ADBMS

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B1 - CompS

Experiment 1

Date of Practical: 1/10/22

Aim: Case study of professional & commercial database

22/25

Database: ScyllaDB

ScyllaDB is an open-source distributed NoSQL wide-column data store. It was designed to be compatible with Apache Cassandra while achieving significantly higher throughputs and lower latencies.
ScyllaDB uses a shared design on each node, meaning that each CPU core handles a different subset of data. Cores do not share data but rather communicate explicitly when they need to.

Why is ScyllaDB preffered?

1) Price performance

Building on the NoSQL DBaaS achieves millions of OPS throughput from single node, resulting in huge cost savings.

2) Low latencies

Consistent single-digit millisecond p99 latencies ensure dependable performance

3) No vendor lock-in

Built in for portability, you can easily migrate data to other clouds or on-premise deployments

4) Cassandra / DynamoDB compatible

Migrate to ScyllaDB Cloud from Apache Cassandra or Amazon DynamoDB without changing your application code

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Company: Hotstar (Disney+ Hotstar), India's most popular streaming service, accounts for over 40% of global Disney+ subscribers, offers 100,000 hours of content on-demand and most-watched sporting event (IPL with over 25 million concurrent viewers)

The Hotstar database previously consisted of a new data model then they moved to a high-performance low latency database-as-a-service called as Scylla Cloud. It lowered the latency issues for both read & write to ensure snappy user experience that today's streaming users expect. - even with rapidly growing content library and skyrocketing subscriber base.

A main-engaging feature that they used was of "continue watching" which majority of the user based had been keen to use. As it would promote the watching again from that particular time-stamp. So they use ScyllaDB to process 100 to 200 GB of data daily for this feature to be in use.

Comparision.

DynamoDB	ScyllaDB
It is a fully managed proprietary NoSQL database service that supports the document data structures as well as key-value pairs	It is a open-source distributed NoSQL database with wide-column data store. It was designed to be compatible with Apache Cassandra to lower latencies.

Ans.- Compatible

Sort of ?

	DynamoDB	SpiceDB
Cloud based only	Commercial ✓	Open-source ✓
Built in security	Yes, with encryption at rest ✓	-
Continuous Backup	✓	✗
Cost	With high	very low
Replication	Possible	not compatible
Scalability	Tracks how close usage is to the upper bounds allowing the user to auto-scale	Highly scalable but doesn't adjust itself according to the workload
Access controls	permits fine-grained access controls within data by table owner creating the workloads to avoid creating bottlenecks	Access rights are defined per object, no granular defining options available
Pricing	Only factor where dynamo falls apart, limited yearly cost $525,000	$1900
Features	✓	✗
Transaction	ACID	✗ API for single operations
Consistency	✓	Scalable replication factor
Threads		
RCB workload	Overall Throughput: 857	202K (ops/sec)
	READ operations: ~~50M~~ 2.3M	~~50~~ 2 = M (Avg)
	UPDATE operations: ~~50M~~ 2.3M	~~50~~ 2 M (Avg

Recommendation: As the previously used database which is ScyllaDB has some drawbacks of its own and which DynamoDB shines in. Some of the features are like the persistence of event-stream data, which has Time-ordered streams within the AWS database that enables the developers to receive and update item-level data both before and after DynamoDB updates. In case of the system failure the ScyllaDB also doesn't hold the backup database in which there can be stored the data, it has some backup of the data but not comparable to the AWS services provided by DynamoDB. There are many AWS options to use as a services for DynamoDB and and its data analysis and maintenance of which DynamoDB has a few. As Hotstar needs high performance and low latency database ~~DynamoDB~~ ScyllaDB satisfies its job But DynamoDB is a very good option.

Conclusion: ScyllaDB has both its advantages and disadvantages but overall it is working perfectly for the intended work of Hotstar in serving the customers to their requirements. The only major deciding factor of the usage of ScyllaDB is because of its cost and the vast open source community. Apart from those factors DynamoDB is a far better alternative to it and can be used extensively used instead of ScyllaDB to manifest all the AWS cloud services as well.

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Exp 2

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Exp 2

Aim: Perform operation like searching, insertion, deletion on B-Tree and B+Tree

Theory:

⊙B-Tree

B-Tree is a self-balancing tree. B-Trees are useful when we are dealing with huge amounts of data that can't be fitted in main memory. When the number of keys is high, the data is read from the disk in forms of blocks. Disk access time is very high compared to the main memory access time.

The main idea of using B-Trees is to reduce the number of disk accesses. Most of the tree operations require $O(h)$ disk accesses where h is the height of the tree. B-Tree is a fat tree meaning, the height of B-Tree is kept low by putting maximum possible keys in a B-Tree node. Generally, the B-Tree node size is kept equal to disk block size. Since the height of the B-Tree is kept low so total disk access for most of the operations are reduced significantly compared to balanced Binary search tree like AVL Trees.

⊙Properties of B-Tree

→ All leaves are at the same level.

→ B-Tree is defined by term minimum degree 't'. The value of 't' depends upon disk block size.

→ Every node except the root must contain atleast (t-1) keys. The root may contain minimum of 1 key.

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→ All nodes may contain almost (2*t - 1) keys.
→ No. of children of a node is equal to no of keys in it plus 1
→ All keys of a node are sorted in increasing order.
→ It grows & shrinks from root.
→ Insertion happens only at leaf node.

Time complexity of B-Tree:
Search - O(log n)
Insert - O(log n)
Delete - O(log n)

⊛ B+ Tree

B+ Tree is an extension of B-Tree which allows efficient insertion, deletion and search operations. In B-Tree, keys and records both can be stored in internal as well as leaf nodes. whereas, in B+ tree records can only be stored on leaf nodes and internal nodes can only store key values.

The leaf node of a B+ tree are linked together in the form of singly linked list to make search queries more efficient. B+ trees are used to store the large amount of data which can't be stored in main memory. Due to the fact that, size of main memory is always limited, the internal nodes of B+ tree are stored in main memory whereas leaf nodes are stored in secondary memory.

⊙ Properties of B+ tree
→ All leafs are at some level.
→ The root has atleast two children
→ Each node except root can have a maximum of m children and atleast m/2 children
→ Each node can contain a maximum of (m-1) keys and a minimum of ⌈m/2⌉ − 1 keys
→ Keys are used for indexing
→ Data can be stored sequentially or directly

⊙ Time Complexity
Search - O(log n)
Insert - O(log n)
Delete - O(log n)

✱ B-Tree vs B+ Tree

B-Tree	B+ Tree
① Search keys cannot be repeatedly stored	① Redundant search keys can be present.
② Data can be stored in the leaf node as well as internal nodes	② Data can only be stored on the leaf nodes
③ Searching for some data is slower process some data can be found on internal nodes as well as leaf nodes	③ Search is comparitively faster as data can only be found on the leaf nodes.
④ Deletion of internal nodes are complicated & time consuming	④ Deletion will never be a complexed process since some elements will be deleted from leaf

B Tree	B+ Tree
⑤ Leaf nodes can't be linked together	⑤ Leaf nodes are linked together to make search operations more efficient.

Conclusion: Thus, we successfully studied & compared various operations in B tree & B+ tree.

B Tree Code:

```
class BTreeNode:
  def __init__(self, leaf=False):
    self.leaf = leaf
self.keys = []     self.child
= []


class BTree:
  def __init__(self, t):
    self.root = BTreeNode(True)
    self.t = t


  def insert(self, k):     root = self.root
if len(root.keys) == (2 * self.t) - 1:
      temp = BTreeNode()
self.root = temp
temp.child.insert(0, root)
self.split_child(temp, 0)
self.insert_non_full(temp, k)
else:
      self.insert_non_full(root, k)
```

```
  def insert_non_full(self, x, k):
    i = len(x.keys) - 1
if x.leaf:
      x.keys.append((None, None))
while i >= 0 and k[0] < x.keys[i][0]:
x.keys[i + 1] = x.keys[i]         i -= 1
      x.keys[i + 1] = k
else:
      while i >= 0 and k[0] < x.keys[i][0]:
i -= 1       i += 1
      if len(x.child[i].keys) == (2 * self.t) - 1:
        self.split_child(x, i)
if k[0] > x.keys[i][0]:
          i += 1
self.insert_non_full(x.child[i], k)


  def split_child(self, x, i):
    t = self.t     y =
x.child[i]     z =
BTreeNode(y.leaf)
x.child.insert(i + 1, z)
    x.keys.insert(i, y.keys[t - 1])
    z.keys = y.keys[t: (2 * t) - 1]
    y.keys = y.keys[0: t - 1]
if not y.leaf:
      z.child = y.child[t: 2 * t]
```

```
      y.child = y.child[0: t - 1]

  def print_tree(self, x, l=0):
    print("Level ", l, " ", len(x.keys), end=":")
for i in x.keys:       print(i, end=" ")     print()
l += 1     if len(x.child) > 0:       for i in
x.child:         self.print_tree(i, l)

  def search_key(self, k, x=None):
if x is not None:
      i = 0       while i < len(x.keys) and k >
x.keys[i][0]:         i += 1       if i < len(x.keys)
and k == x.keys[i][0]:
        return (x, i)
elif x.leaf:
return None
else:
        return self.search_key(k, x.child[i])

else:
      return self.search_key(k, self.root)


def main():   B
= BTree(3)
```

```
  for i in range(10):
B.insert((i, 2 * i))

  B.print_tree(B.root)

  if B.search_key(8) is not None:
    print("\nFound")
  else:
    print("\nNot Found")



if __name__ == '__main__':
  main()
```

Output:

```
Level  1   2:(3, 6) (4, 8)
Level  1   4:(6, 12) (7, 14) (8, 16) (9, 18)

Found
```

B+ Tree

Code:

```
import math

class Node:     def
__init__(self, order):
```

```
        self.order = order
self.values = []        self.keys
= []        self.nextKey =
None        self.parent =
None        self.check_leaf =
False


    def insert_at_leaf(self, leaf, value, key):
        if (self.values):
            temp1 = self.values
for i in range(len(temp1)):
if (value == temp1[i]):
                    self.keys[i].append(key)
break                elif (value <
temp1[i]):
                    self.values = self.values[:i] + [value] + self.values[i:]
self.keys = self.keys[:i] + [[key]] + self.keys[i:]
break                elif (i + 1 == len(temp1)):
self.values.append(value)                    self.keys.append([key])
break        else:
            self.values = [value]
self.keys = [[key]]



class BplusTree:
```

```
    def __init__(self, order):
self.root = Node(order)
self.root.check_leaf = True

    def insert(self, value, key):
        value = str(value)
old_node = self.search(value)
old_node.insert_at_leaf(old_node,
value, key)


        if (len(old_node.values) == old_node.order):
            node1 = Node(old_node.order)
node1.check_leaf = True             node1.parent =
old_node.parent             mid = int(math.ceil(old_node.order /
2)) - 1             node1.values = old_node.values[mid + 1:]
node1.keys = old_node.keys[mid + 1:]             node1.nextKey
= old_node.nextKey             old_node.values =
old_node.values[:mid + 1]             old_node.keys =
old_node.keys[:mid + 1]             old_node.nextKey = node1
self.insert_in_parent(old_node, node1.values[0], node1)

    def search(self, value):         current_node =
self.root         while(current_node.check_leaf
== False):
            temp2 = current_node.values
for i in range(len(temp2)):
if (value == temp2[i]):
```

```
                current_node = current_node.keys[i + 1]
break               elif (value < temp2[i]):
                current_node = current_node.keys[i]
break               elif (i + 1 ==
len(current_node.values)):
current_node = current_node.keys[i + 1]
break
        return current_node


    def find(self, value, key):        l =
self.search(value)         for i, item in
enumerate(l.values):             if item ==
value:               if key in l.keys[i]:
return True               else:
return False         return False


    def insert_in_parent(self, n, value, ndash):
if (self.root == n):
            rootNode = Node(n.order)
rootNode.values = [value]
rootNode.keys = [n, ndash]
self.root = rootNode             n.parent
= rootNode            ndash.parent =
rootNode            return


        parentNode = n.parent
temp3 = parentNode.keys         for
```

```
i in range(len(temp3)):            if
(temp3[i] == n):

                parentNode.values = parentNode.values[:i] + \
                    [value] + parentNode.values[i:]
parentNode.keys = parentNode.keys[:i +
                                      1] + [ndash] + parentNode.keys[i + 1:]
if (len(parentNode.keys) > parentNode.order):
                    parentdash = Node(parentNode.order)
parentdash.parent = parentNode.parent                    mid =
int(math.ceil(parentNode.order / 2)) - 1
parentdash.values = parentNode.values[mid + 1:]
parentdash.keys = parentNode.keys[mid + 1:]
value_ = parentNode.values[mid]                    if (mid == 0):
                        parentNode.values = parentNode.values[:mid + 1]
else:
                        parentNode.values = parentNode.values[:mid]
parentNode.keys = parentNode.keys[:mid + 1]                    for j
in parentNode.keys:                        j.parent = parentNode
for j in parentdash.keys:                            j.parent = parentdash
self.insert_in_parent(parentNode, value_, parentdash)


    def delete(self, value, key):
node_ = self.search(value)


        temp = 0
        for i, item in enumerate(node_.values):
if item == value:
```

```
            temp = 1

            if key in node_.keys[i]:
if len(node_.keys[i]) > 1:

node_.keys[i].pop(node_.keys[i].index(key))
elif node_ == self.root:                    node_.values.pop(i)
node_.keys.pop(i)                  else:
                    node_.keys[i].pop(node_.keys[i].index(key))
del node_.keys[i]
node_.values.pop(node_.values.index(value))
self.deleteEntry(node_, value, key)               else:
                print("Value not in Key")
return        if temp == 0:
          print("Value not in Tree")
return

   def deleteEntry(self, node_, value, key):

       if not node_.check_leaf:
          for i, item in enumerate(node_.keys):
if item == key:
                node_.keys.pop(i)
break           for i, item in
enumerate(node_.values):              if item
== value:
```

```
                node_.values.pop(i)
break

    if self.root == node_ and len(node_.keys) == 1:
        self.root = node_.keys[0]
node_.keys[0].parent = None
del node_           return
    elif (len(node_.keys) < int(math.ceil(node_.order / 2)) and node_.check_leaf
== False) or (len(node_.values) < int(math.ceil((node_.order - 1) / 2)) and
node_.check_leaf == True):

        is_predecessor = 0
parentNode = node_.parent
        PrevNode = -1
        NextNode = -1
        PrevK = -1          PostK = -1          for
i, item in enumerate(parentNode.keys):

            if item == node_:
if i > 0:
                    PrevNode = parentNode.keys[i - 1]
                    PrevK = parentNode.values[i - 1]

                if i < len(parentNode.keys) - 1:
NextNode = parentNode.keys[i + 1]
                    PostK = parentNode.values[i]
```

```
        if PrevNode == -1:                ndash = NextNode
value_ = PostK            elif NextNode == -1:                is_predecessor
= 1                ndash = PrevNode                value_ = PrevK
else:                if len(node_.values) + len(NextNode.values) <
node_.order:
                ndash = NextNode
value_ = PostK                else:
                is_predecessor = 1
ndash = PrevNode
value_ = PrevK


        if len(node_.values) + len(ndash.values) < node_.order:
if is_predecessor == 0:                    node_, ndash = ndash,
node_                ndash.keys += node_.keys                if not
node_.check_leaf:
                ndash.values.append(value_)
            else:
                ndash.nextKey = node_.nextKey
ndash.values += node_.values


            if not ndash.check_leaf:
for j in ndash.keys:
j.parent = ndash
            self.deleteEntry(node_.parent, value_, node_)
del node_            else:                if is_predecessor ==
1:                if not node_.check_leaf:
```

```
                    ndashpm = ndash.keys.pop(-1)
ndashkm_1 = ndash.values.pop(-1)
node_.keys = [ndashpm] + node_.keys
node_.values = [value_] + node_.values
parentNode = node_.parent                    for i, item in
enumerate(parentNode.values):
                        if item == value_:
                            p.values[i] = ndashkm_1
break                    else:
                    ndashpm = ndash.keys.pop(-1)
ndashkm = ndash.values.pop(-1)
node_.keys = [ndashpm] + node_.keys
node_.values = [ndashkm] + node_.values
parentNode = node_.parent                    for i, item in
enumerate(p.values):                        if item == value_:
                            parentNode.values[i] = ndashkm
break                else:                    if not
node_.check_leaf:
                    ndashp0 = ndash.keys.pop(0)
ndashk0 = ndash.values.pop(0)                    node_.keys
= node_.keys + [ndashp0]                    node_.values =
node_.values + [value_]                    parentNode =
node_.parent                    for i, item in
enumerate(parentNode.values):                        if item ==
value_:
                            parentNode.values[i] = ndashk0
break                    else:
```

```
                    ndashp0 = ndash.keys.pop(0)
ndashk0 = ndash.values.pop(0)                    node_.keys
= node_.keys + [ndashp0]                    node_.values =
node_.values + [ndashk0]                    parentNode =
node_.parent                    for i, item in
enumerate(parentNode.values):                    if item ==
value_:
                        parentNode.values[i] = ndash.values[0]
break

            if not ndash.check_leaf:
for j in ndash.keys:
j.parent = ndash                if not
node_.check_leaf:                    for j in
node_.keys:                    j.parent =
node_                if not
parentNode.check_leaf:
for j in parentNode.keys:
j.parent = parentNode



def printTree(tree):
lst = [tree.root]
level = [0]     leaf
= None     flag = 0
lev_leaf = 0
```

```
    node1 = Node(str(level[0]) + str(tree.root.values))

    while (len(lst) != 0):          x =
lst.pop(0)          lev = level.pop(0)
if (x.check_leaf == False):                for i,
item in enumerate(x.keys):
                print(item.values)
else:
            for i, item in enumerate(x.keys):
                print(item.values)
if (flag == 0):
lev_leaf = lev
leaf = x                  flag = 1


record_len = 3 bplustree =
BplusTree(record_len)
bplustree.insert('5', '33')
bplustree.insert('15', '21')
bplustree.insert('25', '31')
bplustree.insert('35', '41')
bplustree.insert('45', '10')

printTree(bplustree)

if(bplustree.find('45', '10')):
    print("Found") else:
```

