SCSSE
School of Computer Science and Software Engineering
Faculty of Informatics

CSCI317  Database Performance Tuning
Subject Outline
Spring Session 2008

Head of School – Professor Philip Ogunbona, Student Resource Centre, Tel: (02) 4221 3606

GENERAL INFORMATION

Subject Coordinator: Dr Janusz Getta
Telephone Number: 4221 4339
Email: jrg@uow.edu.au
Location: 3.210

Dr Getta’s consultation times during session:
Day               Time
Monday 11.30am – 1.30pm
Wednesday 9.30am – 11.30am

Subject Organisation
Session: Spring Session, Wollongong Campus
Credit Points: 6 credit points
Contact hours per week: 3 hours lectures, 2 hours Laboratory
Lecture Times & Location:
Monday: 09.30 – 11.30 at 19.G100
Wednesday: 11.30 – 12.30 at 3.123

Tutorial Day, Time and Location can be found at: http://www.uow.edu.au/student/timetables/index.html

Students should check the subject's web site regularly as important information, including details of unavoidable changes in assessment requirements will be posted from time to time via e-Learning space http://www.uow.edu.au/student/lol. Any information posted to the web site is deemed to have been notified to all students.

Subject Description
The subject addresses the performance problems of relational database systems. In particular, it presents optimisation of query processing in relational database systems, performance tuning of database applications, transaction processing in database systems, optimisation of transaction processing, performance tuning of relational database servers, performance tuning of three tier database applications. Laboratory classes demonstrate the techniques used for elimination of performance problems in database systems. Oracle 9i database management system is used for demonstration purposes and all practical work in the subject.

Objectives
On successful completion of this subject, students should be able to: 1. Explain the principles of query processing and optimisation of query processing in relational database systems 2. Evaluate and improve performance of database applications 3. Explain the principles of transaction processing in database systems 4. Improve performance of transaction processing 5. Explain the principles of benchmarking in
relational database management systems. Evaluate and tune performance of relational database servers.

**Graduate Qualities**
All Schools in the Faculty of Informatics have adopted the UOW Graduate Qualities. On completion of their course graduates will be informed, independent learners, problem solvers, effective communicators and responsible. Further information can be found at http://www.uow.edu.au/about/teaching/qualities/.

**Attendance Requirements:**
It is the responsibility of students to attend all lectures/tutorials/labs/seminars/practical work for subjects for which you are enrolled. It should be noted that the amount of time spent on each 6 credit point subject should be at least 12 hours per week, which includes lectures/tutorials/labs etc.

**Method of Presentation:**
In order to maximize learning outcomes, it is strongly recommended that students attend all lectures.

This subject comprises of 3 hr lecture, 2 hrs Computer Lab.

**Lecture Schedule:**
A proposed Lecture schedule for the subject is as follows:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction, performance tuning methodology, architecture of relational database server</td>
<td>[2].1, [3].1, [9].1, [5].1</td>
</tr>
<tr>
<td>2</td>
<td>Operational aspects of relational database server, utilities for tuning and optimization: dynamic performance views, database server monitoring and diagnostics tools</td>
<td>[1].18, [15].9</td>
</tr>
<tr>
<td>5</td>
<td>Evaluation of relational operators</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Utilities for the static and dynamic analysis of SQL statements</td>
<td>[8].8.7, [3].7, [9].5, [9].6, [7].3, [7].4, [7].5, [5].14</td>
</tr>
<tr>
<td>9</td>
<td>SQL tuning in practice: data manipulation and data definition statements, PL/SQL, JDBC, Embedded SQL</td>
<td>[3].14, [3].15</td>
</tr>
<tr>
<td>11</td>
<td>Optimization of transaction processing and recovery</td>
<td>[4].7, [4].8</td>
</tr>
<tr>
<td>13</td>
<td>Benchmarking of relational database servers: TPC benchmarks, Winsconsin benchmark, other database benchmarks</td>
<td>[16], [17]</td>
</tr>
</tbody>
</table>

Changes to the above schedule will be posted via e-Learning space http://www.uow.edu.au/student/lol. Any information posted to the web site is deemed to have been notified to all students.
Subject Materials:
Any readings/references are recommended only and are not intended to be an exhaustive list. Students are encouraged to use the library catalogue and databases to locate additional readings.

