Behavioral Pattern: Observer

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Coming Up

Describing the observer pattern

- Service communication in a ticket management system

Structure of the observer pattern

Coming Up

Use cases for this pattern

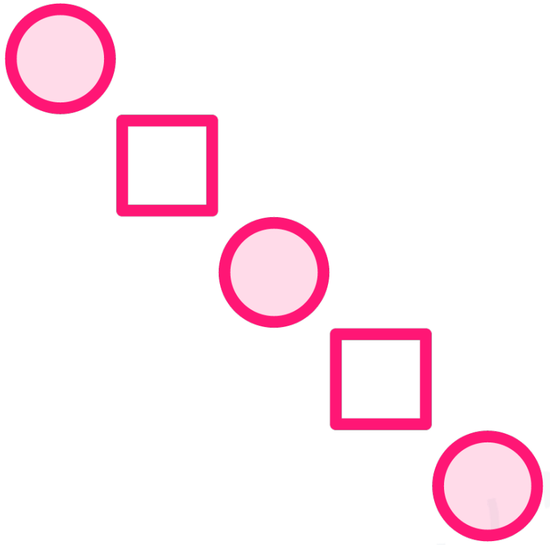
Pattern consequences

Related patterns

Describing the Observer Pattern

Creational

Structural



Behavioral

Observer

The intent of this pattern is to define a one-to-many dependency between objects so that when one object changes state, all its dependents are notified and updated automatically.

Describing the Observer Pattern

Observer is a common pattern

- Observables in Angular
- Service communication in microservice architectures
- ...

```
public class OrderService
{ }

public class TicketStockService
{ }

public class TicketResellerService
{ }
```

Describing the Observer Pattern

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```

Describing the Observer Pattern

These services are related and need to maintain consistency

```
public class OrderService
{
     private TicketStockService _ticketStockService;
     private TicketResellerService _ticketResellerService;
}

public class TicketStockService
{ }

public class TicketResellerService
{ }
```

Describing the Observer Pattern

```
public class OrderService
{
     private TicketStockService _ticketStockService;
     private TicketResellerService _ticketResellerService;

     // methods to notify services...
}

public class TicketStockService
{ }

public class TicketResellerService
{ }
```

Describing the Observer Pattern

We're introducing tight coupling
Becomes complex to maintain

Describing the Observer Pattern

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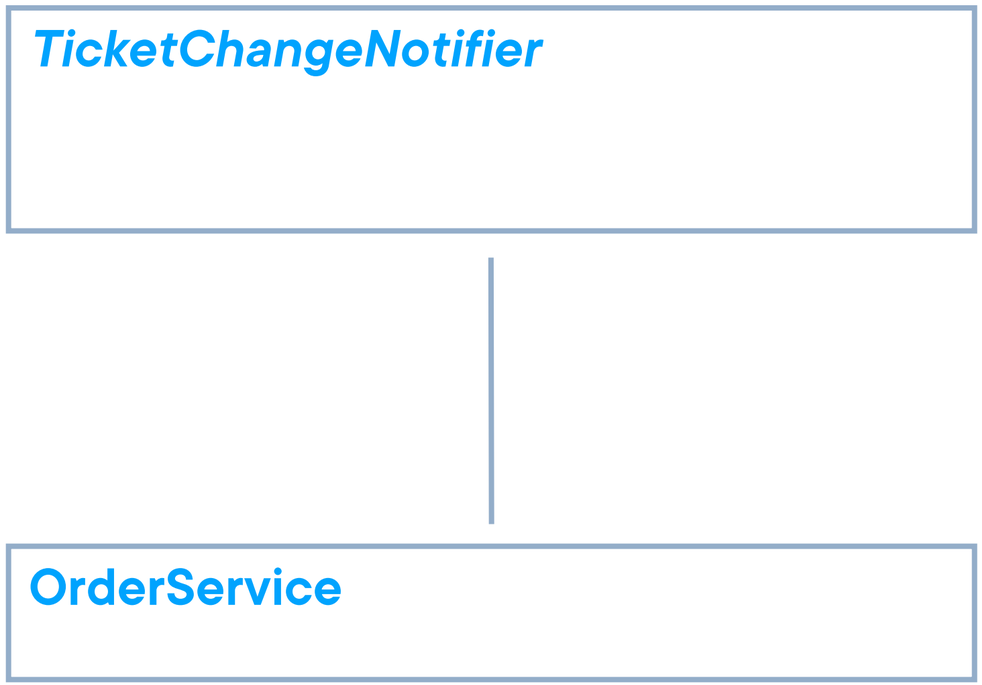
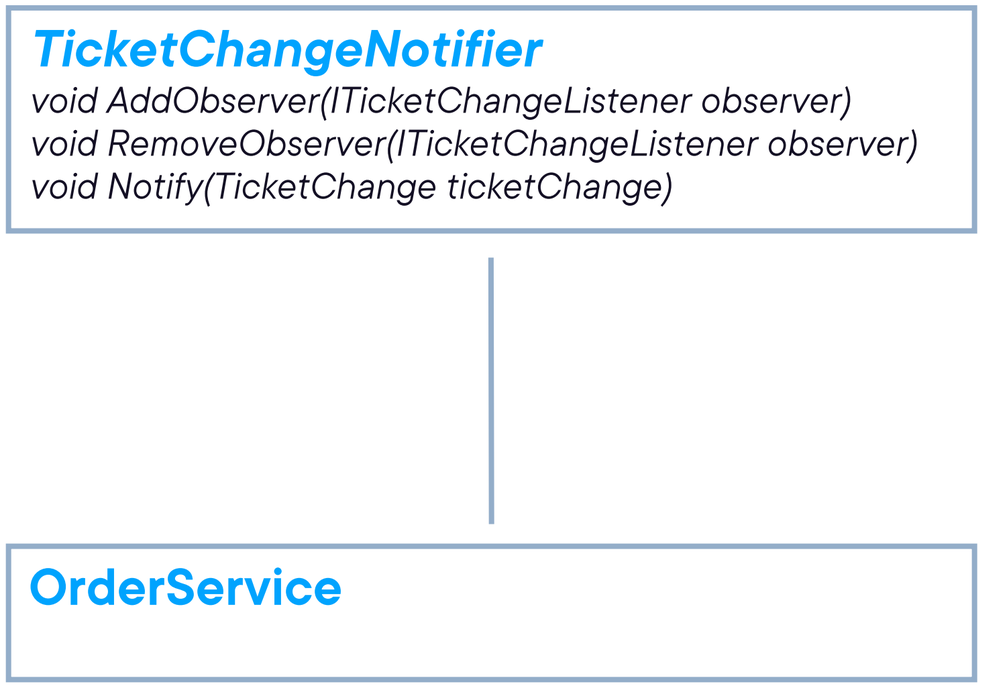


