Workshop

TypeScript Introduction

Hint for trainers

- Report each change or addition to the **trainers'** Discord-Channel.
- Tell which Slide is affected, why the change is important and what benefit your change provides.
- Use the code-highlighting-app if you work with code-snippets.
- Use the following slide if you want to repeat certain topics of the workshop.

Task: Test your knowledge

any

strictNullChecks

Enum

Type Alias

TypeScript

Utility types

Type inference

@ts-expect-error

Interfaces

Generics

TypeScript

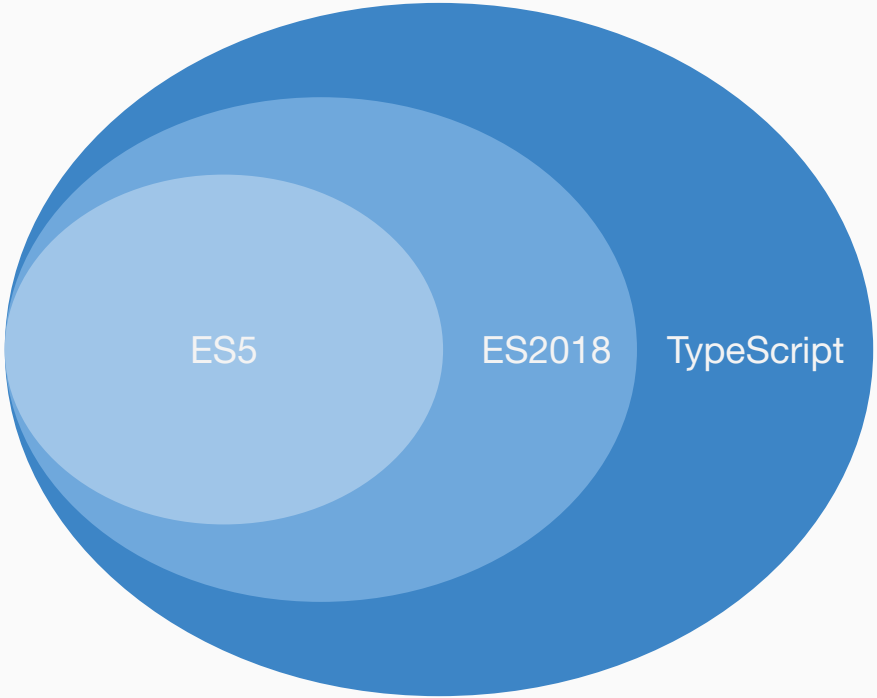
Optional static type-checking

TypeScript is a **typed superset** of JavaScript

that **compiles to plain JavaScript**.

TypeScript is a superset

- Superset of EcmaScript
- Compiles to clean code
- Optional Types



Why TypeScript

Why **TypeScript**

- Use future JavaScript Features today.
- Prevent runtime errors by using the static type system.
- Compiler enables Code Editors to provide better tooling (Auto-Completion, Refactoring, Analysis).
- Detect mistakes at development time (such as wrong function calls, misspelled properties, ...)

The result: better maintenance for long-living projects

Types

Types in TypeScript - Variables

<code>

Types exist for primitive types.

```
let isDone:    boolean = true;

let size:      number = 42;

let firstName: string = 'Lena';
```

Types in TypeScript - Variables

<code>

Types exist for reference types.

```
const attendees: string[] = ['Elias', 'Anna'];

const attendees: Array<string> = ['Elias', 'Anna'];

const attendees: ReadonlyArray<string> = ['Elias', 'Anna'];
```

Types - `any`

<code>

Anything is assignable to something of type `any`. You are in JavaScript-Land.
It disables type-checking completely in all further usages of that variable.

```
let question: any = 'Can be a string';

question = 6 * 7;
question = false;
```

Types - unknown

<code>

unknown takes any type - but you cannot access any property unless you check for its existence

```
let vAny: any = 10;           // We can assign anything to any
let vUnknown: unknown =  10; // We can assign anything to unknown just like any


let s1: string = vAny;      // Any is assignable to anything
let s2: string = vUnknown; // Invalid we can't assign vUnknown to any other type (without an explicit assertion)

vAny.method();      // ok anything goes with any
vUnknown.method(); // not ok, we don't know anything about this variable
```

Types - unknown

Editor is able to detect the correct type depending on conditions.

```
const whoAmI: unknown = '2-4-6-0-1';

// unknown forces you to add runtime checks
if (typeof whoAmI === 'string') {
  const whoAmI: string
  whoAmI.toLocaleUpperCase();

}
```

unknown becomes string

The type **unknown** is more defensive than **any**.

