TypeScript for OO Developers

Or, how to stay cool in front of the millennials

Brexit

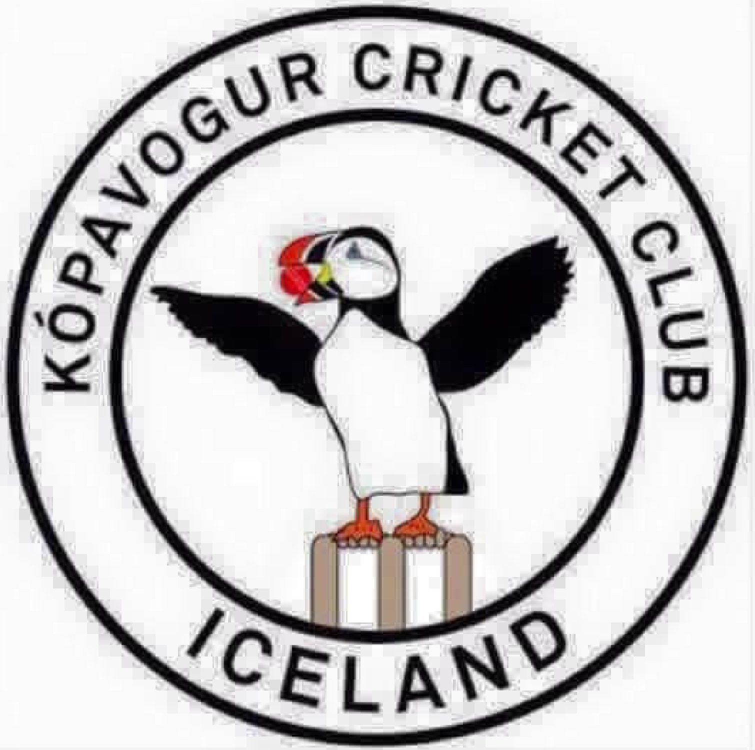
Let’s just get it out of the way ...

IS IT SAFE TO COME OUT YET
OR IS EVERYBODY STILL A POLITICIAN????
Make a Meme+

Shower Thought #67
James Bond is going to need a Visa for his missions now.
fb.com/ShwrThoughts

Oh bloody hell, they play cricket as well

[illegible]



Agenda

- There is no agenda
- Just me talking TypeScript, javascript and OO
- Trying to follow the slides and examples
    - Constructive criticism will be met with stony silence
    - There will be no talk of my little ponies.
- New questions feature:
    - See the url to ask questions
    - Most popular get moved to the front of the queue ;)
    - Please, be mindful of language and tone - everyone can see what you are writing!

COOLJUNK PRODUCTIONS

Who are the OO cool kids ?

- Never!
- Not yet
- “Researching”
- Sometimes. When I’m forced to.
- Mostly
- I’m a 4GL OO wizard. My OO foo is legendary.

What is TypeScript

It is a superset of Javascript language developed and maintained by Microsoft

YEAH YEAH...WAIT
WHAAAAAAT
memes.com

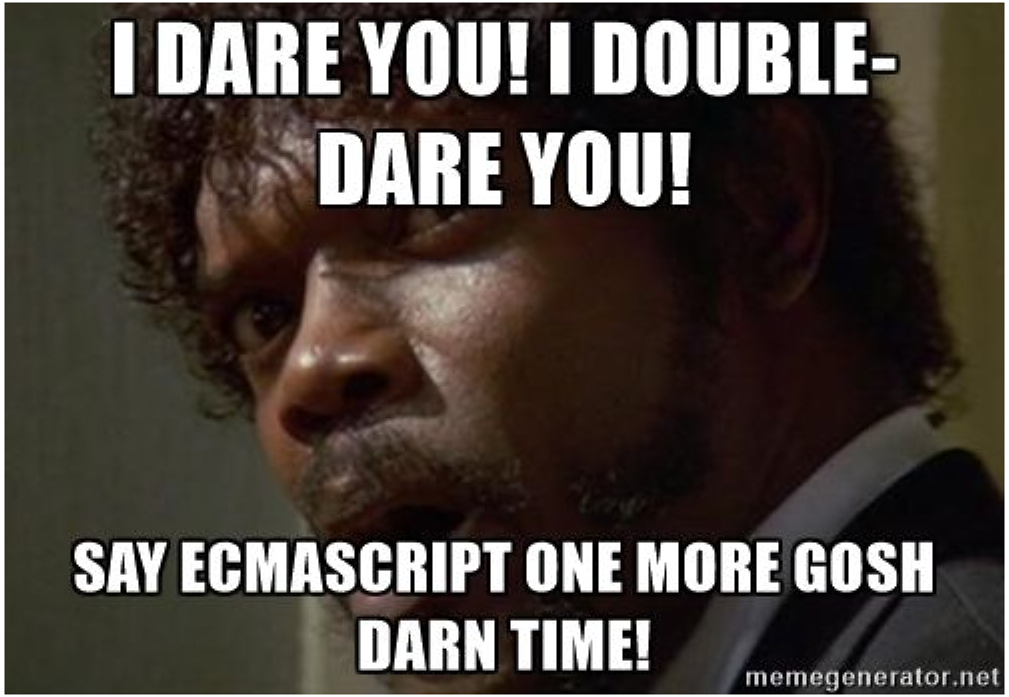
Microsoft ?

