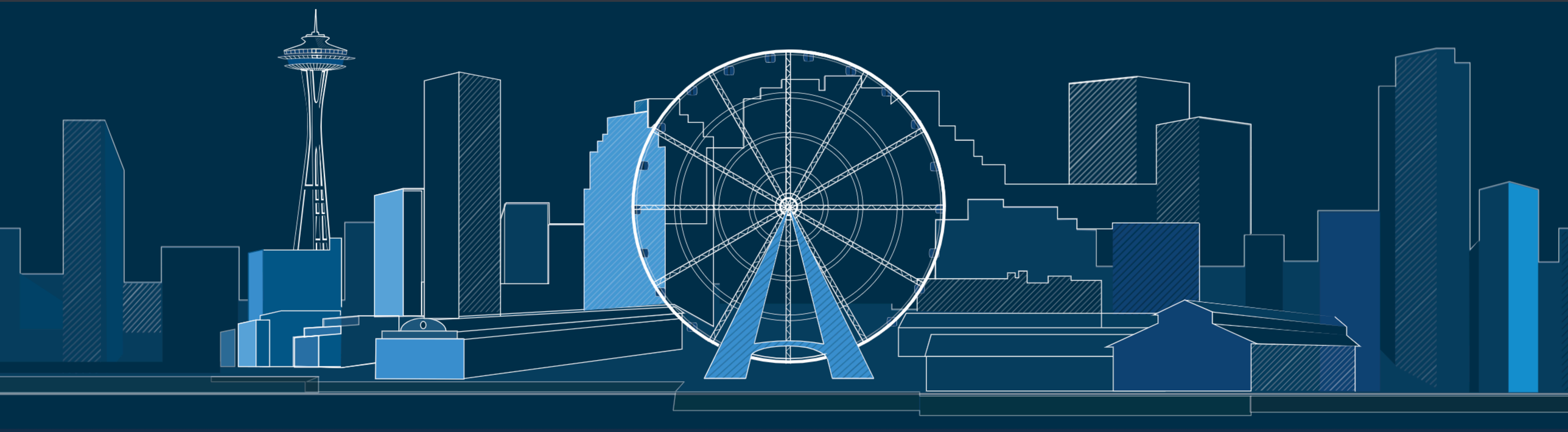

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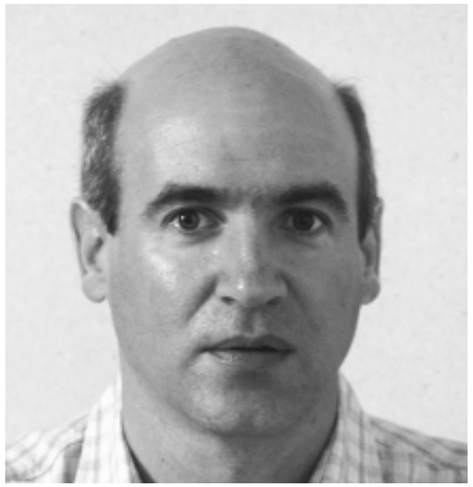

Thierry Chatel

MethoTIC Conseil

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@ThierryChatel

Crealead
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- consultant
- formateur
- GDE Angular

INTRODUCTION

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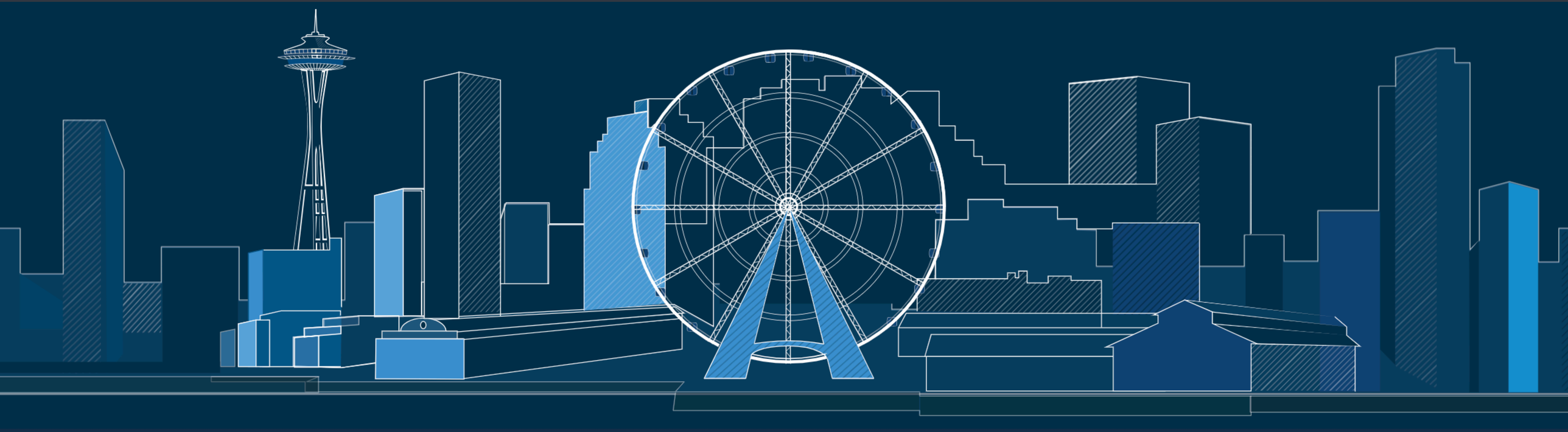