Type inference

Type inference

<code>

You don’t have to set the type of a variable if the compiler can infer it.

```
const firstName  = 'Max';                      // string
const age        = 30;                         // number
const isEmployed = true;                       // boolean
const friends    = ['Stefan', 'Frederike'];    // string[]
const dayOfBirth = Date.parse('...');          // Date
```

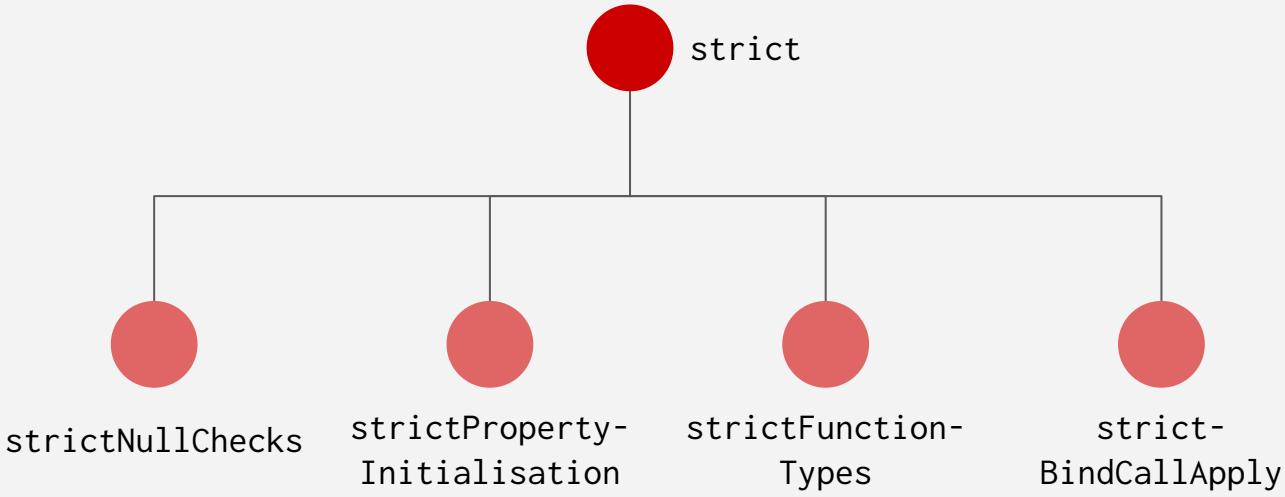
null and undefined

By default each data type in TypeScript does not accept `null` and `undefined`.

Compiler Flag: strict

<code>

Strict is a shorthand activating multiple rules



strictNullChecks

<code>

https://basarat.gitbook.io/typescript/intro/strictnullchecks

strictPropertyInitialization

<code>

https://mariusschulz.com/blog/strict-property-initialization-in-typescript

strictFunctionTypes

<code>

https://www.typescriptlang.org/tsconfig#strictFunctionTypes

strictCallBindApply

<code>

https://www.typescriptlang.org/docs/handbook/release-notes/typescript-3-2.html#strictbindcallapply

Compiler Flag: `strict`

<code>

```
// tsconfig.json
{
  "strict": "true"
  // ...
}
```

Compiler Flag: strict

<code>

In strict null checking mode, the null and undefined values are not in the domain of every type.

```
let firstName  : string  | null      = null;
let age        : number  | undefined = undefined;
let isEmployed : boolean | undefined;


// TypeScript Errors
let firstName  : string = null;
let age        : number = undefined;
let isEmployed : boolean; // undefined
```

Functions

Functions - Types

<code>

Add types to function arguments and return values.

```
function sayHi(firstName: string): void {
  console.log(firstName);
}
```

Functions - Optional parameters

<code>

Parameters can be optional. Use a question mark.

