University at Buffalo
The State University of New York

cse@buffalo

CSE115 / CSE503
Introduction to Computer Science I

Dr. Carl Alphonce

343 Davis Hall

alphonce@buffalo.edu

Office hours:

Tuesday 10:00 AM – 12:00 PM[*]

Wednesday 4:00 PM – 5:00 PM

Friday 11:00 AM – 12:00 PM

OR request appointment via e-mail

[*]*Tuesday adjustments: 11:00 AM – 1:00 PM on 10/11, 11/1 and 12/6*

ANNOUNCEMENTS

(a very early) EXAM 1 NOTICE

DATE: Tuesday October 4

TIME: 8:45 PM – 9:45 PM

LOCATION: various rooms - assignments on Friday

COVERAGE:

- lecture material up to and including 9/23 (this week)
- lab material up to and including lab 3 (next week)
- readings: all assigned up to and including 3.2

BRING: your UB card

NO ELECTRONICS: cell phone, calculator, etc.

IF YOU HAVE A CONFLICT

send me e-mail:
alphonce@buffalo.edu

use this subject line:
[CSE115] Exam 1 conflict

attach documentation of conflict
(e.g. screenshot of class schedule that has your name and the conflict)

no later than:
9:00 PM on Wednesday Sept 28

EXTRA SUPPORT

Extra office hours have been added Th/Fr this week

See PEOPLE page of course website

We are arranging for exam review sessions on the weekend – stay tuned for room/date/time details

EXAM 1 REVIEW SESSIONS:

Sat Oct 1 2016 4:00PM - 5:30PM in Davis 101
Mon Oct 3 2016 5:00PM - 6:20PM in Knox 110

ELECTRONICS:

off & away

ROADMAP

Last time

- Relationships
  - composition
  - association

Today

- Relationships (continued)
  - association
  - accessor/mutator methods

Coming up

- Relationships (continued)

REVIEW

Clifford’s relationship to his tail

Clifford has the same tail throughout his life

COMPOSITION

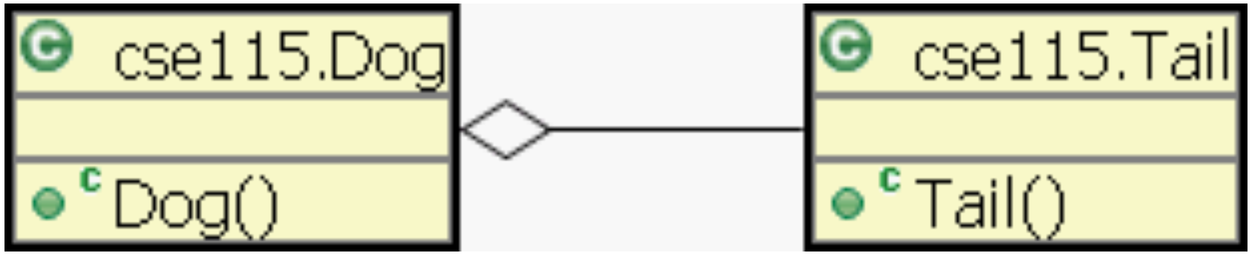
Clifford’s relationship to his collar

Clifford is associated with different collars throughout his life

ASSOCIATION

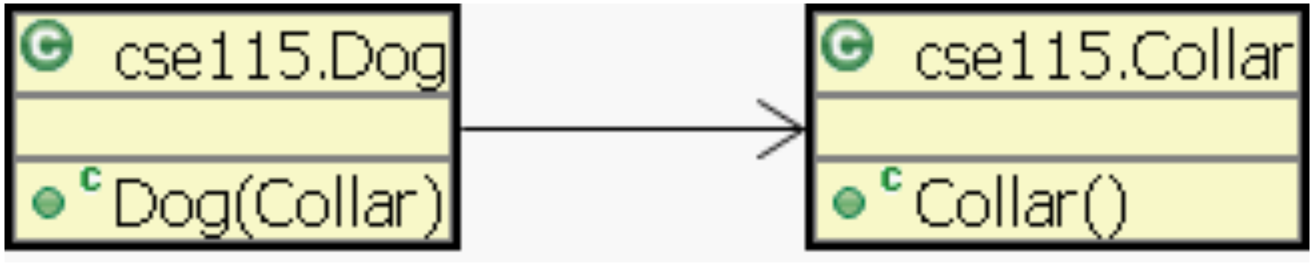
Dog-Tail relationship is COMPOSITION

Dog takes responsibility for creating a Tail



Dog-Collar relationship is ASSOCIATION

Dog takes NO responsibility for creating Collar



Association

No necessary lifetime link between the two objects involved

Two implementations:

- The first is very similar to composition, but differs in one crucial respect: where the target class is instantiated.

- The second, which decouples lifetimes completely, is a bit more complex but also more flexible.

