CSE 510 – Database Management System Implementation

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Phase 2: Modifying Tuple Definitions

Group 6:

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ABSTRACT:

In today's world, all types of data cannot be classified as structured data. Most of the data that we deal with does not follow a predefined schema and thus it is difficult to deal with such data with the help of a traditional relational database. In the first phase we understood the functioning of a relational database (Minibase) and in this phase we focus on modeling it to function as an XML database. To do this, we store XML data in the database by using an interval datatype. In addition to this, we have updated the definitions of the functions like Eval, Sort, SortMerge and NestedLoopsJoins to support the use of interval data type. Using this, we are dynamically generating 3 different query plans to execute the queries regarding pattern trees and calculating the number of pages accessed for each query plan.

Keywords:

Interval, XML, Pattern Tree, Heap file, Sort, Heap Sort, SortMerge Join, NestedLoop Join, Page Counter, Query Execution Plans, Parent-Child, Ancestor-Descendant, Buffer Manager

INTRODUCTION:

Though conventional Relational database systems are popularly used to store and maintain data, at times using other database systems such as XML, NoSQL, etc. are more convenient and performance is increased. In this phase of the project we have made changes for the minibase to efficiently parse the given xml file, store it in tuples and make it available for querying & modifications in future. XML is self-describing, schema independent and contains both data and meta-data. XML is preferred over RDBMS when the data is hierarchical, semi structured or contains sparse attributes.

Terminology:

Interval Fields:
A new data type called interval type is introduced in javaminibase. It consists of start and end numeric values. Every tuple created will have interval type as its attribute and represents the position of the tuple in the database. Based on interval fields, the interval can be **containment**, **enclosure**, **equal** and **no overlap.**

1. **Containment:**
   If there is a tuple A having the start and end field as 2 and 5 and tuple B which has the start and end interval as 3 and 4 then tuple B is said to be contained in tuple A if the start and end value of interval field of tuple B lies in between the start and end value of interval field of Tuple A.

2. **Enclosure:**
   If there is a tuple C having start and end interval as 7 and 8 and tuple D having the start and end interval as 6 and 9 respectively then C is said to be enclosed within the tuple D. This is because the start and end value of interval field of tuple C lies in between the start and end value of interval field of tuple D.

3. **Equal Interval:**
   When the starting interval of tuple A is equal to the start interval of tuple B and the end interval of tuple A is equal to the end interval of tuple B then the intervals are said to be equal.

4. **No overlap:**
   If there is a tuple A with start and end interval as 2 and 5 respectively and tuple D with start and end interval as 6 and 9 respectively then tuple A and tuple D are not overlapping each other because the start and end value of interval field of tuple D are outside the range of start and end value of interval field of tuple A.

Relationship types:

1. **Ancestor-Descendant**:
   If there is a tuple A whose start, and end values of interval fields lies in between the start and end values of the interval field of another tuple B then the tuple A and tuple B are said

to have the ancestor descendant relationship. In this relationship tuple B is the ancestor and tuple A is the descendant.

2. **Parent-Child**:
   All elements contained within another element, all the attributes that are contained by each element and all the values contained by each attribute are said to have the parent child relationship.

Sort Merge Join:
Sort merge join are applied to the sorted table. So unsorted tables should be sorted based on join predicates. Join predicates is the column which is common on both the tables and due to this column both the tables are related to each other. Sort merge join is an expensive process if the sorting has not been done.

If the joining predicate column value of the left table is equal to the joining predicate column value of the right table then the combined tuple will be copied in the output file. When the joining predicate column value of the left table is less than the joining predicate column value of the right table then the pointer on the left table will move to the next row Otherwise, if the joining predicate column value of the right table is less than the joining predicate column value of the left table then the pointer on the right table will move to the next row.

Heap Sort:
Heap sort is a sorting algorithm which can perform sorting based on comparison. Heap converts the given input into heap data structure and then perform sorting on the heap. It either sort the records in min-heap form or max-heap form.

1. **Min-heap**: In min heap, the value in parent node is either less than or equal to the child node. It arranges the elements in the ascending order having smallest element in the root node and the largest element in the leaf node.
2. **Max-heap:** In max heap, the root node will consist of the greatest value and leaf node consist of the smallest value. In this parent node's value is either greater than or equal to the child node value. It is used to arrange the elements in descending order.

Nested Loop Join:
In nested loop join we compare each tuple of one of the two tables with all the other tuples of the second table based on the join predicate column which is the column common on both the tables and due to this column both the tables are related to each other. So if the values in the joining predicate are common then both the tuples are combined otherwise the iterator of the second table will move forward. If all the rows of the second tables are covered then the iterator of the first table is moved to the next row and iterator of second table will again start from the first row to the last row and combined tuples of both the table if the values in the joining predicate are common. This process will continue until all the rows of first column is covered.

Pattern Tree:
A pattern tree consists of number of tags given, tags and the relation between them. Here the tags refer to not the XML markup tags, but the tag name stored in a tuple. The relations may be either of the Parent-Child or Ancestor-descendant.

Heap File:
The given XML document is parsed and stored as bytes in heap files as they are the simplest way to store data in the database. The tuples in a heap file are stored in random order and so it does not require any sorting of tuples on insertion. In cases where large amount of data must be loaded into the database, heap files are the best way to go.

XML Parser:
XML parser consists of methods and properties to access the data in XML documents and perform operations over it. With the help of parser, we can perform operations like read, write, delete, update and search in the document. Parser can be of various types like DOM Parser, SAX parser, StAX parser and JAXP Parser. We used StAX Parser to parse the document.

StAX Parser: StAX parser provides certain built in methods which are used to perform operations on the XML documents. It helps us to achieve the goal of performing event-based XML parsing. It mainly has two different type of API's namely cursor-based API and iterator-based API. It has certain built-in methods like XMLEventReader which read the events from XML documents using iterators and XMLEventWriter which write the XML file.

Why StAX?

1. It streams through the XML file line by line, instead of loading the entire file in memory.

Goal description:

- Declare a data type called interval and modify attribute type definitions to include a new attribute type called "attrInterval".
- Modify get and set methods for tuple and page.
- Modify operand definitions, Tuple comparison methods, condition expressions and PredEval class to include new datatype called intervaltype and attribute type called "attrInterval".
- Modify sort, sortmerge, nestedloop to handle this datatype.
- XML data to interval conversion and storage in the DB.
- Implement a program which, given an interval-indexed XML database and a file containing a pattern tree identifies matching nodes.
- Implement a counter to count the number of pages requested from the buffer manager
- For each query implement three distinct query plans and return the number of pages accessed to obtain the result.

Assumptions:

- Enough disk space is available to store all the intermediate created heap files.
- The three query plans generated may not be the best possible query plans.
- Only 5 characters of the XML tag are stored as fixed length records for simplicity of implementation.

Description of the proposed solution/implementation:

Task 1: **Introduction of interval type fields**:

- Add a class for new data type called **intervalType**.
- Define two methods in the **Convert** class:
  getIntervalTypeValue gets the start and end value of the interval field from the bytes.
  setIntervalTypeValue sets the start and end value of the interval field as bytes in DB.
- Define two methods in **Tuple** class:
  getIntervalFld as a wrapper on getIntervalTypeValue of Convert class
  setIntervalFld as a wrapper on setIntervalTypeValue of Convert class.
- Modify **CompareTupleWithTuple** comparison methods in TupleUtils class by adding a switch case to compare tuple based on start and end values of the interval field.
- Create conditions to join the tuples based on the interval type and introduced a new variable flag in **PredEval** class.