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

Functions - Default parameters

<code>

Function arguments can have defaults for arguments.

```
// type Inference: lastName is a string
function buildName(firstName: string, lastName: string = 'Bond') {
  return firstName + ' ' + lastName;
}
```

Task

Fix all type errors: here

Object property checks:

Interfaces & Type Aliases

There are **two** syntactical flavors to type objects and values:

Interface, Type-Alias

Interfaces

<code>

Give an interface a name and use it as a type for variables.

```
interface Book {
  isbn: string;
  title: string;
}

const book: Book;

book = {
  isbn: '978-1593272821',
  title: 'Eloquent JavaScript'
};
```

Interfaces

A constant book does not satisfy the interface. A property is misspelled.

```
interface Book {
  isbn: string;
  title: string;
}
```

```
Type '{ isbn: string; titles: string; }' is not assignable to type
'Book'.
  Object literal may only specify known properties, but 'titles' does
not exist in type 'Book'. Did you mean to write 'title'? ts(2322)
(property) titles: string
View Problem (⌥F8)    No quick fixes available
```

```
co
  titles: 'Eloquent JavaScript'
}
```

Type Aliases

<code>

Declare type alias by giving it a name & define its shape

```
type Book = {
  isbn: string;
  title: string;
}

const book: Book;

book = {
  isbn: '978-1593272821',
  title: 'Eloquent JavaScript'
};
```

Type Alias

A constant book does not satisfy the type. The compiler throws the same error for both interfaces and type aliases.

```
type Book = {
  isbn: string;
  title: string;
}

co
  titles: 'Eloquent JavaScript'
}
```

```
Type '{ isbn: string; titles: string; }' is not assignable to type
'Book'.
  Object literal may only specify known properties, but 'titles' does
not exist in type 'Book'. Did you mean to write 'title'? ts(2322)
(property) titles: string
View Problem (⌥F8)    No quick fixes available
```

Interfaces and Type Aliases

<code>

Give the structure of an object a name

Interface

```
interface Book {
    isbn: string;
    title: string;
}
```

Type Alias

```
type Book = {
    isbn: string;
    title: string;
}
```

Usage is the same

```
const book: Book = {
  isbn: '978-1593272821',
  title: 'Eloquent JavaScript'
};
```

Using Interfaces and Type Aliases

<code>

Missing properties raise a compile error

```
interface Book {
    isbn: string;
    title: string;
}
```

```
const book: Book = {
  isbn: '978-3-15-000001-4'
}
// Property 'title' is missing in type '{ isbn: string; }' but required in type 'Book'.
```

Using Interfaces and Type Aliases

<code>

Additional properties are not allowed

```
interface Book {
    isbn: string;
    title: string;
}
```

```
const book: Book = {
  isbn: '978-3-15-000001-4',
  title: 'Faust. Der Tragödie Erster Teil',
  pages: 30,
}
// Type '{ isbn: string; title: string; pages: number; }' is not assignable to type 'Book'.
// Object literal may only specify known properties, and 'pages' does not exist in type 'Book'.
```

TypeScript is not a sound type system

<code>

Object literal used for assignment is not a subtype of the Book interface

```
interface Book {
    isbn: string;
    title: string;
}
let book1: Book

const book2 = {
  isbn: '978-3-15-000001-4',
  title: 'Faust. Der Tragödie Erster Teil',
  pages: 30,
}

book1 = book2;
```

No typescript error although type of **book2** is clearly not a subtype of the **Book** interface.

Optional properties

<code>

Properties can be optional.

Interface

```
interface Book {
    isbn: string;
    title: string;
    pages?: number;
}
```

Type Alias

```
type Book = {
    isbn: string;
    title: string;
    pages?: number;
}
```

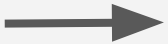
```
const book: Book = {
  isbn: '978-3-15-000001-4',
  title: 'Faust. Der Tragödie Erster Teil',
}
```

Optional properties

<code>

Optional property is **not** equivalent to property which may be undefined.

```
interface Book {
    isbn: string;
    title: string;
    pages?: number;
}
```



```
interface Book {
  isbn: string;
  title: string;
  pages: number | undefined | null;
}
```

```
const book: Book = {
  isbn: '978-3-15-000001-4',
  title: 'Faust. Der Tragödie Erster Teil',
}
// Property 'pages' is missing in type '{ isbn: string; title: string; }' but required
in type 'Book'.
```