Textbook(s):
[1] R. Ramakrishnan and J. Gehrke, Database Management Systems, WCB/McGraw-Hill, 3rd edition, 2003 chapters 4, 12, 13, 14, 18, 19, 20, (the book is available from the University Union Bookshop or from UoW Library on shelves and in a reserve collection)

Other Resources:

Oracle manuals are available on https://sai.uow.edu.au/oradocs/ (firewall) and on http://www.oracle.com/pls/db102/homepage (no firewall). The links to the relevant chapters in the manuals are included in the laboratory specifications.

Oracle textbooks available on Safari Bookshelf (O'Reilly Network), access through a link to Proquest Safari website, the links to relevant chapters in the textbooks are included in the laboratory specifications.

The materials referenced in the lecture presentations and lecture schedule above are available in READINGS folder both on e-Learning or at http://www.uow.edu.au/student/lol.

All other materials related to this subject are available on e-Learning or at http://www.uow.edu.au/student/lol.
Assessment:
This subject has the following assessment components.

<table>
<thead>
<tr>
<th>ASSESSMENT ITEMS &amp; FORMAT</th>
<th>% OF FINAL MARK</th>
<th>DUE DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment 1</td>
<td></td>
<td></td>
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</tbody>
</table>
| The tasks of this assignment include the performance tuning of a simple database application, finding and impact of DBMS initialization parameters on the performance of the system, identification and interpretation of log files and trace files produced by the system, discovering SQL statements executed by an unknown application and tracing block replacements in a data buffer cache. | 4.0%            | Released: 21 July 2008  
Due: 11 August 2007, 7.30 pm |
| Submission format:       |                 |                |
| hardcopy                 |                 |                |
| Assignment 2             |                 |                |
| The tasks of this assignment include the performance tuning of database system through the modifications of system initialization parameters, finding the frequently accessed data objects and permanently "pinning" data objects in transient memory, investigating a negative impact of frequent parsing on performance of SELECT statements, finding the database files used by an unknown database application, and implementing a mini database load monitoring and reporting tool, the manual construction of the query execution plans and estimation of the computation costs, dynamic tracing of SQL statements with SQL_TRACE and interpretation of the results generated by tkprof, tuning of SELECT statement. | 8.0%            | Released: 12 August, 2008  
Due: 8 September, 2008, 7.30pm |
| Submission format:       |                 |                |
| hardcopy                 |                 |                |
| Assignment 3             |                 |                |
| The tasks of this assignment include the manual construction of the query execution plans and estimation of the computation costs, interpretation of query execution plan generated by a database system, using UTLBSTAT/UTLESTAT for monitoring of data dictionary cache, dynamic tracing of SQL statements with SQL_TRACE and interpretation of the results generated by tkprof, tuning of SELECT statement. | 8.0%            | Released: 9 September, 2008  
Due: 13 October, 2008, 7.30pm |
| Submission format:       |                 |                |
| hardcopy                 |                 |                |
| Class test               |                 |                |
| Covers Assignment 1 and Assignment 2 | 20%           | Released: 22 September, 2008, 9.30am, 19-G100 |
| Final examination        |                 |                |
|                         | 60%             |                |

Notes on Assessment:
All assignments are expected to be completed independently. Plagiarism may result in a FAIL grade being recorded for that assignment.
Electronic Submission of Assessment Items:
Unless otherwise notified by the subject coordinator, all written assignments must be submitted electronically.

