Maximo SQL Queries

April 2016
Agenda

• Problem Areas and Solutions
• Query Examples
• Identify Long Running Query
• Dynamic Queries
• Adding New Search Fields
• Q&A
Problem Area

- Wildcard searches
  - `select count(*) from workorder where status like '%APPR%' and siteid like '%BEDFORD%' and jnum like '%XX1234%'`
  - Does full table scan
  - Does not use index
Why is Like a Problem?

- **SEARCHTYPE = WILDCARD**
  - User enters value without equal sign
  - QBE constructs: column like ‘%value%’
  - Database cannot use an index if leading wildcard
Solution

• Teach users to use leading equal sign
• Change SEARCHTYPE to EXACT
• Create a public saved query for them
• If found in a saved query, fix it there
# Solution

<table>
<thead>
<tr>
<th>To search for</th>
<th>Type this</th>
<th>MAXIMO constructs</th>
<th>Can use index?</th>
</tr>
</thead>
<tbody>
<tr>
<td>exact value</td>
<td>=value</td>
<td>where column = 'value'</td>
<td>Yes</td>
</tr>
<tr>
<td>exact list of values</td>
<td>=val1, =val2, =val3</td>
<td>where column in ('val1', 'val2', 'val3')</td>
<td>Yes</td>
</tr>
<tr>
<td>trailing wildcard</td>
<td>value%</td>
<td>where column like 'value%'</td>
<td>Yes</td>
</tr>
<tr>
<td>*leading wildcard</td>
<td>%value</td>
<td>where column like '%value%'</td>
<td>No</td>
</tr>
<tr>
<td>*any match</td>
<td>value or %value%</td>
<td>where column like '%value%'</td>
<td>No</td>
</tr>
<tr>
<td>*any match list of values</td>
<td>val1, val2, val3</td>
<td>where column like '%val1%' or column like '%val2%' or column like '%val3%'</td>
<td>No</td>
</tr>
</tbody>
</table>
Problem Area

- Upper() Function
  - ...and upper(column) = ‘VALUE’...
  - MAXTYPE is ALN
  - QBE uses upper()
  - Upper(column) cannot use an index
Fixing Upper()

- Need to understand the data
  - ...upper(column) = '123456'
    - Is column always numeric data?
  - ...upper(column) = 'WILMAF'
    - Is column always uppercase data?
  - If either is true, change maxtype to UPPER
Problem Area

- **Exists vs. In**
  - The EXISTS function searches for the presence of a single row meeting the stated criteria
  - The IN statement looks for all occurrences
  - IN example
    - SELECT t1.col1 FROM table1 t1
      WHERE t1.col2 IN (SELECT t2.col2 FROM table2 t2)
  - EXISTS example
    - SELECT t1.col1 FROM table1 t1
      WHERE EXISTS (SELECT '1' FROM table2 t2 WHERE t2.col2 = t1.col2)

- IN query - all rows in table2 will be read for every row in table1
- EXISTS query = a maximum of 1 row from table2 will be read for each row of table1
  - This reduces the processing overhead of the statement
Solution

- Rule of thumb
  - If the majority of the filtering criteria are in the subquery then the IN variation may be more performant.
  - If the majority of the filtering criteria are in the top query then the EXISTS variation may be more performant
Query Table

• Saved queries
• Saved performance problems
• Look at the data in the CLAUSE column
• LIKEs
• UPPERs
• Correct them
Add Indexes

- Query cannot be made more efficient
- Query is frequently executed
- Work with the DBA to identify an index that would improve it
- Add the new index in the Database Configuration application
Query Example

- Find Work Orders that were not filled out correctly with missing crafts
- Where clause
  - ((woclass = 'WORKORDER' or woclass = 'ACTIVITY')
    and historyflag = 0
    and siteid = 'XXXX'
    and istask = 0
    and craft is null
    and location in (select y.location from locancestor y
      where y.siteid = 'XXXX'
      and y.ancestor = 'YYYY'))
Query Example

- Find job plans where there is an asset associated with the job plan, and the asset is in location XXXX

- Where clause
  - (siteid = ‘YYYY‘ and jpnum in (select x.jpnum from jpassetsplink x where x.siteid = ‘YYYY‘ and x.assetnum in (select y.assetnum from asset y where y.location = ‘XXXX’ and y.siteid = ‘YYYY’)))
Query Example

- Find inventory where the standard cost greater than $100
- Where clause
  - (status != 'OBSOLETE'
    and siteid = 'XXXX'
    and itemnum in (select itemnum from invcost
    where stdcost > 100
    and siteid = 'XXXX')))
Query Example