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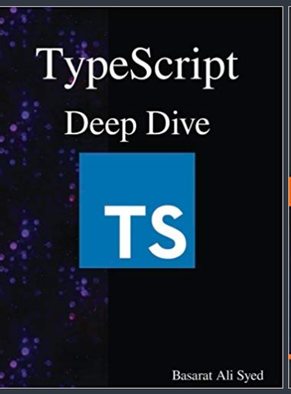
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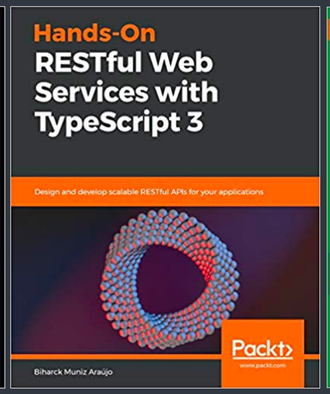
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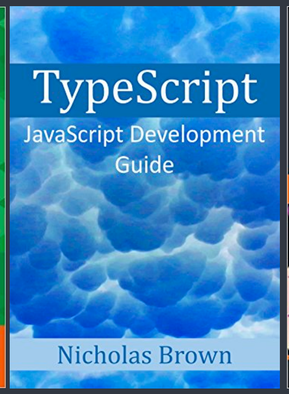
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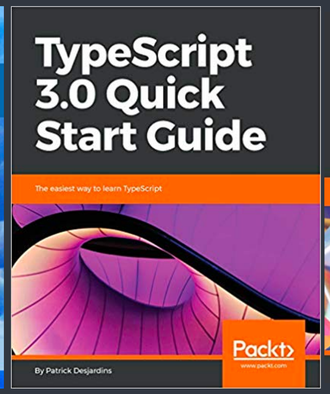
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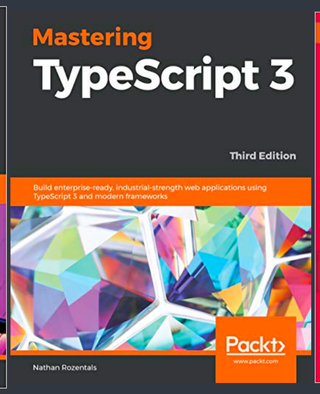
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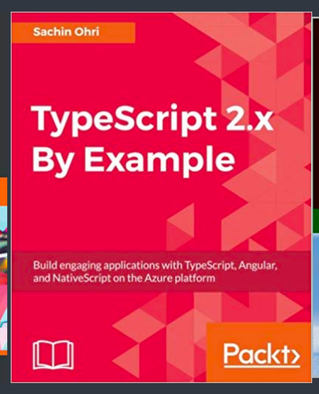
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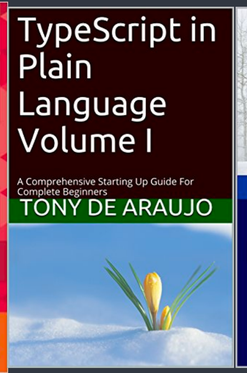
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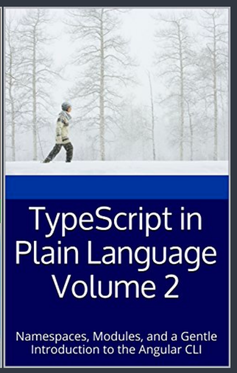
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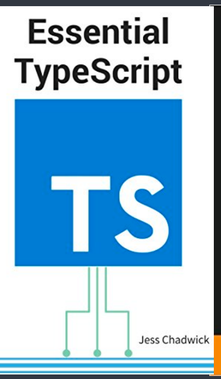
