Introduction to TypeScript

SoftUni Team

Technical Trainers

Software University

https://softuni.bg

Have a Question?

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#TypeScript

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Introduction to TypeScript

What is TypeScript?

- TypeScript is an **open-source** programming language developed by Microsoft
- It is a **statically typed** superset of JavaScript that transpires to plain JavaScript
- TypeScript adds optional **static typing**, making it more robust and maintainable

Why Use TypeScript?

- Static Typing: Helps catch errors during development, improving **code quality** and **reliability**
- Better Tooling: Enhanced code editor support with **intelligent auto-completion**, navigation, and refactoring

Why Use TypeScript?

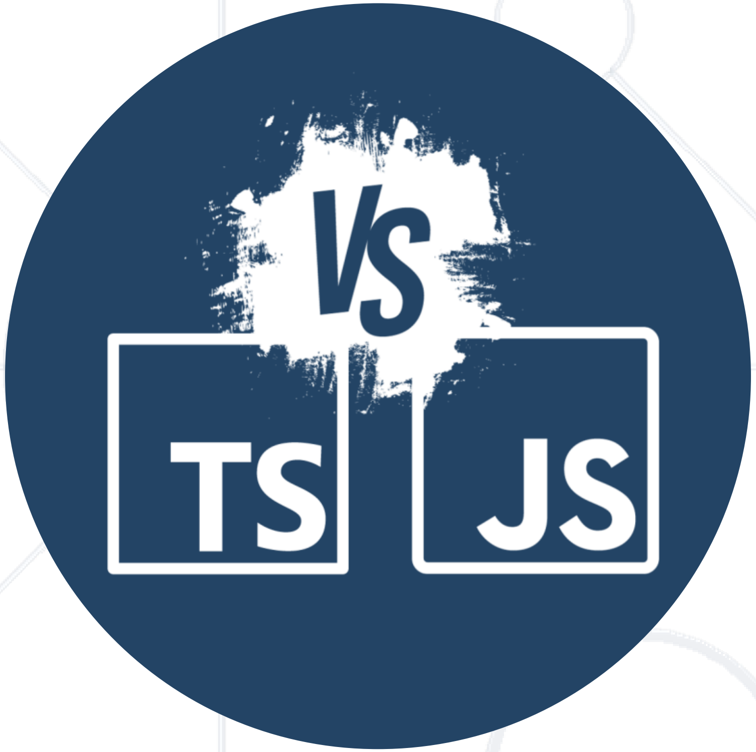
- **Readability and Maintainability**: Type annotations provide **self-documentation**, making code easier to understand and maintain
- **Scalability**: Suitable for **large-scale applications** with a strong type system

Key Features of TypeScript

- Static Typing: Types are **inferred** or **explicitly** declared, catching type-related errors during development
- Interfaces: Define contracts for **object shapes**, **enhancing code** readability and maintainability
- Classes: Follow **object-oriented principles** with support for constructors, properties, and methods

Key Features of TypeScript

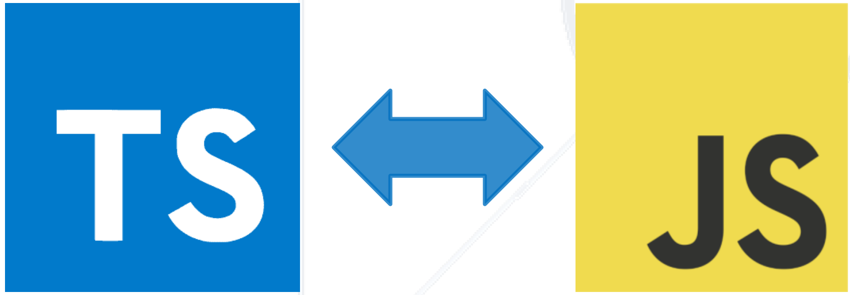
- **Enums**: Define a set of **named constants** for improved code readability
- **Generics**: Write **flexible** and **reusable** code components
- **Modules**: Organize code into **logical** and **reusable** units for better maintainability



TypeScript vs JavaScript

TypeScript vs JavaScript

- JavaScript: A **dynamic, loosely** typed language widely used for **web development**
- TypeScript: A **statically typed** superset of JavaScript that provides additional **features** and **tools** for better development experience