Describing the Observer Pattern



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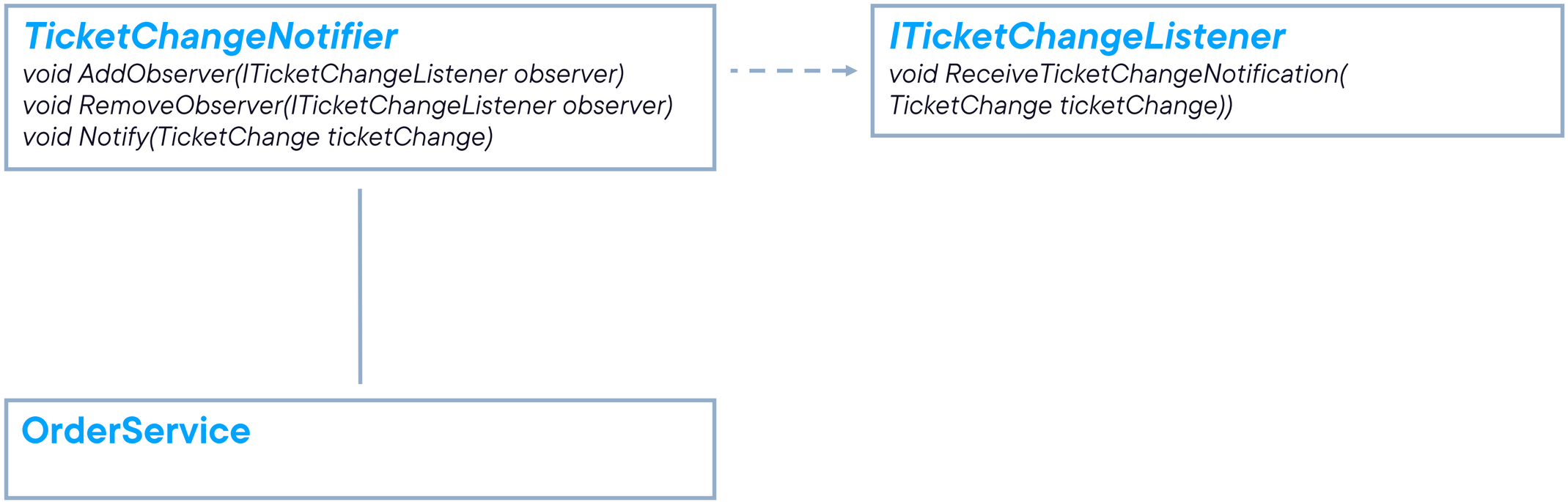
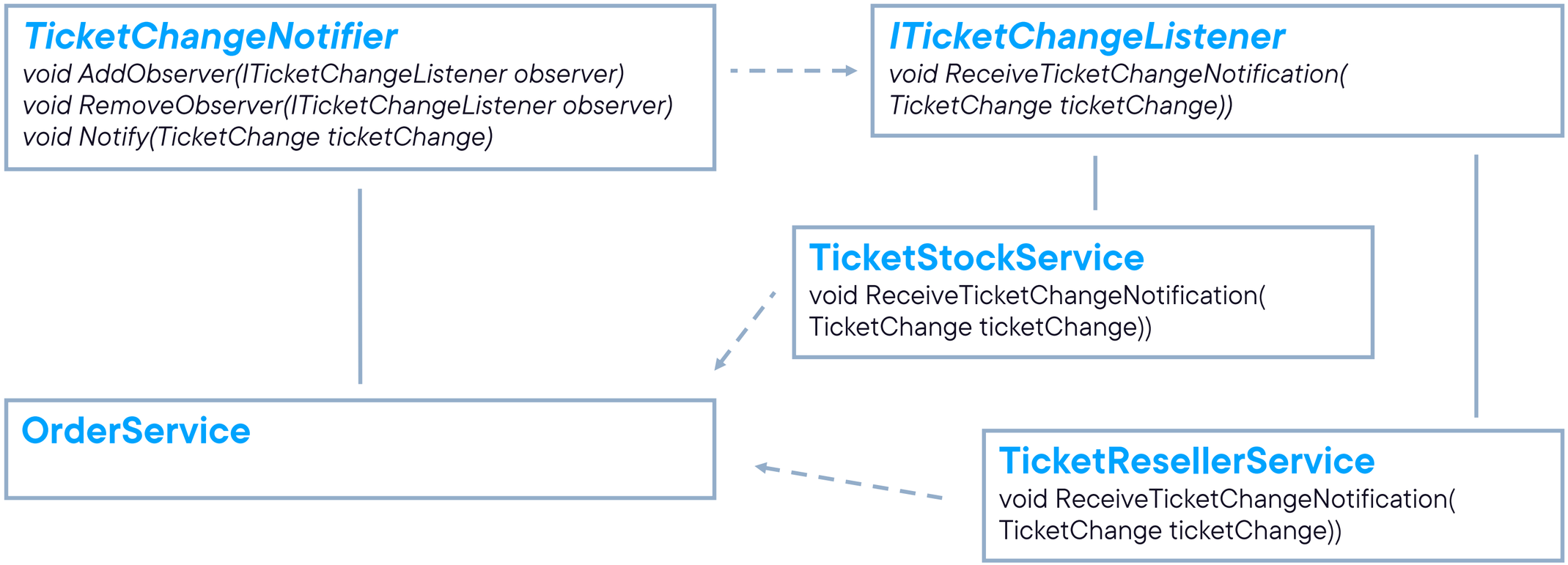
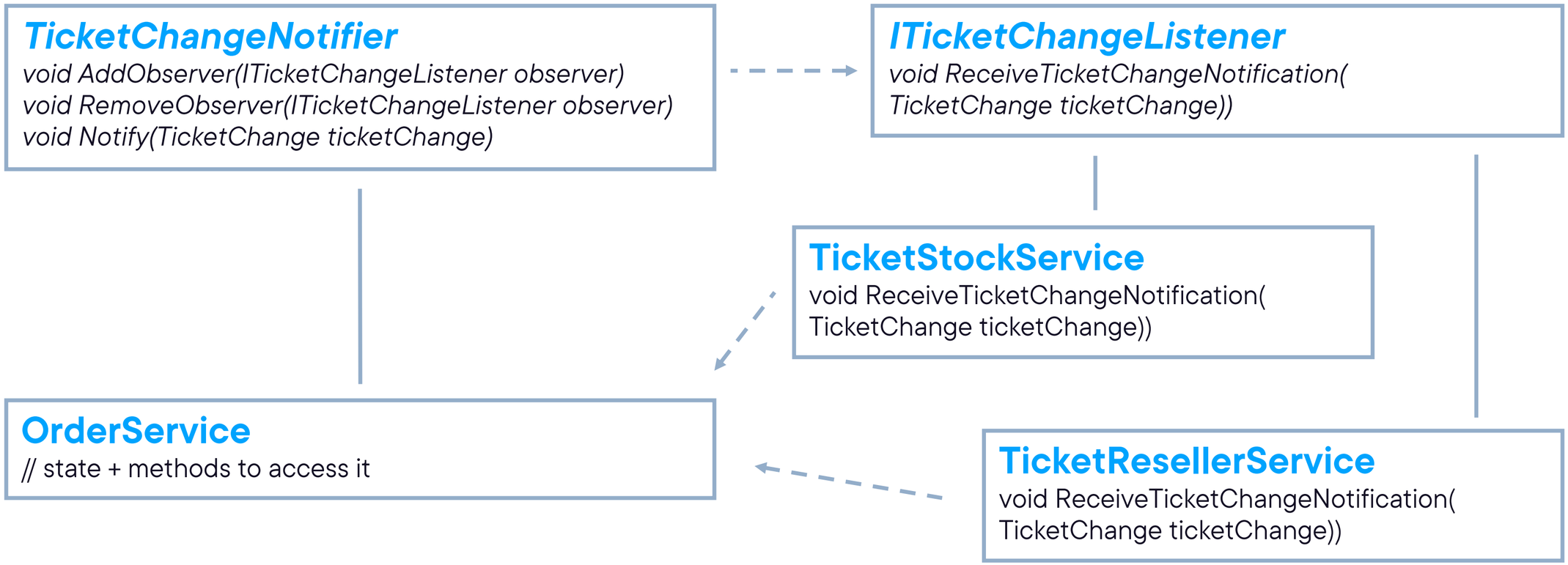


