ES6 & TypeScript

By
Anand Kulkarni

Promises

- Promises provide a standard implementation of handling asynchronous programming in JavaScript without using callbacks.
- A promise represents a value that we can handle at some point in the future.
- A promise contract is immutable.

Working with Promises

```
var p2 = Promise.resolve("foo");
p2.then((res) => console.log(res));  //Output: foo

var p = new Promise(function(resolve, reject) {
setTimeout(() => resolve(4), 2000);
});

p.then((res) => {
res += 2;
console.log(res);
}); //Output: 6

p.then((res) => console.log(res)); //Output: 4
```

Promises are immutable.

Rejecting a Promise

Any promise throwing an error is considered as rejecting a promise.

```
var p = new Promise(function(resolve, reject) {
        setTimeout(() => reject("Timed out!"), 2000);
});

p.then((res) => console.log(res),
(err) => console.log(err)); //Output: Timed out!
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```

Promise.catch() method:

```
var p = new Promise(function(resolve, reject) {
setTimeout(() => {throw new Error("Error encountered!");}, 2000); });
p.then((res) => console.log("Response:", res))
.catch((err) => console.log("Error:", err));//Throwing an Error is the same as calling reject().
```

Promise.all

The Promise.all() method returns a single Promise that resolves when all of the promises in the iterable argument have resolved, or rejects.

```
var p = new Promise(function(resolve, reject) {
    resolve("bar");
});
var p2 = new Promise(function(resolve, reject) {
    setTimeout(() => resolve("foo"), 2000);
});
Promise.all([p, p2]).then(function (promises) {
        promises.forEach(function (text) { console.log(text); }); //Output: bar
foo after 2 secs.
});
```

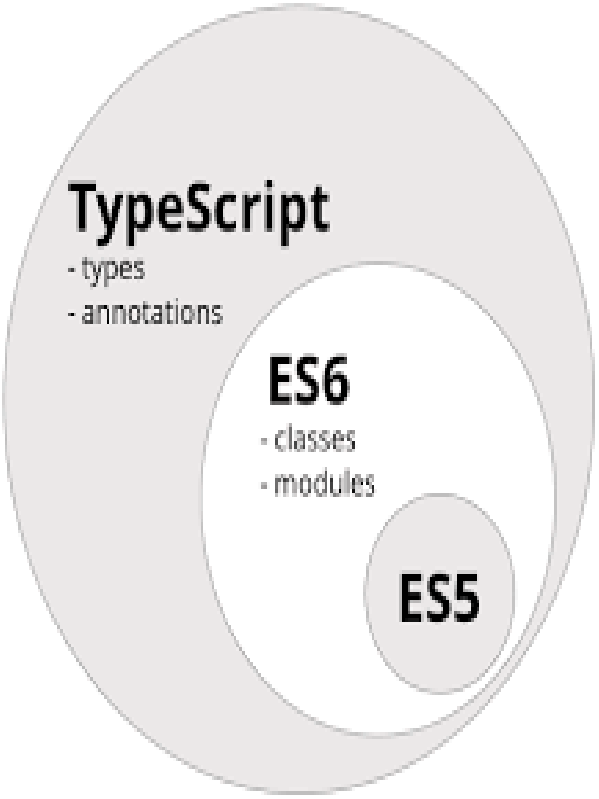
Promise.race

Sometimes we don't want to wait until all of the promises have completed; rather, we want to get the results of the first promise to fulfill.

```
function delay(ms) {
    return new Promise((resolve, reject) => {
    setTimeout(resolve, ms);
}); }
Promise.race([ delay(3000).then(() => "I finished second."),
delay(2000).then(() => "I finished first.") ])
.then(function(txt) {
        console.log(txt);
})
.catch(function(err) {      console.log("error:", err); });
//Output: I finished first.
```

TypeScript

- TypeScript is a free and open-source programming language developed and maintained by Microsoft.
- It is a superset of JavaScript, and adds optional static typing and class-based object-oriented programming to the language.
- The major feature supported in TypeScript which is not available in ES6 is ‘types’ & ‘annotations’.
- You can try TypeScript code online at https://www.typescriptlang.org/play/



Writing TypeScript App

- Create a new directory, for example ‘typescript_demo’.
- Change directory: cd typescript_demo
- Install typescript using npm: npm install –g typescript
- Write a .ts file, may be greeter.ts.
- Compile greeter.ts using tsc compiler: tsc greeter.ts
- Now write index.html & include greeter.js file into it.
- Finally open index.html inside browser.

Built-in Types in TypeScript

1) Boolean
2) Number
3) String
4) Array
5) Tuple
6) Enum
7) Any
8) Void
9) Null
10) Undefined

Using Built-in data types

TypeScript supports variables having specific type. Thus, when you create a variable you may not only say ‘var’ or ‘let’ but you can specify its type like integer, string etc.

```
let isDone: boolean = false;

let decimal: number = 6;

let color: string = "blue";

let x: [string, number];  //tuple

x = ["hello", 10]; // OK

enum Color {Red, Green, Blue};

let c: Color = Color.Green;
```

Using Built-in data types

Any:

```
let notSure: any = 4;

notSure = "maybe a string instead";

notSure = false; // okay, definitely a Boolean
```

Void:

```
function warnUser(): void { alert("This is my warning message"); }
```

Null and Undefined:

```
let u: undefined = undefined;

let n: null = null;
```

Classes in TypeScript continue..

- TypeScript class contains fields, constructors & methods.
- You can have inheritance among classes using ‘extends’ keyword.
- However, TypeScript does not support multiple inheritance.

Classes in TypeScript

TypeScript class is similar to ES6 class, except we can specify the type of the fields the class is going to have.

```
class Car {
        engine:string; //field
        constructor(engine:string) {
                this.engine = engine
        }
        disp():void {
                console.log("Function displays Engine is  :   "+this.engine)
        }
}
```

Interfaces

An interface is a syntactical contract that an entity should conform to.

```
interface IPrintable {
    max_elements: number;
    print: ()=>void
}

let circle: IPrintable = {
    max_elements: 100,
    print:()=>console.log("Circle printed ", circle.max_elements)
}
circle.print();
console.log("max elements = ", circle.max_elements);
```

Arrays with Interfaces

Interface can define both the kind of key an array uses and the type of entry it contains. Index can be of type string or type number.

```
interface namelist {    [index:number]:string  }
var list2:namelist = ["John",1,"Bran"] //Error. 1 is not type string

interface ages {    [index:string]:number  }
var agelist:ages;
agelist["John"] = 15   // Ok
agelist[2] = "nine"   // Error
```

Multiple inheritance with Interfaces

```
interface IParent1 {
  v1:number
}
interface IParent2 {
  v2:number
}
interface Child extends IParent1, IParent2 { }
var Iobj:Child = { v1:12, v2:23}
console.log("value 1: "+this.v1+" value 2: "+this.v2); //Output: value 1: 12
value 2: 23
```

Generics

Generics help us to create reusable components. It means, a component with generics are capable of working over variety of types rather than a single one.

Suppose there is a function that returns the same value as its argument:

```
function echo(arg: number): number {    return arg;          }
```

The ‘echo’ function will work only for number as input. If we want to use it for other types like string, array, boolean etc. then we should write argument type as ‘Any’.

```
function echo(arg: any): any {    return arg;          }
```

However, function with ‘any’ will not really make it generic because we actually are losing the information about what that type was when the function returns.

Generics continue…

Let us write the ‘echo()’ function with generics support:

```
function echo<T>(arg: T): T {
    return arg;
}
let output = echo<string>("myString"); // type of output will be 'string‘.
```

Thank you!!