TypeScript vs JavaScript

- TypeScript

```
class Person {
  private firstName: string;
  constructor(fName: string) {
    this.firstName = fName;
  }
  greeting() {
    return `${this.firstName}`
  }
}
```

- JavaScript

```
"use strict";
class Person {
  constructor(fName) {
    this.firstName = fName;
  }
  greeting() {
    return  `${this.firstName}`;
  }
}
```

Environment and Setup

Install Visual Studio Code

- In this course we will use and demonstrate on:
  - Visual Studio Code
  - Installation Guidelines
- Alternatives:
  - WebStorm
  - JS Fiddle

Install TypeScript to Visual Studio Code

- Install **TypeScript** with **npm**

```
npm install -g typescript (latest stable build)
```

- Test if **TypeScript** is **installed properly**

```
tsc --version //Should return a message 'Version 5.x.x'.
```

- Create the **tsconfig.json** file

```
tsc --init – This command will create a new tsconfig.json file
```

Configuration of "tsconfig.json"

- In the tsconfig.json file, please **remove the comments** from the following:

```
{
  "compilerOptions" : {
       "target": "esnext",   // ECMAScript target version
      "module": "esnext",   // module code generation
      "sourceMap": true,    // Generates corresponding .map file
      "strict": true,       // strict type-checking options
      "outDir": "out",      // redirect output to the directory.
    }
}
```

Transpilation vs Compilation

- Transpilation
  - Source code is **translated** to a similar-level language.
  - Output is in a **similar abstraction** level
  - **Example:** TypeScript to JavaScript
- Compilation
  - Source code is translated to a **lower-level language**
  - Output is in a form suitable for **direct execution** by the machine

Basic Data Types

Basic Data Types

- **String** - used to represent **textual** data

```
let str: string = 'hello';
str = 'singleQuotes' ; // valid
str = "doubleQuotes" ; // valid
str = 11; // invalid
```

- **Number** - used to represent **numeric** data

```
let decimal: number = 11; // valid
let hex: number = 7E3; // valid
let binary: number = 11111100011 // valid
let float: number = 3.14 // valid
decimal = 'hello'; // invalid
```

Basic Data Types

- **Boolean** - only **true** and **false** values
  - Functions or expressions that return **true** or **false** values may also be assigned to **Boolean** data type

```
let isBool: boolean = true;
isBool = 5 < 2; // valid
let numbers = [1, 2, 3, 4];
isBool = numbers.includes(100) // valid
isBool = 11; // invalid
```

Basic Data Types

- **Symbol** - used to represent **unique** data

```
let uniqueSymbol: symbol = Symbol('mySymbol');
let anotherSymbol: symbol = Symbol('mySymbol');
console.log(uniqueSymbol === anotherSymbol); // false
```

- **null and undefined** - special types used to represent absence of a value in variables and functions

```
let undefinedValue1; // undefined
let undefinedValue2: undefined = undefined;
let person: null = null
```

Basic Data Types

- **Array** - use any valid data type (String, Boolean, Number) and postfix []

```
let arrayOfStr: string[];
arrayOfStr.push('Hello'); // valid
arrayOfStr.push('World'); // valid
arrayOfStr.push(11); // invalid
```

- **Tuple** - array with fixed number of elements whose types are known

```
let tuple:[string, number];
tuple = ['Hello', 11]; // valid
tuple = [11, 'Hello']; // invalid
```

Basic Data Types

- **Enum** - gives sets of numeric values more readable names
  - By default each enum starts at 0

```
enum DaysOfTheWeek {
    Monday,  // 0
    Tuesday, // 1
    …
};
let day: DaysOfTheWeek;
day = DaysOfTheWeek.Monday;
console.log(day); // 0
if (day === DaysOfTheWeek.Monday) {
    console.log('I hope you all had a great weekend!');
} // It will print the message
```

Basic Data Types

- **Any** and **Unknown** - takes any and all values. It's a way to escape the strong types. Unknown is safer

```
let a: any = 'hello'; // let a: unknown = 'hello';
a = true; // valid
a = 11 ; // valid
```

- **Void** - mainly used in functions that return no value

```
function greet(message: string): void {
    console.log(message);
}
```

Optional Data Types

- The **optional** data types are marked with **?**
  - Required parameters **cannot** follow optional ones

```
function optionalParams(name: string, mail?: string) {
     // some logic
} // valid

function optionalParams(name?: string, mail: string) {
     // some logic
} // invalid
```

