Generics

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Overview

- What are generics?
- Type parameters
- Generic functions
- Generic classes and interfaces
- Generic constraints

What Are Generics?

Code that works with multiple types

Accept “type parameters” for each instance or invocation

Apply to functions, interfaces, and classes

What Are Type Parameters?

- Specify the type a generic will operate over
- Listed separate from function parameters inside angle brackets
- Conventionally represented by the letter ‘T’ (e.g. Array<T>)
- Actual type provided at instance creation or function invocation

```
let poetryBooks: Book[];

let fictionBooks: Array<Book>;
```

Using Array<T>

Type parameter specifies the type the array can contain

Type parameters are part of the type

```
let poetryBooks: Book[];

let fictionBooks: Array<Book>;

let historyBooks = new Array<Book>(5);
```

Using Array<T>

Type parameter specifies the type the array can contain

Type parameters are part of the type

Type parameters are listed separate from function parameters

Generic Functions

```
function LogAndReturn<T>(thing: T): T {

}
```

Generic Functions

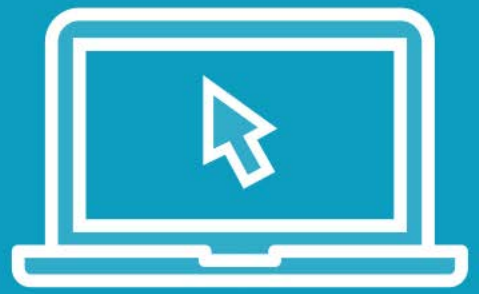
```
function LogAndReturn<T>(thing: T): T {
    console.log(thing);
    return thing;
}
let someString: string = LogAndReturn<string>('log this');
```

Generic Functions

```
function LogAndReturn<T>(thing: T): T {
    console.log(thing);
    return thing;
}
let someString: string = LogAndReturn<string>('log this');

let newMag: Magazine = { title: 'Web Dev Monthly' };
let someMag: Magazine = LogAndReturn<Magazine>(newMag);
```

Demo



Creating and using generic functions

Generic Interfaces

```
interface Inventory<T> {

}
```

Generic Interfaces

```
interface Inventory<T> {
    getNewestItem: () => T;
    addItem: (newItem: T) => void;
    getAllItems: () => Array<T>;
}
let bookInventory: Inventory<Book>;
// populate the inventory here...
let allBooks: Array<Book> = bookInventory.getAllItems();
```

Generic Classes

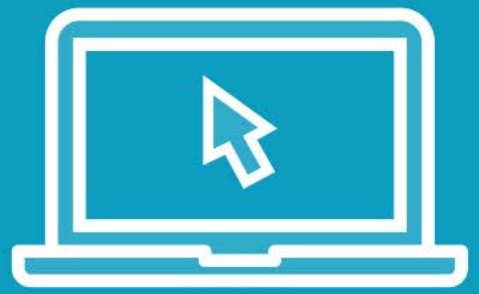
```
class Catalog<T> implements Inventory<T> {

}
```

Generic Classes

```
class Catalog<T> implements Inventory<T> {
    private catalogItems = new Array<T>();
    addItem(newItem: T) {
        this.catalogItems.push(newItem);
    }
    // implement other interface methods here
}
let bookCatalog = new Catalog<Book>();
```

Demo



Creating and using a generic class

“I’m a real believer in that creativity comes from limits, not freedom.”

Jon Stewart

Fresh Air (NPR)

Jon Stewart: The Most Trusted Name In Fake News

```
interface CatalogItem {
    catalogNumber: number;
}

class Catalog<T extends CatalogItem> implements Inventory<T> {
    // implement interface methods here
}
```

Generic Constraints

Describe types that may be passed as a generic parameter

“extends” keyword applies constraint

```
interface CatalogItem {
    catalogNumber: number;
}
class Catalog<T extends CatalogItem> implements Inventory<T> {
    // implement interface methods here
}
```

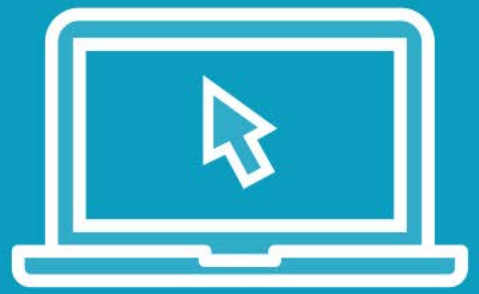
Generic Constraints

Describe types that may be passed as a generic parameter

“extends” keyword applies constraint

Only types satisfying the constraint may be used

Demo



Adding a constraint to a generic class

Summary

When to use generics

Type parameters

Generic functions, classes, and interfaces

Adding constraints to generic classes