print("Not found") **Output:**

```
['15', '25']
['35', '45']
['5']
Found
```

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ADBMS Experiment-3

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Exp 3

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Aim: To simulate query optimisation by performing SQL query on database

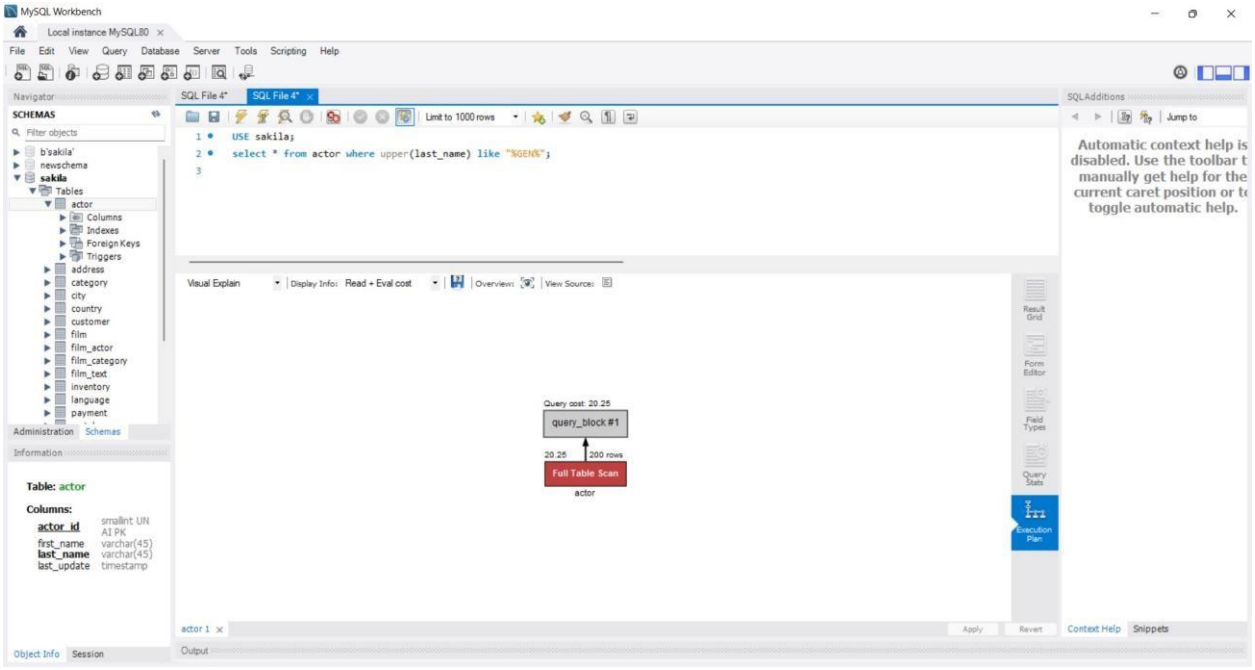
Theory: query optimization is of great importance for performance of a relational database, especially for ~~extra~~ execution of complexed SQL statements.
There are 2 ways:-
1) Heuristic Based 2) Cost Based

Heuristic Based:-
A query tree is a data structure that corresponds to a relational algebra expression. The same query could be corresponding to many different relational expressions & hence many different query trees. The task of heuristic optimization of query trees is to find a final query tree that is efficient to execute. The main heuristic is to apply first the operations that reduce the size of intermediate results

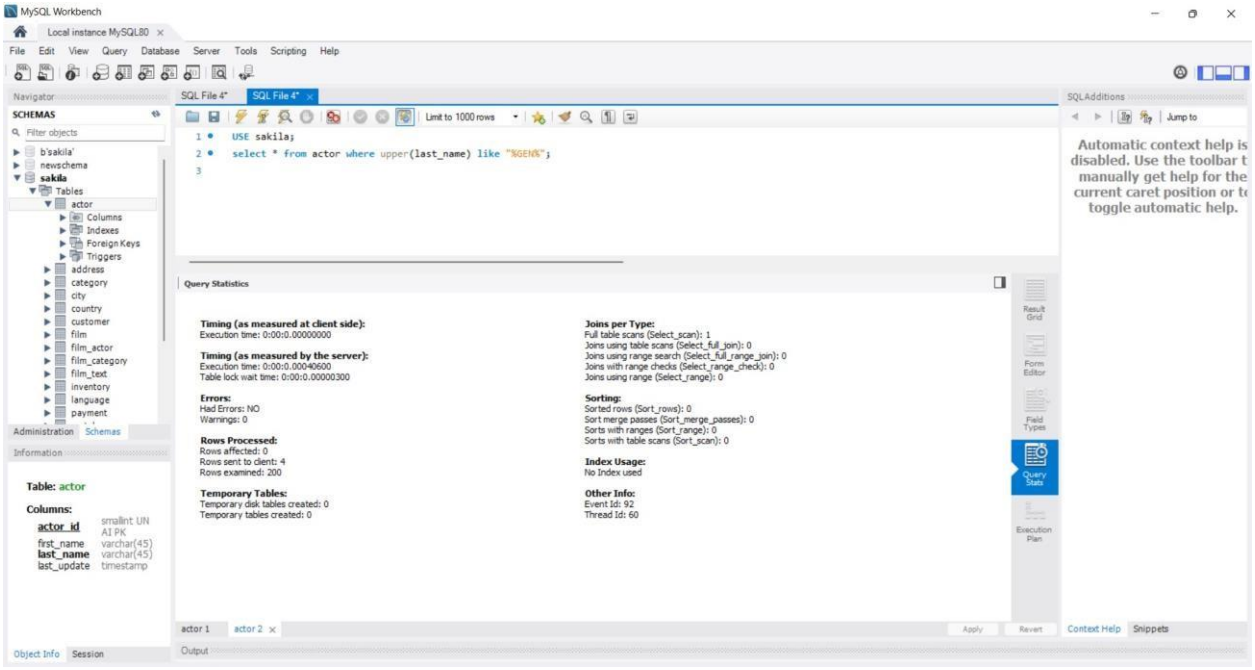
Cost Based:-
Estimate and compare the costs of executing a query using different execution strategies and chose the strategy with lowest cost estimate. The cost of any query includes access wrt to secondary storage, storage cost, memory usage cost, no. of memory buffer at time of execution, communication etc

Conclusion: In this experiment we have performed table level and index level optimization and compared it to the results of no optimization.