Nesting

<code>

Interfaces and Type Aliases can be nested

Interface

```
interface Profile {
  id: number;
  gender: string;
  name: string;
  pictureUrl?: string;
  address: {
    street: string,
    zipCode: string,
    city: string,
  }
}
```

Type Alias

```
type Profile = {
  id: number;
  gender: string;
  name: string;
  pictureUrl?: string;
  address: {
    street: string,
    zipCode: string,
    city: string,
  }
}
```

Nesting

<code>

Extract the nested address into an own interface/type alias

Interface

```
interface Profile {
  id: number;
  gender: string;
  name: string;
  pictureUrl?: string;
  address: Address;
}
```

Type Alias

```
type Profile = {
  id: number;
  gender: string;
  name: string;
  pictureUrl?: string;
  address: Address;
}
```

```
interface Address {
  street: string;
  zipCode: string;
  city: string;
}
```

Extends & Intersection Type

<code>

The properties of Book are merged into Magazine.

Interface

```
interface Book {
    isbn: string;
    title: string;
    pages?: number;
}


interface Magazine extends Book {
  coverUrl: string;
}
```

Type Alias

```
type Book = {
    isbn: string;
    title: string;
    pages?: number;
}


type Magazine = Book & {
  coverUrl: string;
}
```

Union Type

<code>

Expect a property to be either one or the other

Interface

```
interface Style {
  position?: string;
  padding?: string | number;
  margin?: string | number;
  // other style properties
}
```

Type Alias

```
type Style = {
  position?: string;
  padding?: string | number;
  margin?: string | number;
  // other style properties
}
```

Alternative 1

```
const style: Style = {
  padding: '15px'
}
```

Alternative 2

```
const style: Style = {
  padding: 15
}
```

Union Type

<code>

Common Pattern: Discriminating Unions

```
interface Book {
  title: string;
  isbn: string;
}

interface Magazine {
  title: string;
  issn: string;
}

type ReadingMaterial = Book | Magazine;
```

```
const readingMaterial: ReadingMaterial[] = [
    {
        title: 'Vogue',
        issn: '0042-8000',
    },
    {
        title: 'Robinson Crusoe',
        isbn: '978-3401002569'
    }
]
```

title is called the discriminant. It's a common, non-optional literal property of both interfaces.

Union Types

<code>

Declaring that a type can be either one or another.

```
interface Book {
  isbn: string;
  title: string;
}
```

```
interface Magazine {
  title: string;
  issn: string;
}
```

```
type ReadingMaterial = Book | Magazine;

const getBook = (title: string): ReadingMaterial | undefined =>
  readingMaterial.find(rM => rM.title === title)
```

When to use Interfaces

Interfaces

<code>

An Interface can be implemented by a class.

```
class Biography implements Book {
  isbn: string;
  title: string;
}
```

Interfaces - Class types

Forgetting to implement flipPage throws a compile error.

```
interface CanFlip {
  flipPage: () => void;
}
```

```
Class 'BookListComponent' incorrectly implements interface 'CanFlip'.
  Property 'flipPage' is missing in type 'BookListComponent' but
required in type 'CanFlip'. ts(2420)

login.component.ts(16, 3): 'flipPage' is declared here.

class BookListComponent

View Problem (⌥F8)    Quick Fix... (⌥Enter)
```

```
class BookListComponent implements CanFlip {

}
```

Interface Merging

<code>

When re-declaring interfaces its properties merge

```
interface Book {
    isbn: string;
    title: string;
}

// other code...

interface Book {
   pages?: number;
}
```

```
interface Book {
    isbn: string;
    title: string;
    pages?: number;
}
```

When to use Type Aliases

Type Alias for unions of type literals

<code>

You can allow certain valid values for a type

```
// Example 1
type HttpStatusCodes = 200 | 201 | 400;

// Example 2
type TextAlignOptions = 'left' | 'right' | 'center' | 'auto' | 'justify';
```

Type alias for primitive types

<code>

Use type aliases to provide more context (as a form of documentation)

```
type ContractId = string;
type CustomerId = string;

export interface Contract {
   id: ContractId;
   customerId: CustomerId;
}
```

Interfaces vs. Type Aliases

Interface vs. Type Alias

<code>

Opinionated guide

“Interfaces are generally **preferred over** type literals because interfaces can be *implemented, extended* and *merged*.”