Task 2: Modify Sort

- Sort method is modified to sort all tuples based on the start values when sort attribute is of type attrInterval.

Task 3: Modify SortMerge Join

- Create switch cases in Projection class to join the tuples based on interval field.
- Modify looping condition to work with interval data types.

Note: This task has not been implemented and verified in this phase.

Task 4: **Modify NestedLoops Join**

To implement nested loop joins for XML data, we have introduced conditions for operations of interval data types. To evaluate if two tuples can be joined using NLJs, we call the method Eval that uses the iterator for the left input and the heap file for the right input. The Ancestor-Descendant relationship is implemented using the operator aopGT in this method (i.e. if first tuple contains the other tuple).

Here we check compare the start and end values of the two tuples being compared. For the intervals of these tuples if the interval start value of the tuple is less than that of the second tuple and the interval end value is more than that of the second tuple, then the method returns -1. This comparison is made between the tuples in the inner input to each tuple in the outer input and the pair of such tuples that return -1 on comparison are joined.

Task 5: **Parse XML file and Store as Heap File**

A tuple is created for each tag, attribute and contents of the attribute. Each tuple consists of three attributes (tagname, interval (start, end) and parentnode). Tag is a string type and stores the value of the tag, attribute and values. Interval has start and end elements which are integers. parentnode is of integertype and has the start value of the Interval field of its parent.

Step 1: Read start element's tag, set its start interval and push it into the stack

Step 2: Read the attributes of the tag, create a node with interval values for attribute name and attribute value and store it in the heap file.

Step 3: Read the value of the tag just encountered, set its interval and store it in the heap file.

Step 4: Read next tag,

If it is an end tag, save its value, interval on the heap file and pop the node on stack, set its end interval and store it on.

If it is a start tag, go to Step 1.

Step 5: Repeat until the stack is empty and all lines of the file have been read.

Each Tuple will have 34 bytes with data as:

1. 5-character string Tag
2. Start interval int value
3. End interval int value
4. Parent node interval start int value
5. Tuple Header

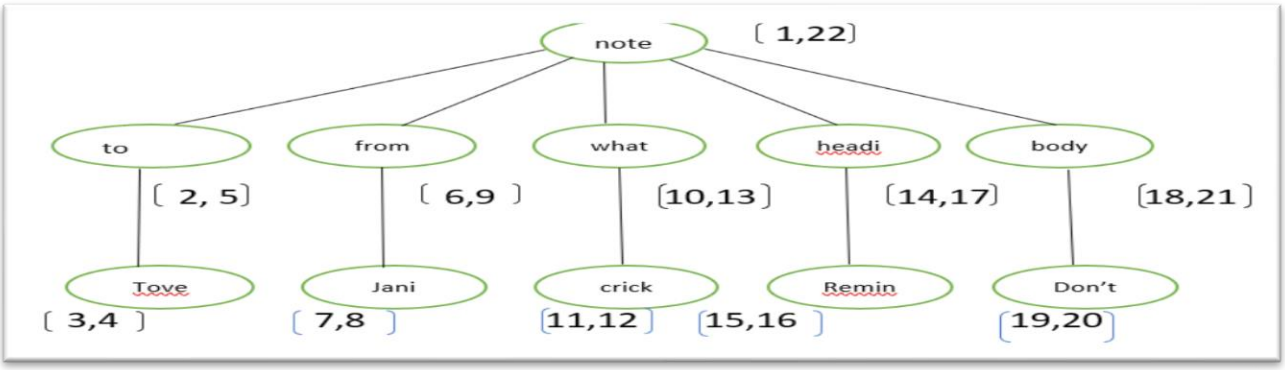
String Tag	Int interval start	Int interval end	Int Parent Node interval start

Example 1:

Sample XML file input:

```
<note>
<to>Tove</to>
<from>Jani</from>
<what>cricket</what>
<heading>Reminder</heading>
<body>Don't forget me this weekend!</body>
</note>
```

Interval based Representation:



Ancestor-Descendant relationship:
In the above figure "crick" {Interval – 11,12} and "note" {Interval – 1,22} has an ancestor-descendant (AD) relationship as the interval for the latter is contained in the interval for the former. But, "crick" {Interval – 11,12} and "body" {Interval – 18,21} do not share the AD relationship as the interval for the latter is not contained in the interval for the former.

Parent-Child relationship:
To implement the Parent-Child (PC) relationship we have included the attribute Parent's start ID in the node type. i.e. In the node "crick", an attribute for Parent's start ID will be 10.

Task 6: **Generate 3 Query Plans for given pattern tree**

A pattern tree is given as input and all the matching nodes that satisfy the given relationships are to be returned.

Step 1: Read the number of Tags

Step 2: For each tag, create a subset of tuples that match the tag.

Step 3: Read the relationship specification for two tuples (AD / PC) and join them using NLJ. Store this result in a heap file with file name as "tag1 | tag2"

Step 4: Create a candidate join list containing all the tags joined in step 3.

Step 5: Select first node in the candidate list as Start node.

Step 6: Randomly select second candidate from the list:

If the candidate can be joined, remove it from the list and perform NLJ on the two selected tuples and store it in a heap file. This join output will be the new first candidate now.

Else repeat step 6.

Step 7: Perform step 6 until the candidate list is empty. The resultant after this step is the desired output.

Repeat above algorithm 3 times to obtain 3 query plans.

Note: The random function may end up giving repetitive query plans and needs to be handled.

Task 7: **Page Access Counter**

A new class called PCounter is created to count the number of pages that are accessed by the buffer manager for each query. Each time a page is read the rcounter, a member of the PCounter, class gets incremented and each time if something is written on the page the wcounter, another member of the PCounter class, gets incremented. The count of pages i.e., rcounter + wcounter that are accessed are returned along with the output of each query plan.

Minibase Configuration Changes:

- The minibase page size has been set to 512 bytes.
- The Buffer pool size is set to 8K frames.
- MAX_SPACE is set to 16K frames.

Interfaces Specifications:

Platform used: JDK 8 and Linux OS (Ubuntu).

Interfaces/classes created:

1. Reading the XML file using StAX and storing in a heap file:

For this functionality we have created the class 'DBUtil.java' in the package 'loaddb'.
The method storeXMLasHeapFile uses the path of the XML file as an input and creates a heapfile 'xml.in'.

2. Find all the tags from the query:

To find all the occurrences of the tags mentioned in the queries in the heap file 'xml.in', we have created the class 'HeapFileUtil.java' in the package 'loaddb'.
The method createSubsetHFforAllTags takes the heap file 'xml.in' and the array of tags as input and creates a separate heap file which stores all the attributes of all the occurrences of the individual tags by scanning 'xml.in'.

3. Pattern tree:

The patterns given in the query file containing pattern tree are stored as objects of the class 'PatternTreeNode' in the package 'loaddb'.
These objects store the first node, second node and the relation (Parent-Child/Ancestor-Descendant) as attributes.

4. Operations on tuples:

The various operations on the tuples are performed using the methods of the class 'XmlTupleUtil' in the package 'loaddb'.
The method prepareString takes the xml tag (string) as an input and reduces it to a 5-character string.
The method getTupleAttrTypes takes the number of nodes involved in a join operation and returns the attribute types of the resulting tuple.