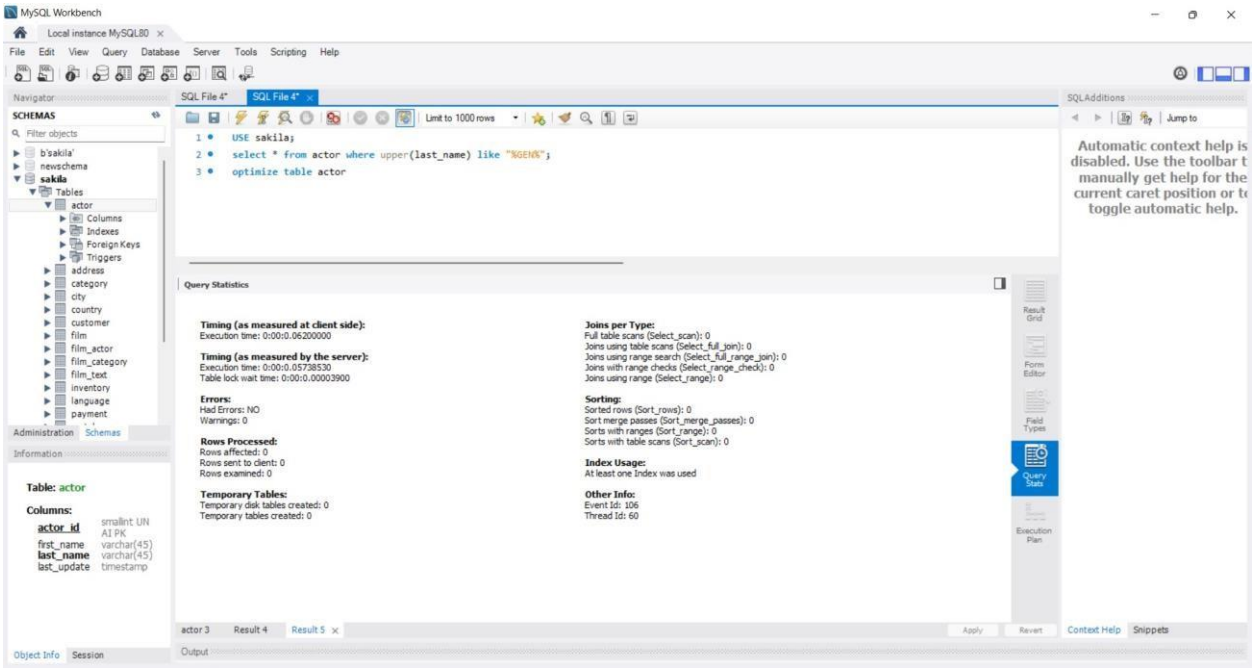
1) SELECT QUERY



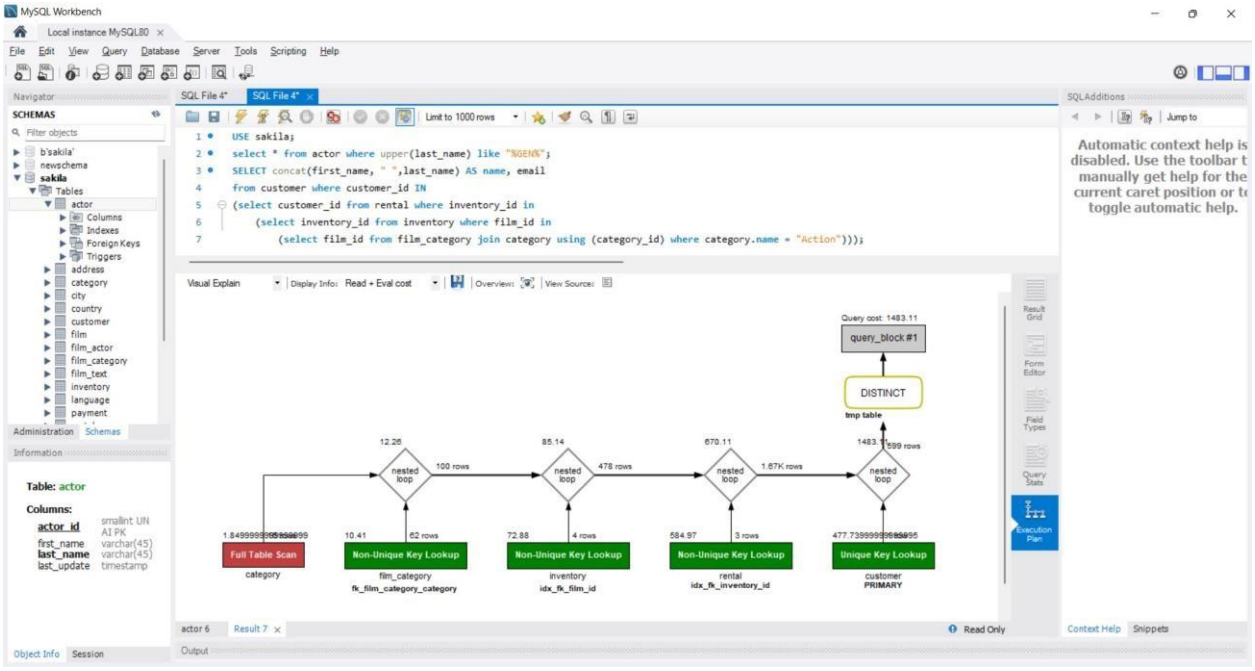
BEFORE OPTIMIZING



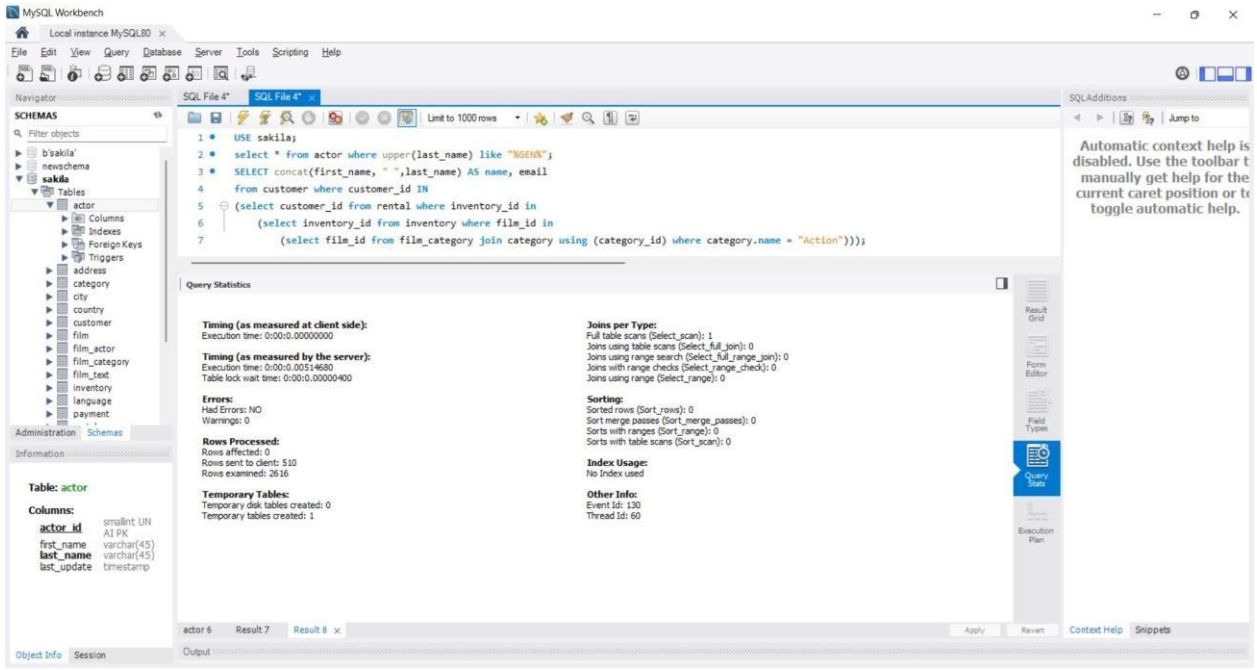
AFTER OPTIMIZING



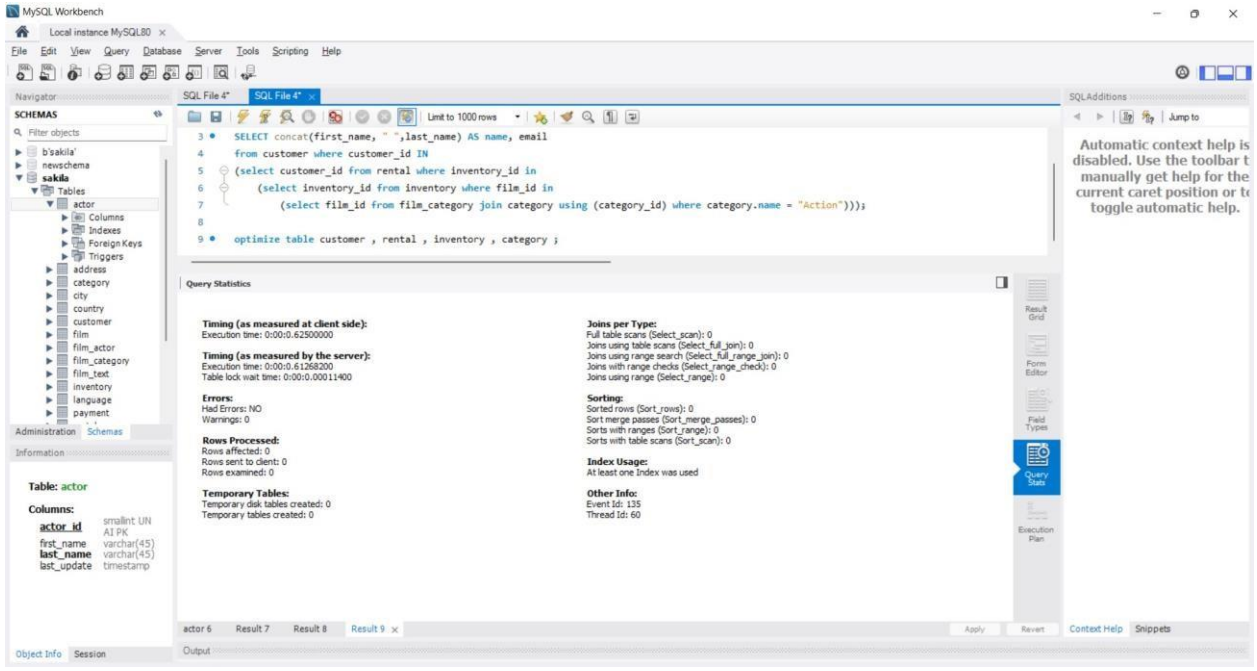
2) NESTED



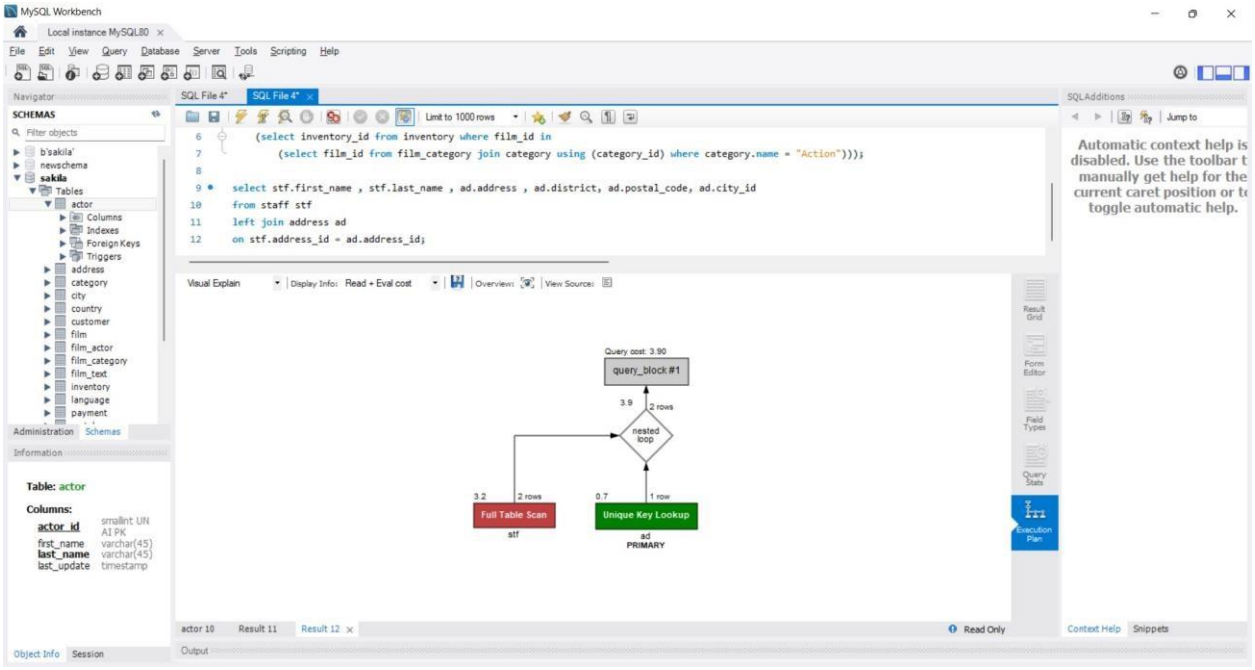
BEFORE OPTIMIZING



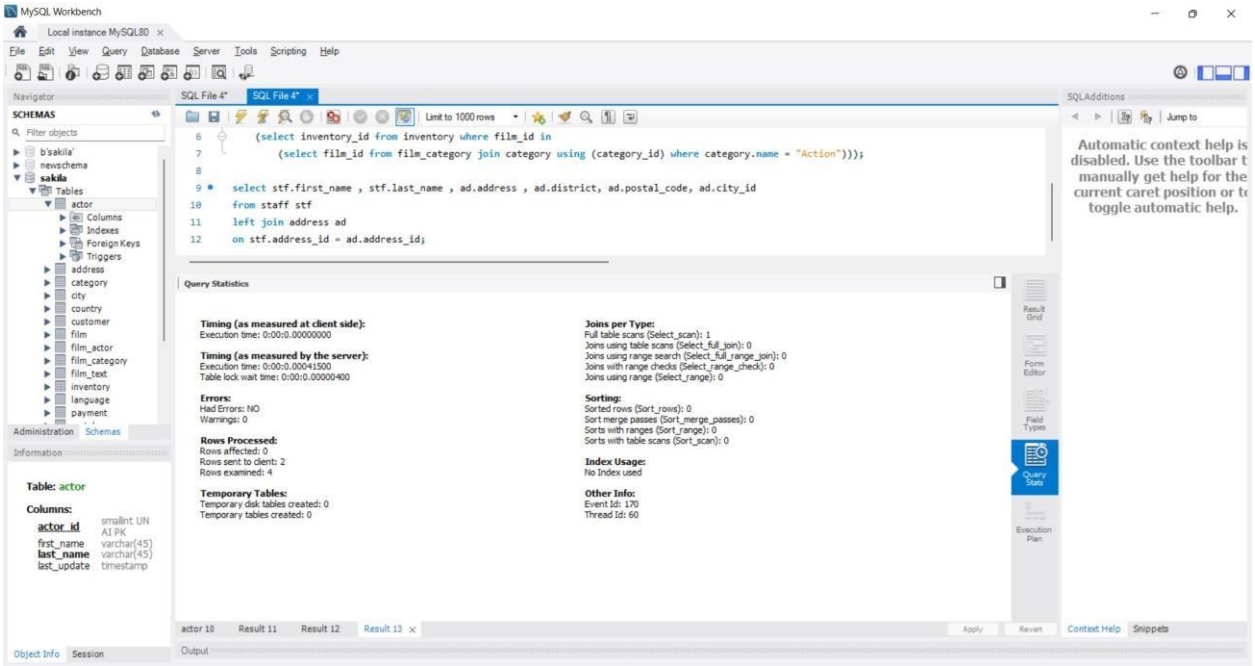
AFTER OPTIMIZING