https://github.com/bradzacher/eslint-plugin-typescript/blob/master/docs/rules/prefer-interface.md

Interface vs. Type Alias

<code>

TypeScript Docs

"Type aliases and interfaces are **very similar**, and in many cases you can **choose between them freely**. Almost all features of an interface are available in type, the key distinction is that a **type cannot be re-opened** to add new properties vs an **interface** which is **always extendable**.."

https://www.typescriptlang.org/docs/handbook/2/everyday-types.html#differences-between-type-aliases-and-interfaces

Interface vs. Type Alias

<code>

Opinionated guide

“Interfaces are basically a way to describe data shapes, for example, an object.

Type is a definition of a type of data, for example, a union, primitive, intersection, tuple, or any other type.”

https://blog.logrocket.com/types-vs-interfaces-in-typescript/

Task

Create an interface: here

TypeScript Generics

TypeScript Generics

<code>

The Array-Type is implemented as a generic.

```
const books: Array<number> = []

const list: ReadonlyArray<string> = ["foo", "bar"];


const books: {title: string, isbn: string}[] = []

const books: User[] = []
```

TypeScript Generics

<code>

Generic object

```
type ResponseT<T> = {
  id: number;
  data: T[];
  createdAt: number;
  modifiedAt: number;
};

const response: ResponseT<Book> = {
  id: 1,
  data: [{ isbn: 'abc', title: 'Faust' }],
  createdAt: 12345678,
  modifiedAt: 12345678,
}
```

Generic Functions

<code>

Input argument is of same type as return value

```
const logIdentity = <T>(arg: T): T => {
  console.log(arg);
  return arg;
};
```

Generic Functions

<code>

Reverse a list: what gets passed into the function should be of the same type of what gets returned

```
const reverse = <T>(items: T[]): T[] => {
  let result = [];
  for (let i = items.length - 1; i >= 0; i--) {
    result.push(items[i]);
  }
  return result;
}
```

Generic Functions

<code>

Reverse a list: what gets passed into the function should be of the same type of what gets returned

```
const reversed = reverse([3, 2, 1]) // [1, 2, 3]
// Safety!
reversed[0] = '1'; // Error!


const reverse = <T>(items: T[]): T[] => {
  let result = [];
  for (let i = items.length - 1; i >= 0; i--) {
    result.push(items[i]);
  }
  return result;
}
```

Generic Functions

<code>

Placement of the generic identifier in arrow function expressions

```
function reverse<T>(items: T[]): T[] { /* ... */ }

// arrow function expression:

const reverse = <T>(items: T[]): T[] => { /* ... */ }
```

Task

Generic Type: here

--- Advanced Types ---

Enums

Enum

<code>

Using enums can make it easier to document intent, or create a set of distinct cases.

```
enum Progress {
  min = 0,
  max = 100,
}
```

Enum

<code>

Using enums can make it easier to document intent, or create a set of distinct cases.

```
enum LogLevel {
  ERROR,
  WARN,
  INFO,
  DEBUG
}
```

is equivalent

```
enum LogLevel {
  ERROR = 0,
  WARN = 1,
  INFO = 2,
  DEBUG = 3,
}
```

Enum

<code>

Named enum

```
enum Gender {
  Female = 'FEMALE',
  Male = 'MALE',
  Other = 'OTHER',
}
```

Records

Record

<code>

Define type of all key and value pairs of object

```
const months: Record<string, number> = {
  january: 1,
  february: 2,
  march: 3,
  april: 4,
  mai: 5,
  june: 6,
  july: 7,
  august: 8,
  september: 9,
  october: 10,
  november: 11,
  december: 12,
};
```

```
const months: Record<string, number> = {
  january: 1,
  february: 2,
  march: 3,
  (property) august: string
  Type 'string' is not assignable to type 'number'. ts(2322)
  View Problem (⌥F8)    No quick fixes available
  august: '8',
  september: 9,
  october: 10,
  november: 11,
  december: 12,        You, seconds ago • Uncommitted changes
};
```

Record

<code>

Define type of all key and value pairs of object

```
const arrayToObject = (values: number[]): Record<string, number> => {
  // ...
};

const getNumberFormatSettings = (): Record<string, string> => ({
  decimalSeparator: '.',
  groupingSeparator: ',',
});
```