- Yup. Microsoft
- Open source, Cross-platform
- Free
- No runtime libraries
- Developed by Anders Hejlsberg
  - lead architect of C# and creator of Delphi and Turbo Pascal,
- Introduced October 2012
- Adopted by google for Angular2

whaaaat ?

Getting back to “What is TypeScript ?”

- Static typing
- Class-based OO programming
- supports definition files
  - https://github.com/DefinitelyTyped/DefinitelyTyped
- Compiles down to standard javascript
- Works on client (browser) and server (node.js)
- Strict superset of ECMAScript 2015, which is a superset of ECMAScript 5


I DARE YOU! I DOUBLE-DARE YOU!
SAY ECMASCRIPT ONE MORE GOSH DARN TIME!
memegenerator.net

ECMAScript === javascript

- See what I did there ?
- TypeScript code (.ts) is transpiled
- Creates new .js code
- Compiler has watchers (compile on save)
- JS build tools (grunt / gulp etc) have ts support

4GL vs JS challenges

- Equals
- Typesafe
- Classes
- Variable declaration

Example of js gotcha

```
var x = 1;
var y = 2;

if ( x = y ) {
   console.log("yay");
} else {
   console.log("boo");
}
```

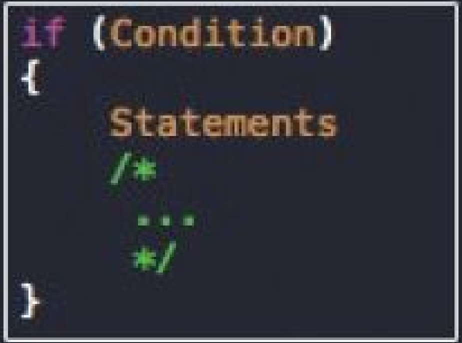
Quick - some OO (TS & 4GL) advantages

- Type-safe
  - No spelling errors
- Code Reuse and Recycling
- Encapsulation
- Makes you sound cool
  - “Injection”, “factory”, “instantiation”, “inheritance”

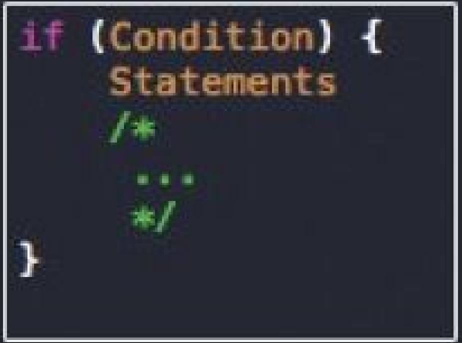
Code formatting

- Code formatting in this presentation will offend
- Both 4GL and JS coders
- Tough
- I have to work within the constraints of a slide ;)

There are two types of people.



```
if (Condition)
{
    Statements
    /*
     ...
     */
}
```



```
if (Condition) {
    Statements
    /*
     ...
     */
}
```

Programmers will know.

Why A TypeScript and 4GLOO presentation ?