The method getTupleProjection takes as input the number of nodes in the inner relation tuple as well as the outer relation tuple and the common nodes in the two tuples. In turn, it returns the total number of fields in the relation.

5. Query execution and output:

The main function for our program is present in the Class 'XmlDB.java' in the package 'loaddb'.
This method prompts for an input for the path of our XML input file as well as the query file.
The method queryExecute takes the list of pattern tree nodes as input and an integer (value 1 to 3) signifying the 3 query plans (random combinations of joins) and prints the result of the query.

System requirements:

- OS Version: Windows 10/8/7 x64 or macOS 10.8 or later or GNOME or KDE desktop
- 4 GB RAM
- JDK Version: JDK 8
- Disk Space: 1.5GB hard disk space + at least 1GB for caches

Installation Instructions:

- Download the zip containing the code base
- Unzip it to desired location

Execution Instructions:

- Open terminal and navigate to the src folder of the project
- Execute: make db
- Execute: make load

Related Work:

1. H. V. Jagadish1, Shurug Al-Khalifa1, Adriane Chapman1, Laks V. S. Lakshmanan2, Andrew Nierman1, Stelios Paparizos1, Jignesh M. Patel1, Divesh Srivastava3, Nuwee Wiwatwattana1, Yuqing Wu1, Cong Yu1 "TIMBER: A native XML database"
   It helped us to understand the overall design and architecture of XML database.

2. Hanyu Li, Lee, Wynne Hsu, Chen "An Evaluation of XML Indexes for Structural Join"
   This paper explores the state-of-the-art indexes and analyzes how well they support XML structural joins. This helped us to handle structural relationships efficiently in XML query processing.

3. H. V. Jagadish, Laks V. S. Lakshmanan, Divesh Srivastava, Keith Thompson "TAX: A Tree Algebra for XML"
   This paper helped us understand TAX: A formal bulk algebra that is essential for optimization of XML queries and manipulating XML data.

Conclusions:

In this phase of the project, we learnt how to model a relational database into an XML database. Many modifications were made to have the XML document stored in the form of tuples in pages in the database and making the database available and suitable for querying and modifications. This includes the changes that has been made to eval, sort, sortmerge join and nestedloop join. In addition to this, we implemented a program to read pattern tree and find matching tuples with the similar tag names and satisfying the relations between tag names mentioned in the pattern tree using 3 different query plans with the help of join operations like nested-loop. A counter is successfully implemented to observe the number of pages accessed by each query plan of different inputs.

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12) ORACLE Help center , XML Parsing for Java, https://docs.oracle.com/cd/B28359_01/appdev.111/b28394/adx_j_parser.htm#ADXDK3000 , 9

APPENDIX

Contribution:

Aakash Rastogi	- Interval data type Implementation and modification in tuple comparison methods. - Sort Merge implementation with Interval data type.
Varun Rao Veeramaneni	- Implementing a program to identify matching nodes in the pattern tree with 3 different query plans.
Sumit Rawat	- Implementation of Nested Loops Join - Modification of Eval to work for joins with interval data type.
Yash Jain	- XML parsing and storage. - Implementing a program to identify matching nodes in the pattern tree with 3 different query plans.
Narsimha Reddy Sarasani	- Implementation of Sort function.
Manoj Tiwaskar	- Implementation of buffer manager's page access counter.

Results:

Sample query output for given input:

Sample1:

Input:

```
6
root
100K_
Q6267
Ref
Author
Muell
1 2 AD
1 3 AD
1 4 AD
4 5 PC
5 6 PC
```

Output:

```
Enter data file path:
/home/group6/asu/coursework/cse510/project/phase2/minjava/javaminibase/src/sample.xml
Replacer: Clock

File parsing completed.


Enter query file path:
/home/group6/asu/coursework/cse510/project/phase2/minjava/javaminibase/src/patternSample1.txt
Page access for first level joins: 5


QueryPlan :1
------------------------
root │100K_
root │100K_│root │Ref
root │100K_│root │Ref  │Ref  │Autho
root │100K_│root │Ref  │Ref  │Autho│root │Q6267
------------------------
Result:
 Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_,
IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref  , IntervalType{start=125, end=170},
ParentNode= 2} Tuple = {Tag=Autho, IntervalType{start=150, end=153}, ParentNode= 125} Tuple =
{Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Muell,
IntervalType{start=151, end=152}, ParentNode= 150}
```

Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=171, end=200}, ParentNode= 2} Tuple = {Tag=Autho, IntervalType{start=180, end=183}, ParentNode= 171} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Muell, IntervalType{start=181, end=182}, ParentNode= 180}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=77167, end=77220}, ParentNode= 77032} Tuple = {Tag=Autho, IntervalType{start=77196, end=77199}, ParentNode= 77167} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Muell, IntervalType{start=77197, end=77198}, ParentNode= 77196}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=79225, end=79278}, ParentNode= 79048} Tuple = {Tag=Autho, IntervalType{start=79254, end=79257}, ParentNode= 79225} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Muell, IntervalType{start=79255, end=79256}, ParentNode= 79254}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=95605, end=95658}, ParentNode= 95266} Tuple = {Tag=Autho, IntervalType{start=95646, end=95649}, ParentNode= 95605} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Muell, IntervalType{start=95647, end=95648}, ParentNode= 95646}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=136403, end=136464}, ParentNode= 136268} Tuple = {Tag=Autho, IntervalType{start=136456, end=136459}, ParentNode= 136403} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Muell, IntervalType{start=136457, end=136458}, ParentNode= 136456}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=136531, end=136584}, ParentNode= 136268} Tuple = {Tag=Autho, IntervalType{start=136576, end=136579}, ParentNode= 136531} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Muell, IntervalType{start=136577, end=136578}, ParentNode= 136576}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=137459, end=137516}, ParentNode= 136268} Tuple = {Tag=Autho, IntervalType{start=137500, end=137503}, ParentNode= 137459} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Muell, IntervalType{start=137501, end=137502}, ParentNode= 137500}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=141879, end=141912}, ParentNode= 141698} Tuple = {Tag=Autho, IntervalType{start=141904, end=141907}, ParentNode= 141879} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Muell, IntervalType{start=141905, end=141906}, ParentNode= 141904}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=162261, end=162302}, ParentNode= 162080} Tuple = {Tag=Autho, IntervalType{start=162290, end=162293}, ParentNode= 162261} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple =

{Tag=Muell, IntervalType{start=162291, end=162292}, ParentNode= 162290}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=292709, end=292734}, ParentNode= 292610} Tuple = {Tag=Autho, IntervalType{start=292726, end=292729}, ParentNode= 292709} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Muell, IntervalType{start=292727, end=292728}, ParentNode= 292726}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=329299, end=329340}, ParentNode= 329200} Tuple = {Tag=Autho, IntervalType{start=329324, end=329327}, ParentNode= 329299} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Muell, IntervalType{start=329325, end=329326}, ParentNode= 329324}
Page access count after Query 1 5

QueryPlan :2
---
root │100K_
root │100K_│root │Q6267
root │100K_│root │Q6267│root │Ref
root │100K_│root │Q6267│root │Ref │Ref │Autho