Excess Property Checks

Excess Property Checks

<code>

Not defined properties cause a warning when directly giving a type to an object literal.

```
interface Car {
  wheels: number;
  engine: string;
}

const Tesla: Car = {
  wheels: 4,
  engine: 'electric',
  cameras: 20, // Error
}
```

```
(property) cameras: number

Type '{ wheels: number; engine: string; cameras: number; }' is not
assignable to type 'Car'.
  Object literal may only specify known properties, and 'cameras'
does not exist in type 'Car'. ts(2322)

View Problem (⌥F8)    No quick fixes available
cameras: 20,      You, seconds ago • Uncommitted changes
}
```

Indexable Types

<code>

Object with certain properties but **arbitrary additional properties**.

```
interface Car {
  wheels: number;
  engine: string;
  [key: string]: unknown;
}

const MyTesla: Car = {
  wheels: 4,
  engine: 'electric',
  cameras: 20,
}
```

Excess Property Checks

<code>

Not defined properties cause an error when directly giving a type to an object literal.

```
interface Car {
  wheels: number;
  engine: string;
}

const Tesla = {
  wheels: 4,
  engine: 'electric',
  cameras: 20,
}

const MyTesla: Car = Tesla;
```

No TypeScript Error

Utility types

Partial

<code>

Make all properties optional

```
type FormValues = {
  firstName: string;
  surname: string;
  dateOfBirth: Date;
  gender: Gender;
};
```

```
type FormValuesPartial = {
  firstName?: string;
  surname?: string;
  dateOfBirth?: Date;
  gender?: Gender;
};
```

```
const initialValues: Partial<FormValues> = { ...storedUserData };
```

Omit and Pick

<code>

omit certain properties of an object or pick only certain properties

```
interface Book {
  id: number;
  isbn: string;
  title: string;
  pages?: number;
}

type BookId = Pick<Book, 'id'>
type BookId = { id: Book['id'] };
type BookId = Omit<Book, 'isbn' | 'title' | 'pages'>;
```

```
const Id = {
  id: 12,
}
```

Three solutions which all lead to the same type.

This is an **indexed access type**

Omit and Pick

<code>

`omit` certain properties of an object or `pick` only certain properties

```
interface Book {
  id: number;
  isbn: string;
  title: string;
  pages?: number;
}

type BookDetails = Pick<Book, 'title' | 'pages'>;
type BookDetails = Omit<Book, 'id' | 'isbn'>;
type BookDetails = {
  title: Book['title'];
  pages?: Book['pages'];
}
```

```
const Details: BookDetails = {
  title: 'Hamlet',
  pages: 67,
}
```

Three solutions which all lead to the same type.

Combining Utility types

<code>

Combine utility types with other types to create more powerful types.

```
interface Book {
  id: string,
  title: string,
  isbn: string,
}

// Example 1
type OptionalBookPropsWithoutId = Omit<Partial<Book>, ‘id’>;

// Example 2
type BookWithNumberId = Omit<Book, 'id'> & { id: number };
```