Other Procedures for the submission of assessment items:
Assignments are to be submitted personally to your lecturer or tutor. The students are allowed to submit assignments during the lecturer's office hours (in bldg 3 Level 2 room 210), or during 10 minutes break between the lecture classes on Monday or Tuesday (in a lecture hall), during the laboratory classes (in a laboratory room), or during an assignment submission session 2 hours before the assignment deadline. All submissions must be accompanied by a standard Assignment Cover Sheet available from the School office. No assignments will be accepted without Assignment Cover Sheet. The students must collect a submission receipt signed by a lecturer. All assignments that do not satisfy the submission requirements listed above will not be evaluated and will be returned to the students during the next lab class with mark 0.0. All assignments must be submitted as hard copy only. No part of an assignment will be accepted as electronic mail or fax.

Assignments should be submitted on their respective due dates (please see a table above). Penalties may apply to all late work, except if special consideration is deemed necessary or unless an extension has been granted by your subject co-coordinator or lecturer. Requests for extensions should be submitted through SOLS with the appropriate documentation verified by ARD. The requests not supported by the documentation and not verified by ARD will be denied.

Electronic release of Assessment Items
Specifications of all assignments will be released in electronic format ONLY. There will be NO printed hardcopies distributed during lecture or lab classes. The students will collect the electronic copies of specifications on e-learning site and at http://www.uow.edu.au/student/lol. Only one submission is accepted for each assignment. Therefore, make sure that you are really happy with your assignment before submission.

Class test
The written class test will be held in Week 10, 22 September, from 9.30am to 11.30am am in room 19-G100. The class test is worth 20% towards the final marks. The class test will cover a scope of Assignment 1 and Assignment 2.

Remarks on Assessment
(a) As assignments are to assess a student's understanding of course material, each assignment must be solved using only material covered up to that point in the course (unless otherwise stated in the question).
(b) Students who copy an assignment will receive zero for that assignment. This also covers assignments which may be the product of community effort by several students. Working together is acceptable, but the final assignment must be the work of the individual student, as assessment is a measure of your ability.
(c) Programs that do not compile due to the syntax errors will receive no marks, and may still be commented upon. Proper documentation and program style are needed in the assignments to receive the full marks.
(d) The specifications of assignments and sample solutions will be available on e-Learning site and at http://www.uow.edu.au/student/lol.
(e) Students should check the web page regularly for changes and updates to subject information together with assessment marks.
Procedures for the return of assessment items:
The annotated copies of evaluated assignments will be personally returned to the students after one week from the respective submission date. The assignments may be collected by the students during the laboratory classes or during the lecturer’s office hours. The enquiries about the assignment marks can only be made to the tutors during laboratory class times or to the lecturer during the lecturer’s office hours. The enquiries about the assignment marks can only be made in a period of time of maximum 1 week after the evaluated copies of assignment are handed out. After 1 week of “enquiry period”, no more marks will be changed. The assignment marks will be available on SOLs on the assignment return day.

Penalties for late submission of assessment items:
Penalties apply to all late work, except if special consideration has been granted. Late submissions will attract a penalty of 25% of the assessment mark per day including weekends. Work more than four (4) days late will be awarded a mark of zero.

Supplementary Exams
Supplementary Exams will be dealt with in accordance with student academic consideration policy (http://www.uow.edu.au/handbook/courserules/specialconsideration.html) 6.2 Timing of Supplementary Exams.

While the School normally grants supplementary exams when the student does not sit the standard exam for an acceptable reason, each case will be assessed on its own merit and there is no guarantee a supplementary exam will be granted. If a supplementary exam is granted, you will normally be notified via SOLs Mail the time and date of this supplementary exam. You must follow the instructions given in the email message.

Please note that if this is your last session and you are granted a supplementary exam, be aware that your results will not be processed in time to meet the graduation deadline.

Special Consideration Policy
The School recognises that it has a responsibility to ensure equity and consistency across its subjects for all students. Sometimes, in exceptional circumstances, students need to apply for student special consideration in order to complete all assessable work.