Result:
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Ref , IntervalType{start=125, end=170}, ParentNode= 2} Tuple = {Tag=Autho, IntervalType{start=150, end=153}, ParentNode= 125} Tuple = {Tag=Muell, IntervalType{start=151, end=152}, ParentNode= 150}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Ref , IntervalType{start=171, end=200}, ParentNode= 2} Tuple = {Tag=Autho, IntervalType{start=180, end=183}, ParentNode= 171} Tuple = {Tag=Muell, IntervalType{start=181, end=182}, ParentNode= 180}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Ref , IntervalType{start=77167, end=77220}, ParentNode= 77032} Tuple = {Tag=Autho, IntervalType{start=77196, end=77199}, ParentNode= 77167} Tuple = {Tag=Muell, IntervalType{start=77197, end=77198}, ParentNode= 77196}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Ref , IntervalType{start=79225, end=79278}, ParentNode= 79048} Tuple = {Tag=Autho, IntervalType{start=79254, end=79257}, ParentNode= 79225} Tuple = {Tag=Muell, IntervalType{start=79255, end=79256}, ParentNode= 79254}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Ref , IntervalType{start=95605, end=95658}, ParentNode= 95266} Tuple

= {Tag=Autho, IntervalType{start=95646, end=95649}, ParentNode= 95605} Tuple = {Tag=Muell, IntervalType{start=95647, end=95648}, ParentNode= 95646}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Ref , IntervalType{start=136403, end=136464}, ParentNode= 136268} Tuple = {Tag=Autho, IntervalType{start=136456, end=136459}, ParentNode= 136403} Tuple = {Tag=Muell, IntervalType{start=136457, end=136458}, ParentNode= 136456}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Ref , IntervalType{start=136531, end=136584}, ParentNode= 136268} Tuple = {Tag=Autho, IntervalType{start=136576, end=136579}, ParentNode= 136531} Tuple = {Tag=Muell, IntervalType{start=136577, end=136578}, ParentNode= 136576}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Ref , IntervalType{start=137459, end=137516}, ParentNode= 136268} Tuple = {Tag=Autho, IntervalType{start=137500, end=137503}, ParentNode= 137459} Tuple = {Tag=Muell, IntervalType{start=137501, end=137502}, ParentNode= 137500}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Ref , IntervalType{start=141879, end=141912}, ParentNode= 141698} Tuple = {Tag=Autho, IntervalType{start=141904, end=141907}, ParentNode= 141879} Tuple = {Tag=Muell, IntervalType{start=141905, end=141906}, ParentNode= 141904}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Ref , IntervalType{start=162261, end=162302}, ParentNode= 162080} Tuple = {Tag=Autho, IntervalType{start=162290, end=162293}, ParentNode= 162261} Tuple = {Tag=Muell, IntervalType{start=162291, end=162292}, ParentNode= 162290}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Ref , IntervalType{start=292709, end=292734}, ParentNode= 292610} Tuple = {Tag=Autho, IntervalType{start=292726, end=292729}, ParentNode= 292709} Tuple = {Tag=Muell, IntervalType{start=292727, end=292728}, ParentNode= 292726}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19} Tuple = {Tag=Ref , IntervalType{start=329299, end=329340}, ParentNode= 329200} Tuple = {Tag=Autho, IntervalType{start=329324, end=329327}, ParentNode= 329299} Tuple = {Tag=Muell, IntervalType{start=329325, end=329326}, ParentNode= 329324}
Page access count after Query 2 5

QueryPlan :3
---
root │100K_
root │100K_│root │Ref
root │100K_│root │Ref │Ref │Autho

root │100K_│root │Ref │Ref │Autho│Autho│Muell

Result:
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=125, end=170}, ParentNode= 2} Tuple = {Tag=Autho, IntervalType{start=150, end=153}, ParentNode= 125} Tuple = {Tag=Muell, IntervalType{start=151, end=152}, ParentNode= 150} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=171, end=200}, ParentNode= 2} Tuple = {Tag=Autho, IntervalType{start=180, end=183}, ParentNode= 171} Tuple = {Tag=Muell, IntervalType{start=181, end=182}, ParentNode= 180} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=77167, end=77220}, ParentNode= 77032} Tuple = {Tag=Autho, IntervalType{start=77196, end=77199}, ParentNode= 77167} Tuple = {Tag=Muell, IntervalType{start=77197, end=77198}, ParentNode= 77196} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=79225, end=79278}, ParentNode= 79048} Tuple = {Tag=Autho, IntervalType{start=79254, end=79257}, ParentNode= 79225} Tuple = {Tag=Muell, IntervalType{start=79255, end=79256}, ParentNode= 79254} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=95605, end=95658}, ParentNode= 95266} Tuple = {Tag=Autho, IntervalType{start=95646, end=95649}, ParentNode= 95605} Tuple = {Tag=Muell, IntervalType{start=95647, end=95648}, ParentNode= 95646} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=136403, end=136464}, ParentNode= 136268} Tuple = {Tag=Autho, IntervalType{start=136456, end=136459}, ParentNode= 136403} Tuple = {Tag=Muell, IntervalType{start=136457, end=136458}, ParentNode= 136456} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=136531, end=136584}, ParentNode= 136268} Tuple = {Tag=Autho, IntervalType{start=136576, end=136579}, ParentNode= 136531} Tuple = {Tag=Muell, IntervalType{start=136577, end=136578}, ParentNode= 136576} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=137459, end=137516}, ParentNode= 136268} Tuple = {Tag=Autho, IntervalType{start=137500, end=137503}, ParentNode= 137459} Tuple = {Tag=Muell, IntervalType{start=137501, end=137502}, ParentNode= 137500} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_,

IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=141879, end=141912}, ParentNode= 141698} Tuple = {Tag=Autho, IntervalType{start=141904, end=141907}, ParentNode= 141879} Tuple = {Tag=Muell, IntervalType{start=141905, end=141906}, ParentNode= 141904} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=162261, end=162302}, ParentNode= 162080} Tuple = {Tag=Autho, IntervalType{start=162290, end=162293}, ParentNode= 162261} Tuple = {Tag=Muell, IntervalType{start=162291, end=162292}, ParentNode= 162290} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=292709, end=292734}, ParentNode= 292610} Tuple = {Tag=Autho, IntervalType{start=292726, end=292729}, ParentNode= 292709} Tuple = {Tag=Muell, IntervalType{start=292727, end=292728}, ParentNode= 292726} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=100K_, IntervalType{start=4, end=5}, ParentNode= 3} Tuple = {Tag=Ref , IntervalType{start=329299, end=329340}, ParentNode= 329200} Tuple = {Tag=Autho, IntervalType{start=329324, end=329327}, ParentNode= 329299} Tuple = {Tag=Muell, IntervalType{start=329325, end=329326}, ParentNode= 329324} Tuple = {Tag=Q6267, IntervalType{start=20, end=21}, ParentNode= 19}
Page access count after Query 3 5

Sample2:

Input:

5
root
seqle
102
species
lycop
1 2 AD
2 3 PC
1 4 AD
4 5 PC

Output:

Enter data file path:
/home/group6/asu/coursework/cse510/project/phase2/minjava/javaminibase/src/sample.xml
Replacer: Clock

File parsing completed.