3 changes to source class:

1. Declaration of instance variable
2. Assignment of ***existing*** instance to the instance variable
3. Parameter of constructor is of same type as instance variable

Dog – Collar example in Java

```
public class Dog {
   1 private Collar _myCollar;
     public Dog(Collar c)3{
    2  _myCollar = c;
     }
}
```

MOVING ON

Parameter

local variable declared in parameter list

- parameter list appears in method header

value of parameter is determined at method call

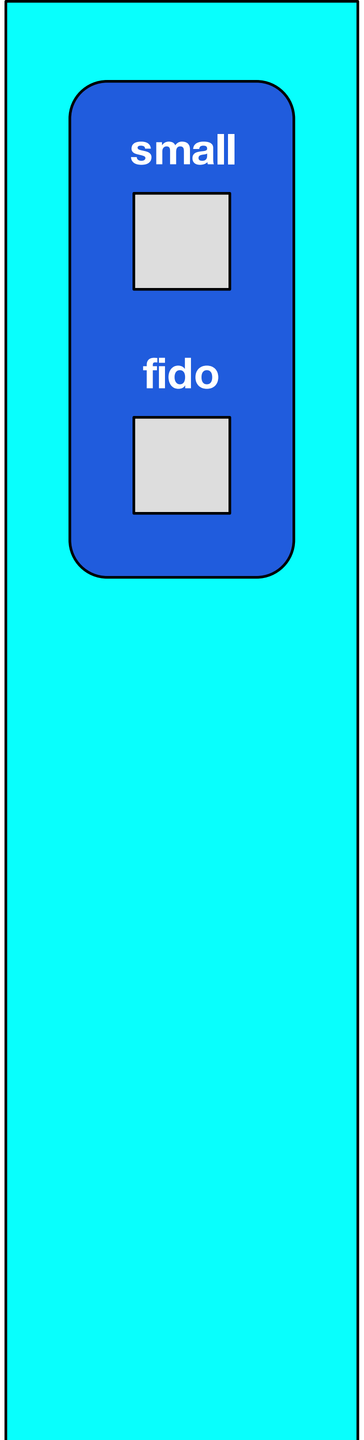
- the value of the argument expression is assigned to the parameter on entry to the method

multiple parameter declarations are separated by commas in the parameter list

- (Actor a, Director d, Screenwriter s)

During execution…

```
public class SomeClass {
     public void someMethod() {
          Collar small;
          Dog fido;
          small = new Collar();
          fido = new Dog(small);
     }
}
public class Dog {
    private Collar _myCollar;
    public Dog(Collar c) {
        _myCollar = c;
    }
}
```