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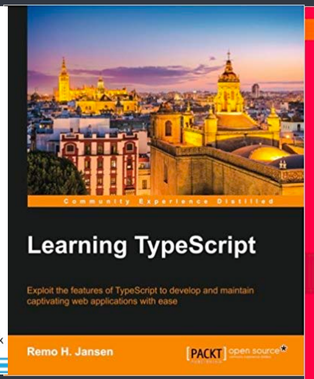
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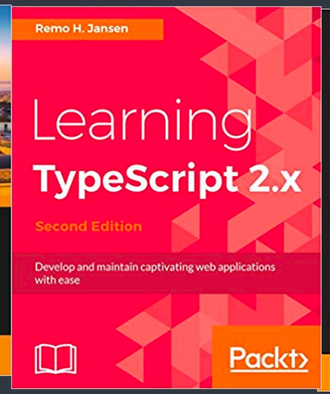
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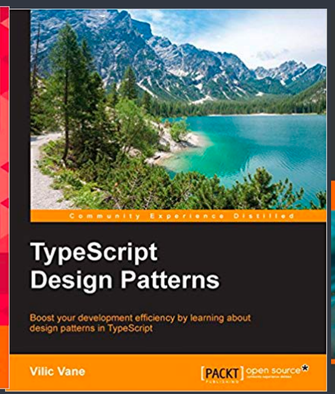
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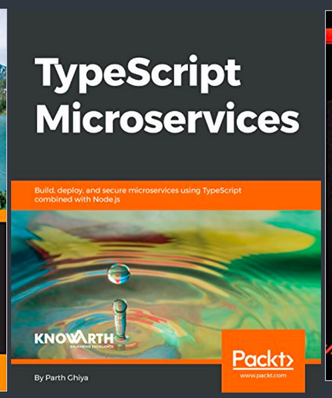
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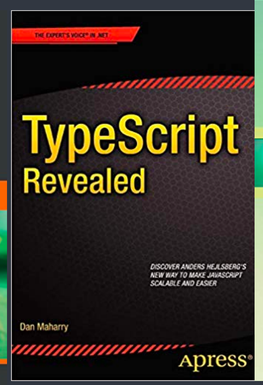
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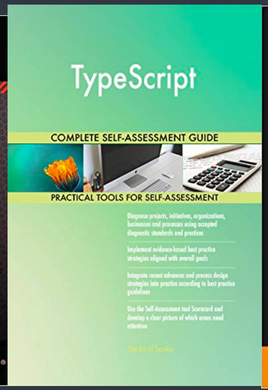
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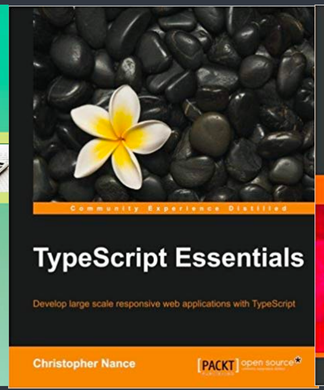
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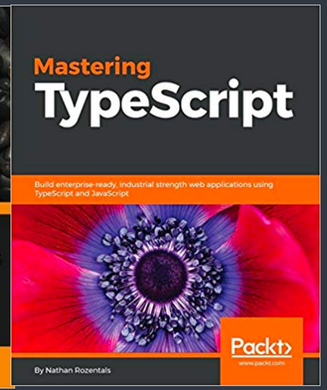
