Introduction to: TypeScript

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Who created TypeScript?

Anders
Hejlsberg

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What is TypeScript?

“ TypeScript is a
typed superset of JavaScript
that compiles to plain JavaScript. ”

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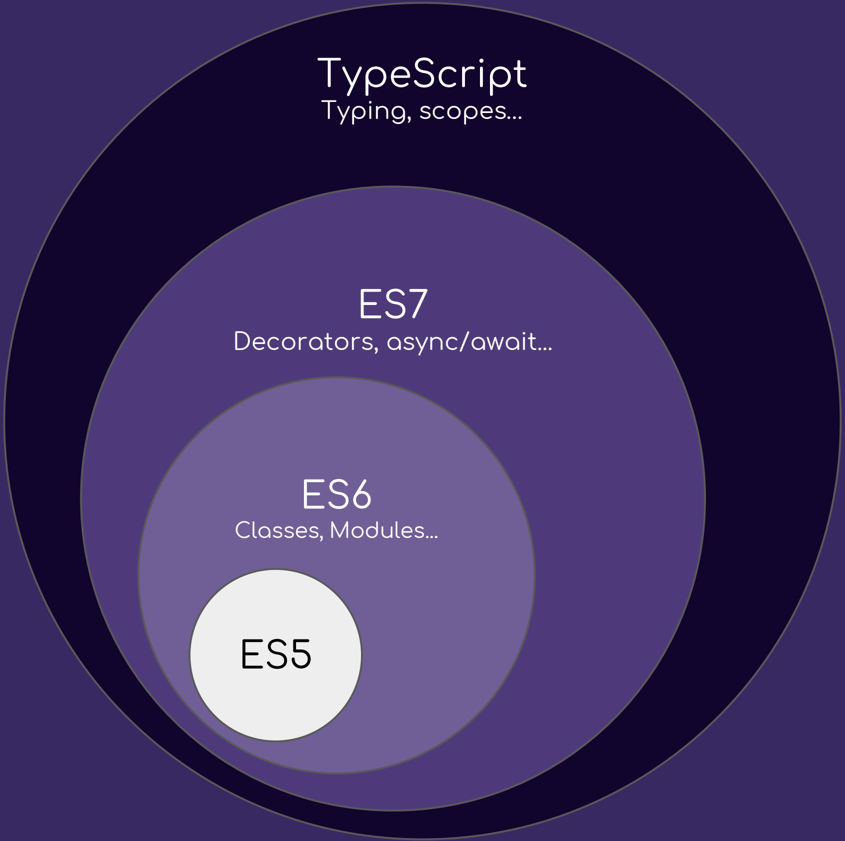

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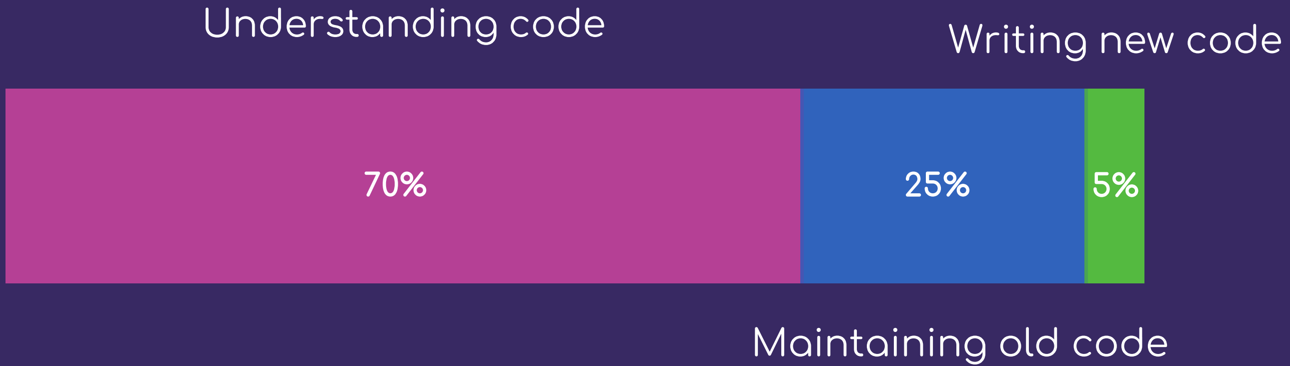
What does a developer spend time on?