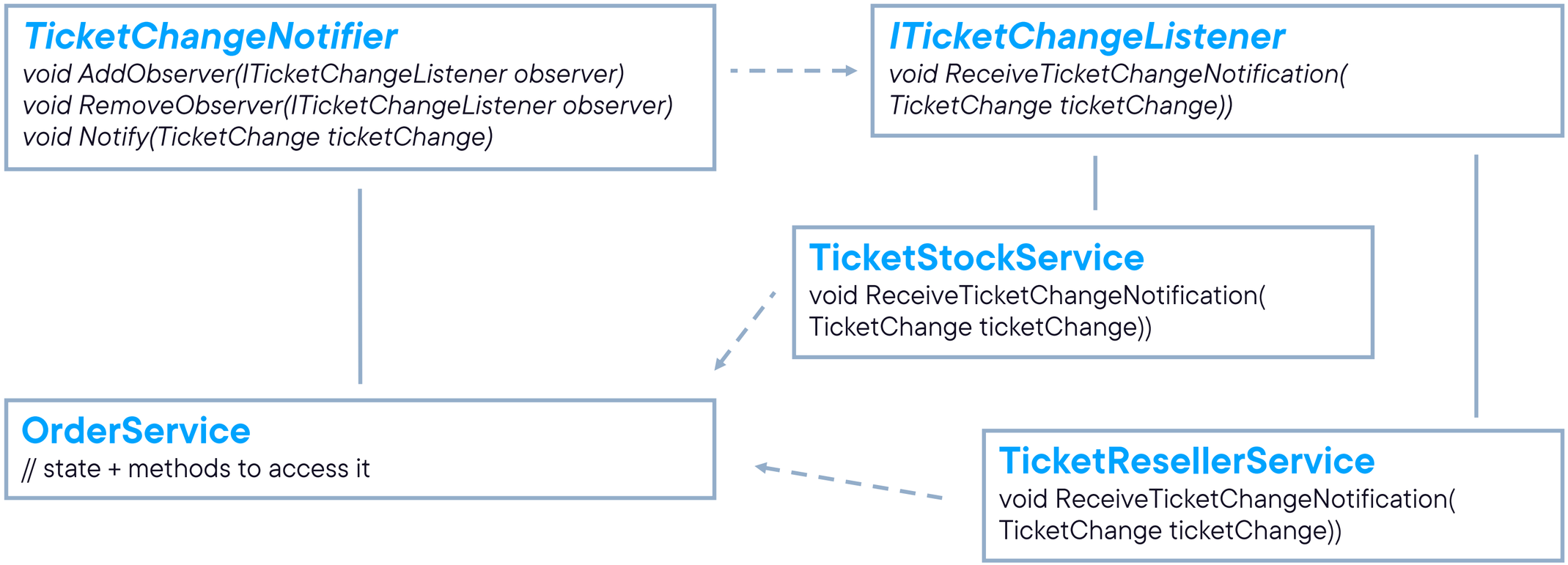
Describing the Observer Pattern



Describing the Observer Pattern



Structure of the Observer Pattern



