Introduction to Databases (winter term 2004/2005)

Assignment 10

RWTH Aachen: hand in on January 17, 2005 during tutorial
B-IT: hand in on January 20, 2005 during tutorial

Task 10.1 (UML) (4 Points)

We consider the following – very informal and brainstorm-like – description of a library system that should be developed.

• **Books and journals**
  The library contains books and journals. In contrast to journals, there can be more than one copy of the same book. Journals are published regularly (e.g. four times a year, or each month) and can contain different articles by different authors. Some books can be borrowed for a standard time period of 2 months, some only for a very small time period (2 days), some books have to stay in the library all the time. All books can be borrowed by research assistants and professors without restrictions (i.e. without time limits). Journals cannot be borrowed by anyone.
  If a book is not reserved by another user, the borrow period can be extended on request by a library user.

• **Tracking of books**
  It is essential that the system is capable of tracking the current position of a (possibly borrowed) book. Furthermore, it should automatically send an email to library users who have not brought back their books on time and notify the librarian.

• **Search**
  The system should provide the standard library retrieval functions: search by (journal, book or article) title, author, publication year ... If a retrieved book is not present at the library, it should be possible to reserve the book. If the book returns to the library, the system automatically notifies the library user by email. This function is naturally only available to registered library users, the search function should be accessible to everyone.

a) Make the above description more precise by formulating the three use cases that are most important to you.

b) On this basis, develop a (suitably simplified) class diagram that models the library system.

Concentrate on the data part of the system and leave out the method signatures.

Task 10.2 (XML) (2 Points)

Given are following data records about employees:

<table>
<thead>
<tr>
<th>First Name</th>
<th>Middle Name</th>
<th>Last Name</th>
<th>Salary</th>
<th>Position</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jim</td>
<td>John</td>
<td>Smith</td>
<td>2000</td>
<td>Employee</td>
<td></td>
</tr>
<tr>
<td>Luis</td>
<td>Gulliver</td>
<td>Black</td>
<td>2500</td>
<td>Employee</td>
<td></td>
</tr>
<tr>
<td>Isabel</td>
<td>Maibaum</td>
<td>Siegel</td>
<td>8000</td>
<td>CEO</td>
<td>R101</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4500</td>
<td>Manager</td>
<td>R201</td>
</tr>
</tbody>
</table>

a) Represent the above (sparsely filled) table in the object exchange model (OEM).

b) Give an XML-document for these data records.
Task 10.3 (Some simple questions on XML) (3 Points)

a) Why is the comparison of XML documents usually done on the XML Information Set they induce?

b) Consider a relational database (containing multiple tables with multiple rows).
   Sketch, how this data could be represented using XML. Consider both mapping possibilities (data inside nested elements or in attributes).

c) What are the differences between the reference mechanisms of XML (compare slide 26) and foreign keys in relational databases?