small
fido

During execution…

```
public class SomeClass {
     public void someMethod() {
          Collar small;
          Dog fido;
   ──────►small = new Collar();
          fido = new Dog(small);
     }
}
public class Dog {
    private Collar _myCollar;
    public Dog(Collar c) {
        _myCollar = c;
    }
}
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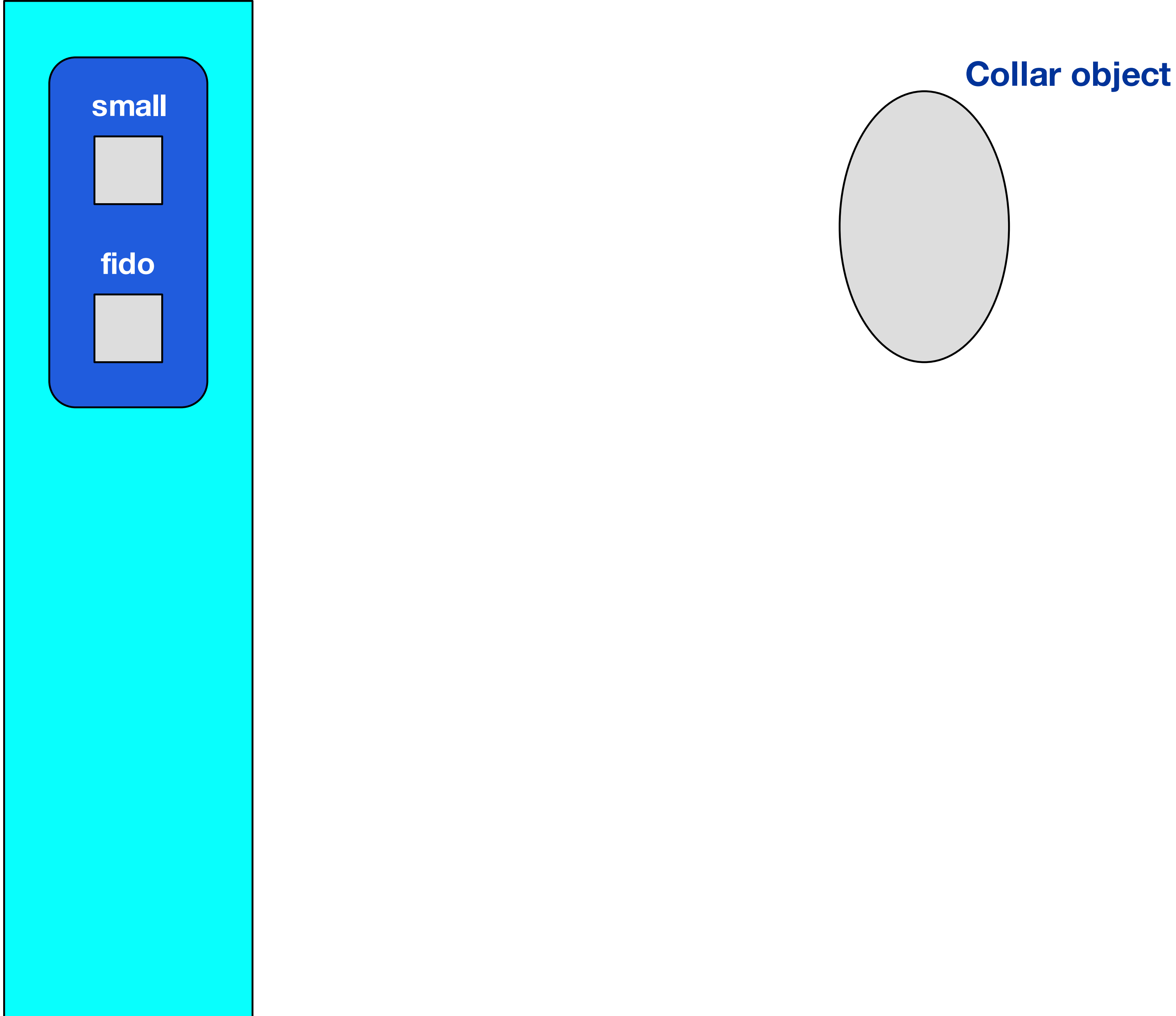
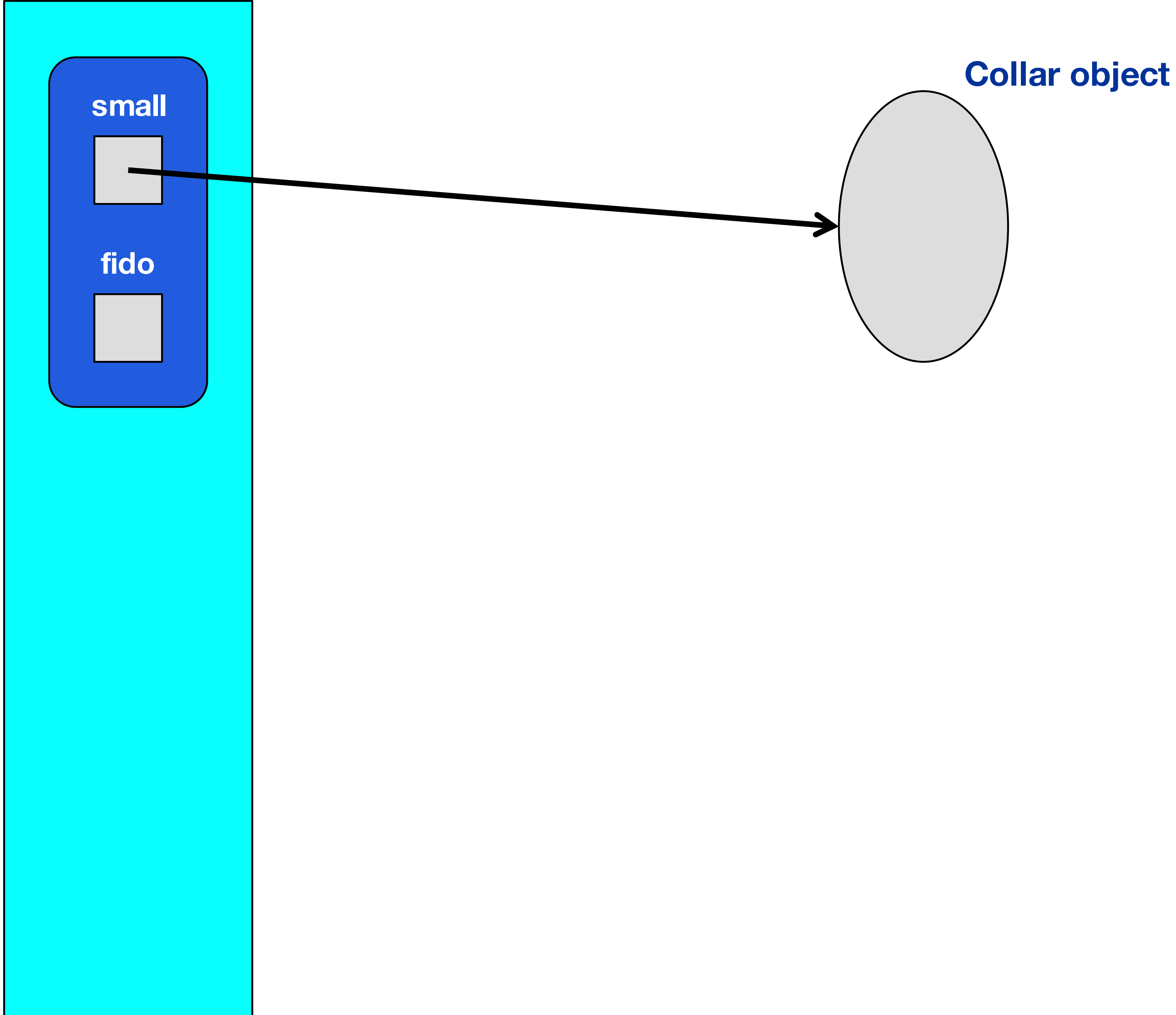

small
fido
Collar object

During execution…