Utility types

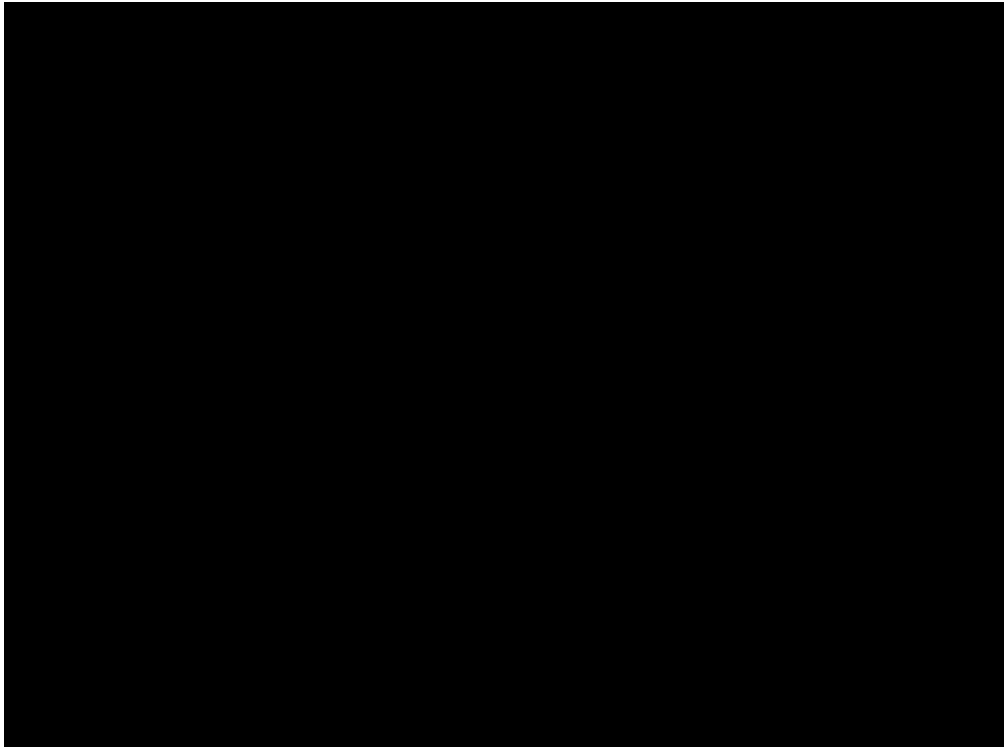
<code>

E.g. Use Pick<T, keyof T> to stay in sync with your models.

```
interface Titles {
  bookTitles: Pick<Book, 'title'>[];
  videoTitles: Pick<Video, 'title'>[];
}
```

Utility types

E.g. Use Pick<T, keyof T> to stay in sync with your models.



Compose TypeScript’s utility types

Partial<T> makes all properties of a type optional. What if we want to make only a few properties optional?

We can create our own utility type **Optional<>**.

How to read a complex type definition

<code>

This is how you can use it to make a property optional.

```
interface Customer {
    id: string;
    firstName: string;
    lastName: string
}

const optionalCustomer: Optional<Customer, 'firstName' | 'lastName'> = {
    id: "12";
}
```

How to read a complex type definition

<code>

Solution: This is how **Optional** can look like.

Let's break this type down into pieces and learn how we can read & understand complex custom types.

```
export type Optional<T, K extends keyof T> =  Pick<Partial<T>, K> & Omit<T, K>;
```

How to read a complex type definition

<code>

```
export type Optional<T, K extends keyof T> =  Pick<Partial<T>, K> & Omit<T, K>;
```

We create a new type and sharing it with other modules.

How to read a complex type definition

<code>

```
export type Optional<T, K extends keyof T> =  Pick<Partial<T>, K> & Omit<T, K>;
```

We name the type “Optional”.

How to read a complex type definition

<code>

```
export type Optional<T, K extends keyof T> =  Pick<Partial<T>, K> & Omit<T, K>;
```

“Optional” has two parameters:

1. The Object that should be made partially optional.
2. The properties of the object that should be optional.
   K has to be a property name of the Object.

How to read a complex type definition

<code>

```
export type Optional<T, K extends keyof T> =  Pick<Partial<T>, K> & Omit<T, K>;
```

Make the Object completely optional.

How to read a complex type definition

<code>

```
export type Optional<T, K extends keyof T> =  Pick<Partial<T>, K> & Omit<T, K>;
```

Take only the optional properties being specified in **K**.

```
interface AandB { a: string, b: string };

Pick<Partial<AandB>, “b”> // Result: { b?: string | undefined }
```

How to read a complex type definition

<code>

```
export type Optional<T, K extends keyof T> =  Pick<Partial<T>, K> & Omit<T, K>;
```

Combine the Result from Pick<...> with the Result form Omit<...>.