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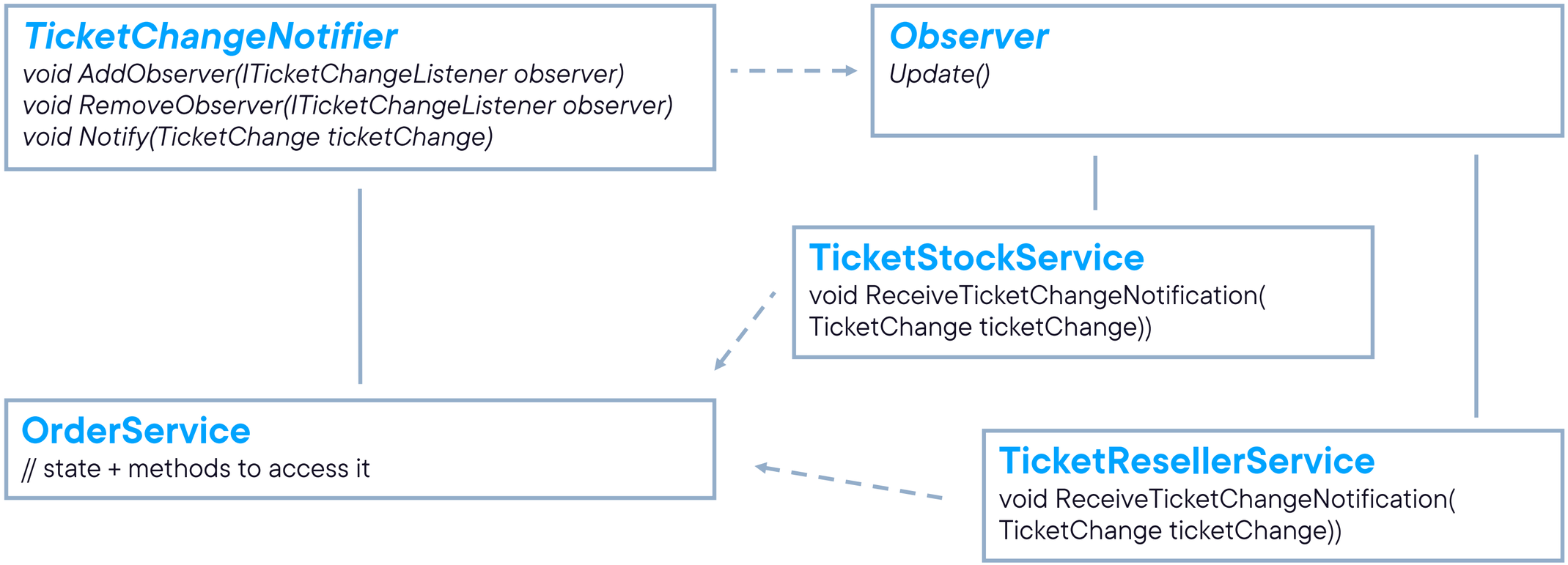
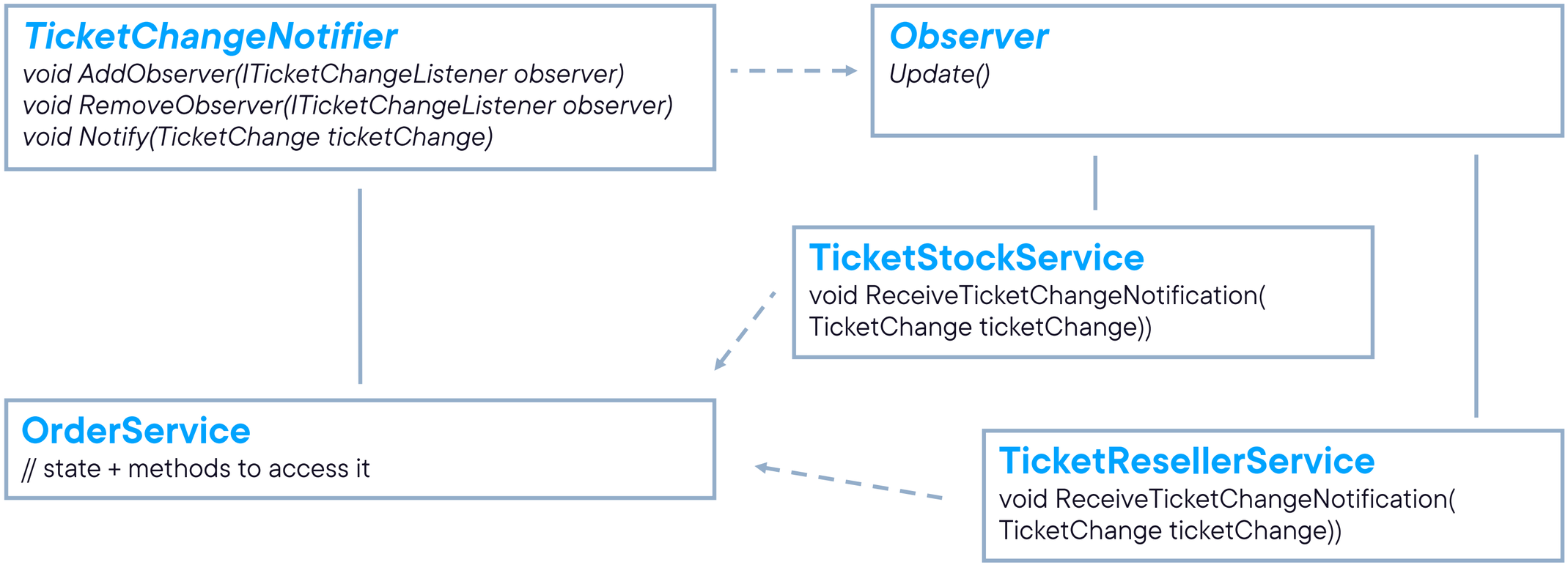