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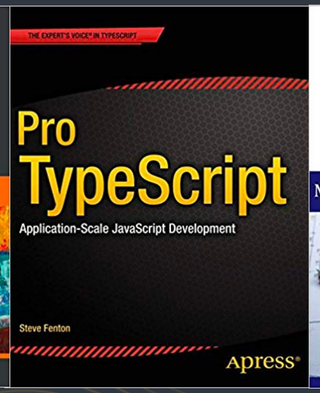
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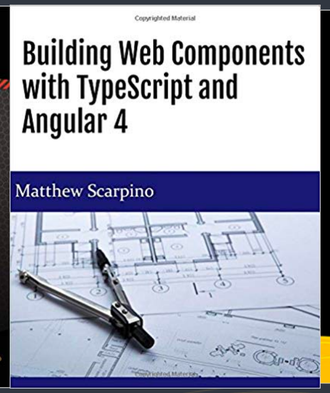
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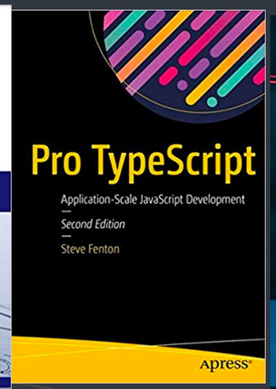
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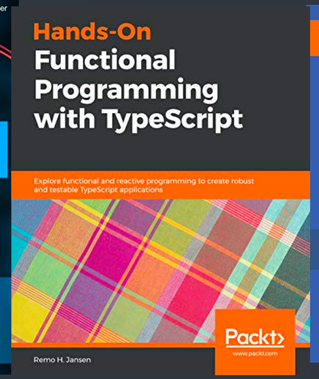
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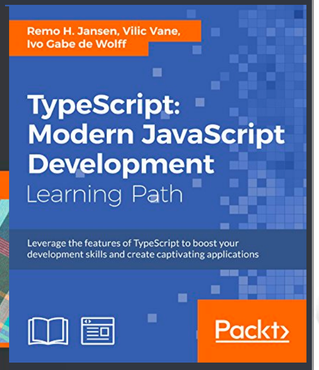
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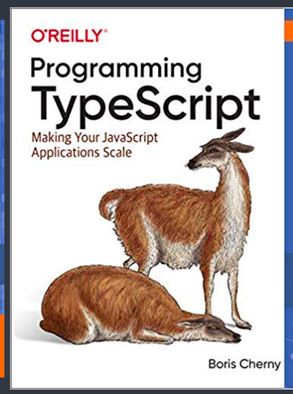
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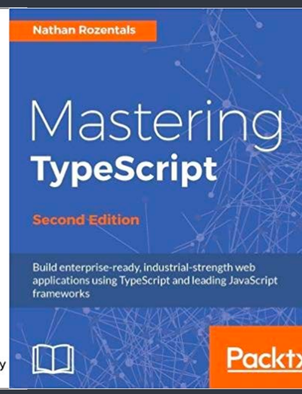
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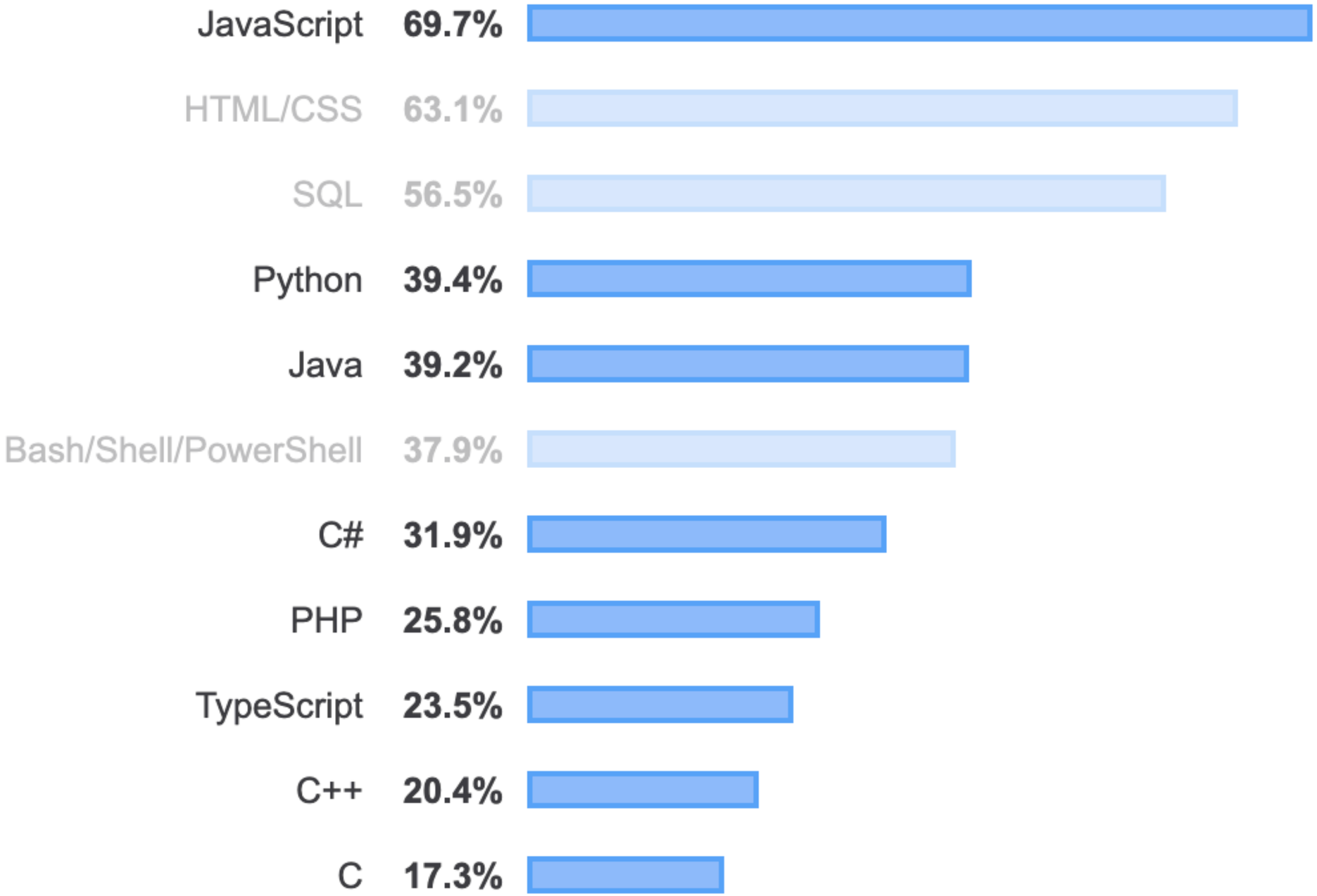
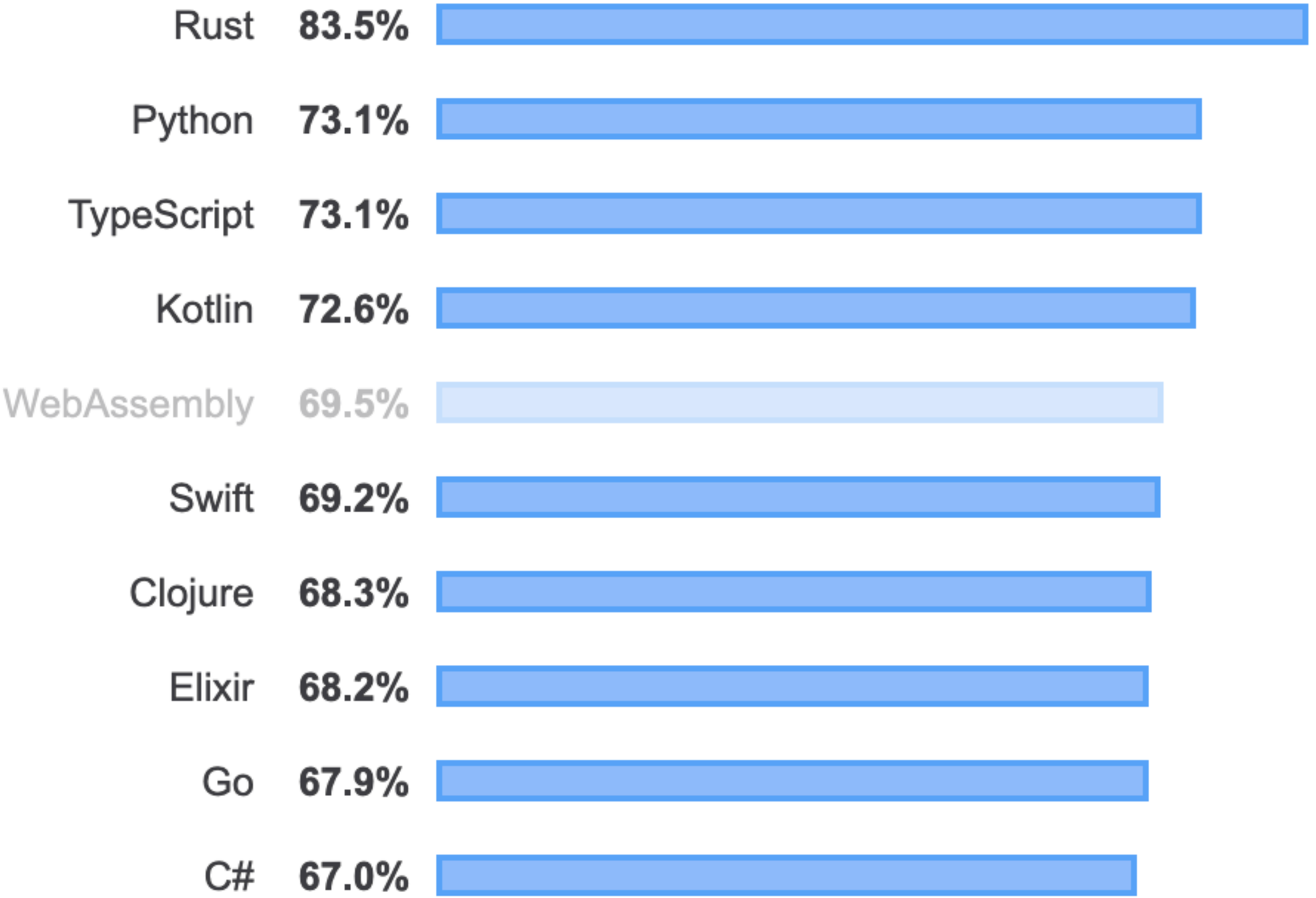
Most Popular Technologies