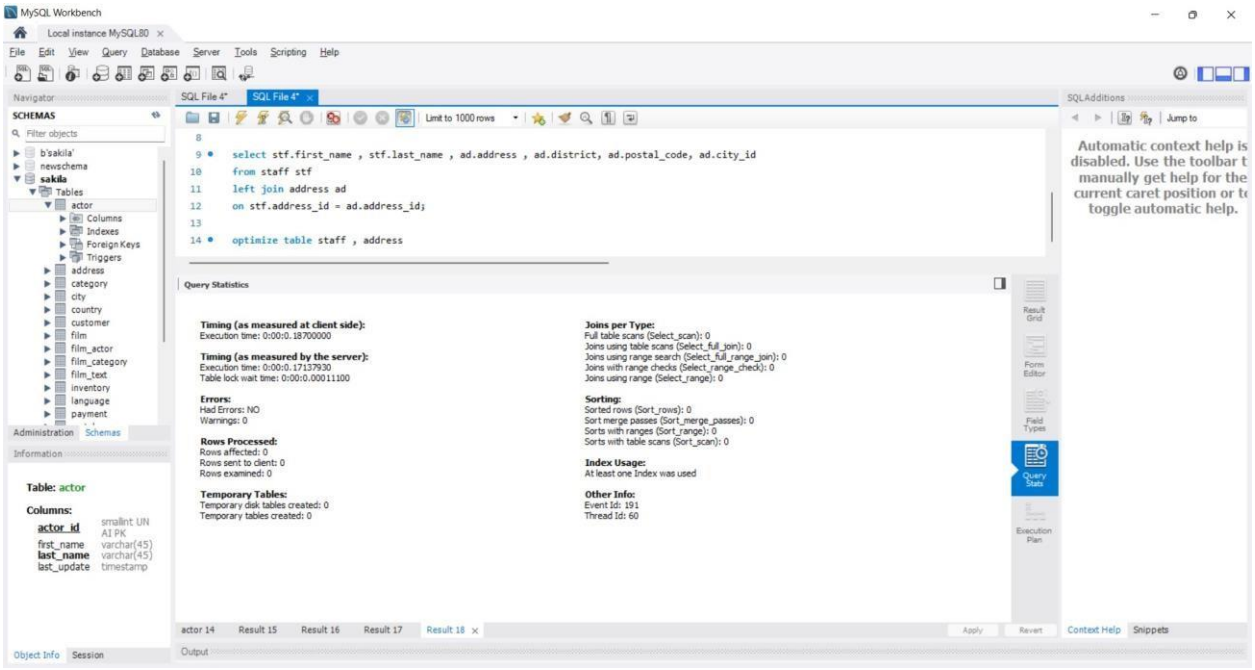
3) LEFT JOIN



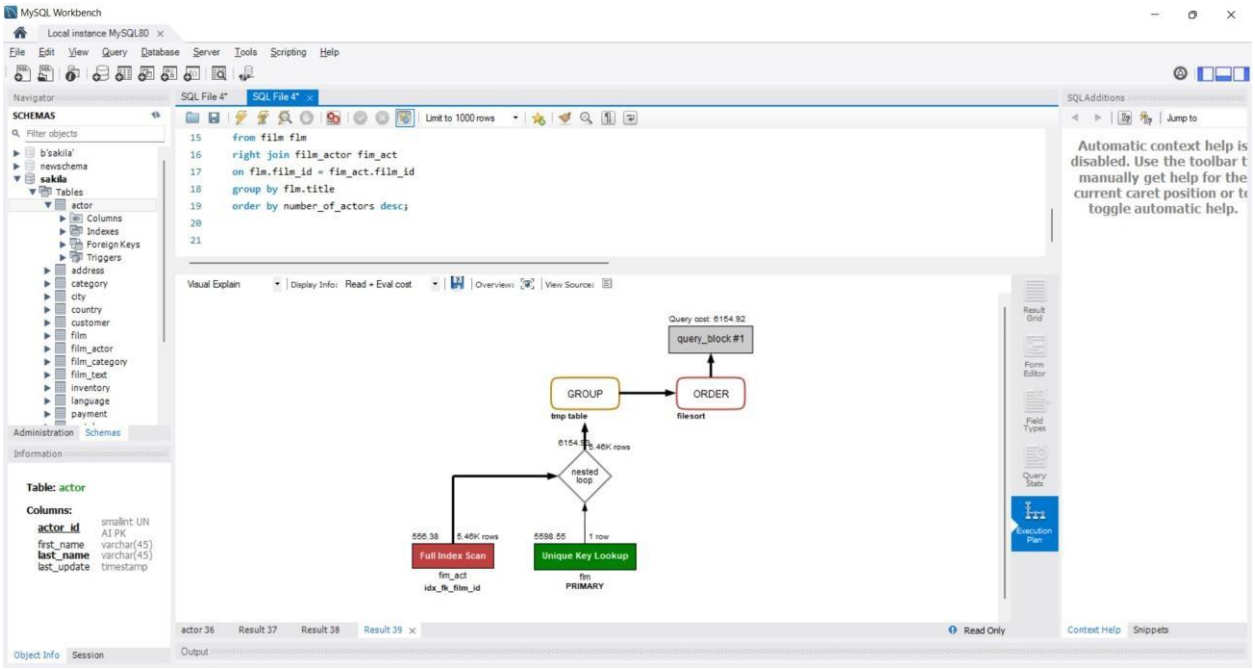
BEFORE OPTIMIZING



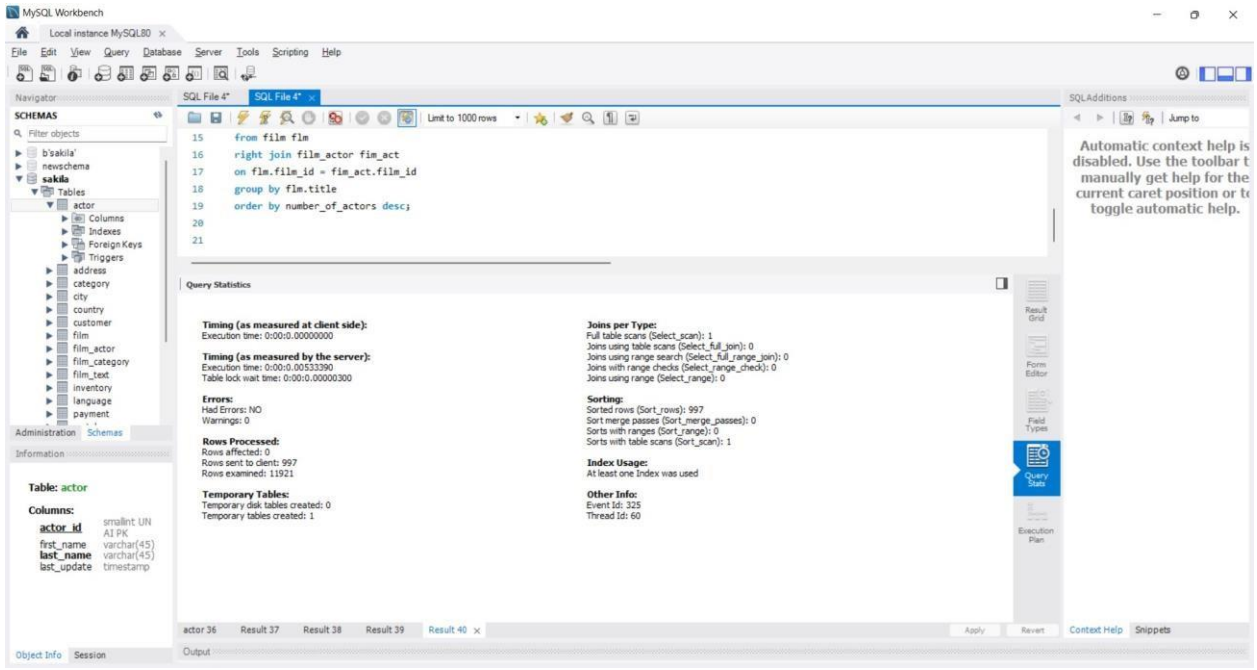
AFTER OPTIMIZING



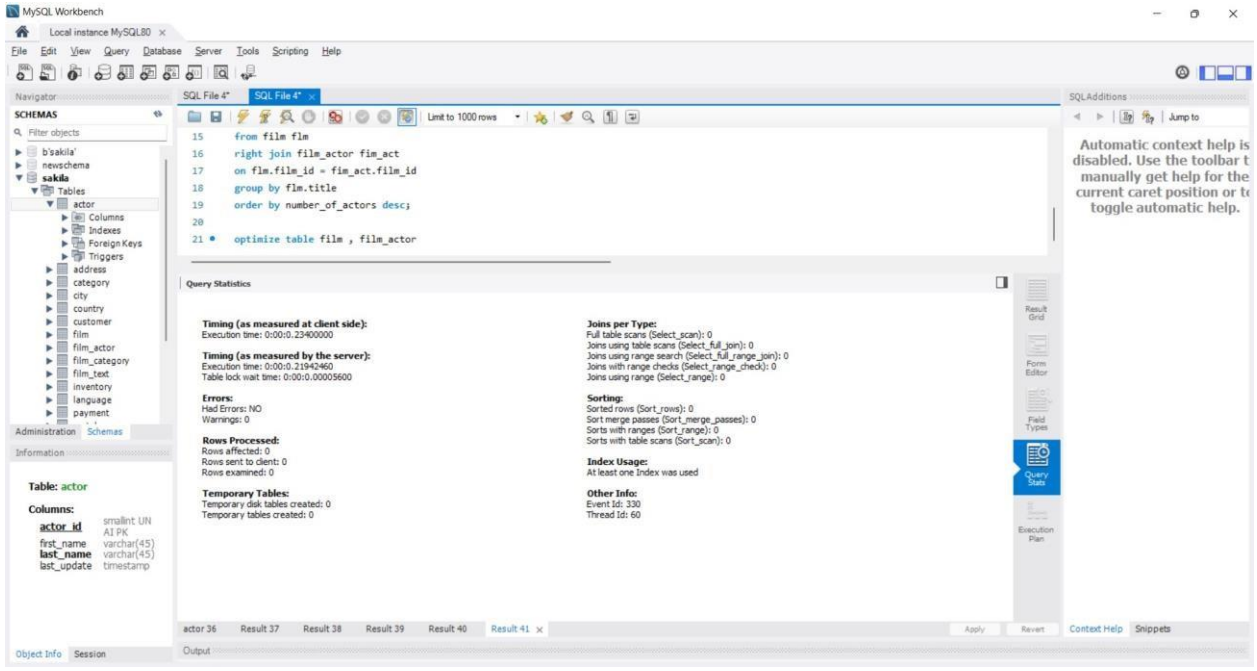
4) RIGHT JOIN



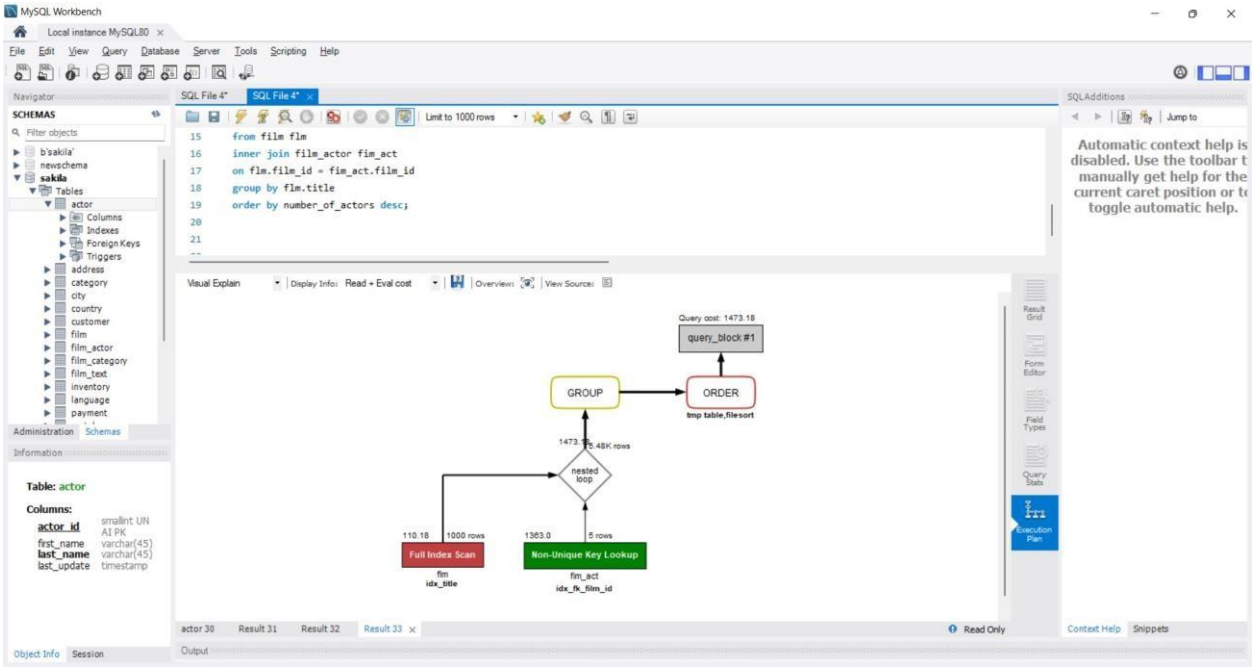
BEFORE OPTIMIZING



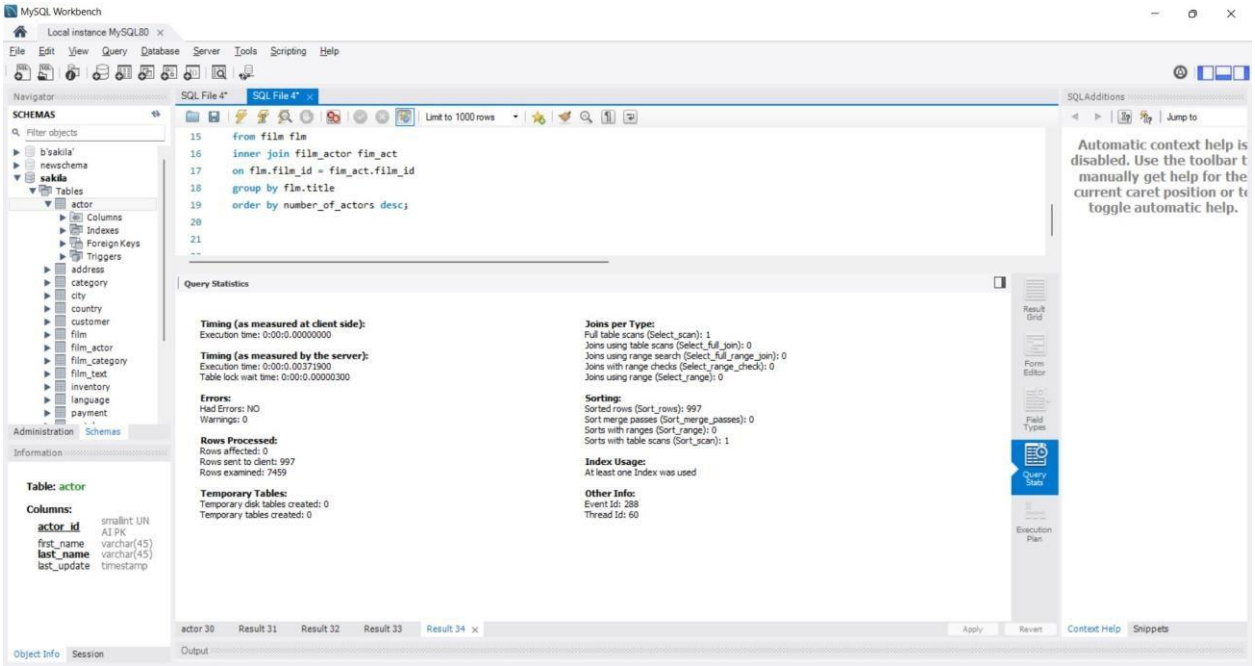
AFTER OPTIMIZING