`Observer` **defines an updating interface for objects that should be notified of changes in a** `Subject`

Structure of the Observer Pattern



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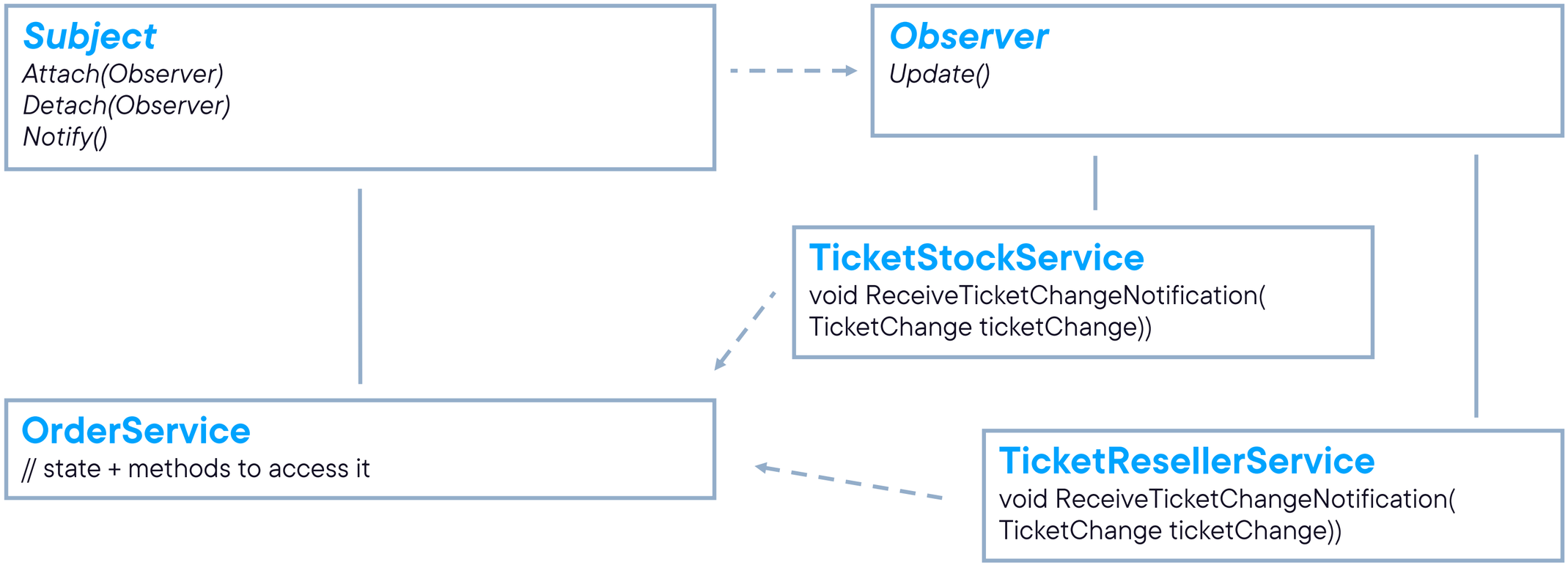
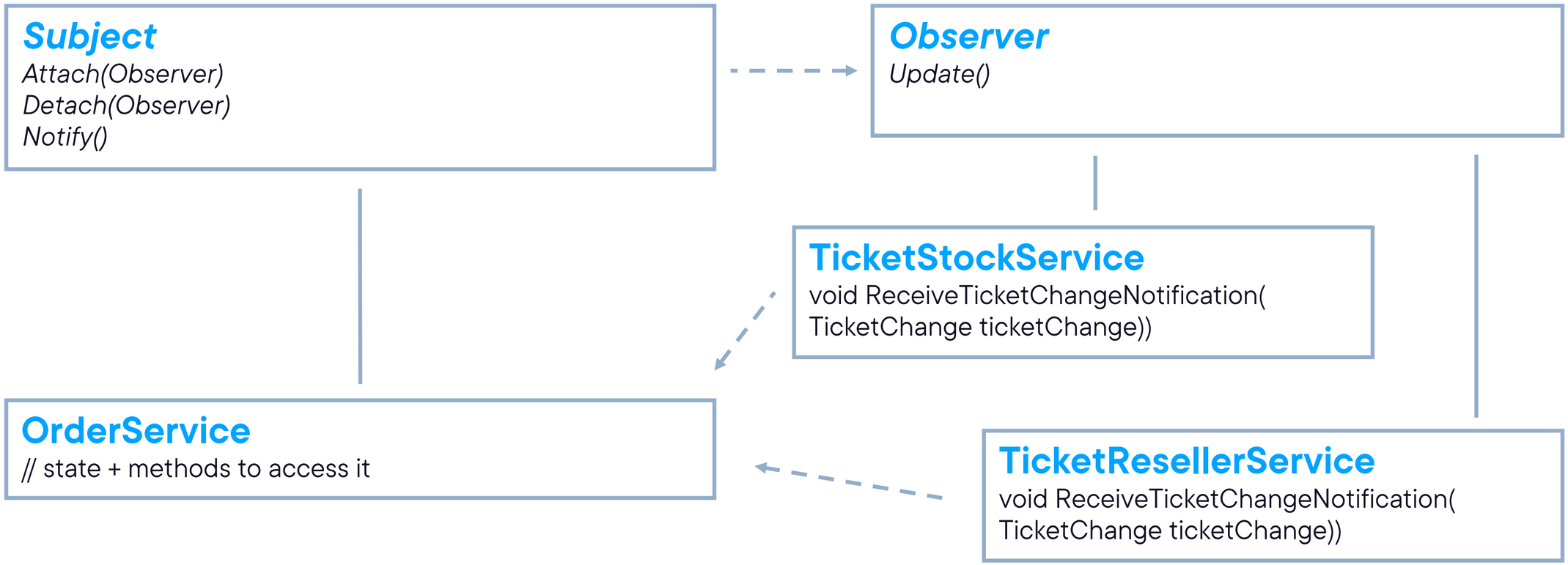


`Subject` **knows its** `Observers`. **Provides an interface for attaching and detaching them.**