Enter query file path:
/home/group6/asu/coursework/cse510/project/phase2/minjava/javaminibase/src/patternSample2.txt
Page access for first level joins: 5
QueryPlan :1
---
root |seqle
root |seqle|seqle|102
root |seqle|seqle|102 |root |Speci

Result:
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=621, end=624}, ParentNode= 608} Tuple = {Tag=102 , IntervalType{start=622, end=623}, ParentNode= 621} Tuple = {Tag=Speci, IntervalType{start=675, end=678}, ParentNode= 608} Tuple = {Tag=Lycop, IntervalType{start=676, end=677}, ParentNode= 675}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=621, end=624}, ParentNode= 608} Tuple = {Tag=102 , IntervalType{start=622, end=623}, ParentNode= 621} Tuple = {Tag=Speci, IntervalType{start=4559, end=4562}, ParentNode= 4488} Tuple = {Tag=Lycop, IntervalType{start=4560, end=4561}, ParentNode= 4559}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=621, end=624}, ParentNode= 608} Tuple = {Tag=102 , IntervalType{start=622, end=623}, ParentNode= 621} Tuple = {Tag=Speci, IntervalType{start=5473, end=5476}, ParentNode= 5402} Tuple = {Tag=Lycop, IntervalType{start=5474, end=5475}, ParentNode= 5473}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=621, end=624}, ParentNode= 608} Tuple = {Tag=102 , IntervalType{start=622, end=623}, ParentNode= 621} Tuple = {Tag=Speci, IntervalType{start=7745, end=7748}, ParentNode= 7670} Tuple = {Tag=Lycop, IntervalType{start=7746, end=7747}, ParentNode= 7745}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=621, end=624}, ParentNode= 608} Tuple = {Tag=102 , IntervalType{start=622, end=623}, ParentNode= 621} Tuple = {Tag=Speci, IntervalType{start=10633, end=10636}, ParentNode= 10566} Tuple = {Tag=Lycop, IntervalType{start=10634, end=10635}, ParentNode= 10633}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=621, end=624}, ParentNode= 608} Tuple = {Tag=102 , IntervalType{start=622, end=623}, ParentNode= 621} Tuple = {Tag=Speci, IntervalType{start=11101, end=11104}, ParentNode= 11030} Tuple = {Tag=Lycop, IntervalType{start=11102, end=11103}, ParentNode= 11101}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=621, end=624}, ParentNode= 608} Tuple = {Tag=102 , IntervalType{start=622, end=623}, ParentNode= 621} Tuple = {Tag=Speci, IntervalType{start=11557, end=11560}, ParentNode= 11486} Tuple = {Tag=Lycop, IntervalType{start=11558, end=11559}, ParentNode= 11557}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=621, end=624}, ParentNode= 608} Tuple = {Tag=102 , IntervalType{start=622, end=623}, ParentNode= 621} Tuple = {Tag=Speci, IntervalType{start=11787, end=11790}, ParentNode= 11716} Tuple = {Tag=Lycop, IntervalType{start=11788, end=11789}, ParentNode= 11787}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle,

IntervalType{start=621, end=624}, ParentNode= 608} Tuple = {Tag=102 , IntervalType{start=622, end=623}, ParentNode= 621} Tuple = {Tag=Speci, IntervalType{start=12023, end=12026}, ParentNode= 11952} Tuple = {Tag=Lycop, IntervalType{start=12024, end=12025}, ParentNode= 12023}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=621, end=624}, ParentNode= 608} Tuple = {Tag=102 , IntervalType{start=622, end=623}, ParentNode= 621} Tuple = {Tag=Speci, IntervalType{start=12255, end=12258}, ParentNode= 12184} Tuple = {Tag=Lycop, IntervalType{start=12256, end=12257}, ParentNode= 12255}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=621, end=624}, ParentNode= 608} Tuple = {Tag=102 , IntervalType{start=622, end=623}, ParentNode= 621} Tuple = {Tag=Speci, IntervalType{start=12735, end=12738}, ParentNode= 12664} Tuple = {Tag=Lycop, IntervalType{start=12736, end=12737}, ParentNode= 12735}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=621, end=624}, ParentNode= 608} Tuple = {Tag=102 , IntervalType{start=622, end=623}, ParentNode= 621} Tuple = {Tag=Speci, IntervalType{start=47453, end=47456}, ParentNode= 47374} Tuple = {Tag=Lycop, IntervalType{start=47454, end=47455}, ParentNode= 47453}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=621, end=624}, ParentNode= 608} Tuple = {Tag=102 , IntervalType{start=622, end=623}, ParentNode= 621} Tuple = {Tag=Speci, IntervalType{start=47915, end=47918}, ParentNode= 47836} Tuple = {Tag=Lycop, IntervalType{start=47916, end=47917}, ParentNode= 47915}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=621, end=624}, ParentNode= 608} Tuple = {Tag=102 , IntervalType{start=622, end=623}, ParentNode= 621} Tuple = {Tag=Speci, IntervalType{start=119895, end=119898}, ParentNode= 119824} Tuple = {Tag=Lycop, IntervalType{start=119896, end=119897}, ParentNode= 119895}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=621, end=624}, ParentNode= 608} Tuple = {Tag=102 , IntervalType{start=622, end=623}, ParentNode= 621} Tuple = {Tag=Speci, IntervalType{start=207549, end=207552}, ParentNode= 207482} Tuple = {Tag=Lycop, IntervalType{start=207550, end=207551}, ParentNode= 207549}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=621, end=624}, ParentNode= 608} Tuple = {Tag=102 , IntervalType{start=622, end=623}, ParentNode= 621} Tuple = {Tag=Speci, IntervalType{start=238375, end=238378}, ParentNode= 238308} Tuple = {Tag=Lycop, IntervalType{start=238376, end=238377}, ParentNode= 238375}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 , IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci, IntervalType{start=675, end=678}, ParentNode= 608} Tuple = {Tag=Lycop, IntervalType{start=676, end=677}, ParentNode= 675}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 , IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci, IntervalType{start=4559, end=4562}, ParentNode= 4488} Tuple = {Tag=Lycop, IntervalType{start=4560, end=4561}, ParentNode= 4559}

Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 , IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci, IntervalType{start=5473, end=5476}, ParentNode= 5402} Tuple = {Tag=Lycop, IntervalType{start=5474, end=5475}, ParentNode= 5473}

Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 , IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci, IntervalType{start=7745, end=7748}, ParentNode= 7670} Tuple = {Tag=Lycop, IntervalType{start=7746, end=7747}, ParentNode= 7745}

Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 , IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci, IntervalType{start=10633, end=10636}, ParentNode= 10566} Tuple = {Tag=Lycop, IntervalType{start=10634, end=10635}, ParentNode= 10633}

Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 , IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci, IntervalType{start=11101, end=11104}, ParentNode= 11030} Tuple = {Tag=Lycop, IntervalType{start=11102, end=11103}, ParentNode= 11101}

Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 , IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci, IntervalType{start=11557, end=11560}, ParentNode= 11486} Tuple = {Tag=Lycop, IntervalType{start=11558, end=11559}, ParentNode= 11557}

Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 , IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci, IntervalType{start=11787, end=11790}, ParentNode= 11716} Tuple = {Tag=Lycop, IntervalType{start=11788, end=11789}, ParentNode= 11787}

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Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 , IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci, IntervalType{start=12255, end=12258}, ParentNode= 12184} Tuple = {Tag=Lycop, IntervalType{start=12256, end=12257}, ParentNode= 12255}

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Page access count after Query 1 5