Return Data Types

- The **return data types** are marked with **:** after the braces in function declaration
  - The **return value type** should match the **return type**

```
function greet (name: string): string {
    return name;
}

console.log(greet('Hello'));
```

Debugging

Debugging in VS Code

- Utilizing VS Code's powerful **integrated debugger** to find and fix issues in your TypeScript code
- Setting **breakpoints**, inspecting **variables**, and stepping through code

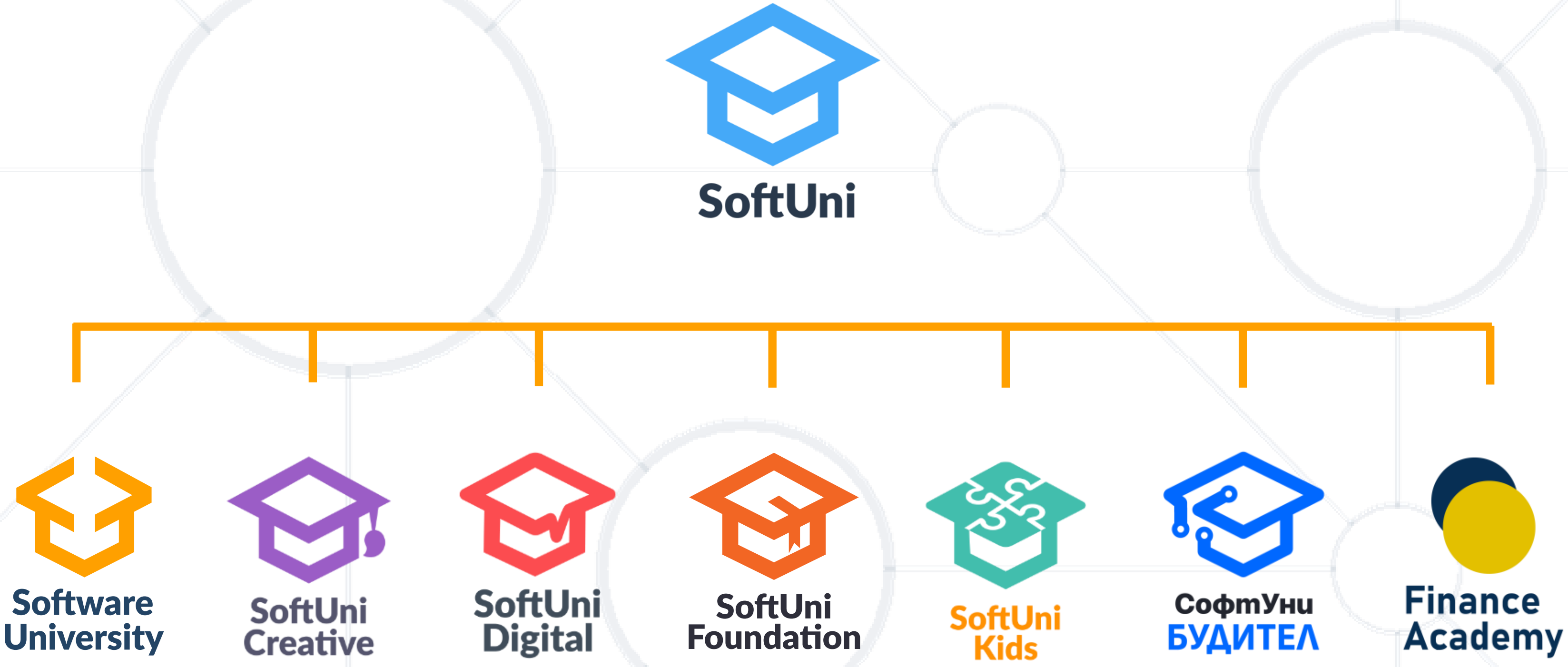
Debugging in VS Code

- Initialize a **TypeScript Project**:
  - Create a **tsconfig.json** file to configure TypeScript settings for the project
- **Launch Configurations**:
  - Configure a **launch.json** file to define how VS Code launches the debugging process
  - Set up configurations for **different scenarios**

Summary

- TypeScript presents strong typing to your JavaScript code
  - let, const and var are used to declare variables
  - There are basic (Number, String, Boolean, etc.) and more advanced data types like union or intersection
- Functions can:
  - Take optional and required parameters and return result

Questions?



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