11.1 Self-constrained virtual class

Description

As a first example of a virtual class attribute, we extend the travel booking system introduced in section . We will encapsulate details about a travel booking in a local nested virtual class `TravelInfo` as shown in the example below:

```
class TravelBooking: Booking
   class TravelInfo:<
      source, destination: ref City
      asString -> s: var String:<
         inner(asString)
      theCarrier: ref Carrier
   theTravel: obj TravelInfo
   confirm::<
      confirmText := confirmText + theTravel.asString
   cancel:
      theTravel.theCarrier.notifyCancellation(bookingRef)
```

The symbol `':<'` specifies that class `TravelInfo` is virtual in the same way as for virtual methods. `TravelInfo` has the following attributes:

- The `source` and `destination` of the travel.
- A method `asString`, that returns a text about travel details that may be emailed to the customer.
-

The virtual class `TravelInfo` is an example of a *self-constrained* virtual class, which is a virtual class that is constrained by an object descriptor specifying the virtual class itself, and this object-descriptor includes declarations and/or statements. This is in contrast to a class-constrained virtual class, which is constrained by a class name.

The specification of `TravelInfo` may be extended in subclasses of `TravelBooking`, just like virtual methods may be extended. `TravelInfo` can only be extensions of the object descriptor specifying the virtual class. A class-constrained virtual class can be extended to any subclass of the virtual class constraining the virtual class.

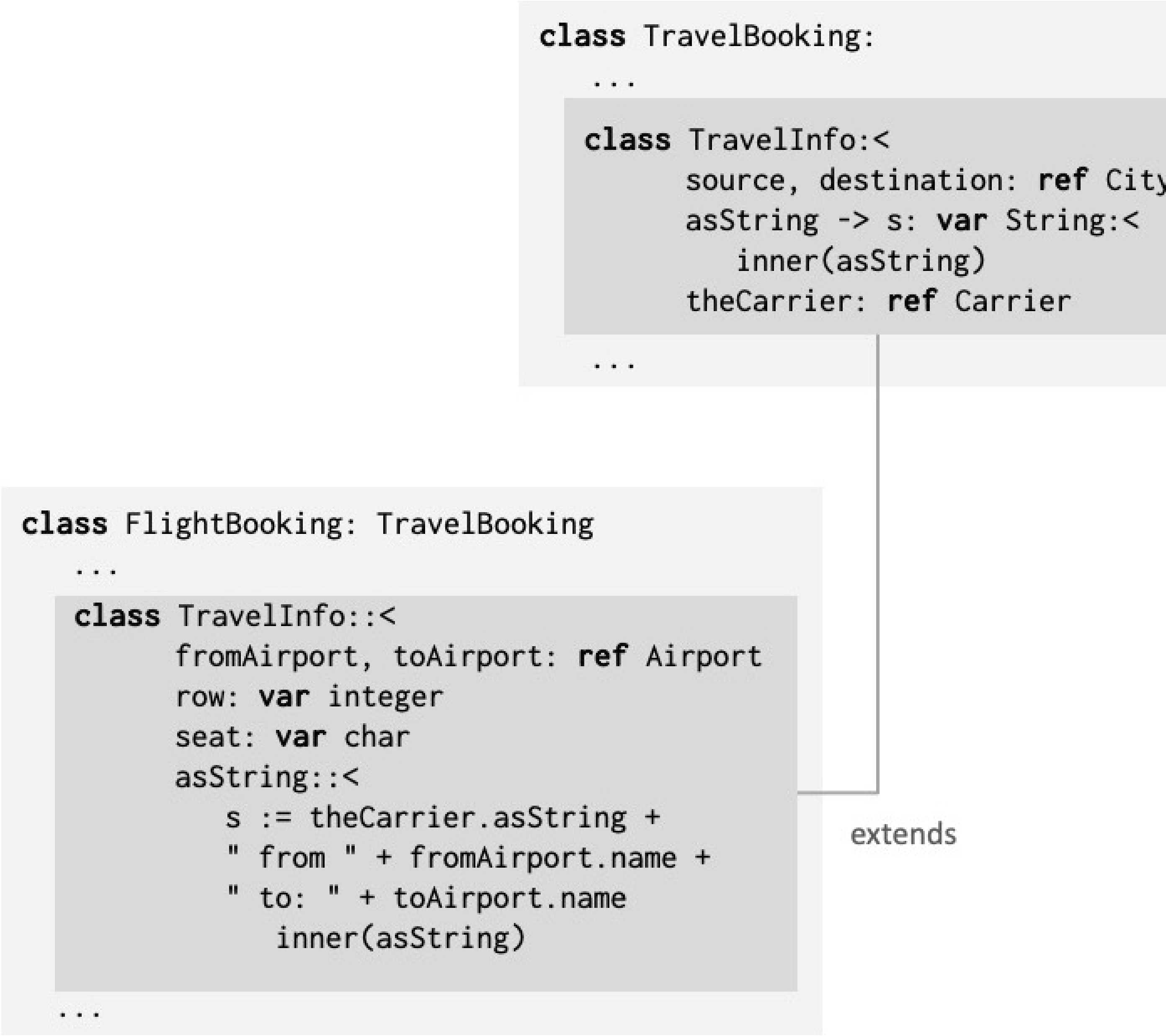
Har givet self-constrained en iteration mere men måske er vi der ikke endnu?
For en virtuel class V :< T er T vel også en object-descriptor?
Men der refereres til class-constrained virtual class som først defineres i næste afsnit, så den skal have en tur mere!

