TypeScript

- TypeScript is an open-source, object-oriented language developed and maintained by Microsoft, licensed under Apache 2 license.
- It was introduced by Anders Hejlsberg - C# team.
- It is a typed superset of JavaScript that compiles to plain JavaScript.
- TypeScript extends JavaScript by adding data types, classes, and other object-oriented features with type-checking.
- TypeScript is not directly run on the browser. It needs a compiler to compile and generate in JavaScript file and which can be executed on any browser.

TypeScript Version History

Version	**Released Date**
TypeScript 0.8	October 2012
TypeScript 0.9	June 2013
TypeScript 1.0	October 2014
TypeScript 2.0	September 2016
TypeScript 3.0	July 2018
TypeScript 4.0	August 2020

How to use TypeScript?

- TypeScript code is written in a file with .ts extension and then compiled into JavaScript using the TypeScript compiler.
- A TypeScript file can be written in any code editor.
- A TypeScript compiler needs to be installed on your platform.
- Once installed, the command *tsc <filename>.ts* compiles the TypeScript code into a plain JavaScript file.
- JavaScript files can then be included in the HTML and run on any browser.

TypeScript Features

1. **Cross-Platform -** TypeScript runs on any platform that JavaScript runs on. The TypeScript compiler can be installed on any Operating System such as Windows, macOS, and Linux.
2. **Object-Oriented Language -** TypeScript provides powerful features such as Classes, Interfaces, and Modules. You can write pure object-oriented code for client-side as well as server-side development.
3. **Static type-checking -** TypeScript uses static typing. This is done using type annotations. It helps type checking at compile time. Thus, you can find errors while typing the code without running your script each time. Additionally, using the type inference mechanism, if a variable is declared without a type, it will be inferred based on its value.
4. **Optional Static Typing** - TypeScript static typing is optional, if you prefer to use JavaScript's dynamic typing.

5. **DOM Manipulation** - Like JavaScript, TypeScript can be used to manipulate the DOM.
6. **ES 6 Features -** TypeScript includes most features of planned ECMAScript 2015 (ES 6, 7) such as class, interface, Arrow functions etc.

Advantage of TypeScript over JavaScript

1. TypeScript always highlights errors at compilation time during the time of development, whereas JavaScript points out errors at the runtime.
2. TypeScript supports strongly typed or static typing, whereas this is not in JavaScript.
3. TypeScript runs on any browser or JavaScript engine.
4. Great tooling supports with IntelliSense, which provides active hints as the code is added.
5. It has a namespace concept by defining a module.

Disadvantage of TypeScript over JavaScript

1. TypeScript takes a long time to compile the code.
2. TypeScript does not support abstract classes.
3. If we run the TypeScript application in the browser, a compilation step is required to transform TypeScript into JavaScript.

TypeScript Installation -

Prerequisite to install TypeScript

- Text Editor or IDE
- Node.js Package Manager (npm)

There are two ways to install TypeScript

1. Install TypeScript as an NPM package on your local machine or in your project.
2. Install TypeScript as a plug-in in your IDE (Integrated Development Env).

Install TypeScript as an NPM

To install TypeScript, enter the following command in the Terminal Window

➔ *$ npm install -g typescript* //Install as a global module

➔ *$ npm install typescript --save-dev* //As dev dependency

To verify the installation is successful, enter the command

➔ *$ tsc -v*

Install TypeScript as plug-in in your IDE

➔ To install extensions from within Visual Studio visit the extension and download TypeScript plugin and restart VS code.

TypeScript First Program

```
console.log("Hello World");
```

```
console.log(12345);
```

Execute from command or git bash -

- Write above line of code in file
- save file as .ts extension
- Compile the TypeScript code. To compile the source code, open the command prompt, and then goes to the file directory location where we saved the above file and use tsc filename.ts it will create .js file
- then use *node filename.js* to run program

Execute from Browser -

TypeScript - Type Annotations

- TypeScript is a typed language, which includes all the primitive types of JavaScript- number, string and boolean.
- In TypeScript, we are going to specify the type of the variables, function parameters and object properties.
- We can specify the type using :Type after the name of the variable, parameter or property. There will be a space after the colon.

  Eg. The following example declares variables -

```
var age: number = 32;          // number variable
var name: string = "David";    // string variable
var status: boolean = true;    // Boolean variable
```

- In the above example, each variable is declared with their data type. These are type annotations.
- We cannot change the value using a different data type other than the declared data type of a variable.
- If we try to do so, TypeScript compiler will show an error. This helps in catching JavaScript errors.
- It is not mandatory in TypeScript to use type annotations. However, type annotations help the compiler in checking types and helps avoid errors dealing with data types.
- It is also a good way of writing code for easier readability and maintenance by future developers working on your code.

➔ Type annotation of parameters

```
function display(id:number, name:string)
{
    console.log("Id = " + id + ", Name = " + name);
}
```

➔ Object with inline annotations

```
var employee : {
    id: number;
    name: string;
};
employee = {
  id: 100,
  name : "John"
}
```