- Find Safety PM work that are past due in the past 6 months. Shows floating date range.
- Where clause
  - (woclass = 'WORKORDER' or woclass = 'ACTIVITY')
    and status not in ('COMP','CLOSE','CAN')
    and istask = 0 and safety = 1
    and siteid = 'XXXX'
    and (pmnum is not null or (parent is not null and jpnum is not null))
    and targcompdate < add_months (trunc (sysdate, 'MM'), +0)
    and targcompdate > add_months (trunc (sysdate, 'MM'), -6)
Identify Long Running SQL

• Turn on SQL Time Limit logging
• Writes a log message for each SQL statement which exceeds the limit
• Start with a high value such as 60000 milliseconds (60 seconds) to find the worst performing SQL first
• Property mxe.db.logSQLTimeLimit
• Set in the System Properties application
• If Oracle, schema userid should have SELECT on V$SESSION view
• Set the root sql logger to WARN in the Logging application
Dynamic Queries

Use case: filter records for logged in user
Solution: the substitution variable :user can be included in the query to resolve to the logged in user, e.g. reportedby = :USER

Use case: filter records for work orders scheduled to start in the next week.
Solution: Reference current date in query. Different depending on database.

SQL Server: schedstart <= ( getdate() + 7)
DB2: schedstart <= ( CURRENT DATE + 7 DAYS)
Oracle: schedstart <= ( sysdate + 7)
Adding New Search Fields

- End users can search for records by using fields on the List, Advanced Search or Attribute Search screen/dialogs. Maximo writes the sql behind the scenes. The sql can be viewed in the Where Clause.
- OOTB a majority of fields are already available for searching via one of the above search methods
- Sometimes there are other ways users would like to be able to frequently search for records
- The Where Clause allows users to enter a sql statement to search for records. However, access to Where Clause should be limited. If a user isn’t skilled with sql, a very inefficient query could be entered in the Where Clause and this could cause performance issues
Adding New Search Fields

- Using Application Designer, new search fields can be added to the List screen and/or Advanced Search.
- These search fields can be fields stored as attributes on the main object that is being searched, e.g. Actual Date fields on the work order.
- These search fields can also be fields that are related to the object, e.g. PO number where parts are being purchased directly for a work order.
Adding New Search Fields

Problem: I want to see all work orders completed for a building in the last month but there are no search fields. I could use the Where Clause...but how do I write that sql?
Adding New Search Fields

Solution: add Actual Date fields to Advanced Search via Application Designer and let Maximo write the sql
Adding New Search Fields

Problem: I want to search for all work orders completed last year where the asset is covered under a warranty contract. I want to search based on Warranty Contract number.
Adding New Search Fields

Solution: add Contract as a search field via Application Designer by leveraging a relationship. May leverage existing relationship or may need to create a new one in Database Configuration.
Resources

- Setting debug properties and logging
- Search methodology
- Efficient query syntax for Maximo applications screen
- Maximo 7.5 Performance Best Practices
  [https://www.ibm.com/developerworks/community/groups/service/html/communityview?communityUuid=a9ba1efe-b731-4317-9724-a181d6155e3a#fullpageWidgetId=W5f281fe58c09_49c7_9fa4_e094f86b7e98&file=c51d5f5b-dea3-4043-a81f-d5213fc10063](https://www.ibm.com/developerworks/community/groups/service/html/communityview?communityUuid=a9ba1efe-b731-4317-9724-a181d6155e3a#fullpageWidgetId=W5f281fe58c09_49c7_9fa4_e094f86b7e98&file=c51d5f5b-dea3-4043-a81f-d5213fc10063)
- Maximo 7.6 Performance Best Practices
  [https://www.ibm.com/developerworks/community/groups/service/html/communityview?communityUuid=a9ba1efe-b731-4317-9724-a181d6155e3a#fullpageWidgetId=W5f281fe58c09_49c7_9fa4_e094f86b7e98&file=e0291480-2b4f-4366-bb01-e6e7360cd033](https://www.ibm.com/developerworks/community/groups/service/html/communityview?communityUuid=a9ba1efe-b731-4317-9724-a181d6155e3a#fullpageWidgetId=W5f281fe58c09_49c7_9fa4_e094f86b7e98&file=e0291480-2b4f-4366-bb01-e6e7360cd033)
- Writing efficient SQL queries (DB2 KnowledgeCenter)
Resources Continued

- Advanced date queries for Maximo
- Wildcards and operators for searching
- Variables for dynamic queries in conditional expressions
Thank You