Programación de aplicaciones interactivas

Introduction to TypeScript

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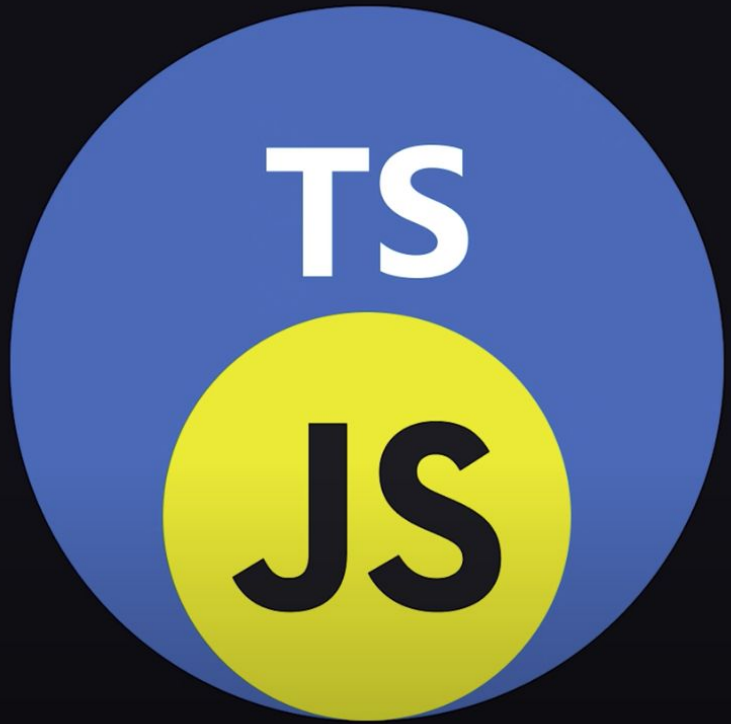
What is TypeScript?

- High-level programming language
- JavaScript superset
- Compiled to interpreted language
- Strongly typed language

What is TypeScript?

- TypeScript is a superset of JavaScript

- Everything in TS is JS
- Not everything in JS is TS



What is TypeScript?

- TypeScript can’t be interpreted
- Can be compiled into JS
- Only then can it be interpreted

What is TypeScript?

- Strongly typed language
- Safer
- Less prone to errors

Setting up TypeScript

What you need:

1- Node.js

2- **Type**Script compiler

3- Code editor

Setting up TypeScript

Installing Curl:

```
$ sudo apt-get install curl
```

Installing Node.js and Npm:

```
$ curl -sL https://deb.nodesource.com/setup_18.x | sudo -E bash -
$ sudo apt-get install -y nodejs
```

Setting up TypeScript

Two types of **Type**Script compilers

TypeScript
Compiler

Setting up TypeScript

TypeScript compiler:

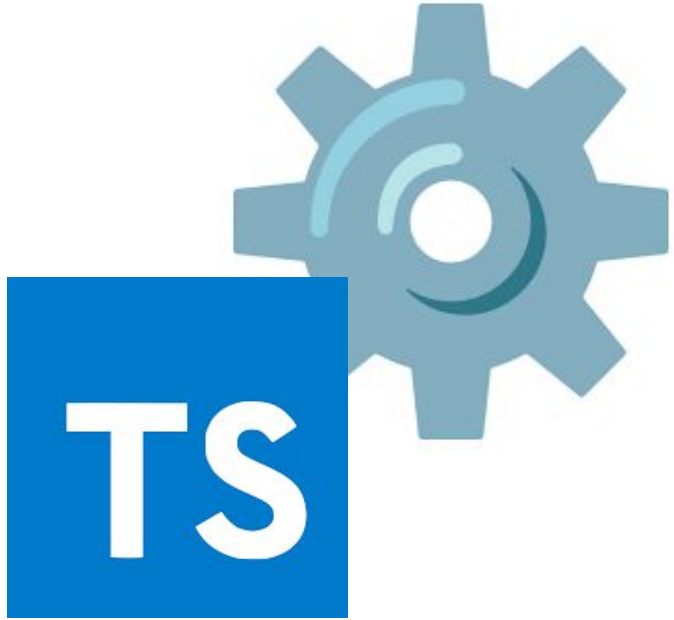
- Compiles TS code into JS code
- Can be then interpreted with Node.js


```
npm install -g typescript
```