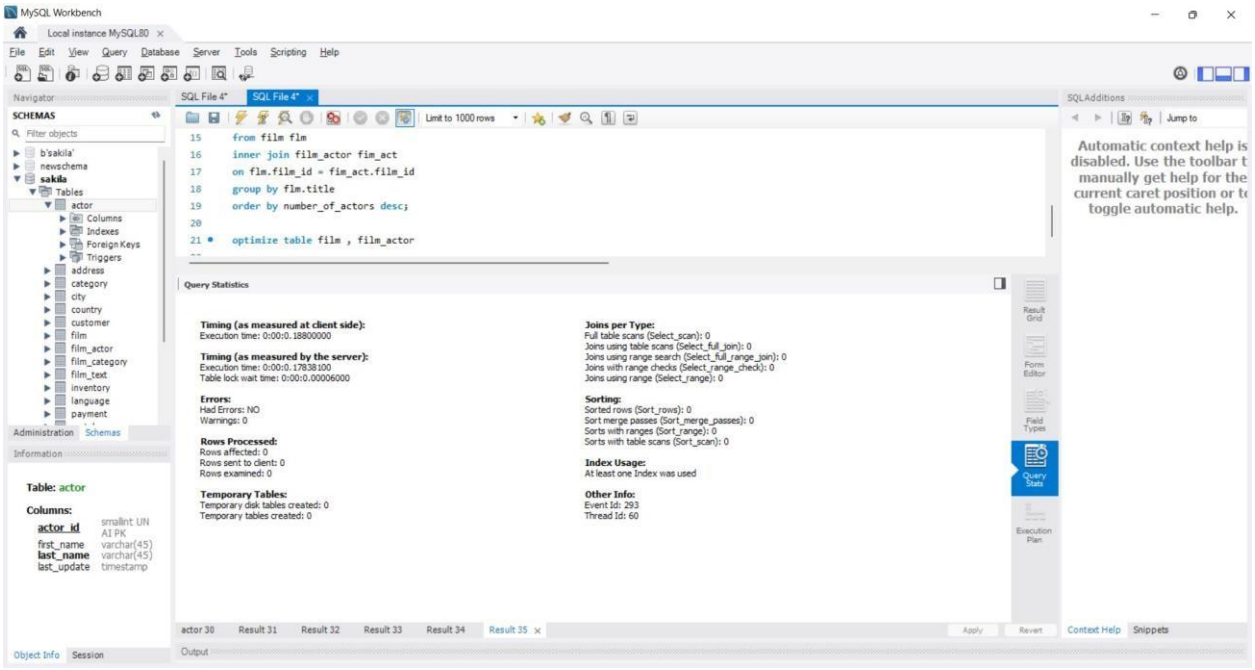
5) INNER JOIN



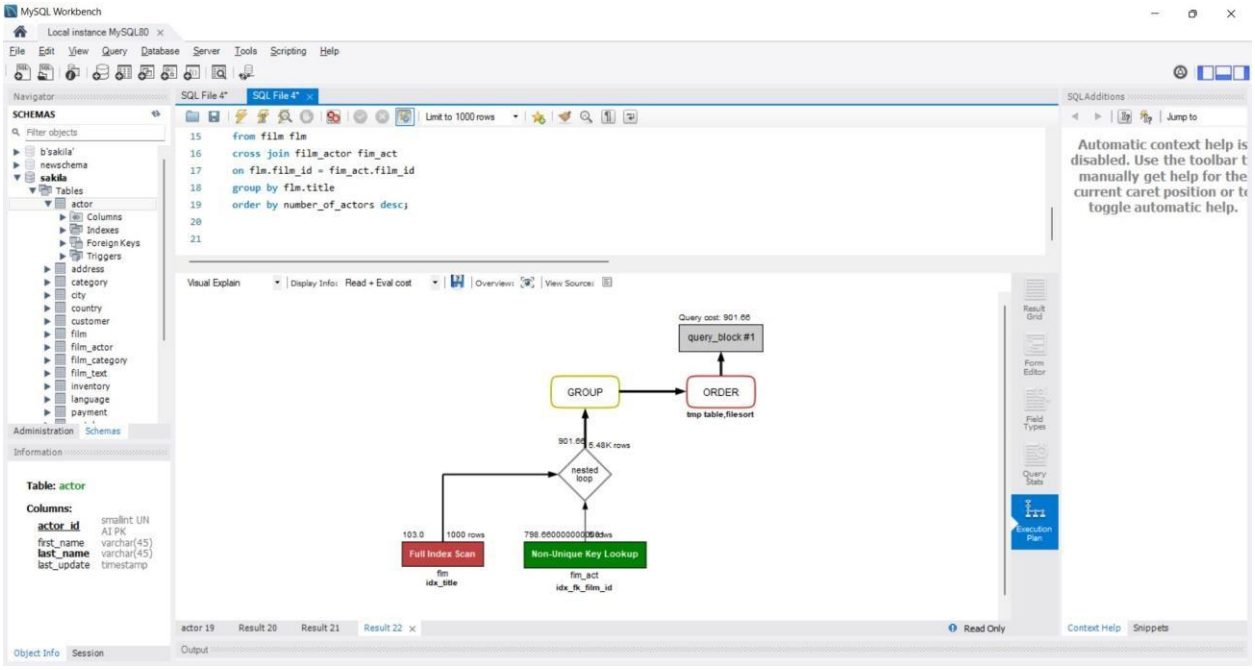
BEFORE OPTIMIZING



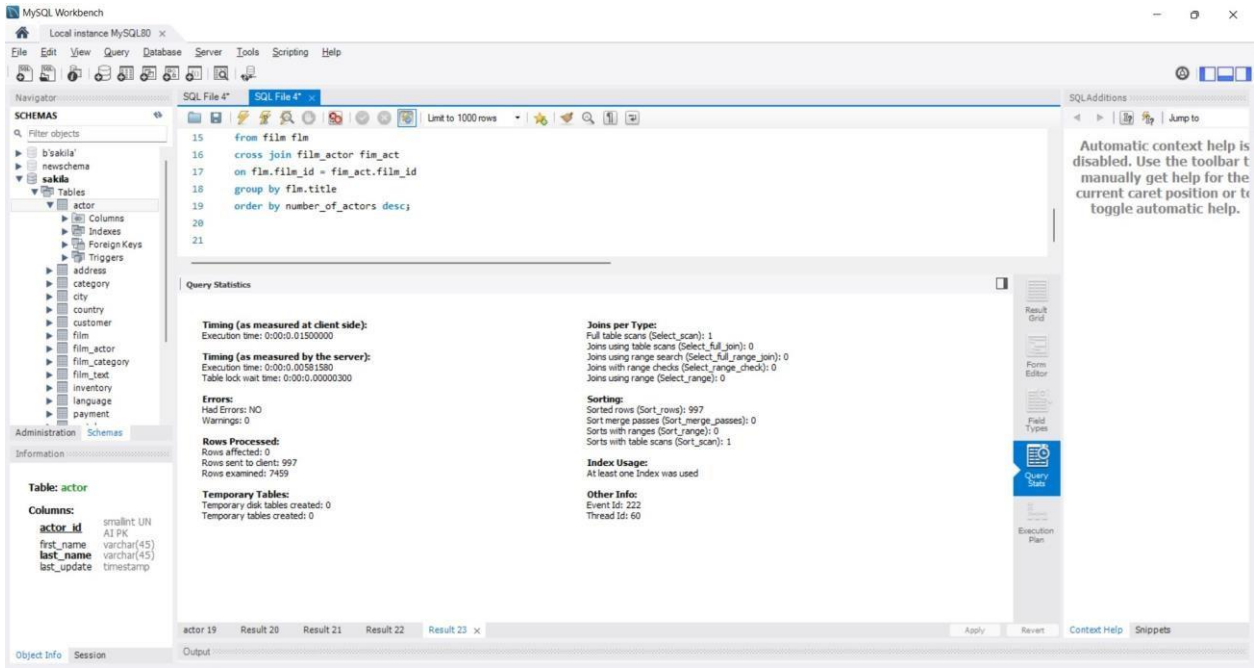
AFTER OPTIMIZING



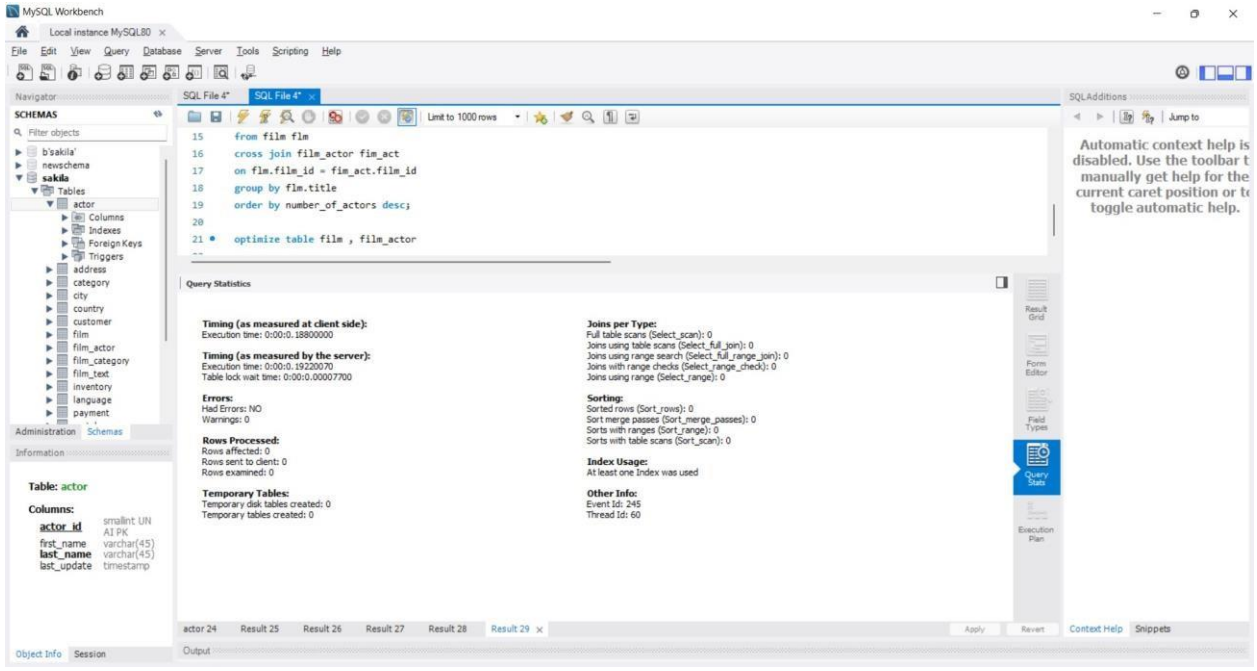
6) CROSS JOIN



BEFORE OPTIMIZING

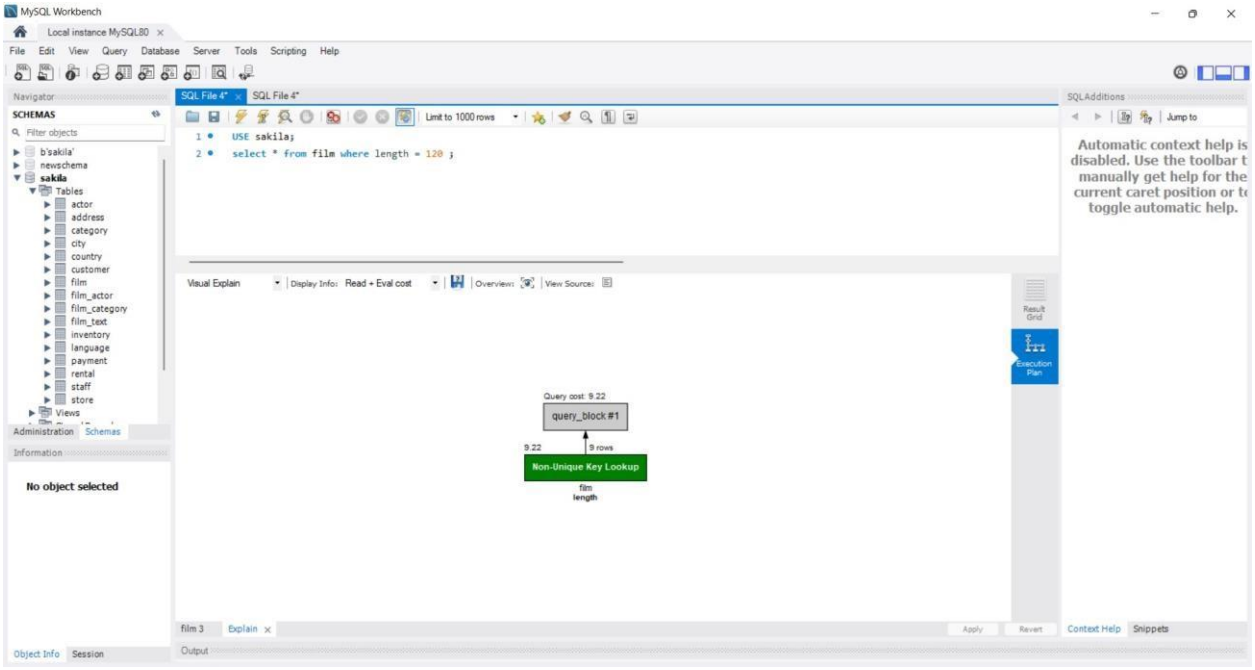


AFTER OPTIMIZING

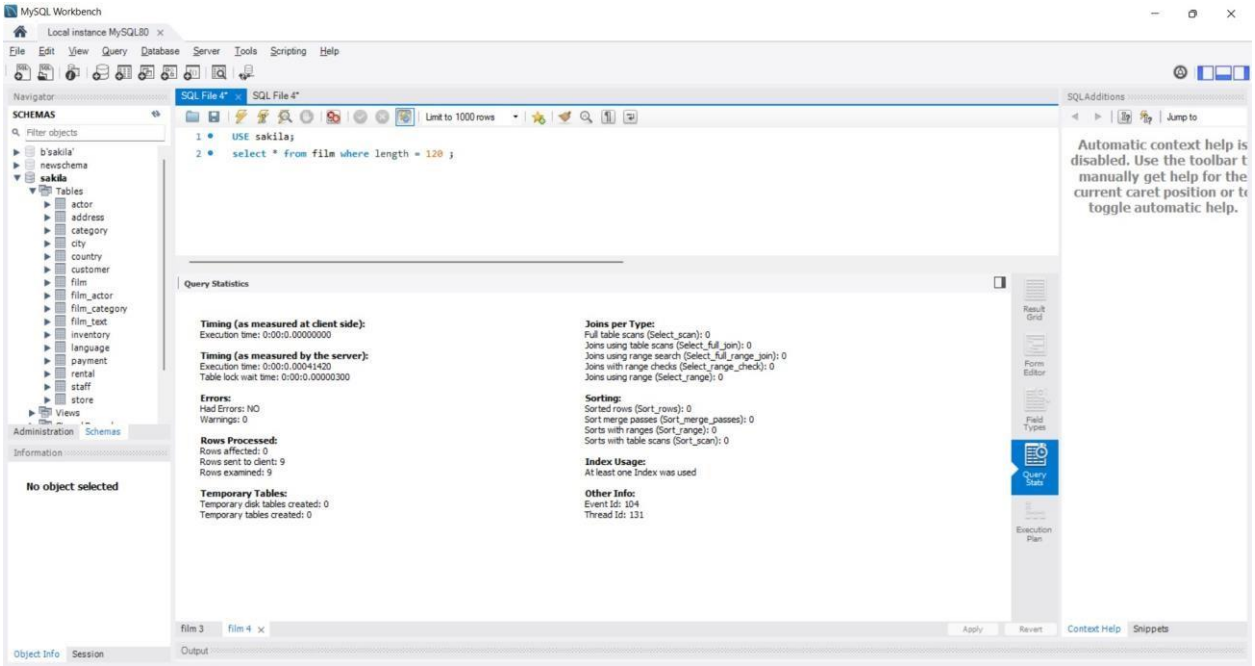