```
public class SomeClass {
     public void someMethod() {
          Collar small;
          Dog fido;
   ────►  small = new Collar();
          fido = new Dog(small);
     }
}
public class Dog {
    private Collar _myCollar;
    public Dog(Collar c) {
        _myCollar = c;
    }
}
```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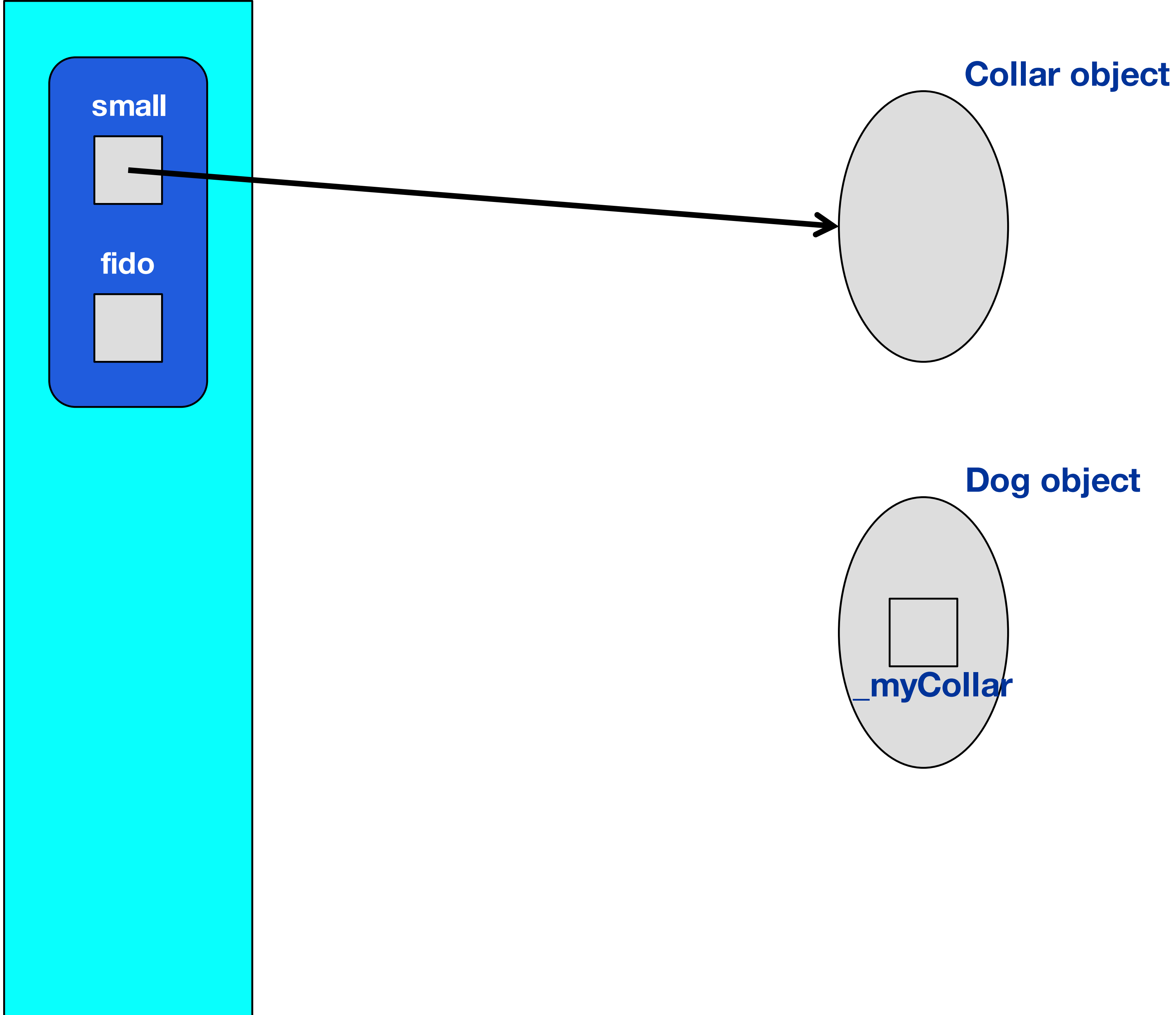
Collar object

During execution…