Setting up TypeScript

Setting up a **Type**Script compiled project:

```
npx tsc --init (tsconfig.json)
npx tsc
```



TSconfig.json:

- Is the configuration file for the compiler.
- Sets all the options before compiling (npx tsc)

- Example basic tsconfig.json:

```jsonc
{
  "compilerOptions": {
    "module": "commonjs",
    "target": "es6",
    "noImplicitAny": true,
    "moduleResolution": "node",
    "sourceMap": true,
    "outDir": "dist",
    "baseUrl": ".",
    "paths": {
      "*": [
        "node_modules/*"
      ]
    }
  },
  "include": [
    "src/**/*"
  ]
}
```

EsLint para TypeScript:

- EsLint support typescript code.
- For setting in the project:

```
npm install --save-deveslint @typescript-eslint/parser @typescript-eslint/eslint-plugin
npx eslint --init
```

- Generates **.eslint.json**
- Add to **package. json:**

```
"lint": "eslint . --ext .ts"
```

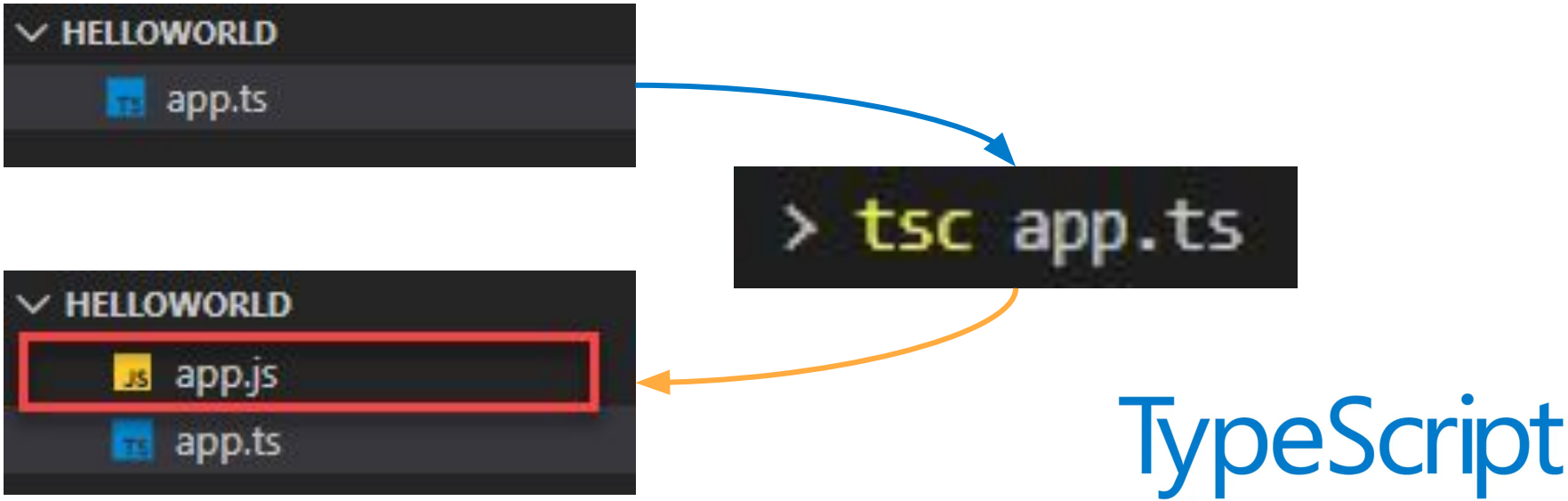
- Execute the Linter:

```
npm run lint
```

```
{
    "env": {
        "browser": true,
        "commonjs": true,
        "es2021": true
    },
    "overrides": [
    ],
    "parser": "@typescript-eslint/parser",
    "plugins": [
        "@typescript-eslint"
    ],
    "extends": [
        "eslint:recommended",
        "plugin:@typescript-eslint/eslint-recommended",
        "plugin:@typescript-eslint/recommended"
    ],
    "rules": {
        "no-console": 2        You, hace 1 segundo • Uncom
    }
}
```

Setting up TypeScript

Using the **Type**Script compiler:



Setting up TypeScript

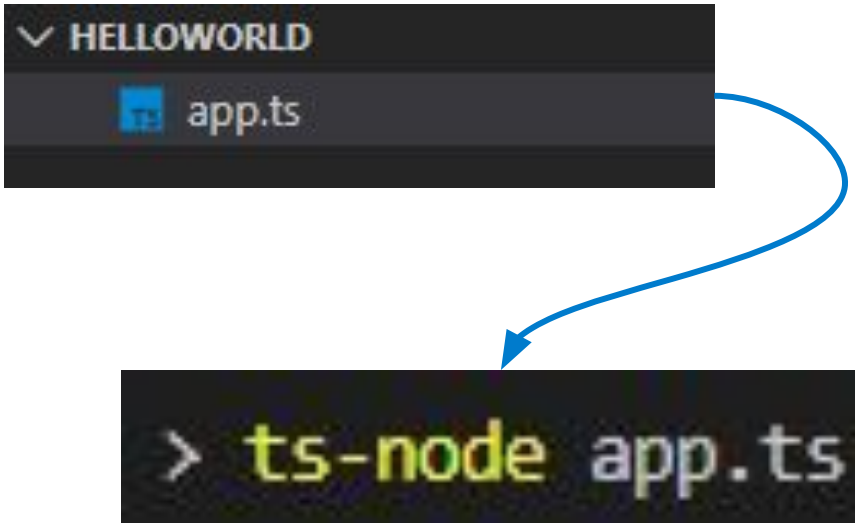
TypeScript node:

- Recommended option
- Doesn't need compiling
- Can interpret **Type**Script directly

```
npm install -g ts-node
```

Setting up TypeScript

Using **Type**Script node:



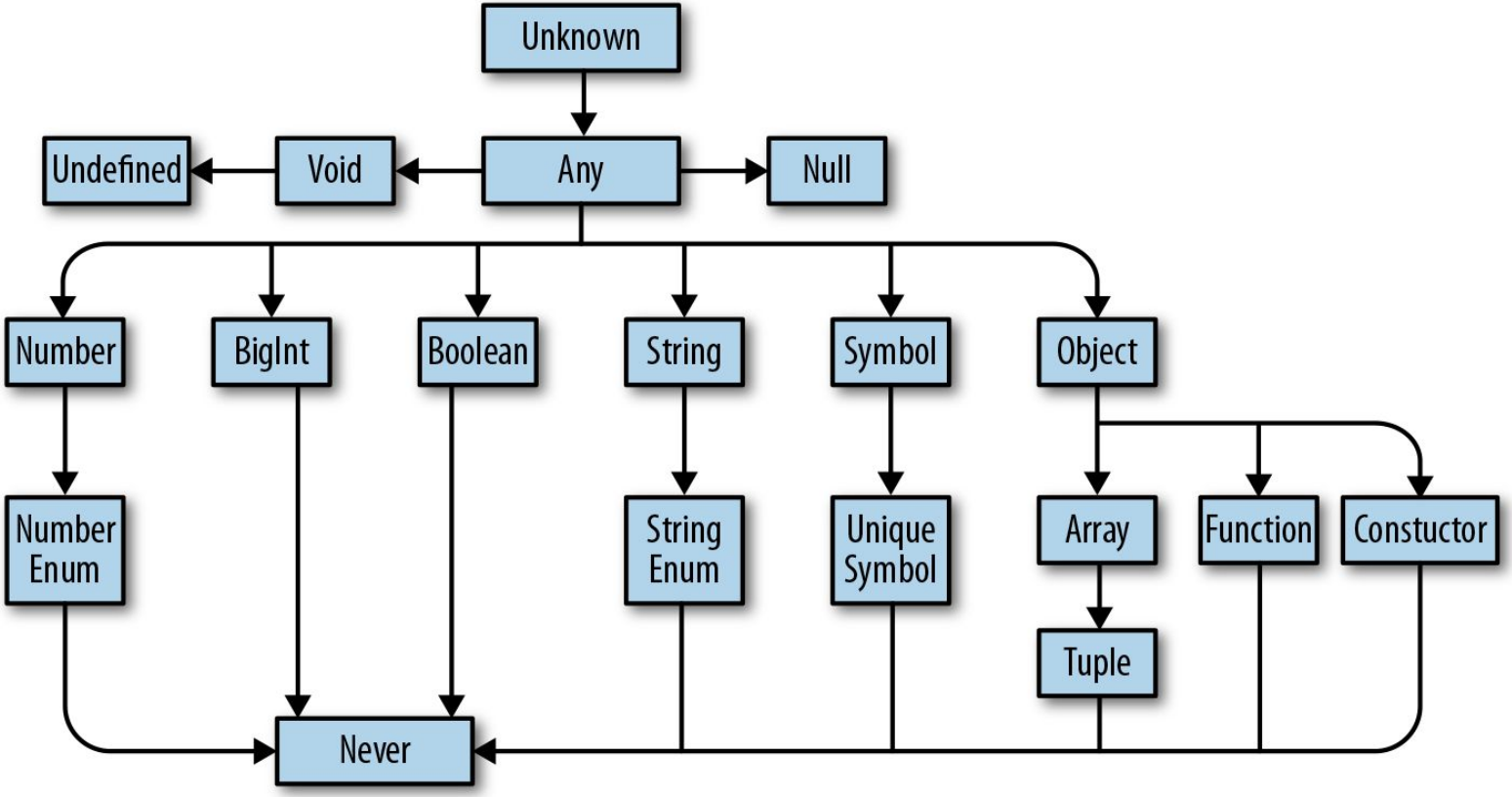
Hello World example:

Declaring types:

```
let variable: string = "hello";
let anotherVariable: number = 5;
let arrayVariable: number[] = [1, 2, 7];
```

```
let variable: number | string
variable = 10; // Fine
variable = "Hello" // Also fine
variable = false; // Nope
```

Types in TypeScript:



Number:

```
let decimal: number = 6;
let floatingPoint: number = 1.19982
let hex: number = 0xf00d;
let binary: number = 0b1010;
let octal: number = 0o744;
```

- Floating point

- Base 2, 8, 10...

BigInt:

```
let big: bigint = 100n;
```

- Bigger than number

Boolean:

```
let trueBoolean: boolean = true;
let falseBoolean: boolean = false;
```

- Either true or false

String:

```
let age: number = 15;

let color: string = "blue";
let sentence: string = `Hello, I'm ${age} years old and my favourite color is ${color}`
```

Array:

```
let listA: number[] = [1, 2, 3];

let listB: Array<number> = [1, 2, 3];
```

- Values have to be the same type

Tuple:

```
let tuple: [number, string, boolean] = [10, "hello", true];
```

- Can have different types

- Types need to be declared

Unknown:

```
1   let notSure: unknown = 4;
2   notSure = "maybe a string instead";
3
4   // OK, definitely a boolean
5   notSure = false;
```

- Can be anything

- Can change at any moment

Any:

```ts
let anyVariable: any = 4;
// OK, someProperty might exist at runtime
anyVariable.someProperty();
// OK, toFixed exists (but the compiler doesn't check)
anyVariable.toFixed();

let unknownVariable: unknown = 4;
unknownVariable.toFixed();
```

```
let unknownVariable: unknown

'unknownVariable' is of type 'unknown'
```

- Same as unknown

- But allows you to check for properties

Void:

```
function voidFunction(): void {
  console.log("This function returns nothing");
}
```

- Nothing

- Used for variables without value like function returns

Null and Undefined:

```
// Not much else we can assign to these variables!
let u: undefined = undefined;
let n: null = null;
```

- Null and Undefined have their own type

Never:

```ts
// Function returning never must not have a reachable end point
function error(message: string): never {
  throw new Error(message);
}

// Inferred return type is never
function fail() {
  return error("Something failed");
}

// Function returning never must not have a reachable end point
function infiniteLoop(): never {
  while (true) {}
}
```

- Represents values that never happen

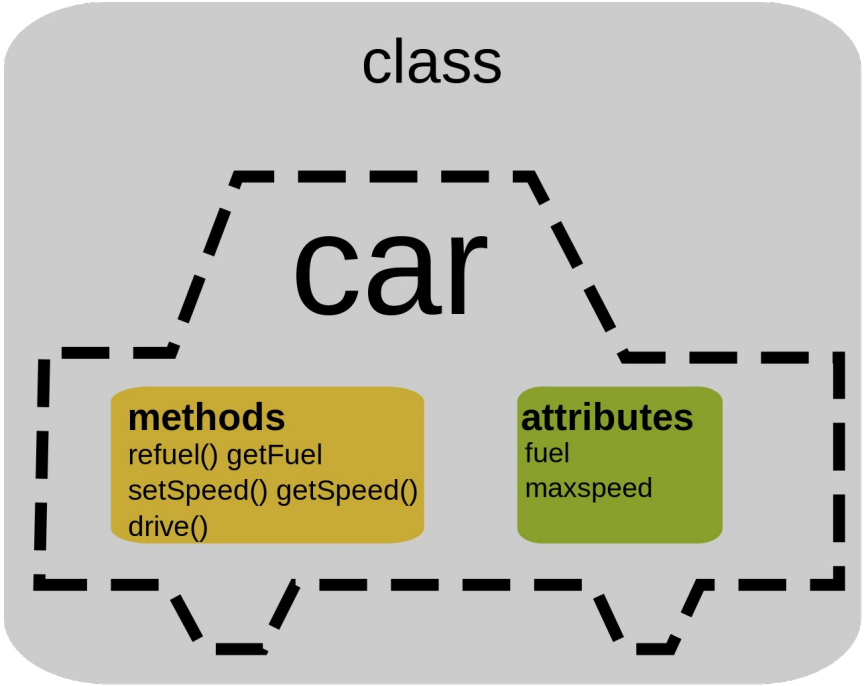
Optional/Default parameters:

Functions in TS can have optional and default parameters

```ts
function optionalParameterFunction(neededParameter: number, optionalParameter?: number): void {
    // some code
    return;
}

function defaultParameterFunction(neededParameter: string, defaultParameter: number = 10): void {
    return;
}
```

Classes:

- TS lets you create fully fledged classes
- You can specify types
- You can define attributes and methods.
- There’s class inheritance.
- You can define abstract classes & methods.



Classes:

```
class Person {
    private firstName: string;
    private readonly lastName: string;
    private age: number;

    constructor(firstName: string, lastName: string, age: number) {
        this.firstName = firstName;
        this.lastName = lastName;
        this.age = age;
    }

    public getFullName(): string {
        return `${this.firstName} ${this.lastName}`;
    }

    public changeLastName(lastName: string): void {

        this.lastName = lastName;  // This will give an error
        return;
    }

    protected getAge(): number {
        return this.age;
    }
}

const person = new Person("Pedro", "Piqueras", 67);
console.log(person.getFullName());
```

Example of a class:

Classes: Static Method

- The static members are accessed using the class name
- Don’t need to instantiate an object to use it.

```
class Circle {
    static pi: number = 3.14;
    static calculateArea(radius:number) {
        return this.pi * radius * radius;
    }
}
Circle.pi; // returns 3.14
Circle.calculateArea(5); // returns 78.5
```

Classes: Inheritance

Example of inheritance:

```
class Employee extends Person {
    private jobTitle: string;

    constructor(firstName: string, lastName: string, age: number, jobTitle: string) {

        // Calls the constructor of the Person class:
        super(firstName, lastName, age);
        this.jobTitle = jobTitle;
    }

    describe(): string {
        return `I'm a ${this.jobTitle}, my name is ${super.getFullName()} and I'm ${super.getAge()}`;
    }
}
```

Classes: Overrides

Method overriding:

```
class Employee extends Person {
    private jobTitle: string;

    constructor(firstName: string, lastName: string, age: number, jobTitle: string) {

        // Calls the constructor of the Person class:
        super(firstName, lastName, age);
        this.jobTitle = jobTitle;
    }

    public changeLastName(lastName: string): void {
        console.log("I'm sorry but changing the last name of an employee is not allowed");
        return;
    }
```

Classes: Abstracts

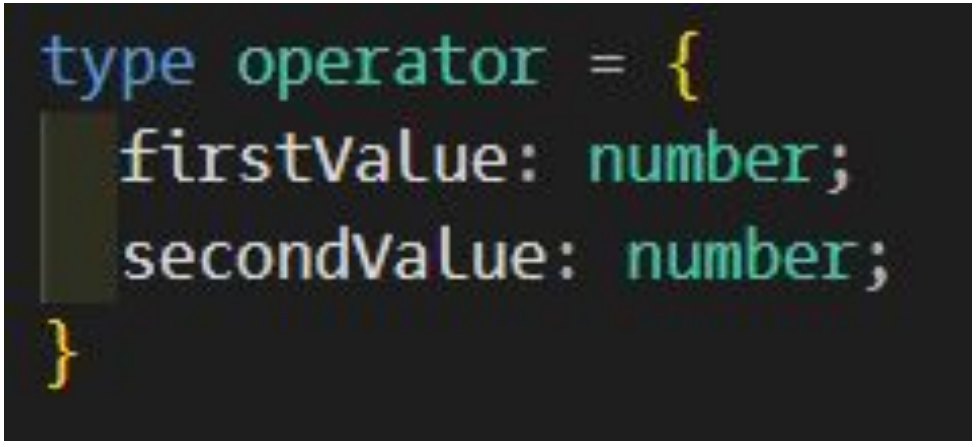
```
abstract class Vehicle {
    protected kilometers: number;
    private brand: string;
    private model: string;

    constructor(kilometers: number, brand: string, model: string) {
    }

    abstract getQuality(): number;

    get carInfo(): string {
        return `${this.brand} ${this.model}, ${this.kilometers}km`;
    }
}

let myCar = new Vehicle(87000, 'Volkswagen','Tiguan');  // You can't create instances of abstract classes
```