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Before Typescript

Hungarian Notation

Hungarian notation

Prefix	Type	Example
b	Boolean	var bIsVisible = true;
e	DOM element	var eHeader = document.getElementById('header');
f	Function	var fCallback = function () { ... };
n	Number	var nSides = 4;
o	Object	var oPoint = new Point(200, 345);
a	Array	var aNames = ['Luke', 'Nick', 'David'];
s	String	var sUrl = 'http://www.google.com';
$	jQuery	var $Header = $('#header');

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Scope

Prefix	Type	Example
_	Private	var _transformData = function (data) { ... return result; }
	Public	var render = function () { ... };
🚫	Protected	🚫

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JSDoc comments

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JSDoc comments

@enum

@class

@public

@protected

@param {string} color

@private

@access

@constant

@constructor

@param {LACE_TYPES} type

@package

@typedef

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Why types are so important?

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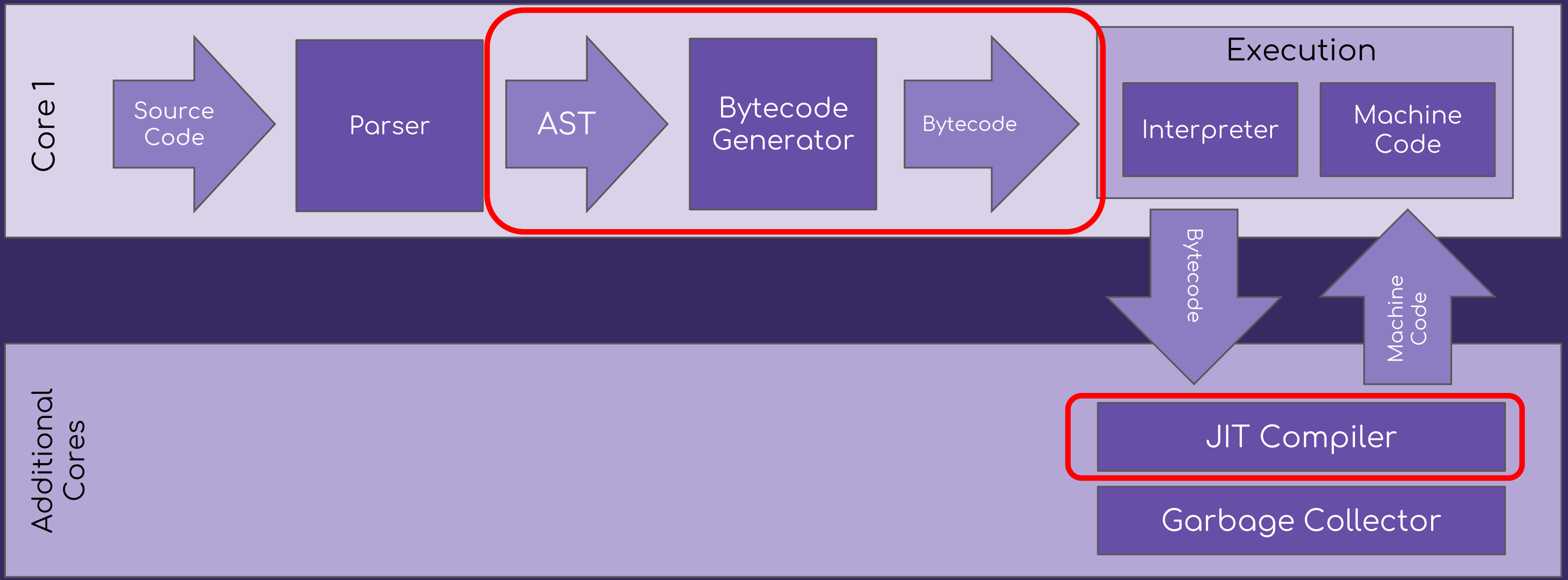
Why types are so important?