Below, the specification of is extended in a way which is similar to the way a virtual method may be extended:

```
class FlightBooking: TravelBooking
   class TravelInfo::<
      fromAirport, toAirport: ref Airport
      row: var integer
      seat: var char
      asString::<
         s := theCarrier.asString +
              " from " + fromAirport.name +
              " to " + toAirport.name
         inner(asString)
```

The extension (also called further binding) of `TravelInfo` works as follows:

- The symbol `'::<'` specify that this declaration of `TravelInfo` extends (‘`::`') the one from the superclass `TravelBooking`, and that it is still virtual (`'<'`).
- The extension includes reference variables `fromAirport` and `toAirport`.
- It includes a `row` and `seat` for this booking.



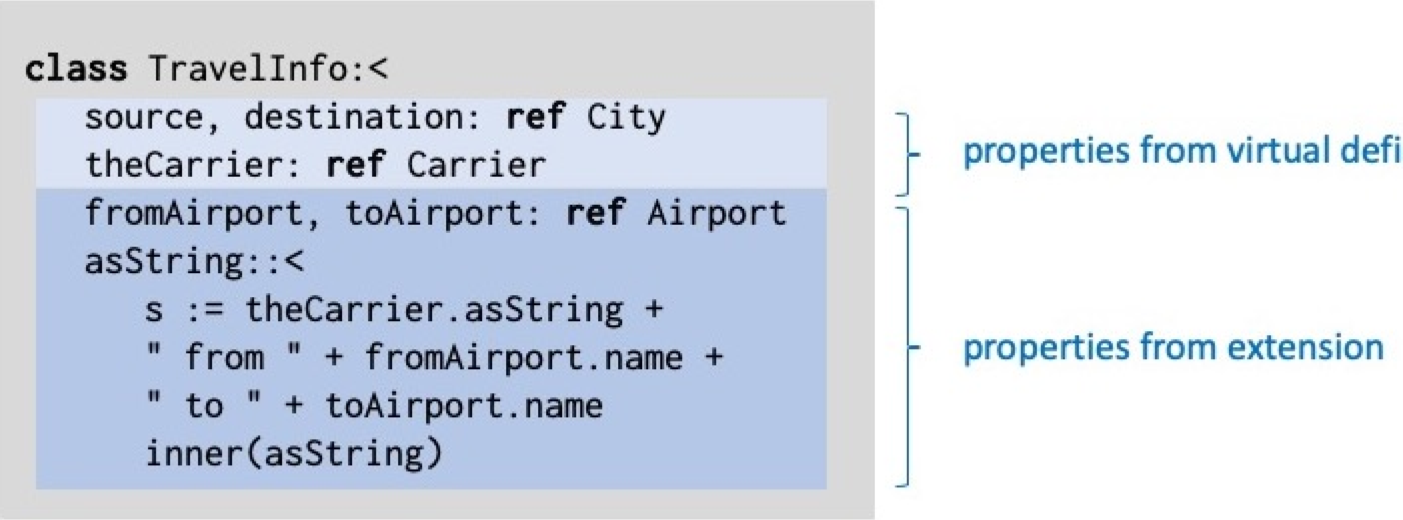
```
class TravelBooking:
   ...
   class TravelInfo:<
         source, destination: ref City
         asString -> s: var String:<
            inner(asString)
         theCarrier: ref Carrier
   ...
```

```
class FlightBooking: TravelBooking
   ...
   class TravelInfo::<
         fromAirport, toAirport: ref Airport
         row: var integer
         seat: var char
         asString::<
            s := theCarrier.asString +
            " from " + fromAirport.name +
            " to: " + toAirport.name
              inner(asString)

   ...
```

Extending TravelInfo in subclass of TravelBooking

The further binding/extension of `TravelInfo` in `FlightBooking` implies that the complete definition of `TravelInfo` in `FlightBooking` is as follows:

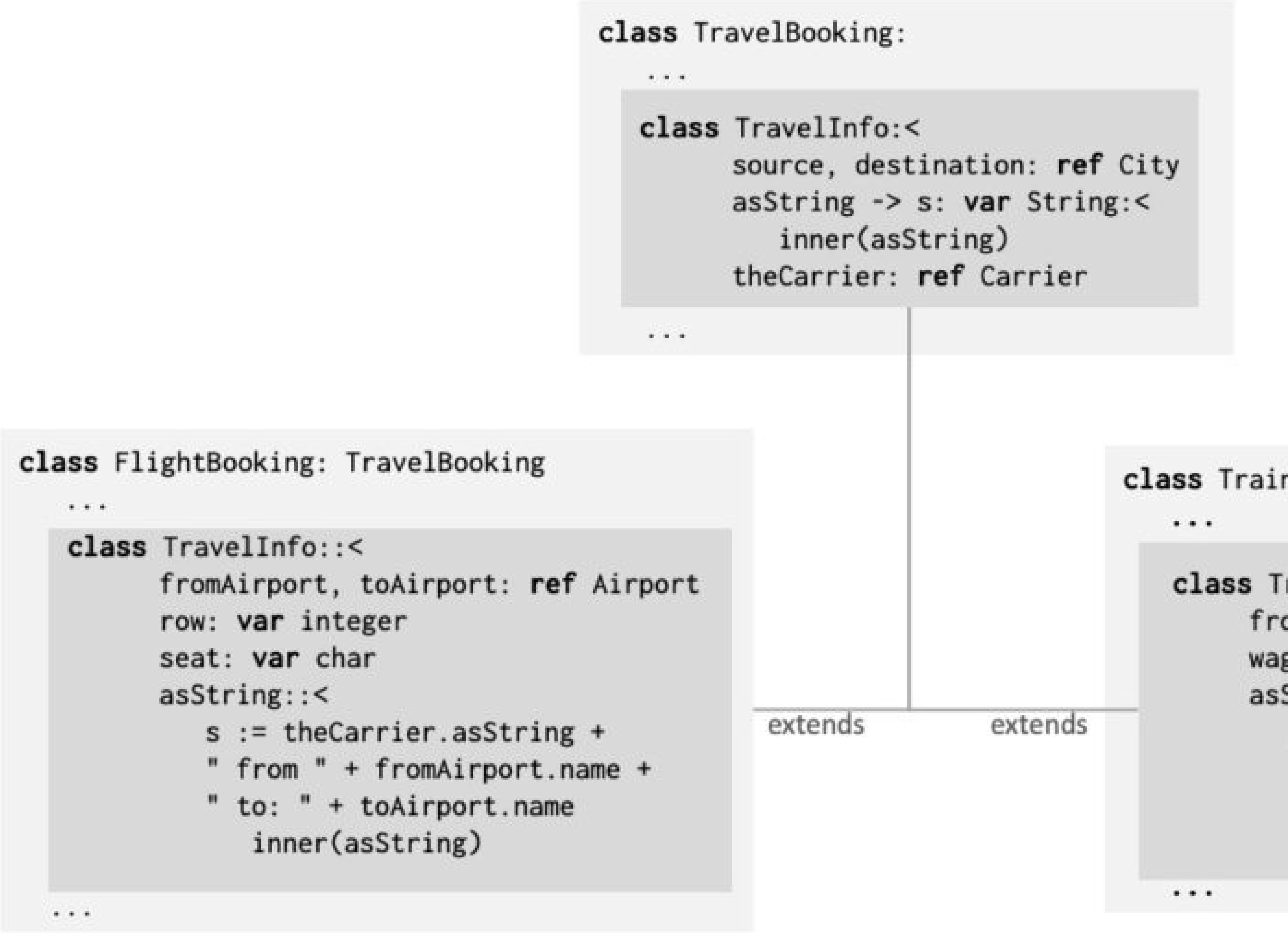


```
class TravelInfo:<
   source, destination: ref City
   theCarrier: ref Carrier
   fromAirport, toAirport: ref Airport
   asString::<
      s := theCarrier.asString +
      " from " + fromAirport.name +
      " to " + toAirport.name
      inner(asString)
```

Also, note, that we in `FlightBooking` do *not* need to extend the virtual method `confirm`, since the information needed for `confirm` is computed by `asString` in `TravelInfo` in `TravelBooking`.