USING INDEXING

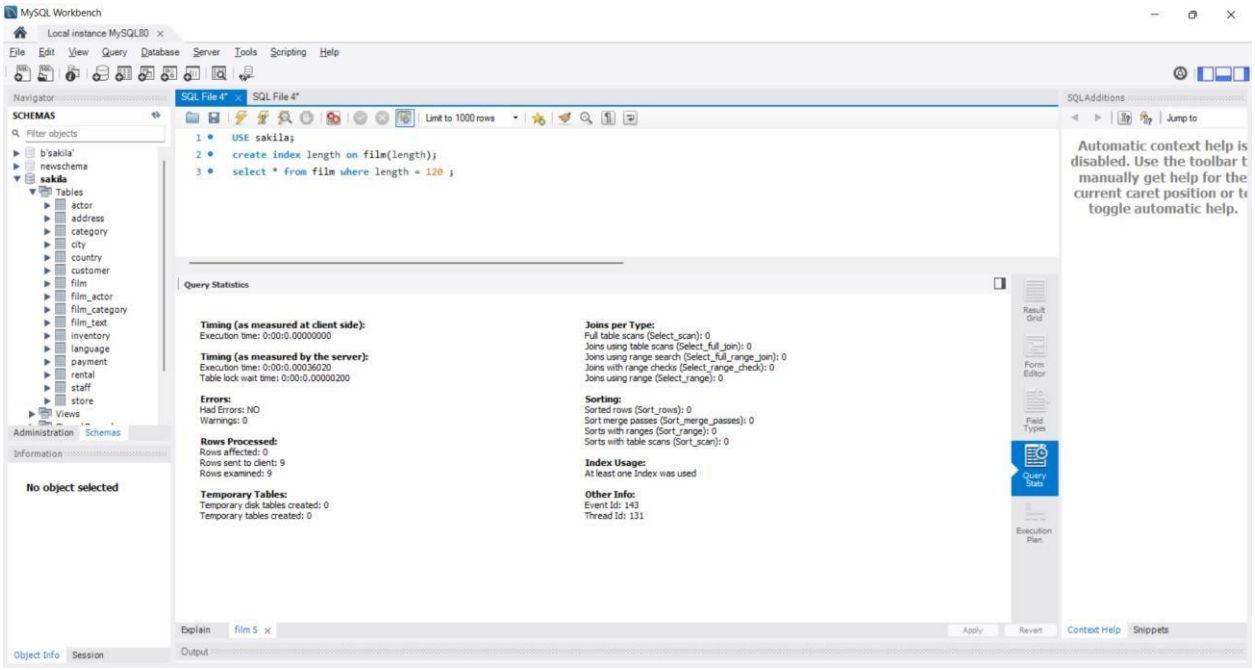
1)SIMPLE QUERY



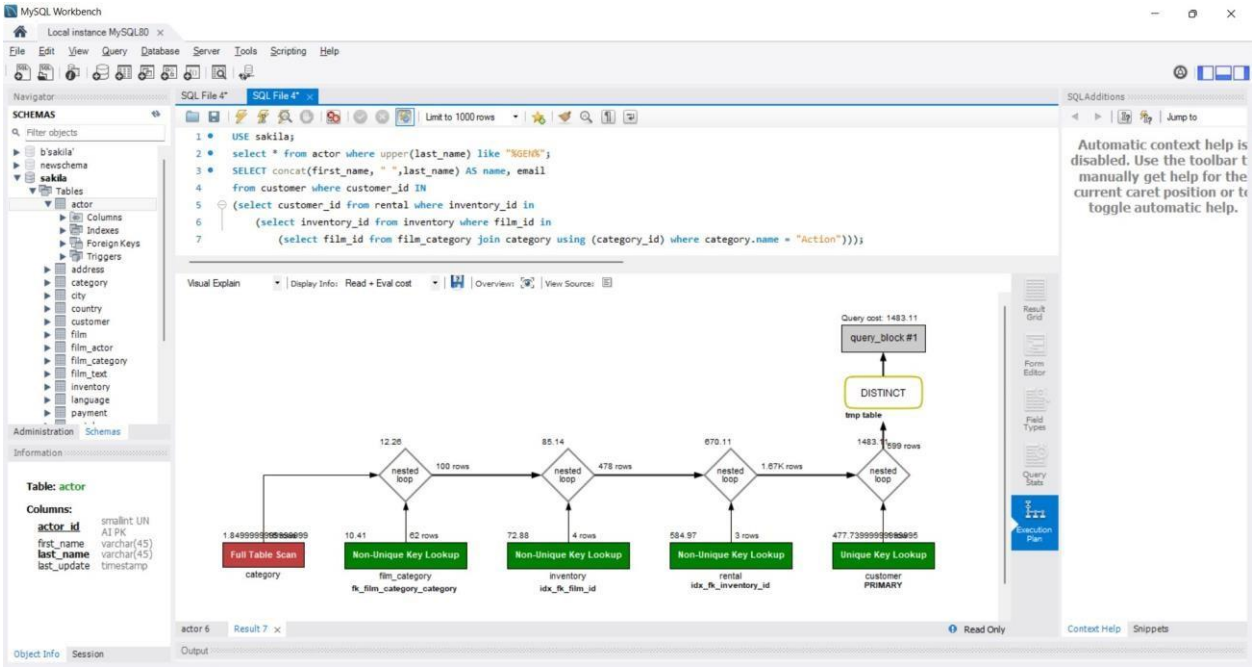
BEFORE INDEXING



AFTER INDEXING



2) NESTED



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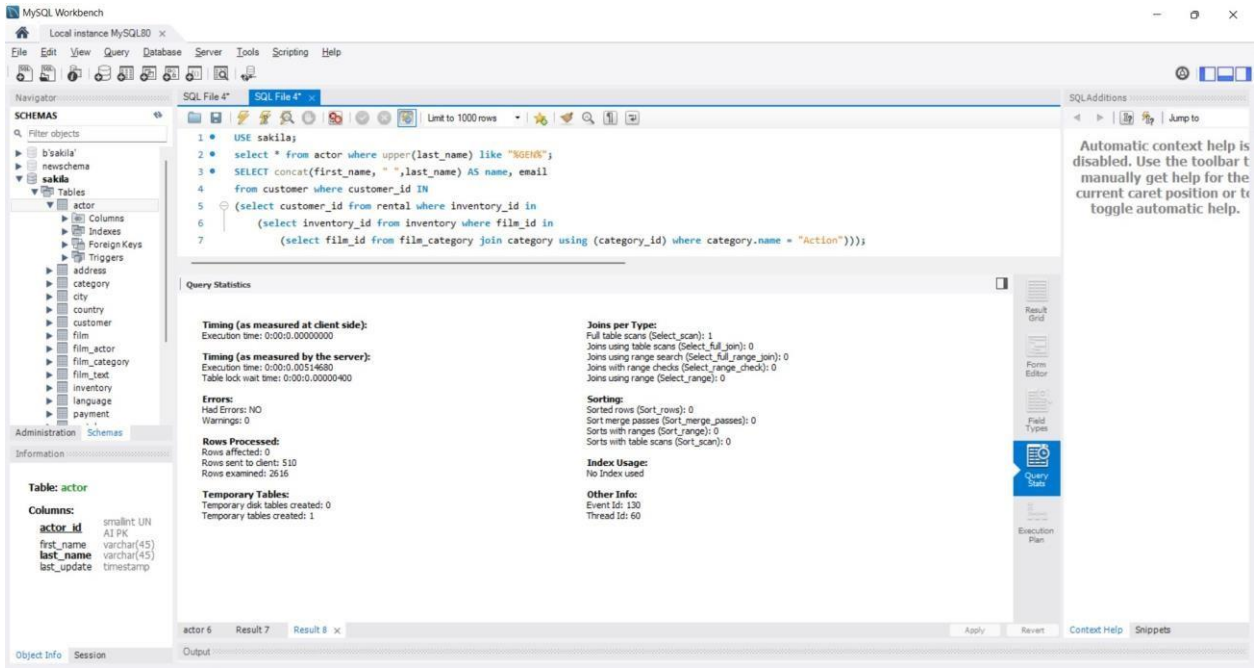
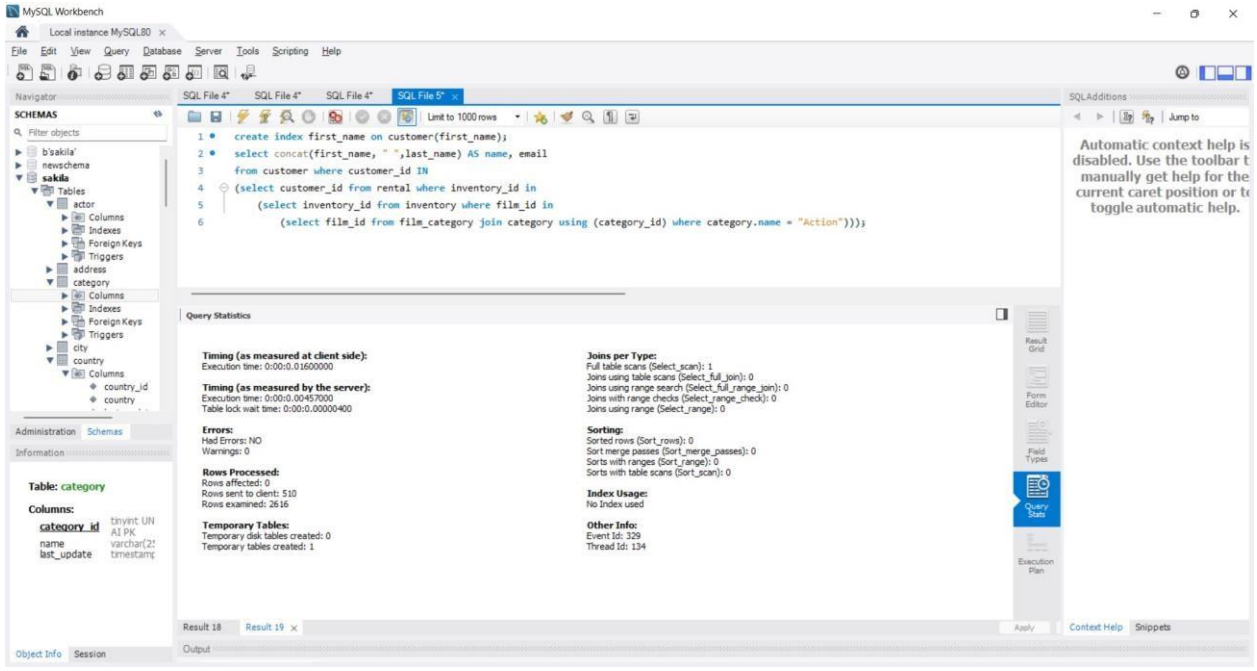
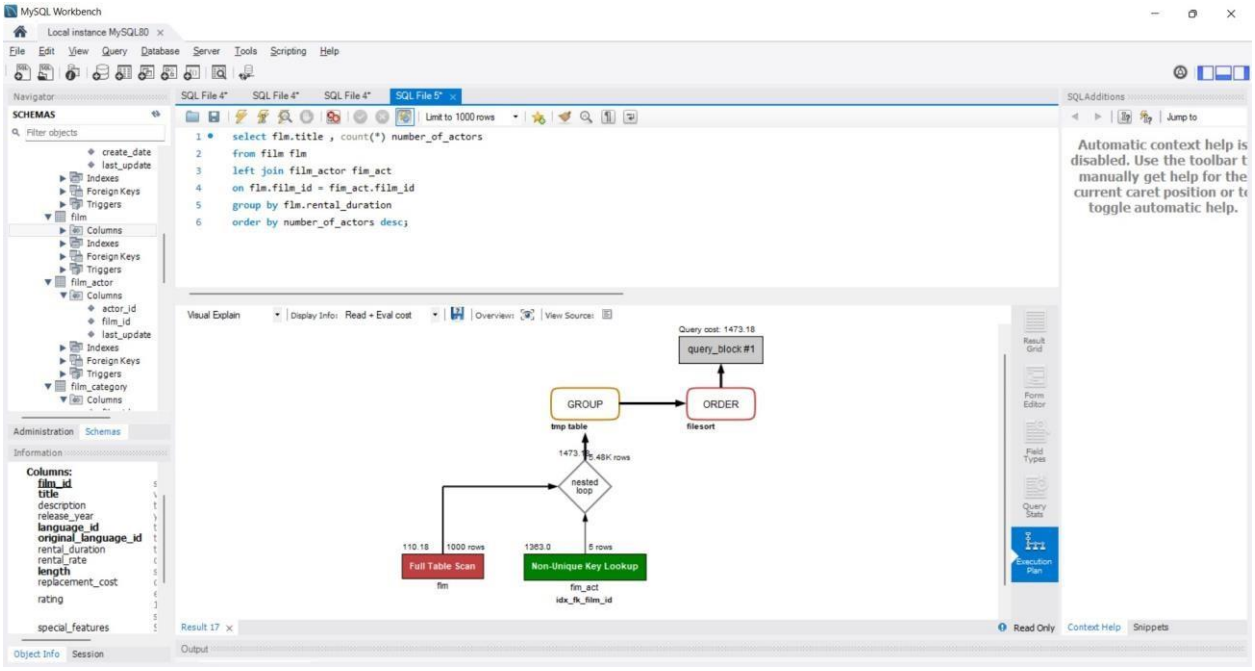