Basic Types

boolean	never	number	any
string	Object	Array	Tuple
Union	null	void	undefined

Type assertions

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Basic Types - Inferred

```
let month = 5;
let name = 'Mik';
let isVisible = false;
let cities = ['New York', 'Oxford', 'Valladolid'];
let person = {
    firstName: 'Gerardo',
    lastName: 'Abelardo'
};
```

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Basic Types - Explicit

```
let month: number;

let name: string;

let isVisible: boolean;

let person: object;

let employee: any;
```

```
let cities: string[];

let customers: Array<any>;

let value: null;

let value2: undefined;

let value3: void;
```

```
let address: [string, number, string, string];
```

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Basic Types

Type Assertions

```
let someValue: any = "this is a string";
let strLength: number = (someValue as string).length;
let strLength2: number = (<string>someValue).length;
```

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Basic Types - Union

```typescript
let area: string| undefined = property('area');
let element: HTMLElement | null = document.getElementById('passion');
let menu: Array<Link | Divider> = getMenu();
```

How TypeScript type-checking works?

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Type-checking focuses on the *shape* that values have.

A.K.A "duck typing" or "structural subtyping".

Enums

Number Enums

String Enums

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Number Enums

```
enum WeatherType {
    Sunny,
    Cloudy,
    Rainy,
    Storm,
    Frost,
    Nightly
}
```

```
enum WeatherType {
    Sunny = 1,
    Cloudy = 2,
    Rainy = 3,
    Storm = 4,
    Frost = 5,
    Nightly = 6
}
```

Number Enums - Usage

```
class Weather {
    getWeatherIcon(weatherType: WeatherType) {
        switch (weatherType) {
            case WeatherType.Sunny: return 'weather_sunny';
            case WeatherType.Cloudy: return 'weather_cloudy';
            case WeatherType.Rainy: return 'weather_rain';
            case WeatherType.Storm: return 'weather_storm';
            case WeatherType.Frost: return 'weather_frost';
            case WeatherType.Nightly: return 'weather_nightly';
        }
    }
}
```

String Enums

```
enum WeatherType {
   Sunny = 'weather_sunny',
   Cloudy = 'weather_cloudy',
   Rainy = 'weather_rain',
   Storm = 'weather_storm',
   Frost = 'weather_frost',
   Nightly = 'weather_nightly',
}
```

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Functions

Function Types

Overloading

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Function Types 1/3

```
function add(x: number, y: number): number {
    return x + y;
}
function multiply(x: number, y: number): number {
    return x * y;
}
let myAdd: (x: number, y: number) => number = add;

type twoOperandsType = (x: number, y: number) => number;

let myMultiply: twoOperandsType = multiply;
```

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Function Types 2/3

```
function buildName(firstName: string, lastName?: string) {
    if (lastName) { return `${firstName} ${lastName}`; }
    else { return firstName; }
}


function buildAddress(street: string, postalCode: string = 'UNDEFINED') {
    if (postalCode) { return `${street} ${postalCode}`; }
    else { return street; }
}
```

Function Types 3/3

```
type buildStringOneOrMoreArguments = (x: string, y: string) => string;
const buildName1: buildStringOneOrMoreArguments = buildName;
const buildAddress1: buildStringOneOrMoreArguments = buildAddress;


function buildFamily(father: string, ...restOfFamily: string[]) {
    return `${father}  ${restOfFamily.join(" ")}`;
}
```

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This

```
const mother = {
    name: 'Maria',
    sons: [
        'Lucho',
        'Mauro'
    ],
    daughters: [
        'Silvia',
        'Romani'
    ],
    getChildren(): string[] {
        return this.sons.concat(this.daughters);
    }
};
```

```
const father = {
    name: 'Manolo',
    sons: [
        'Lucho',
        'Mauro'
    ],
    daughters: [
        'Silvia',
        'Romani'
    ],
    getChildren(this: void) { // Avoid using this.
        return this.sons.concat(this.daughters);
    }
}
```

Arrow Function

```
let deck = {
   suits: ["hearts", "spades", "clubs", "diamonds"],
   cards: Array(52),
   createCardPicker: function() {
       return () => {
           let pickedCard = Math.floor(Math.random() * 52);
           let pickedSuit = Math.floor(pickedCard / 13);
           return {
               suit: this.suits[pickedSuit],
               card: pickedCard % 13
           };
       }
   }
};
```