StackOverFlow

Most Loved Languages



DÉMO

SYNTAXE

Classes

```
class Person {
    firstName = '';
    lastName = '';
    fullName(): string {
        return `${this.firstName} ${this.lastName}`;
    }
}
const me = new Person();
me.firstName = 'Thierry';
me.lastName = 'Chatel';
console.log(me.fullName());
```

Classes

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

const me = new Person('Thierry', 'Chatel');
console.log(me.getFullName());
```

Classes

```
// Angular Component
export class PhotoPageComponent implements OnInit {
  subscription: Subscription;

  constructor(private photoApi: PhotoApiService,
              private result: ResultService,
              private router: Router) { }

  ngOnInit() {
  }
}
```

Getters & Setters

```
class Person {
    get fullName(): string {
        return `${this.firstName} ${this.lastName}`;
    }
    constructor (public firstName: string,
                 public lastName: string) {
    }
}

const me = new Person('Thierry', 'Chatel');
console.log(me.fullName);
```

Getters & Setters

```
class Person {
    private _name: string = '';
    get name(): string {
        return this._name;
    }
    set name(name: string) {
        this._name = name;
    }
}

const me = new Person();
me.name = 'Thierry';
console.log(me.name);
```

public, protected, private

```
class Book {
      public title ='Abcd';
      protected author = 'Xyz';
      private isbn = '132-8263498638';
      page = 352; // default is public
}
```

readonly

```
class Book {
    constructor(public readonly title: string,
                public readonly author: string) {
    }
}

const book = new Book(
  'La Horde du Contrevent',
  'Alain Damasio'
);

book.author = 'toto'; // Error: read-only property!
```

static

```
class Point {
    private constructor(public readonly x: number,
                        public readonly y: number) {
    }
    static fromArray(coord: [number, number]): Point {
        const [x, y] = coord;
        return new Point(x, y);
    }
}

const p = Point.fromArray([12, 5]);
```

extends

```
class Pet {
    eat(): void {
        console.log('eat');
    }
}
class Dog extends Pet {
    run(): void {
        console.log('run');
    }
}
const dog = new Dog();
dog.eat();
```

super

```
class Dog extends Pet {
    constructor() {
        super();
    }
    run(): void {
        console.log('run');
    }
}
```

abstract

```
abstract class Pet {
    abstract eat(): void;
}
class Dog extends Pet {
    constructor() {
        super();
    }
    eat(): void {
        console.log('eat');
    }
    run(): void {
        console.log('run');
    }
}
```

Interfaces