```
public class SomeClass {
    public void someMethod() {
        Collar small;
        Dog fido;
        small = new Collar();
  ──────→ fido = new Dog(small);
    }
}
public class Dog {
    private Collar _myCollar;
    public Dog(Collar c) {
        _myCollar = c;
    }
}
```


small
fido
Collar object
Dog object
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During execution…

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     public void someMethod() {
          Collar small;
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          small = new Collar();
          fido = new Dog(small);
     }
}
public class Dog {
     private Collar _myCollar;
     public Dog(Collar c) {
          _myCollar = c;
     }
}
```

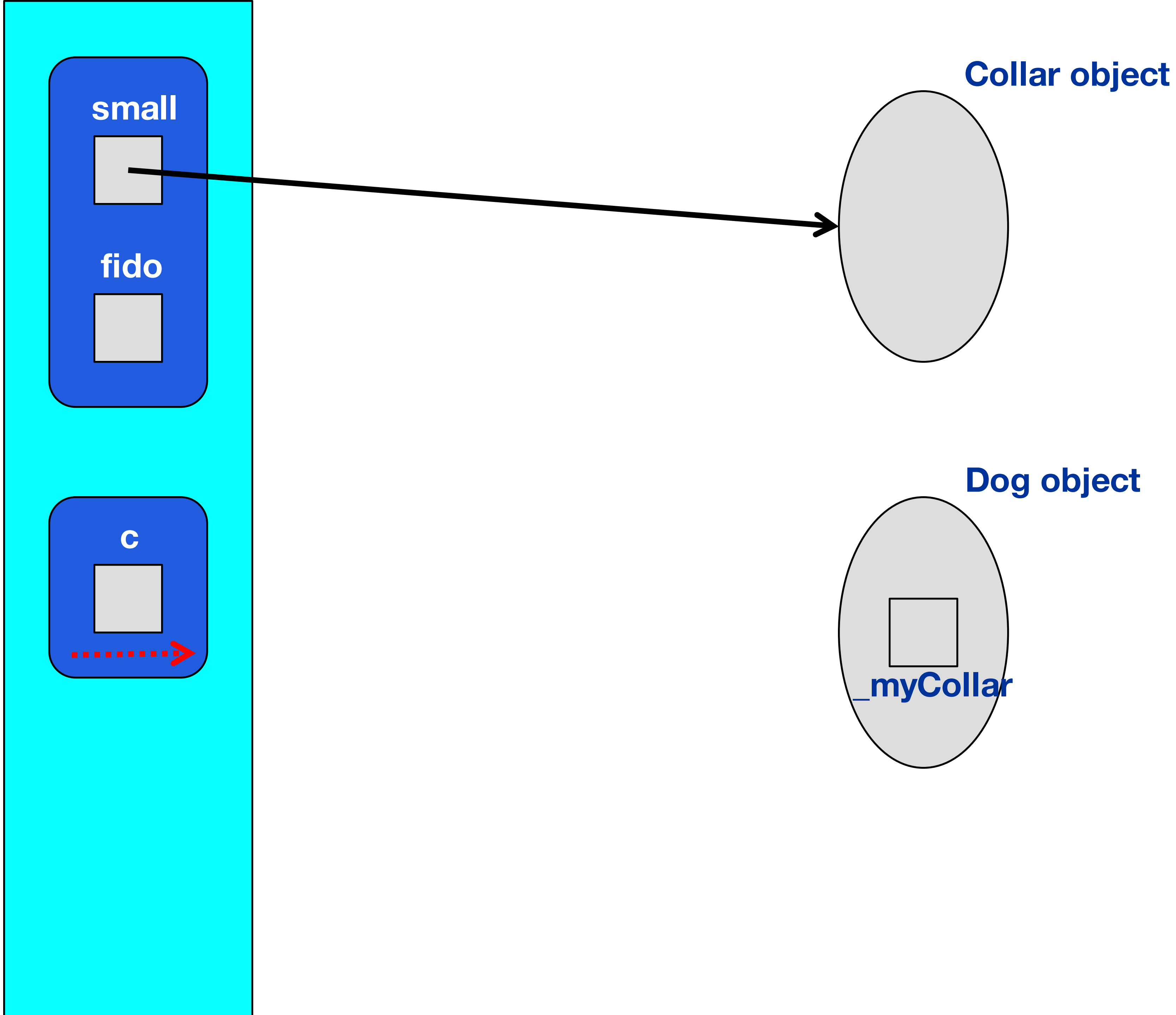
Collar object
small
fido
Dog object
c
_myCollar

