

Concurrency Quiz: SCOOP

First name, last name:

Background information

In this part of the quiz, we would like to collect some information concerning your prior experience with concurrent programming.

What level of studies are you currently completing?

☐ Bachelor in Computer Science

☐ Master in Computer Science

☐ PhD in Computer Science

☐ Other:

Which semester are you currently completing? (e.g. 4th)

Prior experience with concurrency

Have you ever taken or are you currently taking a course other than Software Architecture that covers concurrent programming?

☐ Yes

☐ No

☐ No, but I studied it on my own (e.g. through online tutorials, books, ...)

If yes, what course was/is it and when did you take it? (Please provide details below.)

☐ Parallel programming @ ETH Zurich by T. Gross in Spring

☐ Concepts of concurrent computation @ ETH Zurich by B. Meyer in Spring

☐ Other courses:

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How much of the self-study material on concurrency that you worked with today did you already know before?

☐ none
 ☐ 10%
 ☐ 20%
 ☐ 30%
 ☐ 40%
 ☐ 50%
 ☐ 60%
 ☐ 70%
 ☐ 80%
 ☐ 90%
 ☐ all

Programming experience (sequential and concurrent)

| | (1: a novice ... 5: an expert) |
|--|---|
| Concerning your general programming experience , do you consider yourself... | 1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| Concerning your experience with concurrent programming , do you consider yourself... | 1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| Concerning your experience with the programming language Eiffel , do you consider yourself... | 1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| Concerning your experience with the programming language Java , do you consider yourself... | 1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| Concerning your experience with Java Threads , do you consider yourself... | 1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| Concerning your experience with SCOOP , do you consider yourself... | 1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |

Self-study material

Where did you work through the self-study material?

☐ In the morning lecture ☐ In the exercise class ☐ At home

| | (1: totally disagree ... 5: totally agree) |
|---|---|
| The self-study material was easy to follow. | 1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| The self-study material provided enough examples to help me understand the subject. | 1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| The self-study material provided enough exercises to help me understand the subject. | 1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| I was able to complete the tutorial within 90 minutes. | 1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| The self-study material is a good alternative to the traditional lectures. | 1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| I feel confident that I will be able to solve the tasks in this quiz. | 1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |

Any comments on the self-study material:

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1 Sequential comprehension

Write down the output of the sequential Eiffel program shown below.

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| | | |
|---|---|--|
| <pre> class APPLICATION create make feature a: A b: B c: C make do create a; create b; create c; print ("A") run (a, b) print ("L") end run (aa: A; bb: B) do aa.m(c) bb.n(c) if (aa.done_a and bb .done_b) then print ("M") end end end </pre> | <pre> class A feature done_a: BOOLEAN m (cc: C) do cc.f done_a := true end end </pre> | <pre> class B feature done_b: BOOLEAN n(cc: C) do cc.g done_b := true print ("T") end end </pre> |
| | <pre> class C feature done_c: BOOLEAN f do print("F") done_c := false end g do print("S") done_c := true end end </pre> | |

2 General concurrency concepts

What is multiprocessing?

- ☐ Execution of multiple processes, within a single computer sharing a single processing unit.
- ☐ Execution of a single process on a single computer.
- ☐ Execution of a single process within multiple computers.
- ☐ Execution of multiple processes within a single computer sharing two or more processing units.

Which of the following state transitions is not possible in the status of a process?

- ☐ running \rightarrow ready
- ☐ ready \rightarrow blocked
- ☐ blocked \rightarrow ready
- ☐ running \rightarrow blocked

In the space below explain the terms data race and mutual exclusion.

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What is a deadlock?

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3 Comprehension

Write down three possible (non-deadlock) outputs for the SCOOP program shown below:

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| <pre> class APPLICATION create make feature a: separate A b: separate B c: separate C d: D make do create a; create b; create c; create d; <i>print</i> ("A") <i>run</i> (a, b) <i>print</i> ("L") end <i>run</i> (aa: separate A; bb: separate B) do aa.m (c) bb.n (c) aa.m (c) bb.n (c) d.foo if (aa.done_a and bb.done_b) then <i>print</i> ("M") end end end </pre> | <pre> class A feature done_a: BOOLEAN m (cc: separate C) require cc.done_c do cc.f done_a := true end end </pre> | <pre> class B feature done_b: BOOLEAN n(cc: separate C) require not cc.done_c do <i>print</i> ("T") cc.g done_b := true end end </pre> |
| | <pre> class C feature done_c: BOOLEAN f do <i>print</i> ("F") done_c := false end g do <i>print</i> ("S") done_c := true end end </pre> | <pre> class D feature foo do <i>print</i> ("P") end end </pre> |

4 Errors

Identify errors (possibly compile-time) in the following SCOOP code segment. Justify your answers by providing on the next page the line number and a short explanation for every detected error. (The number of provided spaces does not necessarily correspond to the actual number of errors.)

```

1 class A create make
2 feature
3   b: separate B
4   c: C
5
6   make
7     local
8       b1: B;
9     do
10       create b; create c;
11       b1 := g
12     end
13
14   f(b1: separate B): B
15     local
16       b2: B
17       c1: separate C
18     do
19       b2 := b
20       c1 := c
21       b.f
22       c.g
23       Result := b1.h
24     end
25
26   g: separate B
27     local
28       b1: B
29     do
30       h (b)
31       create b1
32       Result := b1
33     end
34
35   h(b1: B)
36     local
37       b2: separate B
38       c1: C
39       i: INTEGER
40     do
41       create b2
42       i := c.r
43       c1 := b2.h.r
44     end
45 end

```

```

46 class B
47
48 feature
49
50   r: C
51
52   h: B
53
54   f
55     do
56       create h
57       create r
58     end
59 end

```

```

60 class C
61
62 feature
63
64   r: INTEGER
65
66   g
67     do
68       r := 10
69     end
70 end

```

| Line number | Explanation |
|-------------|-------------|
| Line | |
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Feedback on the quiz

How much time did you spend on this quiz?

20' 30' 40' 50' 60' 70' 80' 90' 100' 110' 120'
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

| | | | | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| The difficulty level of the quiz was... (1: too easy, 2: easy, 3: just right, 4: difficult, 5: too difficult) | 1 | 2 | 3 | 4 | 5 |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I feel confident that I solved the tasks of this quiz correctly. (1: totally disagree ... 5: totally agree) | 1 | 2 | 3 | 4 | 5 |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Did you leave any questions of the quiz empty and if so, why?

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Any comments on the quiz:

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