```
interface Entity {
    id: number;
    name: string;
}
class Person implements Entity {
    public id: number;
    constructor(public name: string) {
        this.id = IdGenerator.get();
    }
}
const p: Entity = new Person('Thierry');
```

Interfaces

```
interface Entity {
    id: number;
    name: string;
}
class Person {
    public id: number;
    constructor(public name: string) {
        this.id = IdGenerator.get();
    }
}
const p: Entity = new Person('Thierry'); // still ok
```

Interfaces

```
interface Entity {
      id: number;
      name: string;
      timestamp?: number; // optional
}

const p: Entity = {
   id: 1,
   name: 'Thierry',
};
```

Interfaces

```
interface Entity {
    id: number;
    name: string;
    timestamp?: number; // optional
    // methods
    log(): string;
    touch(timestamp: number): void;
}
```

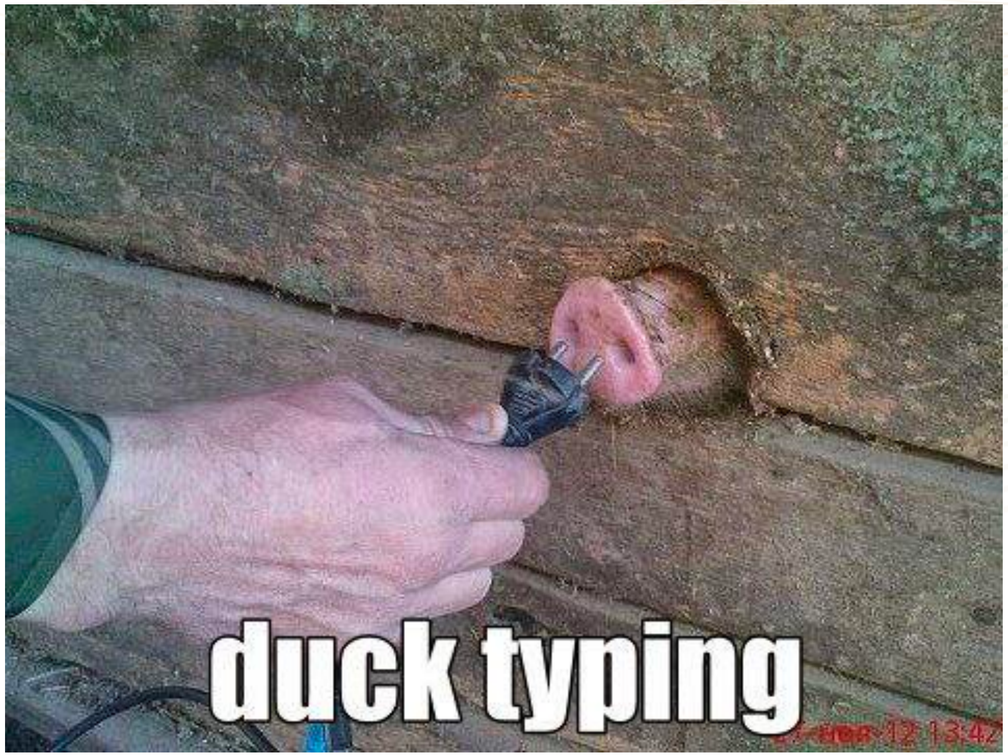
Interfaces

```
interface Entity {
    id: number;
    name: string;
     // methods
    log(): string;
    touch(timestamp: number): void;
}

interface TimedEntity extends Entity {
    timestamp: number;
}
```

Interfaces

« Structural Typing » ≠ « Nominal Typing »



Overloads

```
class Point {
    // overloads, from most to least specific
    move(x: number, y: number): void;
    move(delta: {x: number, y: number}): void;

    // implementation, not a callable type definition
    move(xOrDelta: number | {x: number, y: number},
         y?: number): void {
        // code
    }
}
new Point().move(10, 20);
new Point().move({x: 10, y: 20});
```

Paramètres

```
class Shape {

    build(type: string,
          id?: number,
          size: number = 10,
          ...otherArgs: string[]) {
        // code
    }

}
```

Déstructuration

```
class Shape {

    build(type: string,
          id?: number,
          size: number = 10,
          ...otherArgs: string[]) {
        // code
    }

}
```

rest & spread

```
const [x, y] = [10, 5];
const {x, y} = {x: 10, y: 5};
return {x, y};

const numbers = [10, 20, 30];
const [first, ...otherNumbers] = numbers;
return [first + 1, ...otherNumbers];

const obj = {firstName: 'Thierry', lastName: 'Chatel',
             id: 1, age: 47};
const {id, firstName, lastName, ...otherProperties} = obj;
return {firstName, ...otherProperties};
```

async & await

```
function delay(ms: number): Promise<void> {
    return new Promise<void>(resolve =>
                                setTimeout(resolve, ms));
}

async function dramaticWelcome() {
    console.log('Hello');
    for (let i = 0; i < 3; i++) {
        await delay(500);
        console.log(".");
    }
    console.log('World!');
}
```

namespace

```
export class CropPlugin extends DisplayPlugin {
    // ...
}

export namespace CropPlugin {

    export class CropEvent extends DisplayPlugin.PluginEvent {
        // ...
    }

    export interface Api {
        selection: ApiSelection;
        removeSelected(): void;
    }