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During execution…

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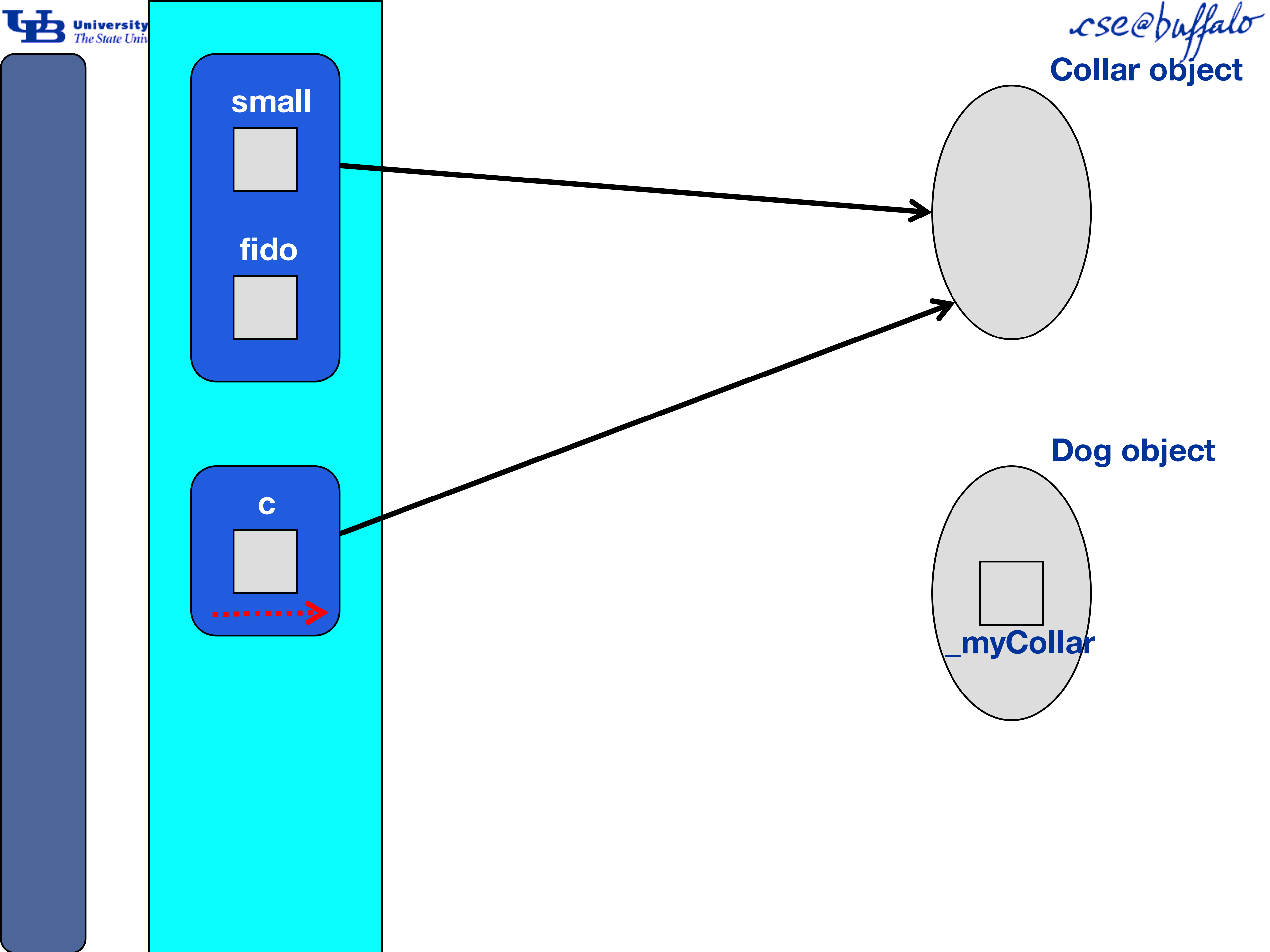
public class SomeClass {
     public void someMethod() {
          Collar small;
          Dog fido;
          small = new Collar();
          fido = new Dog(small);
     }
}

public class Dog {
     private Collar _myCollar;
     public Dog(Collar c) {
          _myCollar = c;
     }
}
```

(argument: a value)

(implicit) assignment

(parameter: a local variable)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During execution…

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     public void someMethod() {
          Collar small;
          Dog fido;
          small = new Collar();
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     }
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public class Dog {
    private Collar _myCollar;
    public Dog(Collar c) {
          _myCollar = c;
    }
}
```

