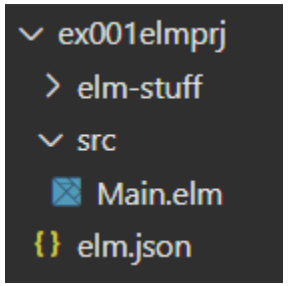
Creating ELM Project

- Create ELM project following the step outlined here.

1- create elm project

```
PS E:\awase-harddisk\CT\elm\codeplayscenarios\ex001elmprj> elm.exe init
```

2- elm project structure



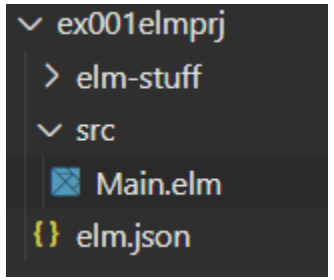
3-Running your elm project

```
PS E:\awase-harddisk\CT\elm\codeplayscenarios\ex001elmprj> elm.exe reactor
Go to http://localhost:8000 to see your project dashboard.
```

Step 2:

Understanding the ELM project structure

- Lets look at the ELM project structure
  - Upon executing the command
    - Elm.exe init
  - It creates a folder structure
    - Src
    - Elm.json



Elm.json

```
ex001elmprj > {} elm.json > {} dependencies > {} indirect > abc elm/virtual-dom
{
    "type": "application",
    "source-directories": [
        "src"
    ],
    "elm-version": "0.19.1",
    "dependencies": {
        "direct": {
            "elm/browser": "1.0.2",
            "elm/core": "1.0.5",
            "elm/html": "1.0.0"
        },
        "indirect": {
            "elm/json": "1.1.3",
            "elm/time": "1.0.0",
            "elm/url": "1.0.0",
            "elm/virtual-dom": "1.0.2"
        }
    },
    "test-dependencies": {
        "direct": {},
        "indirect": {}
    }
}
```

Understanding the ELM project structure

- Lets look at the ELM project structure
  - Upon executing the command
    - Elm.exe init
  - It creates a folder structure
    - Src
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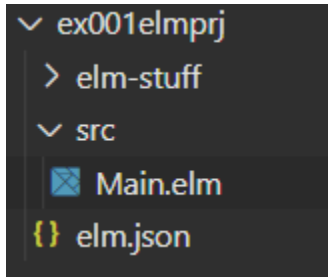
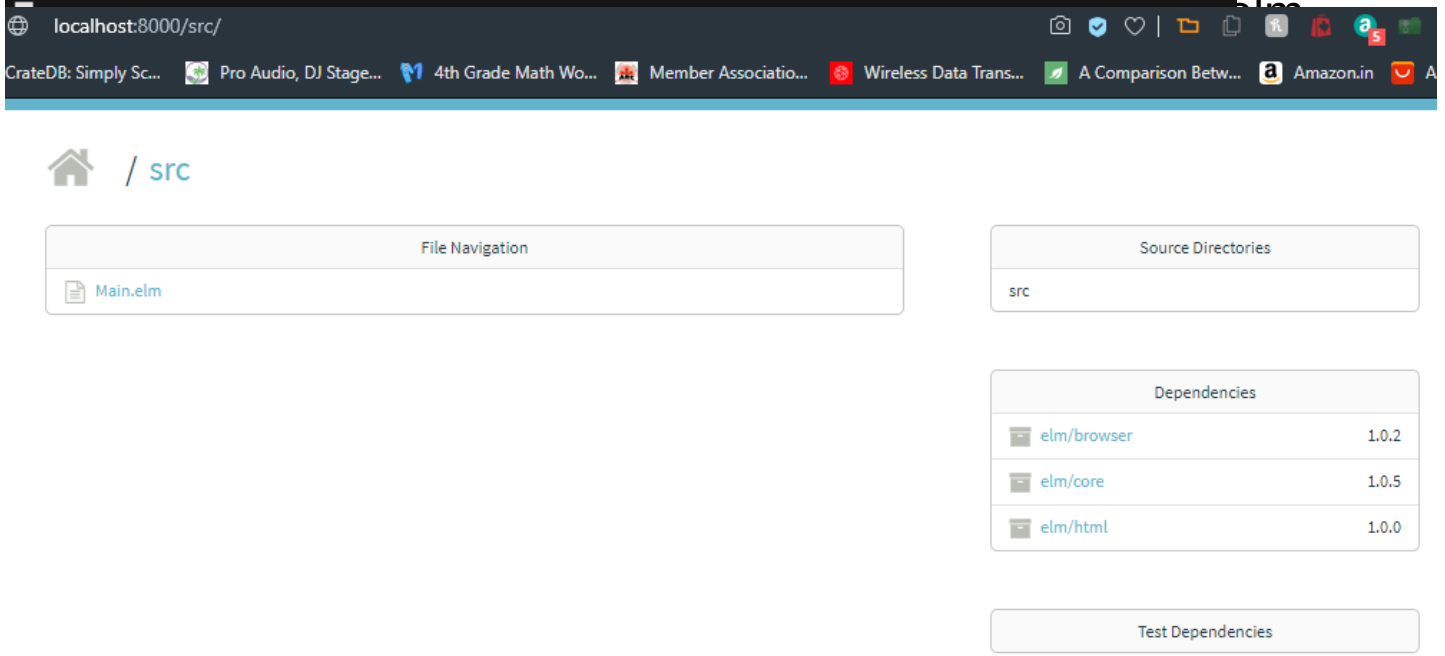


Main.elm

```
module Main exposing (..)
-- Syed Awase Khirni SYCLIQ/TPRI www.sycliq.com www.territorialprescience.com
import Html exposing (text)
-- this is a comment in elm
main =
 computeInterest 1000 3
 |> text
--function type signatures
computeTax: Float -> Float -> String
computeTax amount taxrate =
 Debug.toString (amount * taxrate / 100)
--function type signatures
computeInterest: Float -> Float -> String
computeInterest amount interestrate =
 amount * interestrate / 100
 |> Debug.toString
--function type signatures
computeRatio: Float -> Float -> String
computeRatio divisor dividend =
 dividend / divisor
  |> Debug.toString
-- function currying
isdivisibleBy3: Float -> String
isdivisibleBy3 =
 computeRatio 3
```

Step 3:

```
PS E:\awase-harddisk\CT\elm\codeplayscenarios> elm.exe reactor
Go to http://localhost:8000 to see your project dashboard.
```



Running the elm project

- Lets execute our work and check it out
- => Elm.exe reactor

30