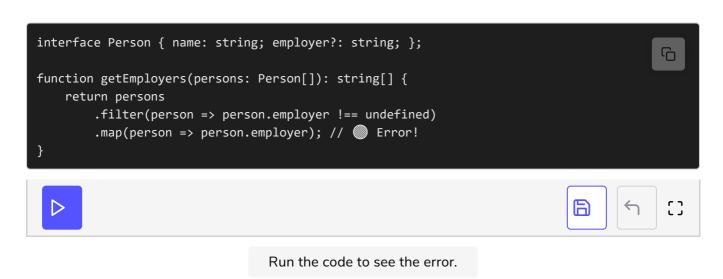
Debugging Errors: Narrowing Types

This lesson walks through the debugging of a compile error that can be addressed by appropriate type narrowing.

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Overview

Another error that we'll look at is an example of a situation when TypeScript is not able to narrow the type of a variable, even though it might be obvious from the perspective of the programmer.



The above code will result in the following error message.

```
Type '(string | undefined)[]' is not assignable to type 'string[]'.
   Type 'string | undefined' is not assignable to type 'string'.
   Type 'undefined' is not assignable to type 'string'.ts(2322)
```

Digging deeper

Let's break down the error message.

```
Type '(string | undefined)[]' is not assignable to type 'string[]'.
```

The error message points to the line containing the return statement. It says that that the inferred type of the expression passed to the return statement (string | undefined)[] does not match the expected return type string[]. The subsequent lines aim to provide some explanation on why these two types don't match. Both types are array types, so TypeScript compares the type of the array element in both. string | undefined is indeed not assignable to string because undefined is not assignable to string. To summarize, we're trying to return an array of possibly undefined string values, where a value of always defined string values is expected.

"But we filter out undefined values," one might say! However, TypeScript has no way of knowing how the predicate provided to filter method affects the type of the array. Even though it's obvious that person.employer will be defined inside map, its type is still string | undefined. We can't expect TypeScript to understand the semantics of Array.filter, so we need to help it a bit.

Type guard to the rescue

Fortunately, there is a way to fix this in an elegant way. Interestingly, there are two overloads for Array.filter:

```
filter(callbackfn: (value: T, index: number, array: T[]) => unknown, thisA
rg?: any): T[];
filter<S extends T>(callbackfn: (value: T, index: number, array: T[]) => v
alue is S, thisArg?: any): S[];
```

The first one is the more obvious one. You've probably been using it all the time without even knowing about it. The second one is more interesting. It's a generic function with type argument <code>S</code>, where <code>S</code> is a subtype of <code>T</code>. The type of the <code>callbackFn</code> parameter is (<code>value: T, index: number, array: T[]) => value is <code>S</code>; it's a type guard! All array elements for which <code>callbackFn</code> returns <code>true</code> can be typed as <code>S</code> instead of <code>T</code>. Therefore, the return type of the whole method is <code>S[]</code>.</code>

All we need to do is provide a type guard version of the predicate where we

tell TypeScript that if person.employer !== undefined then the type of person can be narrowed to Required<Person>.

This example shows how it's sometimes required to provide the type checker a little help to successfully resolve an error.

The next lesson discusses coping with unintuitive error messages.