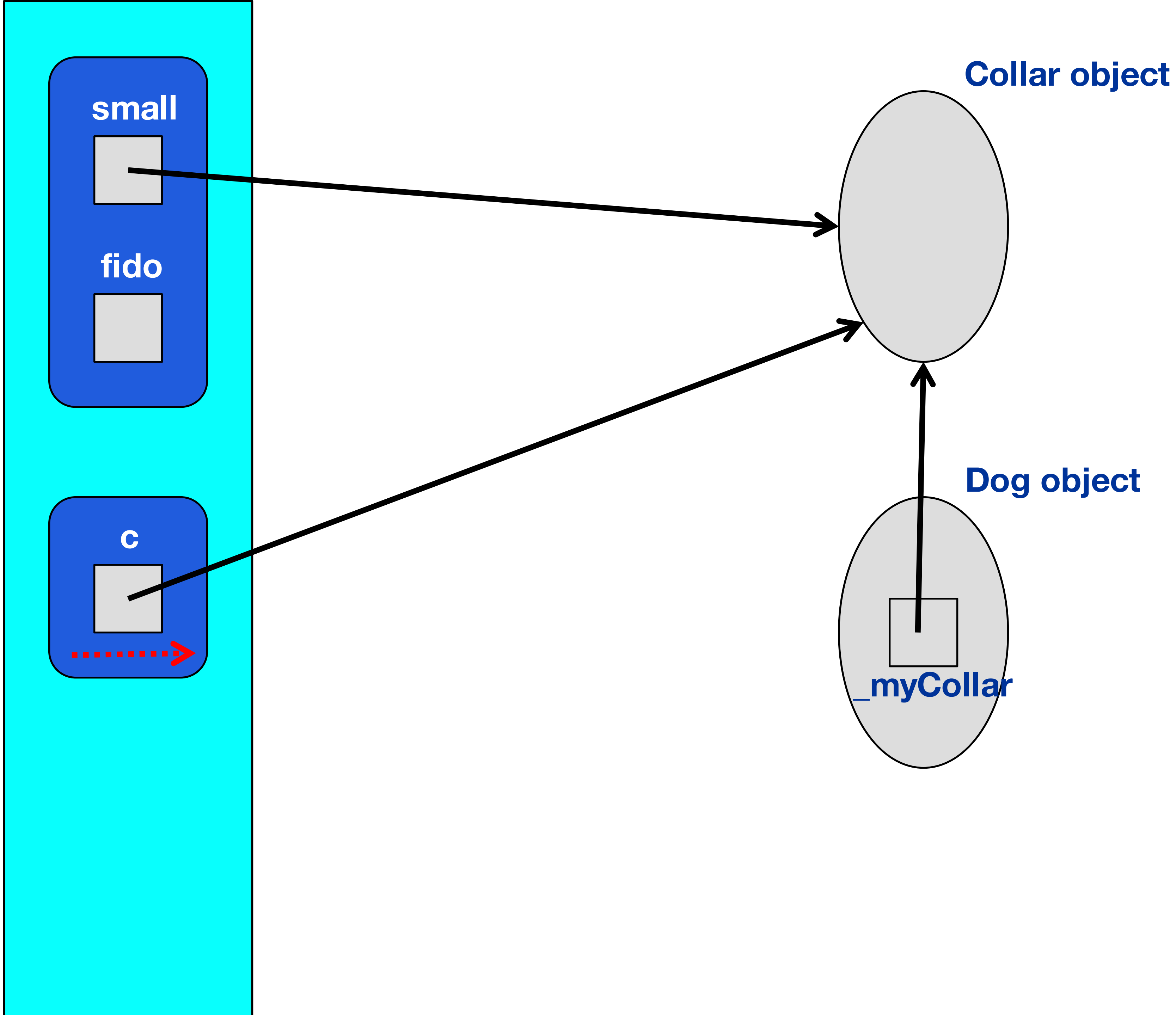
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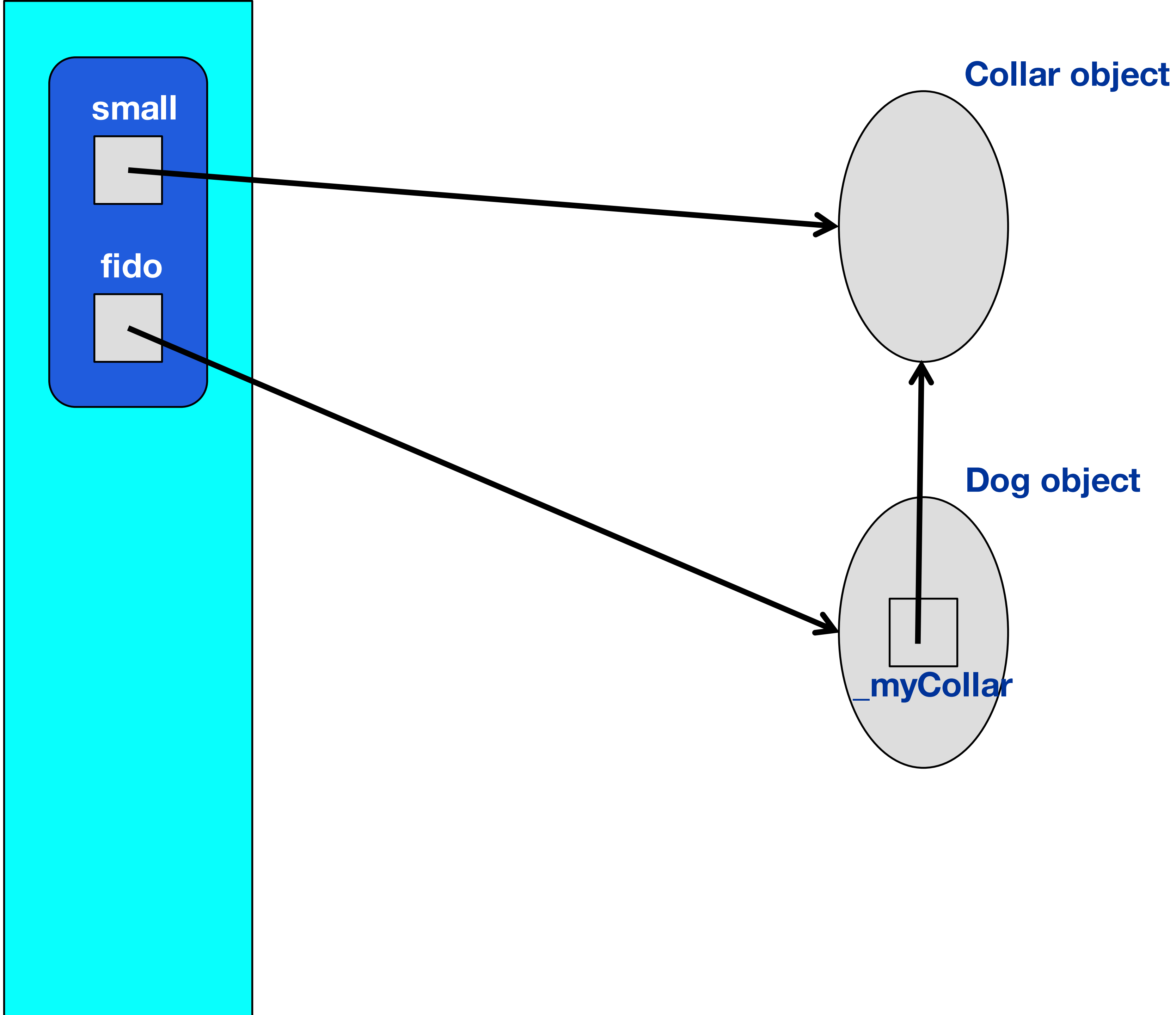
During execution...

```
public class SomeClass {
     public void someMethod() {
          Collar small;
          Dog fido;
          small = new Collar();
────────→ fido = new Dog(small);
     }
}
public class Dog {
    private Collar _myCollar;
    public Dog(Collar c) {
          _myCollar = c;
    }
}
```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fido
Collar object
Dog object
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ASSOCIATION