How to read a complex type definition

<code>

```
export type Optional<T, K extends keyof T> =  Pick<Partial<T>, K> & Omit<T, K>;
```

Use the given object T but remove all properties specified by K.

```
interface AandB { a: string, b: string };

Omit<AandB, “b”> // { a: string }
```

How to read a complex type definition

<code>

```
export type Optional<T, K extends keyof T> =  Pick<Partial<T>, K> & Omit<T, K>;
```

Put both results together:

```
// { b?: string | undefined }                    // { a: string }
```

How to read a complex type definition

<code>

```
export type Optional<T, K extends keyof T> =  Pick<Partial<T>, K> & Omit<T, K>;
```

The specified Key has been made optional.

```
{
  a: string,
  b?: string
}
```

Type Guards

Type Guards | built-in

<code>

With the JavaScript **typeof** operator we can check for a type

```
interface MayBeExecutable {
  work?: () => void; // possibly undefined
}

function executer(unit: MayBeExecutable) {
  if (typeof unit.work === 'function') {
    unit.work();
  }
}
```

Type Guards | built-in

<code>

Check for class instance with **instanceof**

```
const a = new Greeting();  // has method hi
const b = new Farewell();  // has method bye

function do(interaction: Greeting | Farewell) {
  if (interaction instanceof Greeting) {
     interaction.hi(); // type Greeting is inferred
  } else {
    interaction.bye(); // type Farewell is inferred,
                       // since no other type is possible
 }
}
```

Type Guards | Custom

<code>

Help the TypeScript compiler to understand your types better.

```
// Example 1
function isNumber(value: string | number): value is number {
  return !isNaN(value);
}

// Example 2
function isGoldCustomer(customer: NormalCustomer | GoldCustomer)
  : customer is GoldCustomer
{
  return customer.type === 'Gold';
}
```

Type Assertion
(Type Cast)

Type Assertions (Type Casts)

<code>

Override the compiler's type checker. It comes in two syntax forms:

```
// Casting object literal to Person type: `as` syntax
const person = {
    name: 'Victoria',
    age: 28,
} as Person

// Casting object literal to Person: `ang-bracket` syntax
const person = <Person>{
    name: 'Franz',
    age: 34,
};
```

Type Assertions (Type Casts)

<code>

Dangerous use of type assertion: Can you be certain that persons array is not empty?

```
type Person = { name: string, age?: number };
// const persons = [ ... array of persons retrieved from API ];

// TS Error:   Type 'undefined' is not assignable to type 'Person'.
const getPerson = (name: string): Person =>
  persons.find(person => person.name === name);

// Solution 1: Union with undefined
const getPerson = (name: string): Person | undefined =>
  persons.find(person => person.name === name);

// Solution 2: Type assertion
const getPerson = (name: string): Person =>
  persons.find(person => person.name === name) as Person;
```

Type Assertions (Type Casts)

<code>

Valid use of type assertion: Help the compiler to understand what it could not do itself, but which you as the developer know for sure.

```
const deserialize = <T>(data: string): T => JSON.parse(data) as T;

const victoria = deserialize<Person>(
  '{"name":"Victoria", "age":28}'
);
```

keyof Operator

keyof Operator

<code>

Takes an object type and produces a literal union of its keys

```
type Point = { x: number; y: number };
type P = keyof Point;
// Same as: type P = 'x' | 'y';

const x: P = 'x';
const y: P = 'y';

const z: P = 'z'; // Error: Type '"z"' is not assignable to type 'keyof
Point'.
```

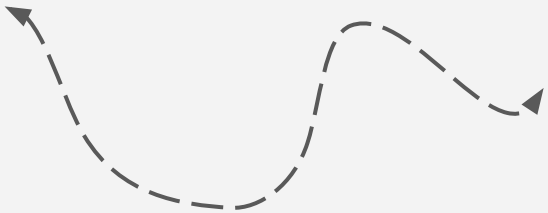
keyof with Enums

<code>

Create type out of enum

```
type LogLevelStrings = keyof typeof LogLevel;
// This is equivalent to:
// type LogLevelStrings = 'ERROR' | 'WARN' | 'INFO' | 'DEBUG';
```

```
enum LogLevel {
  ERROR,
  WARN,
  INFO,
  DEBUG
}
```



Equivalent enums

```
enum LogLevel {
  ERROR = 0,
  WARN = 1,
  INFO = 2,
  DEBUG = 3,
}
```

Tips

Hint

Press **F8** in **VSCode** to jump from type error to type error to fix them.

Hint

Don’t try to type everything perfectly right from the start.

It’s ok to have some curly underlined

https://www.typescriptlang.org/docs/handbook/advanced-types.html

Task: Test your knowledge

any

strictNullChecks

Enum

Type Alias

TypeScript

Utility types

Type inference

@ts-expect-error

Interfaces

Generics

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