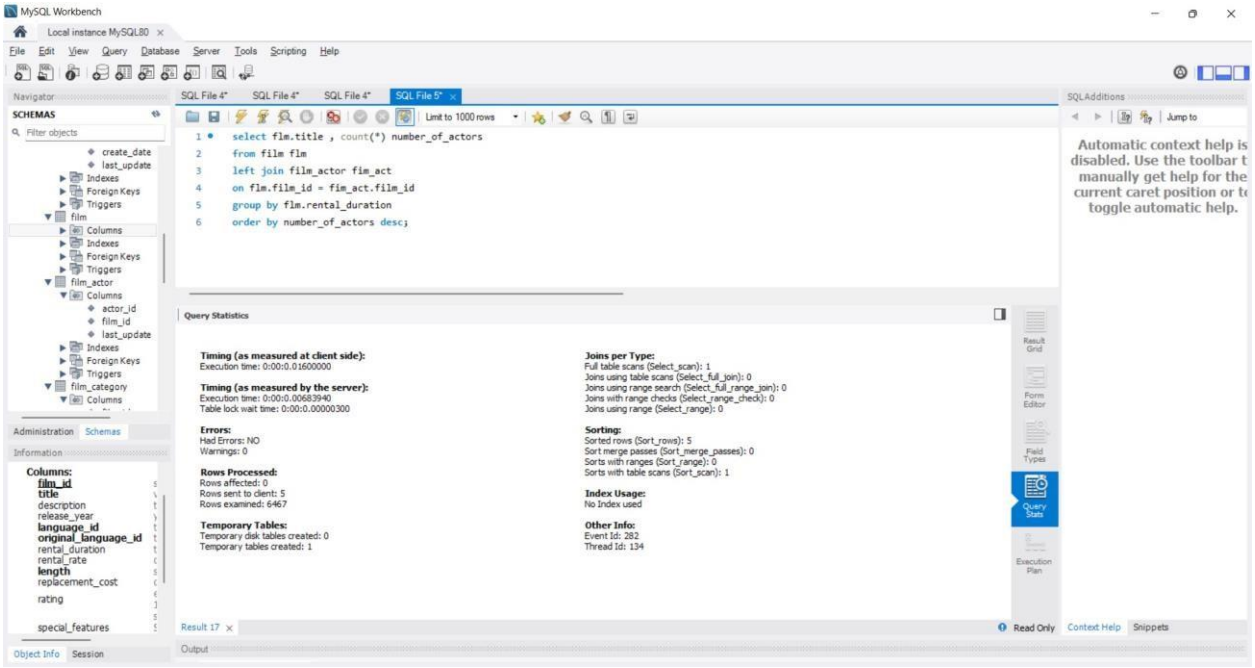
AFTER INDEXING



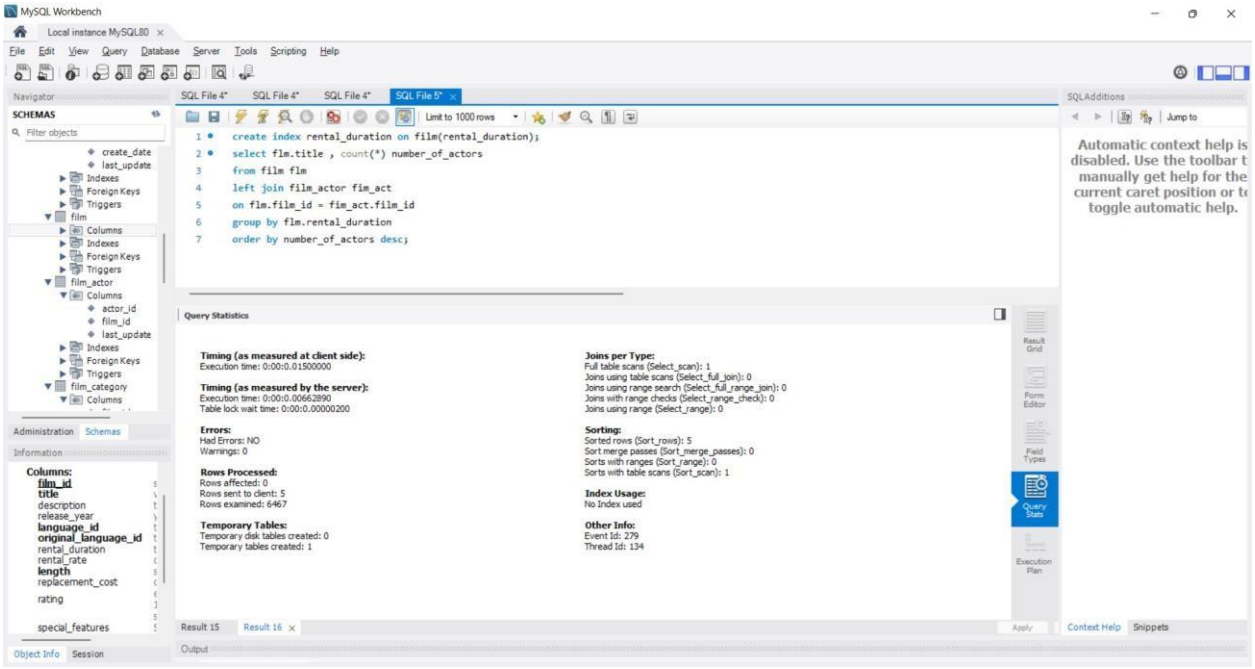
3) LEFT JOIN



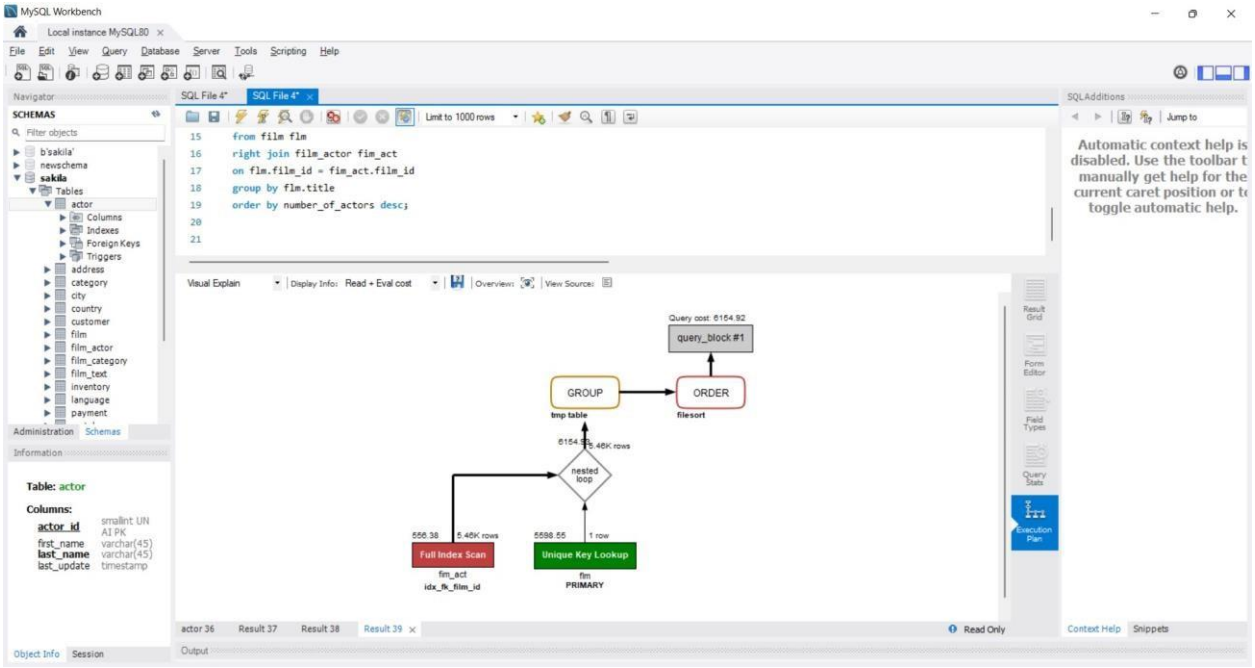
BEFORE INDEXING



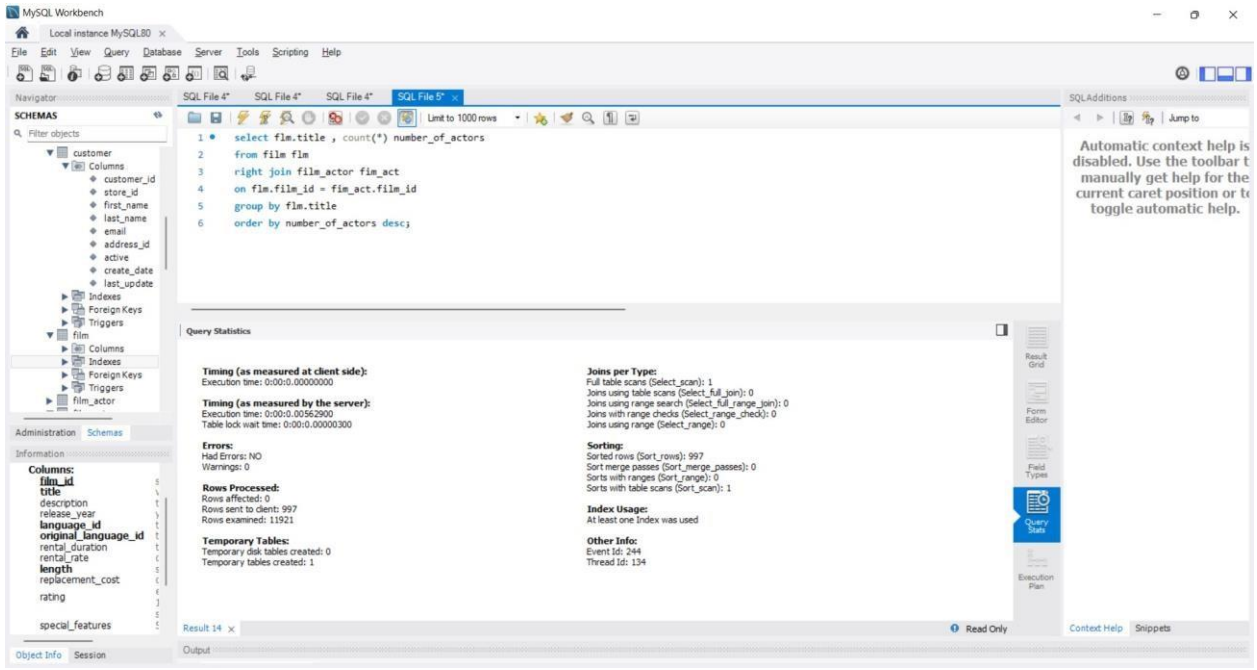
AFTER INDEXING



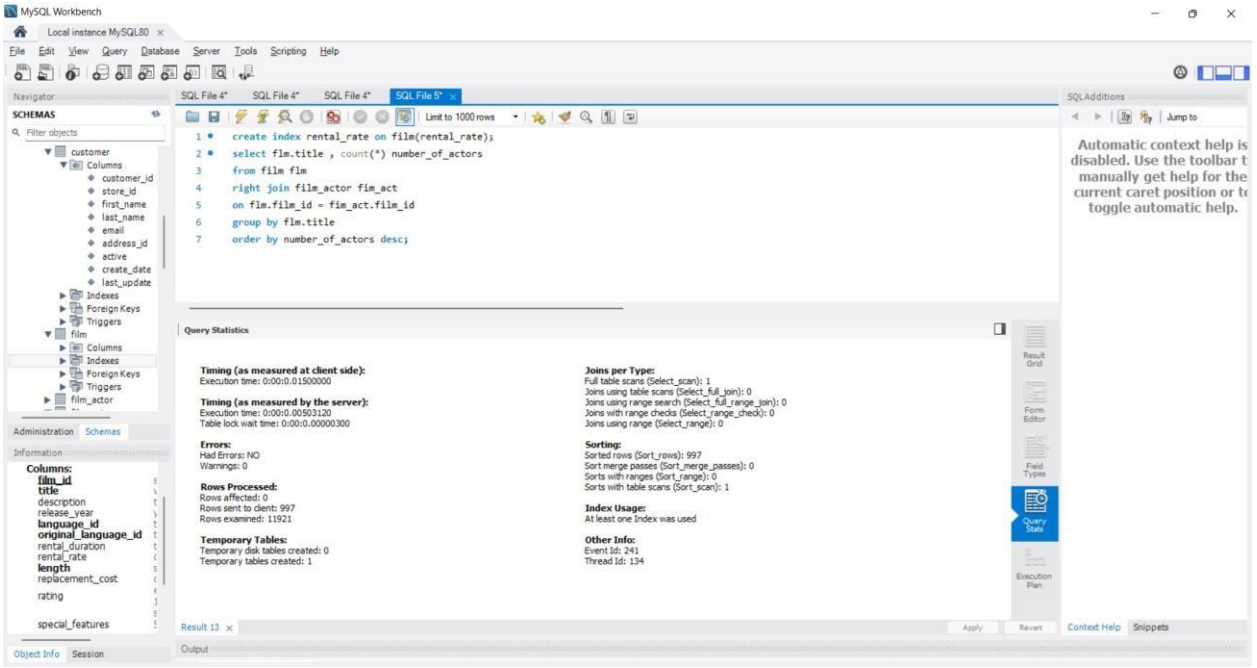
4) RIGHT JOIN



BEFORE INDEXING



AFTER INDEXING



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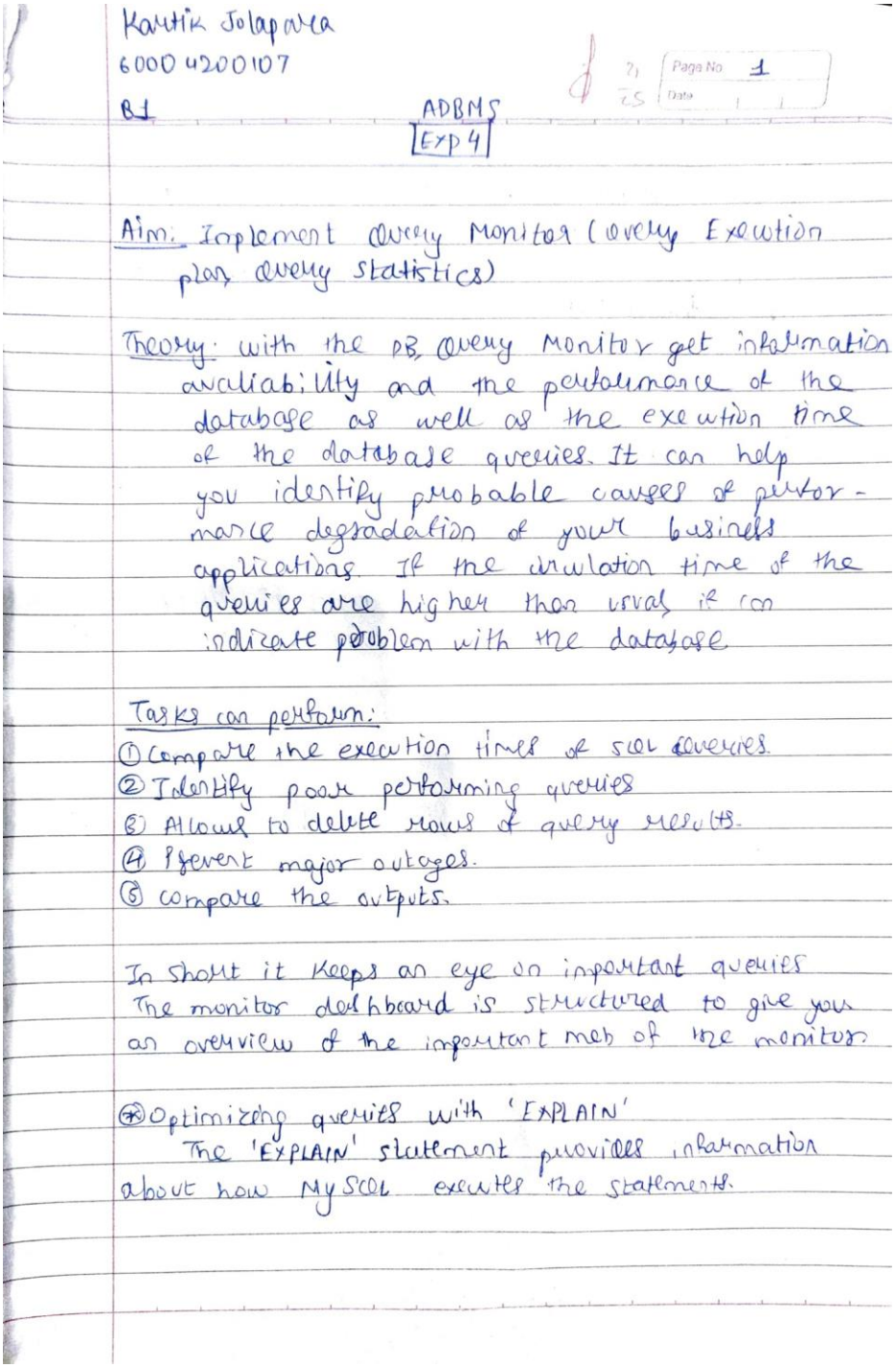
Exp4

Aim: To implement Query Monitor



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ADBMS
[Exp 4]

Aim: Implement Query Monitor (Query Execution plan, Query Statistics)

Theory: With the DB Query Monitor get information availability and the performance of the database as well as the execution time of the database queries. It can help you identify probable causes of performance degradation of your business applications. If the simulation time of the queries are higher than usual it can indicate problem with the database.

Tasks can perform:
1. Compare the execution times of SQL queries.
2. Identify poor performing queries
3. Allows to delete rows of query results.
4. Prevent major outages.
5. Compare the outputs.

In short it keeps an eye on important queries. The monitor dashboard is structured to give you an overview of the important meb of the monitor.

* Optimizing queries with 'EXPLAIN'
The 'EXPLAIN' statement provides information about how MySQL executes the statements.

① Explain works with SELECT, DELETE, UPDATE, INSERT & REPLACE

② Explain is useful for examining queries involving partitioned tables.

③ When EXPLAIN is used with an explainable statement, MySQL displays information from the optimizer about the statement execution plan.

④ For SELECT statement, explain produces additional execution plan information that can be displayed using Show warnings.

⑤ With Explain you can also see where you should add indexes to tables so that the statement executes faster by using indexes to find rows.