(general implementation)

Mutator method: setting a variable's value

A method which changes the value of an instance variable.

Allows us to grant WRITE access to the contents of a variable which itself is PRIVATE.

Association: constructor & mutator method

```
public class Dog {

    private Collar _collar;

    public Dog(Collar c) {
        _collar = c;
    }

    public void setCollar(Collar c) {
        _collar = c;
    }

}
```

PARAMETER DECLARATION

```
public class Dog {

    private Collar _collar;

    public Dog(Collar c) {
        _collar = c;
    }

    public void setCollar(Collar c) {
        _collar = c;
    }

}
```

ASSIGNMENT TO INSTANCE VARIABLE

```
public class Dog {

    private Collar _collar;

    public Dog(Collar c) {
        _collar = c;
    }

    public void setCollar(Collar c) {
        _collar = c;
    }

}
```

Constructor and mutators:

```
public class Dog {
   private Collar _collar;
   private Sweater _sweater;
   private Tail _tail;
   public Dog(Collar c, Sweater s){
      _collar = c;
      _sweater = s;
      _tail = new Tail();
   }
   public void setCollar(Collar abc){
      _collar = abc;
   }
   public void setSweater(Sweater q){
      _sweater = q;
   }
}
```

Similarities:

both set the value of an instance variable

Differences:

constructor sets value of an instance variable when the class is instantiated

mutator sets the value of an instance variable after the object already exists

constructor initializes ALL instance variables

mutator sets the value of just one instance variable

Return statement consists of the keyword “return”, followed by **an expression** whose type matches the given return type

```
public class Farm {
   private example1.BarnYard _t;
   public Farm() {
      _t = new example1.BarnYard();
   }
   public example1.BarnYard getBarnYard() {
      return _t;
   }
}
```

void vs. non-void methods

A void method has no return value, and **the method call is not an expression** (*)

A non-void method has a return value, and **the method call is an expression whose value is the returned value**

* Technically not quite true – void is a type, whose sole value is also called void. Some languages call the type void by the name Unit. Its only role in Java is as the return type specification of methods which do not return a value.

Accessor method: getting a variable's value

A method which returns the value of an instance variable

Allows us to grant READ access to the contents of a variable which itself is PRIVATE.

Accessor method

(a simple example to show the mechanics of defining a non-void method)

```
public class Farm {
   private example1.BarnYard _t;
   public Farm() {
      _t = new example1.BarnYard();
   }
   public example1.BarnYard getBarnYard() {
      return _t;
   }
}
```

Return type specification is the type of the returned value, **example1.BarnYard** in this case.

```
public class Farm {
   private example1.BarnYard _t;
   public Farm() {
      _t = new example1.BarnYard();
   }
   public example1.BarnYard getBarnYard() {
      return _t;
   }
}
```