- Typescript classes very similar to 4GL OO classes
- Very similar functionality
- Helps with transition to javascript
- Opens new possibilities for the cool 4GL OO developers
- Why not ? ;)

Show me the code! (4GL)

```
class Greeter:
    def public property greeting as char no-undo get . set .
    constructor(message as char):
        assign this-object:greeting = message;
    end constructor.

    method public char greet():
        return "Hello, " + this-object:greeting.
    end method.
end class.
```

Show me the code! (TypeScript)

```
class Greeter{
     greeting: string;
     constructor(message: string){
          this.greeting = message;
     }

     greet(){
          return "Hello, " + this.greeting;
     }
}
```

OO 4GL vs TypeScript: abstracts

- No, not abstracts. Abstracts ;)
- We’ll get to real abstracts later

Files: 4GL

- each class defined in a single .cls file
- Compiles to a single .r
- Folder structure is the “package” or namespace
  - *Shapes/Polygons/Triangle.cls* gives ***Shapes.Polygons.Triangle*** class
  - *Shapes/Polygons/Square.cls* gives ***Shapes.Polygons.Square*** class
- **Using** statement allows for shortcuts
  - Using Shapes.*
  - A = new Polygons.Square()

Files: TypeScript

- One or more classes defined per .ts file
- Namespaces defined by , well, namespace ;)

```
namespace Shapes {
    export namespace Polygons {
        export class Triangle { }
        export class Square { }
    }
}
```

Files: TypeScript

- **import** statement used for shortcuts

```
import polygons = Shapes.Polygons;
let sq = new polygons.Square();
```

Compiling

- 4GL:
  - compile Shapes/Polygons/Square.cls save [options]
  - Produces single .r file per .cls
- TS:
  - tsc [options] shapes.ts
  - Produces single .js file per .ts
- Both have compiler tools / utilities
  - Eclipse compile on save (4GL & TS)
  - Grunt / gulp file watchers (TS)
- Both have full IDE support (colour highlighting, syntax etc)

Compiler demo

```
class Greeter{
     greeting: string;
     constructor(message: string){
          this.greeting = message;
     }

     greet(){
          return "Hello, " + this.greeting;
     }
}
```

Compiler options

https://www.typescriptlang.org/docs/handbook/compiler-options.html

Classes

- Defining a class is very similar to the 4GL

```
class <name> {
    public <item>: <datatype>
    public constructor
    public method ..
```

constructors

- JS does not have function overloading
- As a TS constructor is transpiled to a function, overloading is not possible
- Advanced workarounds

Constructor overload

```
export class ShoppingListItem implements IShoppingListItem {
  constructor(item: IShoppingListItem);
  constructor(name: string, amount: number);

  constructor(nameOrItem: string | IShoppingListItem, amount?: number) {
    if (typeof nameOrItem === "object") { }
      else
    if (typeof nameOrItem === "string" && typeof amount === "number") {  }
  }
}
```

Potential problems with such an approach

- Typescript can check constructor parameters
- Javascript cannot
  - Pass in {foo: “bar”} as a parameter, it will be accepted
- Code becomes ugly
  - Can lead to reactions like this

GIFSec.com

Destructors. This is simple.

- There is no such thing in typescript.

ONE DOES NOT SIMPLY
HAVE DESTRUCTORS

Properties

- Same as 4GL
  - Private
  - Public
  - Protected

```
class Person {
    private title: string;
    public firstName: string;
    protected name: string;
```

Properties: getters and setters

```
class Employee {
    private _fullName: string;

    get fullName(): string { return this._fullName; }

    set fullName(newName: string) {
        this._fullName = newName;
    }
}
```

Methods

- Same as 4GL
    - Private
    - Public
    - Protected

```
class Person {
    private move() {};
    public anotherMove() {};
    protected myLittlePony() {};
```

Statics

- Static properties
- Static methods
- Static classes can be created by throwing an error in the constructor
    - RUNTIME only though …

```
class MyClass {
          constructor() { throw new Error("Cannot new class"); }
          static myProp = "Hello";
          static doSomething() { return "World"; }
}
```