QueryPlan :2
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root |seqle|root |Speci
root |seqle|root |Speci|seqle|102 |

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Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 ,

IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci, IntervalType{start=675, end=678}, ParentNode= 608} Tuple = {Tag=Lycop, IntervalType{start=676, end=677}, ParentNode= 675}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 , IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci, IntervalType{start=4559, end=4562}, ParentNode= 4488} Tuple = {Tag=Lycop, IntervalType{start=4560, end=4561}, ParentNode= 4559}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 , IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci, IntervalType{start=5473, end=5476}, ParentNode= 5402} Tuple = {Tag=Lycop, IntervalType{start=5474, end=5475}, ParentNode= 5473}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 , IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci, IntervalType{start=7745, end=7748}, ParentNode= 7670} Tuple = {Tag=Lycop, IntervalType{start=7746, end=7747}, ParentNode= 7745}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 , IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci, IntervalType{start=10633, end=10636}, ParentNode= 10566} Tuple = {Tag=Lycop, IntervalType{start=10634, end=10635}, ParentNode= 10633}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 , IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci, IntervalType{start=11101, end=11104}, ParentNode= 11030} Tuple = {Tag=Lycop, IntervalType{start=11102, end=11103}, ParentNode= 11101}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 , IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci, IntervalType{start=11557, end=11560}, ParentNode= 11486} Tuple = {Tag=Lycop, IntervalType{start=11558, end=11559}, ParentNode= 11557}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 , IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci, IntervalType{start=11787, end=11790}, ParentNode= 11716} Tuple = {Tag=Lycop, IntervalType{start=11788, end=11789}, ParentNode= 11787}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 , IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci, IntervalType{start=12023, end=12026}, ParentNode= 11952} Tuple = {Tag=Lycop, IntervalType{start=12024, end=12025}, ParentNode= 12023}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle,

IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 ,
IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci,
IntervalType{start=12255, end=12258}, ParentNode= 12184} Tuple = {Tag=Lycop,
IntervalType{start=12256, end=12257}, ParentNode= 12255}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle,
IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 ,
IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci,
IntervalType{start=12735, end=12738}, ParentNode= 12664} Tuple = {Tag=Lycop,
IntervalType{start=12736, end=12737}, ParentNode= 12735}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle,
IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 ,
IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci,
IntervalType{start=47453, end=47456}, ParentNode= 47374} Tuple = {Tag=Lycop,
IntervalType{start=47454, end=47455}, ParentNode= 47453}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle,
IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 ,
IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci,
IntervalType{start=47915, end=47918}, ParentNode= 47836} Tuple = {Tag=Lycop,
IntervalType{start=47916, end=47917}, ParentNode= 47915}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle,
IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 ,
IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci,
IntervalType{start=119895, end=119898}, ParentNode= 119824} Tuple = {Tag=Lycop,
IntervalType{start=119896, end=119897}, ParentNode= 119895}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle,
IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 ,
IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci,
IntervalType{start=207549, end=207552}, ParentNode= 207482} Tuple = {Tag=Lycop,
IntervalType{start=207550, end=207551}, ParentNode= 207549}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle,
IntervalType{start=335927, end=335930}, ParentNode= 335914} Tuple = {Tag=102 ,
IntervalType{start=335928, end=335929}, ParentNode= 335927} Tuple = {Tag=Speci,
IntervalType{start=238375, end=238378}, ParentNode= 238308} Tuple = {Tag=Lycop,
IntervalType{start=238376, end=238377}, ParentNode= 238375}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle,
IntervalType{start=336887, end=336890}, ParentNode= 336874} Tuple = {Tag=102 ,
IntervalType{start=336888, end=336889}, ParentNode= 336887} Tuple = {Tag=Speci,
IntervalType{start=675, end=678}, ParentNode= 608} Tuple = {Tag=Lycop, IntervalType{start=676,
end=677}, ParentNode= 675}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle,
IntervalType{start=336887, end=336890}, ParentNode= 336874} Tuple = {Tag=102 ,
IntervalType{start=336888, end=336889}, ParentNode= 336887} Tuple = {Tag=Speci,
IntervalType{start=4559, end=4562}, ParentNode= 4488} Tuple = {Tag=Lycop, IntervalType{start=4560,
end=4561}, ParentNode= 4559}

Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=336887, end=336890}, ParentNode= 336874} Tuple = {Tag=102 , IntervalType{start=336888, end=336889}, ParentNode= 336887} Tuple = {Tag=Speci, IntervalType{start=5473, end=5476}, ParentNode= 5402} Tuple = {Tag=Lycop, IntervalType{start=5474, end=5475}, ParentNode= 5473}

Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=336887, end=336890}, ParentNode= 336874} Tuple = {Tag=102 , IntervalType{start=336888, end=336889}, ParentNode= 336887} Tuple = {Tag=Speci, IntervalType{start=7745, end=7748}, ParentNode= 7670} Tuple = {Tag=Lycop, IntervalType{start=7746, end=7747}, ParentNode= 7745}

Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=336887, end=336890}, ParentNode= 336874} Tuple = {Tag=102 , IntervalType{start=336888, end=336889}, ParentNode= 336887} Tuple = {Tag=Speci, IntervalType{start=10633, end=10636}, ParentNode= 10566} Tuple = {Tag=Lycop, IntervalType{start=10634, end=10635}, ParentNode= 10633}

Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=336887, end=336890}, ParentNode= 336874} Tuple = {Tag=102 , IntervalType{start=336888, end=336889}, ParentNode= 336887} Tuple = {Tag=Speci, IntervalType{start=11101, end=11104}, ParentNode= 11030} Tuple = {Tag=Lycop, IntervalType{start=11102, end=11103}, ParentNode= 11101}

Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=336887, end=336890}, ParentNode= 336874} Tuple = {Tag=102 , IntervalType{start=336888, end=336889}, ParentNode= 336887} Tuple = {Tag=Speci, IntervalType{start=11557, end=11560}, ParentNode= 11486} Tuple = {Tag=Lycop, IntervalType{start=11558, end=11559}, ParentNode= 11557}

Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=336887, end=336890}, ParentNode= 336874} Tuple = {Tag=102 , IntervalType{start=336888, end=336889}, ParentNode= 336887} Tuple = {Tag=Speci, IntervalType{start=11787, end=11790}, ParentNode= 11716} Tuple = {Tag=Lycop, IntervalType{start=11788, end=11789}, ParentNode= 11787}

Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=336887, end=336890}, ParentNode= 336874} Tuple = {Tag=102 , IntervalType{start=336888, end=336889}, ParentNode= 336887} Tuple = {Tag=Speci, IntervalType{start=12023, end=12026}, ParentNode= 11952} Tuple = {Tag=Lycop, IntervalType{start=12024, end=12025}, ParentNode= 12023}

Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=336887, end=336890}, ParentNode= 336874} Tuple = {Tag=102 , IntervalType{start=336888, end=336889}, ParentNode= 336887} Tuple = {Tag=Speci, IntervalType{start=12255, end=12258}, ParentNode= 12184} Tuple = {Tag=Lycop, IntervalType{start=12256, end=12257}, ParentNode= 12255}

Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=336887, end=336890}, ParentNode= 336874} Tuple = {Tag=102 , IntervalType{start=336888, end=336889}, ParentNode= 336887} Tuple = {Tag=Speci, IntervalType{start=12735, end=12738}, ParentNode= 12664} Tuple = {Tag=Lycop,