The University applies strict criteria to the granting of special consideration. Before applying for student special consideration, students should carefully read the University’s policy which can be found at: http://www.uow.edu.au/handbook/courserules/specialconsideration.html

As an example: If a student requires an extension of time for the completion of an assignment this may be granted in certain circumstances. A request for an extension must be made to the Subject Coordinator via SOLs before the due date.

Plagiarism
When you submit an assessment task, you are declaring the following
1. It is your own work and you did not collaborate with or copy from others.
2. You have read and understand your responsibilities under the University of Wollongong's policy on plagiarism.
3. You have not plagiarised from published work (including the internet). Where you have used the work from others, you have referenced it in the text and provided a reference list at the end of the assignment.

Students must remember that:
Plagiarism will not be tolerated.
Students are responsible for submitting original work for assessment, without plagiarising or cheating, abiding by the University’s policies on Plagiarism as set out in the University Handbook under University Policy Directory and in Faculty handbooks and subject guides. Plagiarism has led to the expulsion from the University.
Student Academic Grievance Policy
The School aims to provide a fair, equitable and productive learning environment for all its students. The Student Academic Grievance Policy seeks to support the achievement of this goal by providing a transparent and consistent process for resolving student academic grievances.

Any student who has a grievance over a result should obtain a Faculty of Informatics Appeal Against Decision or Action Affecting Academic Experience form from the Informatics Student Enquiry Centre. (http://www.uow.edu.au/content/groups/public/@web/@inf/@faculty/documents/doc/uow017433.pdf) The student should firstly take the form to the marker/lecturer to discuss the matter and, if the student is still not satisfied, s/he should take the next step as outlined on the form.

Once the grievance has been considered by the Faculty, if the student still feels the situation has not been fully resolved s/he may consult the Dean of Students. However, the Dean of Students can have no input into the academic judgment of the lecturer and can only review the grievance to ensure proper procedure has been followed.

Relevant University Policies, procedures and students services:
For more information students must refer to the Faculty handbook, online references or consult the UOW policy in full at http://www.uow.edu.au/handbook/courserules/studacgrievpol.html which contains a range of policies on educational issues and student matters.

This outline should be read in conjunction with the following documents:

<table>
<thead>
<tr>
<th>Code of Practice - Teaching and Assessment</th>
<th>Code of Practice - Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code of Practice-Honours</td>
<td>Acknowledgement Practice Plagiarism will not be tolerated:</td>
</tr>
<tr>
<td>Key Dates</td>
<td>Special Consideration Policy:</td>
</tr>
<tr>
<td>Course Progress Policy:</td>
<td>Graduate Qualities Policy:</td>
</tr>
<tr>
<td>Academic Grievance Policy (Coursework and honours students)</td>
<td>Non-Discriminatory Language Practice and Presentation</td>
</tr>
<tr>
<td>Occupational Health and Safety</td>
<td>Intellectual Property Policy</td>
</tr>
<tr>
<td>Human Research Ethics:</td>
<td>Rules for student conduct and discipline:</td>
</tr>
<tr>
<td>Information Literacies Introduction Program</td>
<td>Informatics Faculty Librarian, Ms Annette Meldrum, phone: 4221 4637, email: <a href="mailto:ameldrum@uow.edu.au">ameldrum@uow.edu.au</a></td>
</tr>
<tr>
<td><a href="http://www.uow.edu.au/student/services/">http://www.uow.edu.au/student/services/</a></td>
<td>SCSSE Subject Outlines</td>
</tr>
<tr>
<td>Informatics Faculty SEDLO (Student Equity and Diversity Liaison Officers) Virginie Schmelitschek, phone 4221 3833, <a href="mailto:virginie@uow.edu.au">virginie@uow.edu.au</a></td>
<td><a href="http://www.uow.edu.au/informatics/common/uow041847.htm">http://www.uow.edu.au/informatics/common/uow041847.htm</a></td>
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</tbody>
</table>