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Overloading

```
type propertiesObject = { [name: string]: any };
const properties: propertiesObject = {};


function property(propertyName: string, defaultValue: any ): any;
function property(propertyName: string): any | undefined;
function property(propertyName: string, defaultValue?: any) {
   if (defaultValue) {
       properties[propertyName] = defaultValue;
   }
   return properties[propertyName];
}
```

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Interfaces

interface

implements

Interfaces

```
interface TreeLink {
   type: string;
   title: string;
   url: string;
   isCurrent: boolean;
   preferences: any;
   children: TreeLink[];
}
```

```
const treeLink: TreeLink = {
   type: 'external',
   title: 'Google',
   url: 'http://www.google.nl',
   isCurrent: false,
   preferences: {
       navIcon: 'accounts'
   },
   children: []
};
```

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Implements

```
interface Flyable { fly: () => void }
interface Quackable { quack: () => void; }


class Duck implements Flyable, Quackable {
   fly() { console.log('Fly, Fly, Fly'); }
   quack() { console.log('Quack, Quack'); }
}
class Turkey implements Flyable {
   fly() { console.log('Ufff!'); }
}
```

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Classes

class extends implements abstract

public private protected readonly

getters setters

static methods and properties

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Classes

```
class Animal {
    name: string;
    constructor(name: string) {
        this.name = name;
    }
}
```

```
class Animal {
    constructor(
     public name: string
    ) {}
}
```

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Abstract Classes

```
abstract class Animal {
    constructor(
     public readonly name: string
    ) {}
    abstract makeSound(): void;
    abstract move(): void;
    abstract getOffspring(): void;
}
```

```
abstract class Mammal extends Animal{
    constructor(
     public readonly name: string,
     public readonly legs: number
    ) {
        super(name);
    }
}
```

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Inheritance 1/3

```
class Whale extends Mammal {
    constructor(){  super('Whale', 0); }
    makeSound() { console.log('waaoaoooooooooooaoaoo'); }
    move() { console.log('Swim, Swim, Swim, Swim, Swim!'); }
    getOffspring() { console.log('Get birth a calf!'); }
}
```

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Inheritance 2/3

```
class Dog extends Mammal {
    constructor() { super('Dog', 4); }
    makeSound() { console.log('Woof, Woof, Woof!'); }
    move() { console.log('Walk, Walk, Walk!'); }
    getOffspring() { console.log('Get birth a dozen puppies!'); }
}
```

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Inheritance 3/3

```
class Platypus extends Mammal {
   constructor() { super('Platypus', 4); }
   makeSound() { console.log('hrrrrrrrrrrrh'); }
   move() { console.log('Swim, Swim, Walk, Walk!'); }
   getOffspring() { console.log('Put eggs and wait!'); }
}
```

Generics

Generic Types

Generic Classes

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Generics

```
function echo<T>(arg: T): T {
    console.log(arg);
    return arg;
}
```

```
echo('19th October');
echo<string>('Friday');
echo<number>(19);
```

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Generic Types

```
function identity<T>(arg: T): T {
    return arg;
}


let myIdentity: <T>(arg: T) => T = identity;


let myIdentity2: <U>(arg: U) => U = identity;
```

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Generic Classes

```
class Operator<T> {
   initialValue: T;
   operation: (x: T, y: T) => T;
}
const numAdder = new Operator<number>();
numAdder.initValue = 10;
numAdder.operation = function(x, y) {
  return this.initValue + x + y;
};
```

```
const strConc = new Operator<string>();
strConc.initValue = '';
strConc.operation = function (x, y) {
  return `${this.initValue} ${x} ${y}`;
};
```

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Modules and Namespaces

export	import
Default exports	Working with other libraries
Namespacing	Multi-file namespace

Export

```
export class Cat {
   constructor(private name: string, private legs: number){}
}


export default {
   getCatInstance(name: string, legs: number) {
       return new Cat(name, legs);
   }
}
```

Import

```
import { Cat } from './Cat';
import { getCatInstance } from './utils';
```

Namespaces

```
export namespace Shapes {
   export class Triangle { /* ... */ }
   export class Square { /* ... */ }
}
import * as shapes from "./shapes";
let t = new shapes.Shapes.Triangle(); // shapes.Shapes?
```

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Thanks.

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