Structure of the Observer Pattern



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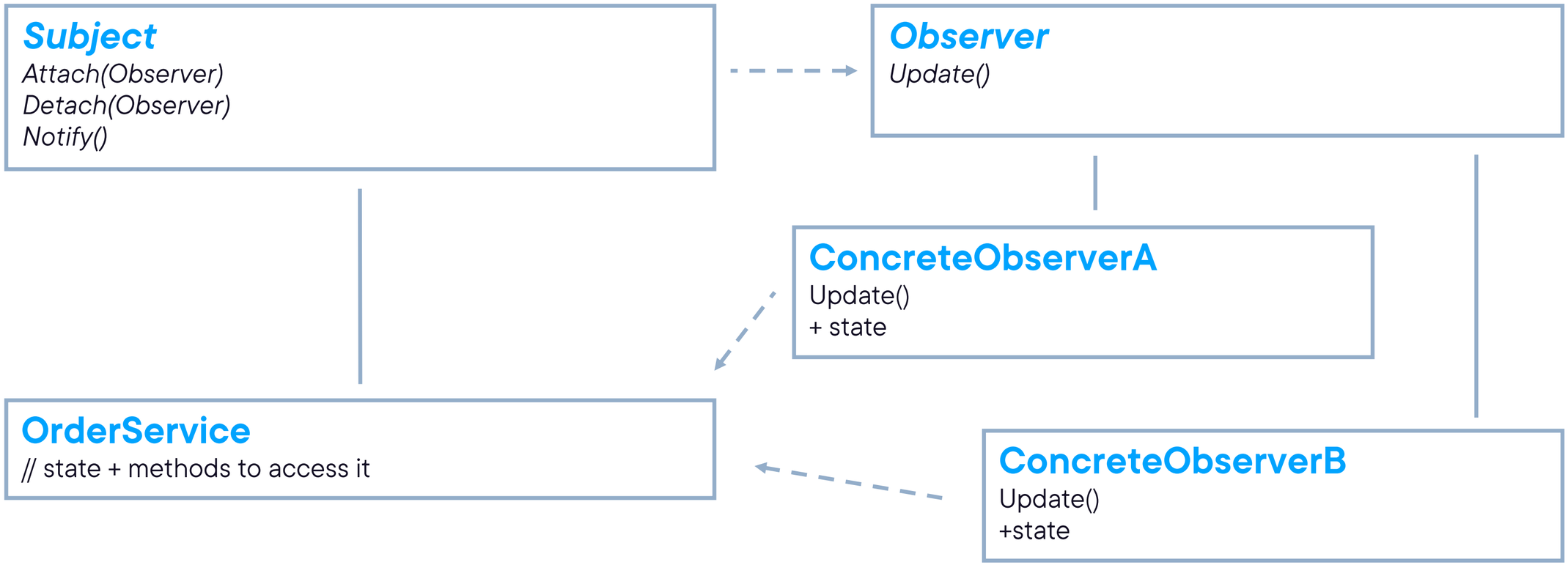
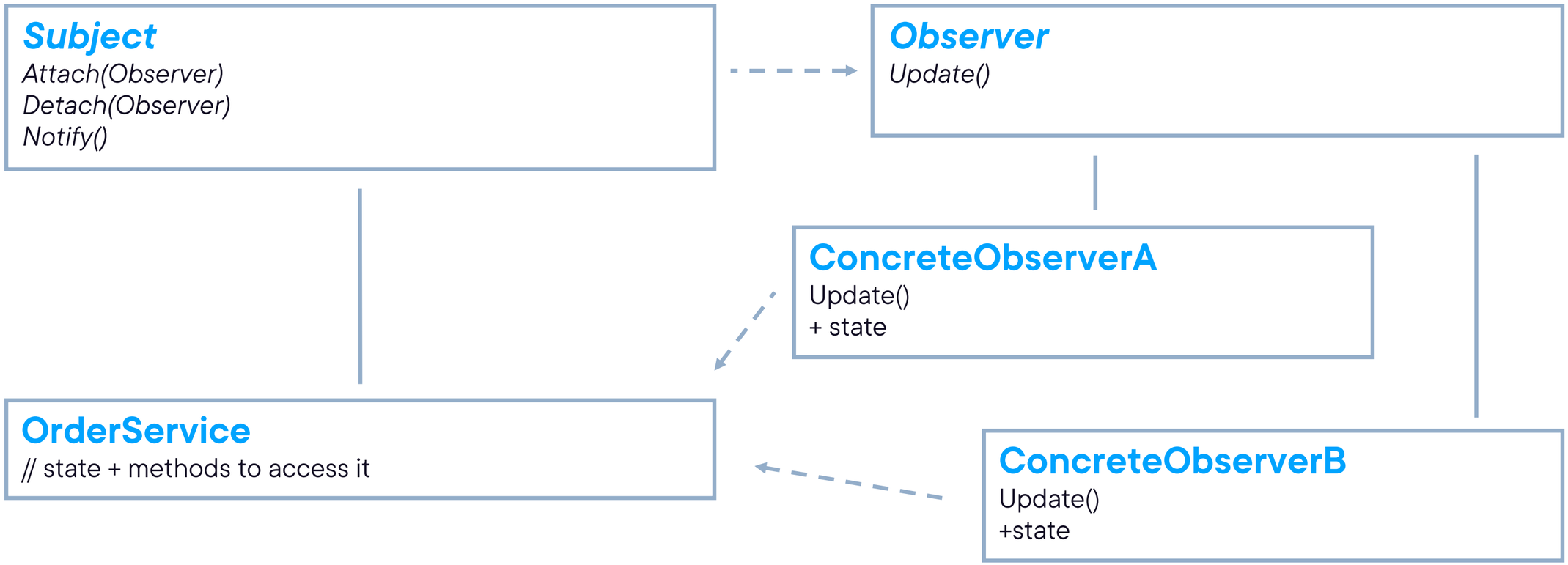


ConcreteObserver **store state that must remain consists with the** Subjects' **state. They implement the** Observer **updating interface to keep state consistent.**

