

Techniques of Java Programming

ETH Zurich

Date: 6 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!

Question	Number of possible points	Points
1	16	
2	14	
3	30	
4	16	
5	6	

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 Dynamic Class Loading (14 Points)

Read through the source code shown in Figure 1.

Why do we use dynamic class loading in above codes? (8 points)

.....
.....
.....
.....

```
class Server
{
    private Service service;
    public void updateService(String location) {
        MyClassLoader cl = new MyClassLoader(location);
        Class c = cl.loadClass('Service');
        service = (Service)c.newInstance();
    }
    public void processRequest (...) {
        Class c = service.getClass();
        Method m = c.getMethod('run', ...);
        m.invoke(service, ...);
    }
}
```

Figure 1: Dynamic Class Loading Example

.....

.....

.....

.....

.....

.....

.....

.....

Give the main features of Java dynamic class loading: (2 points)

.....

.....

.....

.....

.....

Point out the faults in above codes and explain why they are faults: (4 points)

.....

.....

.....

.....

.....

3 Threads (30 Points)

Consider the following piece of code:

```
public class TestThread extends Thread {
    static int a = 0;
    public synchronized void inc1(){
        a++;
    }
    public void run(){
        inc1();
    }
    public static void main(String[] args) {
        Thread [] t=new Thread[1000];
        for (int i=0;i<1000;i++){
            t[i]=new TestThread();
            t[i].start();
        }
        System.out.println(a);
    }
}
```

Question 1: Pick the valid output(s) for an execution of the main method (4 points):

- 0
- 1
- 999
- 1000
- 1001

Question 2: What would you do to ensure that the output is 1000 (15 points)? Explain and then write the code (5 points).

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 3: If one is willing to program a web server, what would you recommend for handling several clients? Explain all the possibilities and motivate your choice (6 points).

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

4 Test Driven Development (16 Points)

4.1 Key Concepts (6 Points)

Explain the key concepts of test driven development:

.....

.....

.....

.....

.....

.....

.....

.....

.....

4.2 Test Driven Development vs. Test First Development (4 Points)

Explain the difference between *Test Driven Development* and *Test First Development*:

.....

.....

.....

.....

.....

.....

.....

.....

.....

4.3 Unit Testing (2 Points)

Describe the purpose and scope of unit testing:

.....

.....

.....

.....

.....

.....

.....

.....

4.4 Types of Software Testing (4 Points)

Besides unit testing, what other types of testing are there and what are they concerned with:

.....

.....

.....

.....

.....

.....

.....

.....

5 General Question (6 Points)

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

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....