Inheritance

- Classes can extend other classes (inherit)
- Exactly the same as 4GL
- Multiple levels
    - More than 3 is bad,no matter what language you use ;)

```
class Animal {
    name: string;
    constructor(theName: string) { this.name = theName; }
    move(dist:number = 0) {console.log(`moved ${dist}m`);
    }
}

class Snake extends Animal {
    constructor(name: string) { super(name); }
    move(dist = 5) { super.move(distance);}
}

class Horse extends Animal {
    constructor(name: string) { super(name); }
    move(dist = 45) { super.move(dist); }
}
```

Interfaces

- Specifies a set of method prototypes and properties
- No default implementation methods or properties
- Allows you to build different classes that conform to an API
- Each class that uses an Interface must implement all methods and properties defined in the interface
- Convention is that interface files start with an I

```
interface IClockInterface {
    currentTime: Date;
    setTime(d: Date);
}

class Clock implements IClockInterface {
    currentTime: Date;
    setTime(d: Date) {
        this.currentTime = d;
    }
    constructor(h: number, m: number) { }
}
```

Polymorhism

- More complicated in TypeScript
- Create overload methods using similar techniques to constructors
- Override a method possible by not calling super()
  - See samples/Inheritance.ts

Abstracts

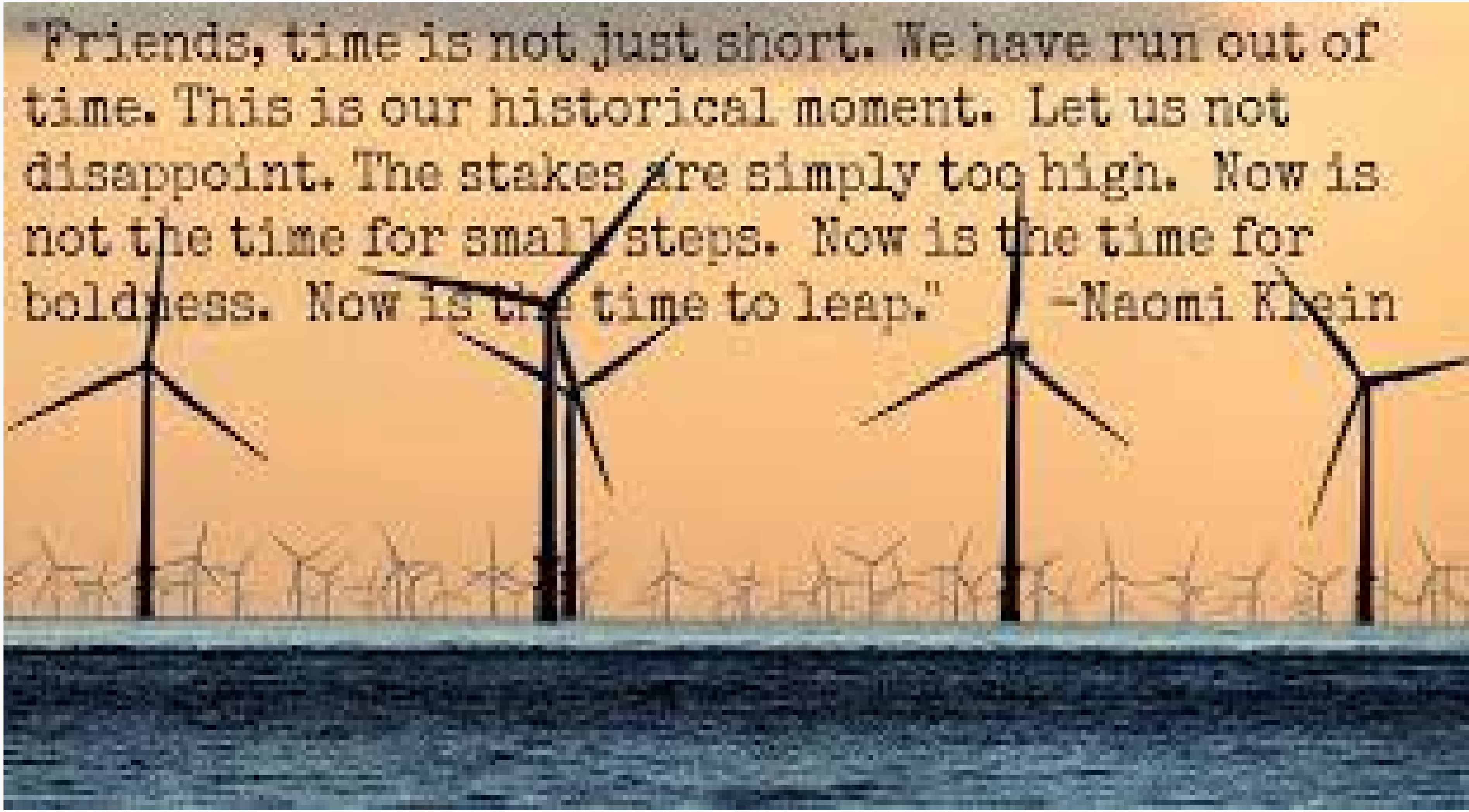
- See, I told you we’d get here
- Very similar to 4GL
- Abstracts are classes than cannot be instantiated by themselves
- Need to inherit an abstract class
- All appropriate properties and methods are available to sub-class

```
abstract class Animal {

    abstract makeSound(): void;

    move(): void {
        console.log("roaming the earth...");
    }
}
```