`ConcreteSubject` **stores state of interest to** `ConcreteObserver` **objects, and sends a notification to its** `Observers` **when its state changes**

Structure of the Observer Pattern



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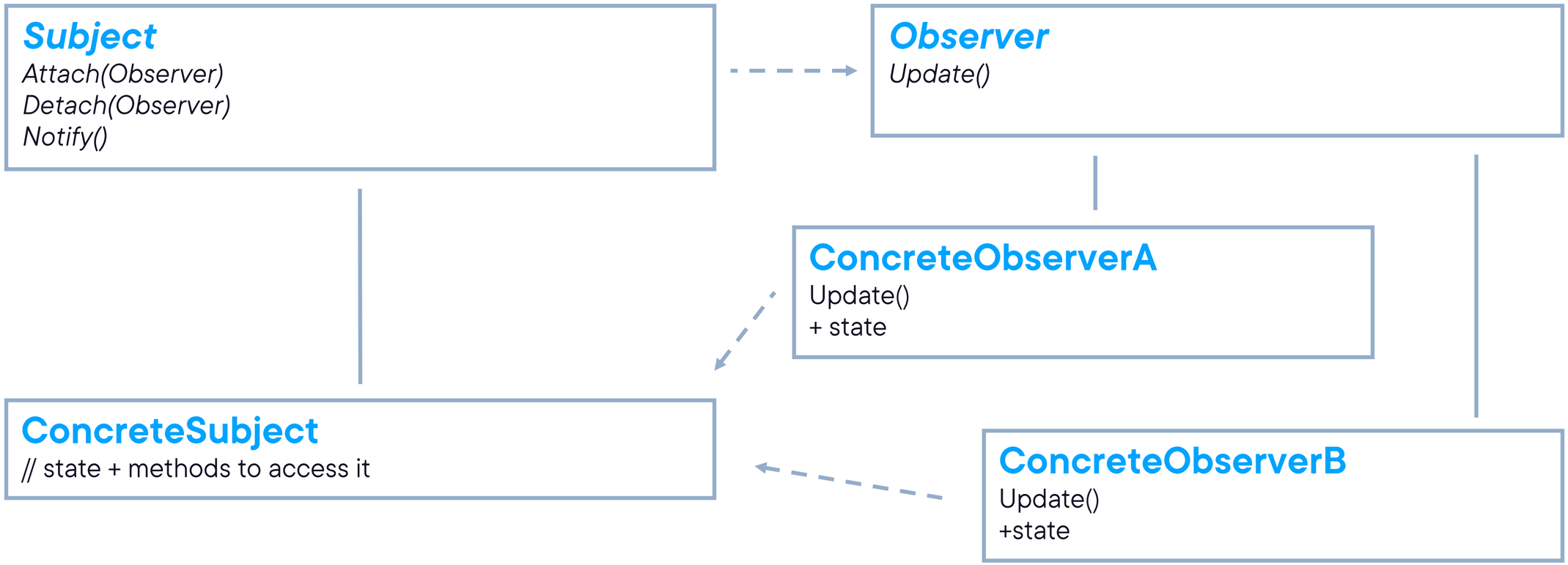