}
```

TYPAGE AVANCÉ

Type Aliases

```
type Name = string;
type NameResolver = () => string;
type Coord = [number, number];
type Container<T> = { value: T };
```

Types de base

boolean, **number**, **string**, null, undefined,
symbol

object, **Date**, **RegExp**, Function...

void, **never**
any, **unknown**
this

Énumérations

```
enum Direction {
    Up = 1,      // By default, first value is 0
    Down,
    Left,
    Right,
}

enum PetType {
    DOG = 'dog',
    CAT = 'cat',
}
```

Tableaux

```
let stats: number[];
let stats: Array<number>;
const stats: number[] = [7, 12, 8, 5];
const stats = [7, 12, 8, 5];

let points: Array<{x: number, y: number}>;
let points: Array<Point>;

let matrix: Array<Array<number>>;

let point: [number, number, Color]; // tuple
```

Fonctions… et classes

```
let callback: (n: number, s: string) => boolean;
let callback: (n: number, ...args: string) => boolean;
type PersonFilter = (person: Person) => boolean;

// Class
let clazz: new (name: string) => Person;
let personFactory: (clazz: new (name: string) => Person,
                    name: string) => Person;
type PersonClass = new (person: Person) => boolean;
let pFactory: (clazz: PersonClass, name: string) => Person;
```

& : Intersection Types

```
interface Person {
    name: string;
}

interface WithId {
    id: number;
}

let savePerson: (modified: Person & WithId) => void;

type PersonWithId = Person & WithId;
```

… with enum

```
enum TitleType { }
enum AuthorType { }

type Title = string & TitleType;
type Author = string & AuthorType;

interface Book { title: Title; author: Author; }

const book1: Book = {
    title: 'La Horde du Contrevent' as Title,
    author: 'Alain Damasio' as Author,
};
```

| : Union Types

```
// Angular Route Guard

canActivate(
  next: ActivatedRouteSnapshot,
  state: RouterStateSnapshot
): Observable<boolean> | Promise<boolean> | boolean {
  return true;
}
```

… with Literal Types

```
type Bit = 0 | 1;

let bit: Bit = 0;
bit = 1; // ok
bit = 2; // error
```

Type Guards

```
// Type Guard with typeof
class Formater {
    leftPad(value: string, padding: string | number):
                                                string {
        if (typeof padding === 'number') {
            padding = Array(padding + 1).join(' ');
        }
        return padding + value;
    }
}
```

Type Guards

```
// Type Guard with instanceof
class Demo {
    addPet(pet: Dog | Cat): void {
        if (pet instanceof Dog) {
            // pet: Dog
        } else {
            // pet: Cat
        }
    }
}
```

Type Guards

```
// Type Guard with in
interface Dog { name: string; }
interface Cat { name: string; }
interface Duck { }

class Demo {
    addPet(pet: Dog | Cat | Duck): void {
        console.log(pet.name); // error
        if ('name' in pet) {
            console.log(pet.name); // ok, pet: Dog | Cat
        }
    }
}
```

Type Guards

```
// Literal Type Guard
interface Dog { type: 'dog', name: string; }
interface Cat { type: 'cat', name: string; }
interface Duck { type: 'duck' }

class Demo {
    addPet(pet: Dog | Cat | Duck): void {
        if (pet.type === 'duck') {
            console.log('Duck has no name.'); // pet: Duck
        } else {
            console.log(pet.name); // ok, pet: Dog | Cat
        }
    }
}
```

Type Guards

```
// User-Defined Type Guard
interface Fish {
    swim(): void;
}
interface Bird {
}

function isFish(pet: Fish | Bird): pet is Fish {
    return 'swim' in pet;
}
```

GENERICS

Generics

```
class Demo {

    identity<T>(param: T): T {
        return param;
    }
}

const demo = new Demo();
const s: string = demo.identity('abc');
const n: number = demo.identity(123);
```

Generics

```
class Demo {

    first<T>(param: T[]): T {
        return param[0];
    }
}

const demo = new Demo();
const n: number = demo.first([1, 2, 3]);
const s: string = demo.first(['a', 'b', 'c']);
const x: string = demo.first(['a', 2]); // error
```

Generics

```
interface Lengthwise {
    length: number;
}

class Demo {

    loggingIdentity<T extends Lengthwise>(param: T): T {
        console.log(param.length);
        return param;
    }

}

new Demo().loggingIdentity('abcd');  // ok
new Demo().loggingIdentity(123);     // error
```

Generics

```
function getProp<T, K extends keyof T>(obj: T, key: K) {
    return obj[key];
}

let obj = { a: 1, b: 2, c: 3 };

getProperty(obj, 'a'); // okay
getProperty(obj, 'm'); // error
```

Generics

```
interface Array<T> {
  [n: number]: T;
  length: number;

  pop(): T | undefined;
  push(...items: T[]): number;
  slice(start?: number, end?: number): T[];
  sort(compareFn?: (a: T, b: T) => number): this;

  map<U>(fn: (value: T, index: number, array: T[]) => U): U[];

  filter<S extends T>(
    fn: (value: T, index: number, array: T[]) => value is S
  ): S[];

  filter(fn: (value: T, index: number, array: T[]) => any): T[];
}
```

TYPAGE EXTRÊME

Index Types

