Techniques of Java Programming

ETH Zurich

Date: 11 July 2006

Family name, first name: .................................................................

Student number: .............................................................................

I confirm with my signature, that I was able to take this exam under regular circumstances and that I have read and understood the directions below.

Signature: .....................................................................................

Directions:

• Exam duration: 90 minutes.

• Use a pen (not a pencil)!

• Please write your student number onto each sheet.

• All solutions can be written directly onto the exam sheets. If you need more space for your solution ask the supervisors for a sheet of official paper. You are not allowed to use other paper.

• You must answer all questions (no questions are optional).

• All personal documents are authorized. Exchanging documents during the examination would mean failing the examination.

• Only one solution can be handed in per question. Invalid solutions need to be crossed out clearly.

• Please write legibly! We will only correct solutions that we can read.

• Manage your time carefully (take into account the number of points for each question).

• Please immediately tell the supervisors of the exam if you feel disturbed during the exam.

Good luck!
<table>
<thead>
<tr>
<th>Question</th>
<th>Number of possible points</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>
1 Middleware and Publish Subscribe (16 Points)

Explain the role of stubs and the role of skeletons in middleware systems (4 points):

**Stub:**

- ...

- ...

- ...

- ...

- ...

**Skeleton:**

- ...

- ...

- ...

- ...

- ...

Explain what marshalling and what unmarshalling is: (6 points)

- ...

- ...

- ...

- ...

- ...

Give an example:

- ...

- ...

- ...

- ...

- ...

- ...
Compare the traditional middleware infrastructures provided by frameworks like Java’s RMI mechanism or CORBA with T-Spaces. Give example uses of each where you see fit: (6 points)

Example use of Java RMI or CORBA:

Example use of T-Spaces:

2 Generics and Autoboxing (12 Points)

Read through codes in Figure 1

```java
List<Integer> ins = Arrays.asList(1, 2, 3);
int s = 0;
for (int n : ints) {s += n;}
assert s==6;
```

Figure 1: Generics and Autoboxing Example

In above source code, can I replace List<Integer> with List<int>? If not, why? (2 points)
```
List ins = Arrays.asList(...
int s = 0;
for (...)
    int n = (...);
s += n;
assert s==6;
```

Figure 2: Generics Implementation

Explain two generic implementation techniques. (4 points)

Please fill in the blanks in Figure 2 with the correct Java 1.4 instructions (no autoboxing, no generics). (6 Points)

(1)

(2)

(3)

3 Byte code (30 Points)

Question 1: Translate back to Java the following method (10 points):

5
public static synchronized int inc1();

Code:
0:   iconst_0
1:   istore_1
2:   goto 18
5:   iconst_1
6:   istore_0
7:   getstatic #10; //Field a:I
10:  iload_0
11:  iadd
12:  putstatic #10; //Field a:I
15:  iinc 1, 1
18:  iload_1
19:  bipush 10
21:  if_icmplt 5
24:  getstatic #10; //Field a:I
27:  ireturn

Question 2: How can one optimize the method previously shown? (8 Points)
Write the resulting byte code (7 points).
Question 3: How one could make such an optimization automatically (5 points)?

4 Non Blocking Input/Output (13 Points)

What is the difference between Blocking Input/Output and Non-blocking Input/Output (5 Points)?

What are the advantages of Blocking Input/Output (2 Points)?
What are the advantages of *Non-blocking Input/Output* (2 Points)?

In a program, why would you use *Non-blocking Input/Output* if you can use multiple threads of execution (4 Points)?
5 General Question (6 Points)

What are the advantages of using abstract classes over interfaces when developing a platform? Explain your point of view.