Structure of the Observer Pattern

State is passed through via the Notify method

- No need for the `ConcreteObserver` to hold a reference to the `ConcreteSubject`

Both implementations are valid

Demo

Implementing the observer pattern

Use Cases for the Observer Pattern

When a change to one object requires changing others, and you don’t know in advance how many objects need to be changed

When objects that observe others are not necessarily doing that for the total amount of time the application runs

When an object should be able to notify other objects without making assumptions about who those objects are

Use Cases for the Observer Pattern

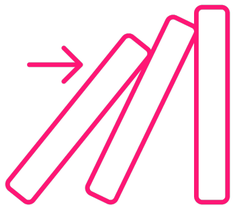
Stock market data updates

Event handling in web development

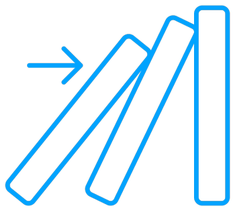
Weather monitoring systems

Traffic management systems

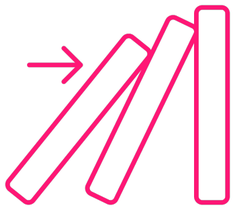
Pattern Consequences



It allows subjects and observers to vary independently: subclasses can be added and change without having to change others: open/closed principle

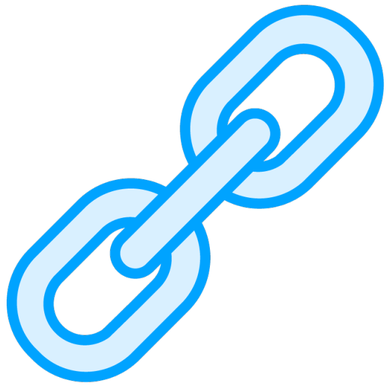


Subject and observer are loosely coupled: open/closed principle

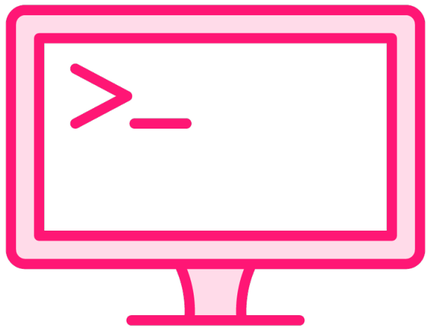


It can lead to a cascade of unexpected updates

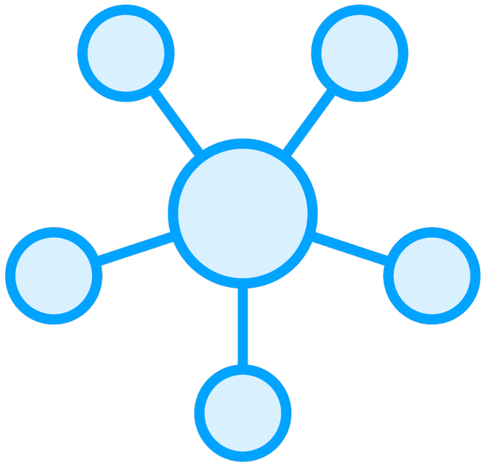
Patterns that Connect Senders and Receivers



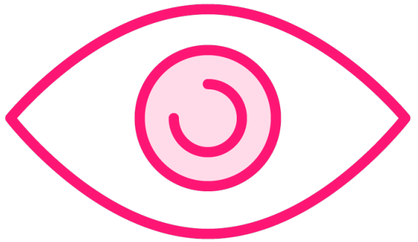
Chain of Responsibility
Passes a request along a chain of receivers



Command
Connects senders with receivers unidirectionally



Mediator
Eliminates direct connections altogether



Observer
Allows receivers of requests to (un)subscribe at runtime

Summary

Intent of the observer pattern:

- To define a one-to-many dependency between objects so that when one object changes state, all its dependents are notified and updated automatically

Summary

Implementation:

- Use an abstract base class to implement `Notify`, `AddObserver` and `RemoveObserver` functionality
- `ConcreteSubjects` are responsible for managing their state

Up Next:

Behavioral Pattern: State