```ts
interface Person {
    id: number;
    name: string;
    age: number;
}

type PropAge = Person['age'];        // number

type Keys = keyof Person;            // 'id' | 'name' | 'age'

type Props = Person[keyof Person]; // string | number
```

Index Types

```
function pick<T, K extends keyof T>(obj: T, keys: K[]):
                                        {[P in K]: T[P]} {
    const res = {};
    keys.forEach(key => res[key as string] = obj[key] as any);
    return res as any;
}
const person = {
    id: 12345,
    name: 'Thierry',
    age: 47,
    active: true,
};
const subObj: {name: string, age: number}
  = pick(person, ['name', 'age']);
```

Conditional Types

```
// T extends U ? X : Y

type Nullable<T> = T | null | undefined;

// Distributive Conditional Type (defined in lib.es5.d.ts)
type NonNullable<T> = T extends null | undefined ? never : T;

type Primitive = number | string | boolean | null | undefined;

const p1: Nullable<string> = null;                  // ok
const p2: Primitive = null;                         // ok
const p3: NonNullable<Primitive> = 'abc';           // ok
const p4: NonNullable<Primitive> = null;            // error
```

Predefined

```
Extract<Client | Employee | Dog, Person>  // Client | Employee
Exclude<Client | Employee | Dog, Person>  // Dog

NonNullable<T>  // Exclude null and undefined from T
    Exclude<T, null | undefined>  // same result

// For a function type:
ReturnType<T>
Parameters<T>  // tuple

// For a constructor type:
InstanceType<T>
ConstructorParameters<T>  // tuple
```

Predefined

```
// Make all properties of an object type…
Partial<Person>  // …optional
Required<Person> // …required
Readonly<Person> // …readonly

// Keep only some properties of an object type:
Pick<Person, 'name' | 'age'>
    // Or other properties :
    Pick<Person, Exclude<keyof Person, 'name' | 'age'>>

// Create an object type with properties of same type:
Record<'firstName' | 'lastName', string>
// {firstName: string, lastName: string}
```

Not Predefined

```
// Reverse of Pick<T, K>:
type Omit<T, K> = Pick<T, Exclude<keyof T, K>>;

// Properties in T but not in U:
type Diff<T, U> = Omit<T, keyof U>;

// T properties of type U:
type KeyNamesOfType<T, U> =
  {[K in keyof T]: T[K] extends U ? K : never}[keyof T];
type KeysOfType<T, U> = Pick<T, KeyNamesOfType<T, U>>;
```

Mix-in

« A mixin is an abstract subclass; i.e. a subclass definition that may be applied to different superclasses to create a related family of modified classes. »

Gilad Bracha and William Cook, Mixin-based Inheritance

Mix-in

```
interface WithTimestamp { timestamp: number; }

type Clazz<T = {}> = new (...args: any[]) => T;

function Timestamped<TBase extends Clazz>(Base: TBase) {
    return class extends Base implements WithTimestamp {
        timestamp = Date.now();
    };
}

class Person {
    constructor(public firstName: string,
                public lastName: string) { }
}
const TimestampedPerson = Timestamped(Person);
```

DECORATORS

Usage (Angular)

```
@Component({
  selector: 'app-image',
  templateUrl: './image.component.html',
  styleUrls: ['./image.component.css']
})
export class ImageComponent {

  @Input() url: string;
  @Input() legend: string;

  constructor(private imageLoader: ImageLoaderService,
              @Inject(LOCALE_ID) private localeId: string) {
  }

}
```

Usage (tsoa)

```
@Route('user')
@Tags('User')
export class UserController {
  @Response<ErrorResponse>('Unexpected error')
  @Get('UserInfo')
  @Tags('Info', 'Get')
  public async userInfo(@Request() request: any): Promise<UserResponse> {
    return Promise.resolve(request.user);
  }

  @Get('EditUser')
  @Tags('Edit')
  public async userInfo(@Request() request: any): Promise<string> {
   // Do something here
  }
}
```

Création

```
function ExtendedOnInit() {
    return (clazz: new (...args: any[]) => OnInit) => {
        const originalOnInit = clazz.prototype.ngOnInit;
        clazz.prototype.ngOnInit = () => {
            console.log('decorator', 'onInit');
            originalOnInit.call(clazz);
        };
        return clazz;
    };
}
interface OnInit { ngOnInit(): void; }

@ExtendedOnInit()
class MyComponent implements OnInit {
    ngOnInit() { console.log('original onInit'); }
}
```

JS LIBS

.d.ts

Fichiers de déclarations de types

ex: https://github.com/reduxjs/redux/blob/master/index.d.ts

DefinitelyTyped - packages @types/*

npm install --save-dev @types/open-layers

lib.d.ts

.tsx

```
class List extends React.Component {
  render() {
    return (
      <ul>
        <li>Item 1</li>
        <li>Item 2</li>
        <li>Item 3</li>
      </ul>
    );
  }
}
```

TODO : conclusion ?

TODO : lien slides