Events: again, this is simple

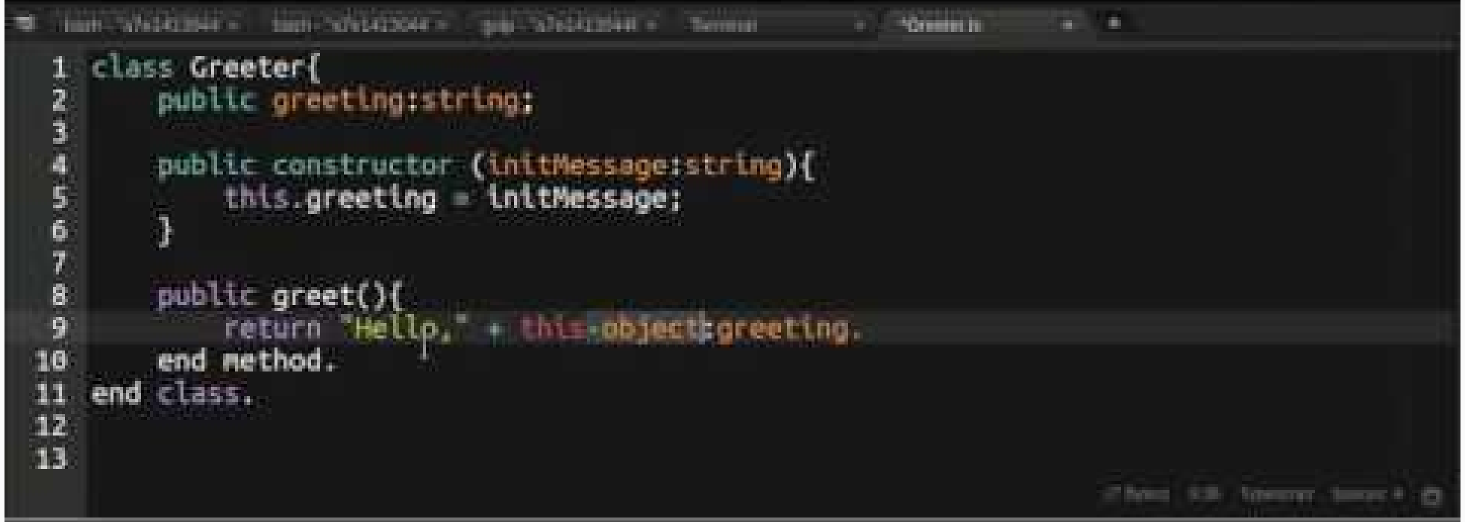
- There are no class events
- You can use standard event emitters
- Pub / sub
- Etc

ONE DOES NOT SIMPLY
HAVE CLASS EVENTS



"Friends, time is not just short. We have run out of time. This is our historical moment. Let us not disappoint. The stakes are simply too high. Now is not the time for small steps. Now is the time for boldness. Now is the time to leap." -Naomi Klein

Converting classes : Greeter.cls



```
class Greeter{
    public greeting:string;

    public constructor (initMessage:string){
        this.greeting = initMessage;
    }

    public greet(){
        return "Hello," + this.object.greeting.
    end method.
end class.
```