**Typescript**

Typescript is a superset of JavaScript that adds static typing, classes, interfaces and others features to help developers write more robust and maintainable code.

It is designed to develop large-scale applications and transcompile to JavaScript.

The main goal of typescript is to improve development experience by catching errors early through type checking and providing a better tooling environment.

It is object oriented and tightly typed programming language. Typescript code transformed to javascript , which may be used in any environment that supports JavaScript, including browsers, nodejs.

Anders Hejlsberg of MICROSOFT created TypeScript. TypeScript was created in response to the limitations of JavaScript for constructing large-scale applications within Microsoft and among its external customers. There was a demand for bespoke tooling to make developing JavaScript components easier due to the complexity of working with complicated JavaScript code.

Compilation vs Interpretation

Javascript

* Interpreted language

Javascript is traditionally considered interpreted language, meaning it is executed line-by-line by the javascript engine in the browser / nodejs runtime without a separate compilation step.

* JIT compilation

Modern javascript engines use Just-In-tim compilation to optimize performance, converting javascript to machine code at runtime

Typescript

* Compiled language

Typescript is a compiled language. It is not executed directly but needs to be converted / transpiled into javascript first.

* Transpilation

The typescript compiler `tsc` compiles typescript code into javascript code. This compiled javascript code can then be executed by any javascript engine.

Steps of compilation

* Parsing

The typescript compiler reads the ‘.ts’ file and parses it into a abstract syntax tree, which represents the structure of the code.

* Type checking

The compiler checks the AST against typescript type system to ensure there are no type errors.

* Transformation

The AST is transformed into a javascript AST, which involves removing TypeScript-specific syntax like type annotation, interfaces.

* Code generation

The javascript AST is then converted into JavaScript code.

* Emit JavaScript

The final JavaScript code is written to ‘.js’ files. If source map are enabled ‘.map’ files are also generated.