We may make a similar extension of `TravelInfo` in `TrainBooking`.

```
   class TrainBooking: TravelBooking
      class TravelInfo::<
         fromStation, toStation: ref TrainStation
         waggon, seat: var
 integer
         asString::<
            s := theCarrier.asString +
            " from: " + fromStation.name + " to: " + toStation.name
            inner(asString)
```



```
class TravelBooking:
   ...
   class TravelInfo:<
         source, destination: ref City
         asString -> s: var String:<
            inner(asString)
         theCarrier: ref Carrier
   ...
```

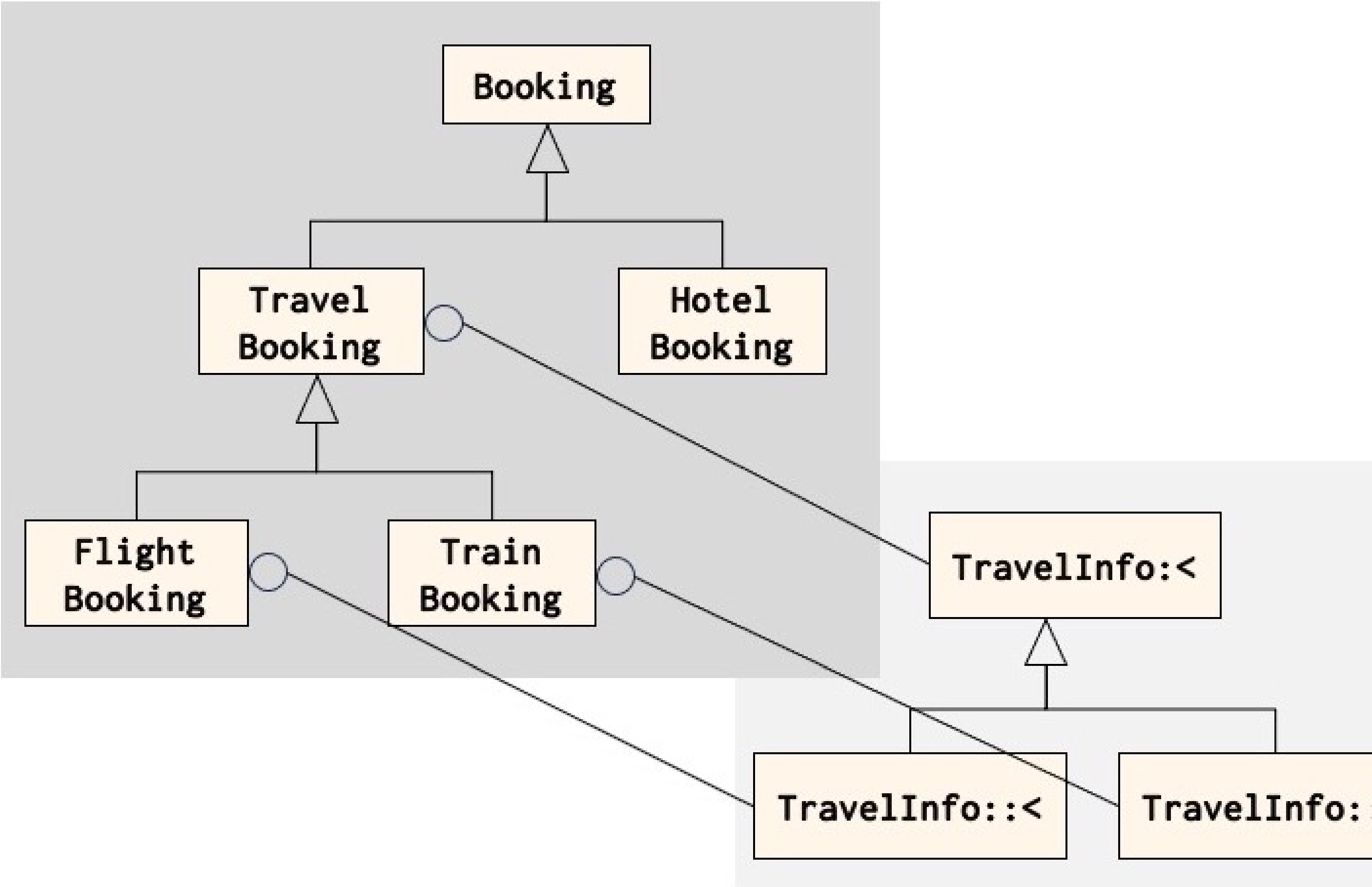
```
class FlightBooking: TravelBooking
   ...
   class TravelInfo::<
         fromAirport, toAirport: ref Airport
         row: var integer
         seat: var char
         asString::<
            s := theCarrier.asString +
            " from " + fromAirport.name +
            " to: " + toAirport.name
             inner(asString)
   ...
```

```
class Trai
   ...
   class Tr
         fro
         wag
         as
   ...
```

Extending TravelInfo in two subclasses of TravelBooking

In the above example, we use the class `Carrier`, which is only sketched below. We may make subclasses of `Carrier` representing airlines and railways as sketches below. The reference `theCarrier` in `FlightBooking` may then refer to an `Airline` object and in `TrainBooking` to a `Railway` object.

```
class Carrier:
   notifyCancellation(bookingRef: var String):
      ...
class Airline: Carrier
   ...
class RailWay: Carrier
   ...
```



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