Assignment 5: SCOOP Type System

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1 Basic Library: Type Combiner

Consider the classes in listing 1. These classes belong to a basic library implementation.

Listing 1: Basic Library

```plaintext
1 class LIST[G]
  feature
  3  last : G
      -- Last element.
  5      put(a_element: G)
  7      -- Add the element to the list.
  9      do
 11      ...
 13 end
end

13 class LIBRARY
  feature
end
```

1.1 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.

2 Stack Library: Type Combiner

Consider the alternative stack based library implementation shown in listing 2.

Listing 2: Stack Library

```plaintext
1 class LIST[G]
  feature
  3  last : G -- Last element.
end

6 class STACK[G]
  feature
  8  top: G -- Top element.
end
```
2.1 Task

What is the result type of \texttt{books.last.top} from the perspective of the library? Justify your answer.

\[
(!, \bullet, \text{LIST}[B]) \ast (!, \bullet, \text{STACK}[A]) \ast (!, \top, \text{BOOK}) =
\]

\[
(!, \bullet, \text{STACK}[A]) \ast (!, \top, \text{BOOK}) = (!, \top, \text{BOOK})
\]

3 Subtyping

Have a look at the attributes shown in listing 3.

Listing 3: Attributes

\begin{verbatim}
px: PROCESSOR
py: PROCESSOR

4 a: separate X
 b: separate <px> X

6 c: separate <py> X
 d: X

8 e: detachable separate X
 f: detachable separate <px> X

10 g: detachable X
\end{verbatim}

3.1 Task

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

- \(a := b\)
- \(a := d\)
- \(b := a\)
- \(b := c\)
- \(b := d\)
- \(d := a\)
- \(d := b\)
- \(a := e\)
- \(e := a\)
4 Valid Targets

Have a look at listing 4.

Listing 4: Enclosing Feature

```
p: PROCESSOR

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

Imagine that the class \( X \) has a function \( \text{twin}: \text{like Current} \) and a procedure \( \text{do\_something} \).

4.1 Task

Decide for each of the following feature calls, whether the calls are valid or not when they appear in feature \( r \) of listing 4.

- \( c.\text{do\_something} \)
- \( c.\text{twin.}\text{do\_something} \)
- \( e := c.\text{twin}; e.\text{do\_something} \)
- \( f := c; f.\text{do\_something} \)
- \( a.\text{do\_something} \)
- \( d := b; d.\text{do\_something} \)