IntervalType{start=12736, end=12737}, ParentNode= 12735}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=336887, end=336890}, ParentNode= 336874} Tuple = {Tag=102 , IntervalType{start=336888, end=336889}, ParentNode= 336887} Tuple = {Tag=Speci, IntervalType{start=47453, end=47456}, ParentNode= 47374} Tuple = {Tag=Lycop, IntervalType{start=47454, end=47455}, ParentNode= 47453}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=336887, end=336890}, ParentNode= 336874} Tuple = {Tag=102 , IntervalType{start=336888, end=336889}, ParentNode= 336887} Tuple = {Tag=Speci, IntervalType{start=47915, end=47918}, ParentNode= 47836} Tuple = {Tag=Lycop, IntervalType{start=47916, end=47917}, ParentNode= 47915}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=336887, end=336890}, ParentNode= 336874} Tuple = {Tag=102 , IntervalType{start=336888, end=336889}, ParentNode= 336887} Tuple = {Tag=Speci, IntervalType{start=119895, end=119898}, ParentNode= 119824} Tuple = {Tag=Lycop, IntervalType{start=119896, end=119897}, ParentNode= 119895}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=336887, end=336890}, ParentNode= 336874} Tuple = {Tag=102 , IntervalType{start=336888, end=336889}, ParentNode= 336887} Tuple = {Tag=Speci, IntervalType{start=207549, end=207552}, ParentNode= 207482} Tuple = {Tag=Lycop, IntervalType{start=207550, end=207551}, ParentNode= 207549}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=336887, end=336890}, ParentNode= 336874} Tuple = {Tag=102 , IntervalType{start=336888, end=336889}, ParentNode= 336887} Tuple = {Tag=Speci, IntervalType{start=238375, end=238378}, ParentNode= 238308} Tuple = {Tag=Lycop, IntervalType{start=238376, end=238377}, ParentNode= 238375}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=338273, end=338276}, ParentNode= 338260} Tuple = {Tag=102 , IntervalType{start=338274, end=338275}, ParentNode= 338273} Tuple = {Tag=Speci, IntervalType{start=675, end=678}, ParentNode= 608} Tuple = {Tag=Lycop, IntervalType{start=676, end=677}, ParentNode= 675}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=338273, end=338276}, ParentNode= 338260} Tuple = {Tag=102 , IntervalType{start=338274, end=338275}, ParentNode= 338273} Tuple = {Tag=Speci, IntervalType{start=4559, end=4562}, ParentNode= 4488} Tuple = {Tag=Lycop, IntervalType{start=4560, end=4561}, ParentNode= 4559}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=338273, end=338276}, ParentNode= 338260} Tuple = {Tag=102 , IntervalType{start=338274, end=338275}, ParentNode= 338273} Tuple = {Tag=Speci, IntervalType{start=5473, end=5476}, ParentNode= 5402} Tuple = {Tag=Lycop, IntervalType{start=5474, end=5475}, ParentNode= 5473}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=338273, end=338276}, ParentNode= 338260} Tuple = {Tag=102 , IntervalType{start=338274, end=338275}, ParentNode= 338273} Tuple = {Tag=Speci,

IntervalType{start=7745, end=7748}, ParentNode= 7670} Tuple = {Tag=Lycop, IntervalType{start=7746, end=7747}, ParentNode= 7745}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=338273, end=338276}, ParentNode= 338260} Tuple = {Tag=102 , IntervalType{start=338274, end=338275}, ParentNode= 338273} Tuple = {Tag=Speci, IntervalType{start=10633, end=10636}, ParentNode= 10566} Tuple = {Tag=Lycop, IntervalType{start=10634, end=10635}, ParentNode= 10633}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=338273, end=338276}, ParentNode= 338260} Tuple = {Tag=102 , IntervalType{start=338274, end=338275}, ParentNode= 338273} Tuple = {Tag=Speci, IntervalType{start=11101, end=11104}, ParentNode= 11030} Tuple = {Tag=Lycop, IntervalType{start=11102, end=11103}, ParentNode= 11101}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=338273, end=338276}, ParentNode= 338260} Tuple = {Tag=102 , IntervalType{start=338274, end=338275}, ParentNode= 338273} Tuple = {Tag=Speci, IntervalType{start=11557, end=11560}, ParentNode= 11486} Tuple = {Tag=Lycop, IntervalType{start=11558, end=11559}, ParentNode= 11557}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=338273, end=338276}, ParentNode= 338260} Tuple = {Tag=102 , IntervalType{start=338274, end=338275}, ParentNode= 338273} Tuple = {Tag=Speci, IntervalType{start=11787, end=11790}, ParentNode= 11716} Tuple = {Tag=Lycop, IntervalType{start=11788, end=11789}, ParentNode= 11787}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=338273, end=338276}, ParentNode= 338260} Tuple = {Tag=102 , IntervalType{start=338274, end=338275}, ParentNode= 338273} Tuple = {Tag=Speci, IntervalType{start=12023, end=12026}, ParentNode= 11952} Tuple = {Tag=Lycop, IntervalType{start=12024, end=12025}, ParentNode= 12023}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=338273, end=338276}, ParentNode= 338260} Tuple = {Tag=102 , IntervalType{start=338274, end=338275}, ParentNode= 338273} Tuple = {Tag=Speci, IntervalType{start=12255, end=12258}, ParentNode= 12184} Tuple = {Tag=Lycop, IntervalType{start=12256, end=12257}, ParentNode= 12255}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=338273, end=338276}, ParentNode= 338260} Tuple = {Tag=102 , IntervalType{start=338274, end=338275}, ParentNode= 338273} Tuple = {Tag=Speci, IntervalType{start=12735, end=12738}, ParentNode= 12664} Tuple = {Tag=Lycop, IntervalType{start=12736, end=12737}, ParentNode= 12735}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=338273, end=338276}, ParentNode= 338260} Tuple = {Tag=102 , IntervalType{start=338274, end=338275}, ParentNode= 338273} Tuple = {Tag=Speci, IntervalType{start=47453, end=47456}, ParentNode= 47374} Tuple = {Tag=Lycop, IntervalType{start=47454, end=47455}, ParentNode= 47453}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle, IntervalType{start=338273, end=338276}, ParentNode= 338260} Tuple = {Tag=102 ,

IntervalType{start=338274, end=338275}, ParentNode= 338273} Tuple = {Tag=Speci,
IntervalType{start=47915, end=47918}, ParentNode= 47836} Tuple = {Tag=Lycop,
IntervalType{start=47916, end=47917}, ParentNode= 47915}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle,
IntervalType{start=338273, end=338276}, ParentNode= 338260} Tuple = {Tag=102 ,
IntervalType{start=338274, end=338275}, ParentNode= 338273} Tuple = {Tag=Speci,
IntervalType{start=119895, end=119898}, ParentNode= 119824} Tuple = {Tag=Lycop,
IntervalType{start=119896, end=119897}, ParentNode= 119895}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle,
IntervalType{start=338273, end=338276}, ParentNode= 338260} Tuple = {Tag=102 ,
IntervalType{start=338274, end=338275}, ParentNode= 338273} Tuple = {Tag=Speci,
IntervalType{start=207549, end=207552}, ParentNode= 207482} Tuple = {Tag=Lycop,
IntervalType{start=207550, end=207551}, ParentNode= 207549}
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=seqle,
IntervalType{start=338273, end=338276}, ParentNode= 338260} Tuple = {Tag=102 ,
IntervalType{start=338274, end=338275}, ParentNode= 338273} Tuple = {Tag=Speci,
IntervalType{start=238375, end=238378}, ParentNode= 238308} Tuple = {Tag=Lycop,
IntervalType{start=238376, end=238377}, ParentNode= 238375}
Page access count after Query 2 5