Abstract classes:

```
class Car extends Vehicle {

    constructor(kilometers: number, brand: string, model: string) {
        super(kilometers, brand, model)
    }

    getQuality(): number {
        return this.kilometers * 0.1;
    }
}

let volksCar = new Car(87000, 'Volkswagen','Tiguan');
```

Data Structuring (Types):

- Create your aliases for complex types.
- Reuse them in all your code.
- Better for clean code.
- restricts the object type.



Data Structuring(Interface)

- Create your aliases for complex types.
- Reuse them in all your code.
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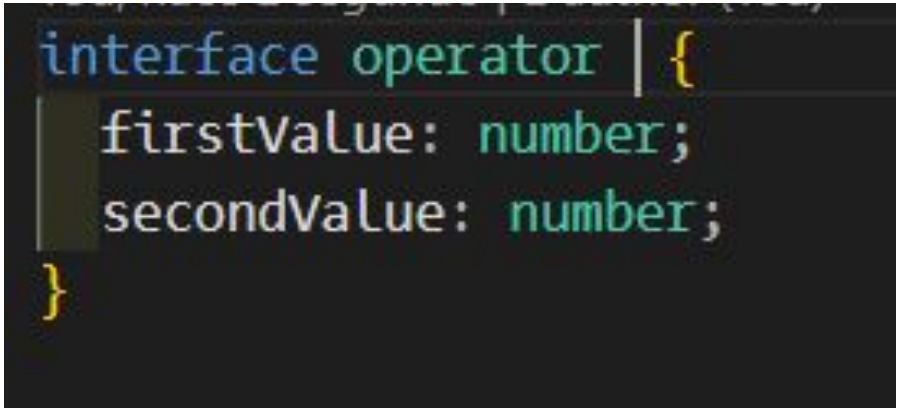

Data Structuring(Interface/types)

```ts
interface operator {
  firstValue: number;
  secondValue: number;
}
```

===

```ts
type operator = {
  firstValue: number;
  secondValue: number;
}
```

Data Structuring(Interface/types)

```ts
interface operator {
  firstValue: number;
  secondValue: number;
}
```

```ts
type operator = {
  firstValue: number;
  secondValue: number;
}
```

Data Structuring(Interface)

- Interfaces can **Extend** the Data structure in any moment, type is a strict data structure.

```
interface Door {
  width: number;
  height: number;
}

interface Door {
  material: string;
}

let windowOne :Door = { width: 12, height: 12 , material: "acero"};

console.log(windowOne);
```

Generics (Templates):

- They don’t exist in JavaScript
- They are a “template” for code.
- They serve to optimize the code, avoiding duplicates in functions.
- Safer than using an ‘any’ parameter for the function

Generics (for functions):

Example:

```
function getRandomElement<type>(items: type[]): type {
    let randomIndex = Math.floor(Math.random() * items.length);
    return items[randomIndex];
}

let array: number[] = [3, 5, 6, 8]
let result = getRandomElement<number>(array);
console.log(result);
```

Generics (for interfaces):

Example:

```
//Generic Interface
...
interface GenericInterface<T, U> {
    key: T;
    value: U;
}

let kv1: GenericInterface<number, string> = { key:1, value:"P" };
let kv2: GenericInterface<number, number> = { key:1, value:12345 };
```

Generics (for classes):

Example:

```
class GenericClass<T,U> {
  valOne: T;
  valTwo: U;

  constructor(valOne: T, valTwo: U) {
    this.valOne = valOne;
    this.valTwo = valTwo;
  }
}

const objectOne =  new GenericClass<number,number>(1,1);
const objectTwo = new GenericClass(2,"pepe");
```