

Assignment 5: SCOOP type system

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1 Subtyping

1.1 Background

Have a look at the attributes shown in listing 1.

Listing 1: Attributes

```
1 px: PROCESSOR
   py: PROCESSOR
3
   a: separate X
5 b: separate <px> X
   c: separate <py> X
7 d: X
   e: detachable separate X
9 f: detachable separate <px> X
   g: detachable X
```

1.2 Task

Decide whether the following attachments are valid or not. Justify your answer.

1. $a := b$
2. $a := d$
3. $b := a$
4. $b := c$
5. $b := d$
6. $d := a$
7. $d := b$
8. $a := e$
9. $e := a$

2 Valid targets

2.1 Background

Have a look at listing 2.

Listing 2: Enclosing Feature

```
p: PROCESSOR
2
r (a: detachable separate X; b: separate <p> X; c: separate X)
4 local
   d: separate <p> X
6   e: separate <c.handler> X
   f: separate X
8 do
   ...
10 end
```

Imagine that the class X has a function $g: X$ and a procedure $do_something$.

2.2 Task

Decide for each of the following feature calls, whether the calls are valid or not when they appear in feature r of listing 2.

1. $c.do_something$
2. $c.g.do_something$
3. $e := c; e.do_something$
4. $f := c; f.do_something$
5. $a.do_something$
6. $d := b; d.do_something$

3 Separate generics or generic separate?

3.1 Background

The interplay between generics and separate types are important to understand, and enforce a good understanding of the type system.

3.2 Task

Consider the differences between:

- `separate LIST [BOOK]`
- `LIST [separate BOOK]`

Explain the distinction using the object/processor diagram.

4 Basic library: type combiner

4.1 Background

Consider the classes in listing 3. These classes belong to a basic library implementation.

Listing 3: Basic Library

```
class LIST[G]
2  feature
   last: G
4     -- Last element.

6  put(a_element: G)
   -- Add the element to the list.
8     do
   ...
10    end
end

12 class LIBRARY
14  feature
   books: LIST[separate BOOK] -- Books.
16 end
```

4.2 Task

What is the result type of `books.last` from the perspective of the library? What is the type of an actual argument in the call `books.put(...)` from the perspective of the library? Justify your answer.

5 Stack library: type combiner

5.1 Background

Consider the alternative stack based library implementation shown in listing 4.

Listing 4: Stack Library

```
class LIST[G]
2  feature
   last: G -- Last element.
4 end

6 class STACK[G]
   feature
8    top: G -- Top element.
   end
10 end

12 class LIBRARY
   feature
   books: LIST[STACK[separate BOOK]] -- Books.
14 end
```

5.2 Task

What is the result type of *books.last.top* from the perspective of the library? Justify your answer.