QueryPlan :3
---
root |seqle
root |seqle|seqle|102
root |seqle|seqle|102 |root |Speci

Result:
Page access count after Query 3 5

SAMPLE 3:

Input:

11
root
Entry
Org
Chord
MedlineID
96305
Keyword
Zinc
Features
Descr
ACETY

1 2 PC
2 3 PC
3 4 PC
2 5 AD
5 6 PC
2 7 PC
7 8 PC
2 9 PC
9 10 AD
10 11 PC

Output:

Enter data file path:
/home/group6/asu/coursework/cse510/project/phase2/minjava/javaminibase/src/sample.xml
Replacer: Clock

File parsing completed.

Enter query file path:
/home/group6/asu/coursework/cse510/project/phase2/minjava/javaminibase/src/patternSample3.txt
Page access for first level joins: 5
QueryPlan :1
---
root │Entry
root │Entry│Entry│Keywo
root │Entry│Entry│Keywo│Entry│Medli
root │Entry│Entry│Keywo│Entry│Medli│Medli│96305
root │Entry│Entry│Keywo│Entry│Medli│Medli│96305│Keywo│Zinc
root │Entry│Entry│Keywo│Entry│Medli│Medli│96305│Keywo│Zinc │Entry│Org
root │Entry│Entry│Keywo│Entry│Medli│Medli│96305│Keywo│Zinc │Entry│Org │Entry│Featu
root │Entry│Entry│Keywo│Entry│Medli│Medli│96305│Keywo│Zinc
│Entry│Org │Entry│Featu│Org │Chord
root │Entry│Entry│Keywo│Entry│Medli│Medli│96305│Keywo│Zinc
│Entry│Org │Entry│Featu│Org │Chord│Featu│Descr

Result:
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=Entry, IntervalType{start=379760, end=380161}, ParentNode= 1} Tuple = {Tag=Keywo, IntervalType{start=380017, end=380020}, ParentNode= 379760} Tuple = {Tag=Medli, IntervalType{start=379930, end=379933}, ParentNode= 379917} Tuple = {Tag=96305, IntervalType{start=379931, end=379932}, ParentNode= 379930} Tuple = {Tag=Zinc , IntervalType{start=380018, end=380019}, ParentNode= 380017} Tuple = {Tag=Org , IntervalType{start=379839, end=379842}, ParentNode= 379760} Tuple = {Tag=Featu, IntervalType{start=380029, end=380160}, ParentNode= 379760} Tuple = {Tag=Chord,

IntervalType{start=379840, end=379841}, ParentNode= 379839} Tuple = {Tag=Descr,
IntervalType{start=380039, end=380042}, ParentNode= 380030} Tuple = {Tag=ACETY,
IntervalType{start=380040, end=380041}, ParentNode= 380039}
Page access count after Query 1 5

QueryPlan :2

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root │Entry
root │Entry│Entry│Keywo
root │Entry│Entry│Keywo│Keywo│Zinc
root │Entry│Entry│Keywo│Keywo│Zinc │Entry│Featu
root │Entry│Entry│Keywo│Keywo│Zinc │Entry│Featu│Entry│Medli
root │Entry│Entry│Keywo│Keywo│Zinc │Entry│Featu│Entry│Medli│Featu│Descr
root │Entry│Entry│Keywo│Keywo│Zinc │Entry│Featu│Entry│Medli│Featu│Descr│Medli│96305
root │Entry│Entry│Keywo│Keywo│Zinc
│Entry│Featu│Entry│Medli│Featu│Descr│Medli│96305│Entry│Org
root │Entry│Entry│Keywo│Keywo│Zinc
│Entry│Featu│Entry│Medli│Featu│Descr│Medli│96305│Entry│Org │Org │Chord
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Result:
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=Entry,
IntervalType{start=379760, end=380161}, ParentNode= 1} Tuple = {Tag=Keywo,
IntervalType{start=380017, end=380020}, ParentNode= 379760} Tuple = {Tag=Zinc ,
IntervalType{start=380018, end=380019}, ParentNode= 380017} Tuple = {Tag=Featu,
IntervalType{start=380029, end=380160}, ParentNode= 379760} Tuple = {Tag=Medli,
IntervalType{start=379930, end=379933}, ParentNode= 379917} Tuple = {Tag=Descr,
IntervalType{start=380039, end=380042}, ParentNode= 380030} Tuple = {Tag=96305,
IntervalType{start=379931, end=379932}, ParentNode= 379930} Tuple = {Tag=Org ,
IntervalType{start=379839, end=379842}, ParentNode= 379760} Tuple = {Tag=Chord,
IntervalType{start=379840, end=379841}, ParentNode= 379839} Tuple = {Tag=ACETY,
IntervalType{start=380040, end=380041}, ParentNode= 380039}
Page access count after Query 2 5

QueryPlan :3

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root │Entry
root │Entry│Entry│Keywo
root │Entry│Entry│Keywo│Entry│Org
root │Entry│Entry│Keywo│Entry│Org │Keywo│Zinc
root │Entry│Entry│Keywo│Entry│Org │Keywo│Zinc │Entry│Medli
root │Entry│Entry│Keywo│Entry│Org │Keywo│Zinc │Entry│Medli│Entry│Featu
root │Entry│Entry│Keywo│Entry│Org │Keywo│Zinc │Entry│Medli│Entry│Featu│Medli│96305
root │Entry│Entry│Keywo│Entry│Org │Keywo│Zinc
│Entry│Medli│Entry│Featu│Medli│96305│Org │Chord

root │Entry│Entry│Keywo│Entry│Org │Keywo│Zinc
│Entry│Medli│Entry│Featu│Medli│96305│Org │Chord│Featu│Descr

Result:
Tuple = {Tag=root , IntervalType{start=1, end=380162}, ParentNode= 0} Tuple = {Tag=Entry, IntervalType{start=379760, end=380161}, ParentNode= 1} Tuple = {Tag=Keywo, IntervalType{start=380017, end=380020}, ParentNode= 379760} Tuple = {Tag=Org , IntervalType{start=379839, end=379842}, ParentNode= 379760} Tuple = {Tag=Zinc , IntervalType{start=380018, end=380019}, ParentNode= 380017} Tuple = {Tag=Medli, IntervalType{start=379930, end=379933}, ParentNode= 379917} Tuple = {Tag=Featu, IntervalType{start=380029, end=380160}, ParentNode= 379760} Tuple = {Tag=96305, IntervalType{start=379931, end=379932}, ParentNode= 379930} Tuple = {Tag=Chord, IntervalType{start=379840, end=379841}, ParentNode= 379839} Tuple = {Tag=Descr, IntervalType{start=380039, end=380042}, ParentNode= 380030} Tuple = {Tag=ACETY, IntervalType{start=380040, end=380041}, ParentNode= 380039}
Page access count after Query 3 5