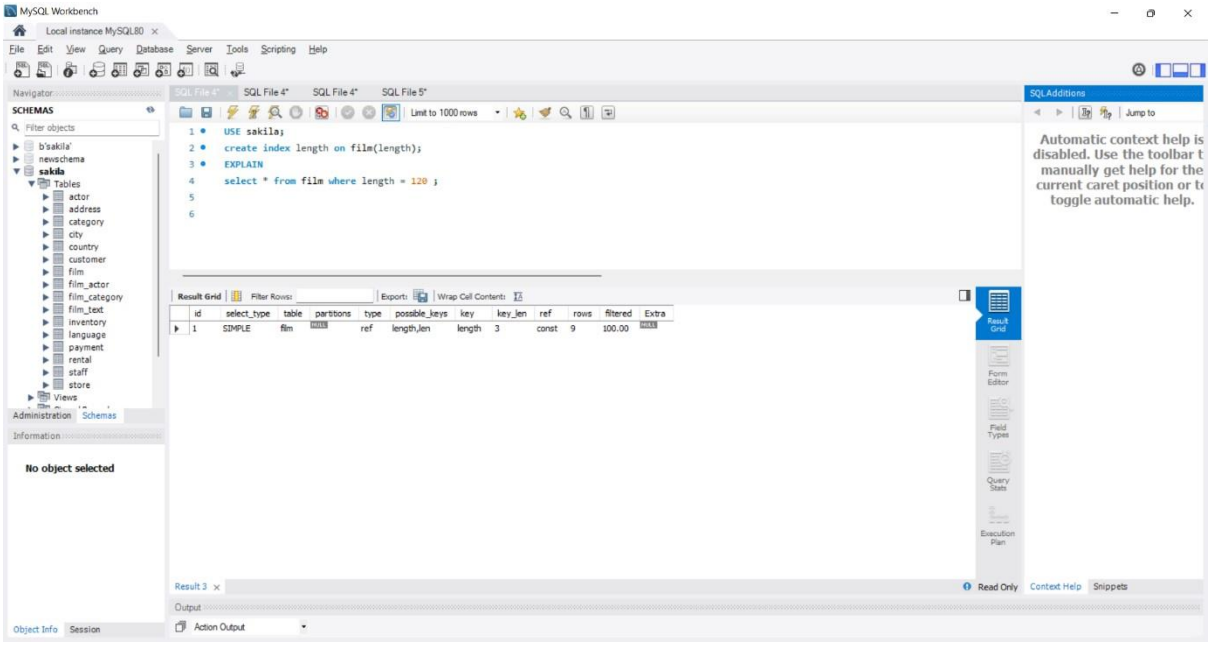
⑥ The optimizer trace may sometimes provide information complementary to that of EXPLAIN.

⑦ EXPLAIN can also be used to obtain information about the columns in a table.

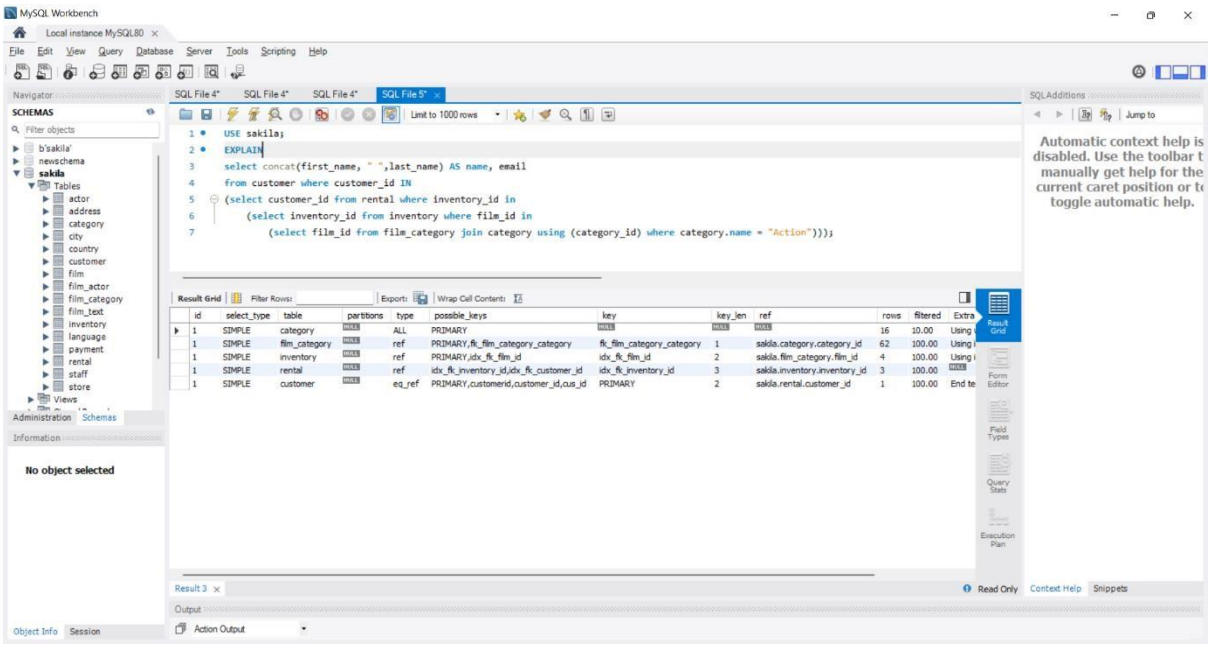
Conclusion: Hence, every Monitoring was implemented successfully in MySQL.

Output:

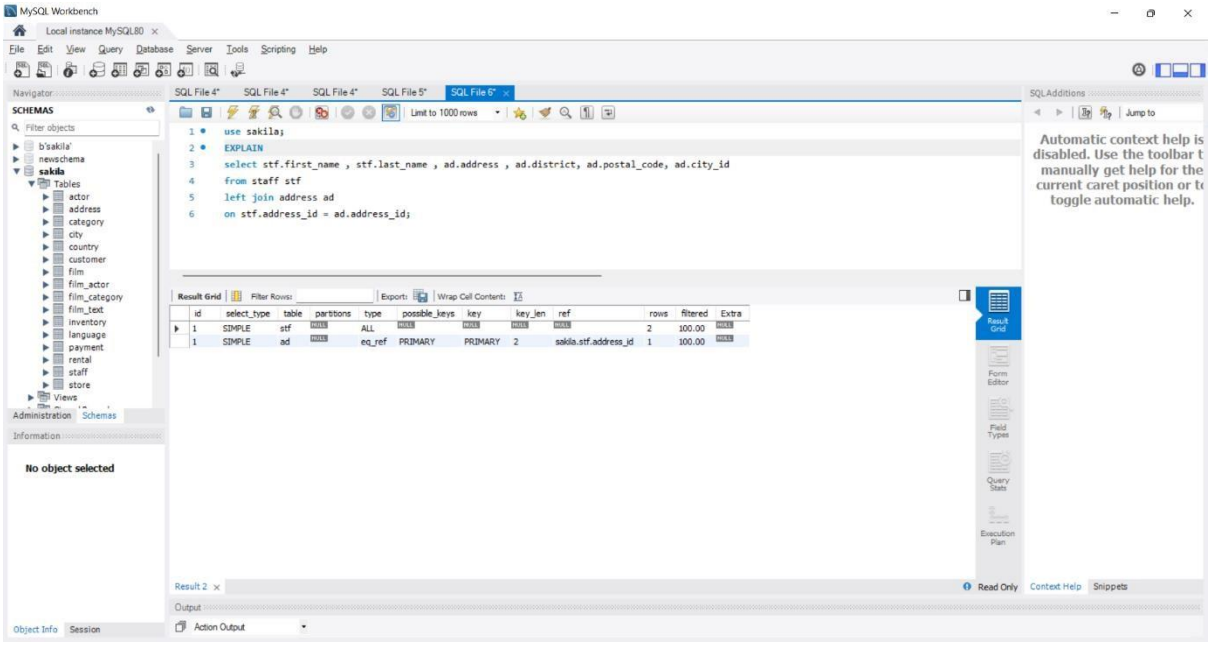
1) SELECT QUERY



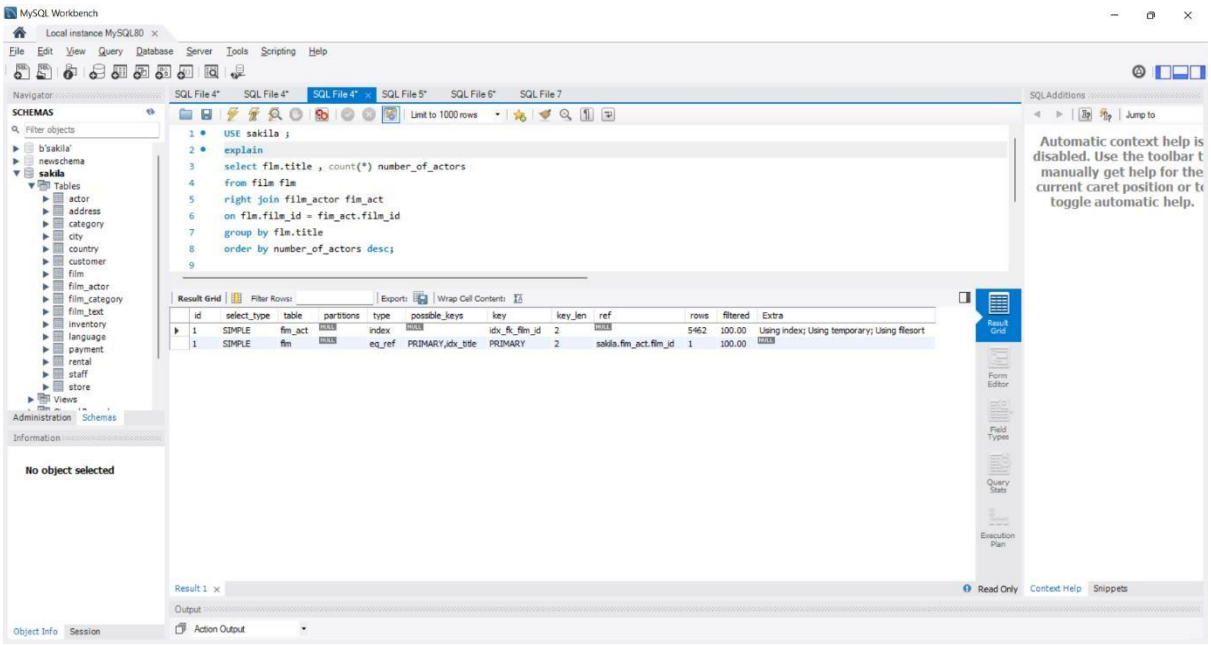
2) NESTED



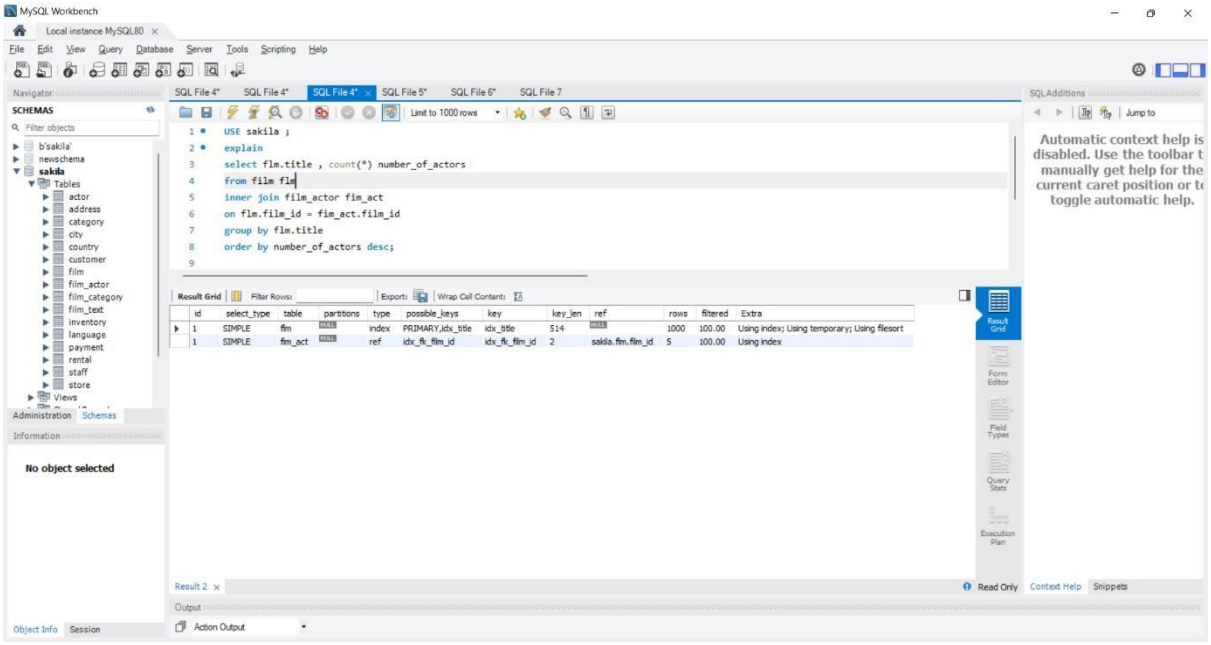
3) LEFT JOIN



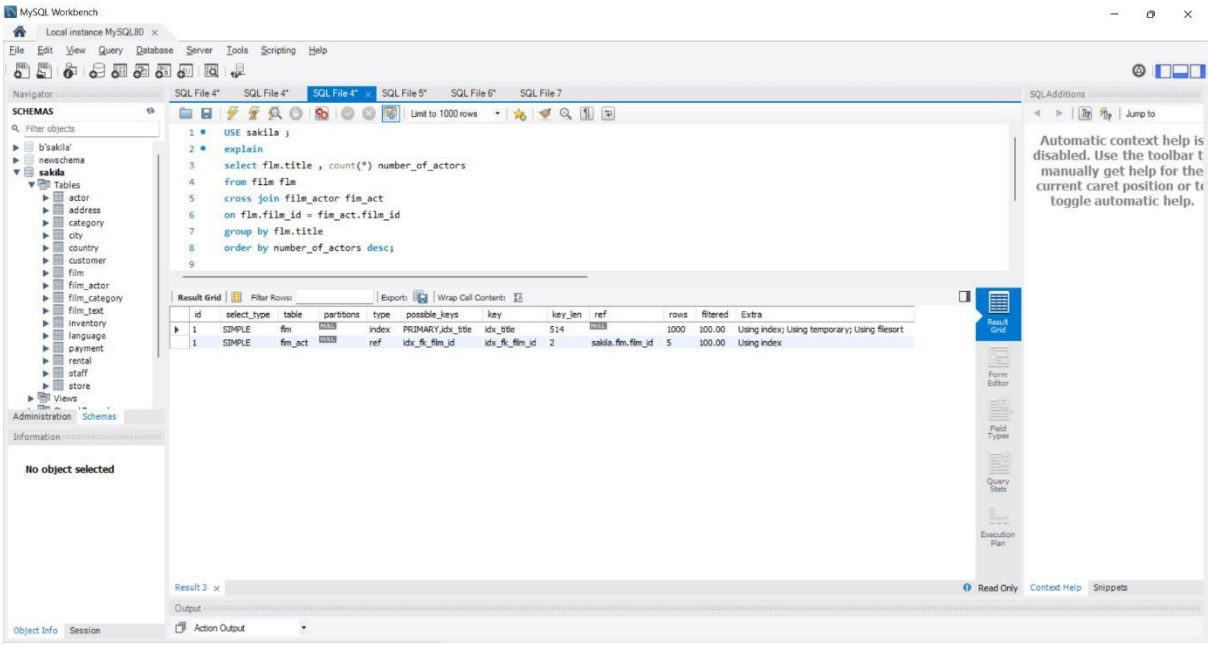
4) RIGHT JOIN



5) INNER JOIN



6) CROSS JOIN



Conclusion:

Thus, we implemented and studied query monitor

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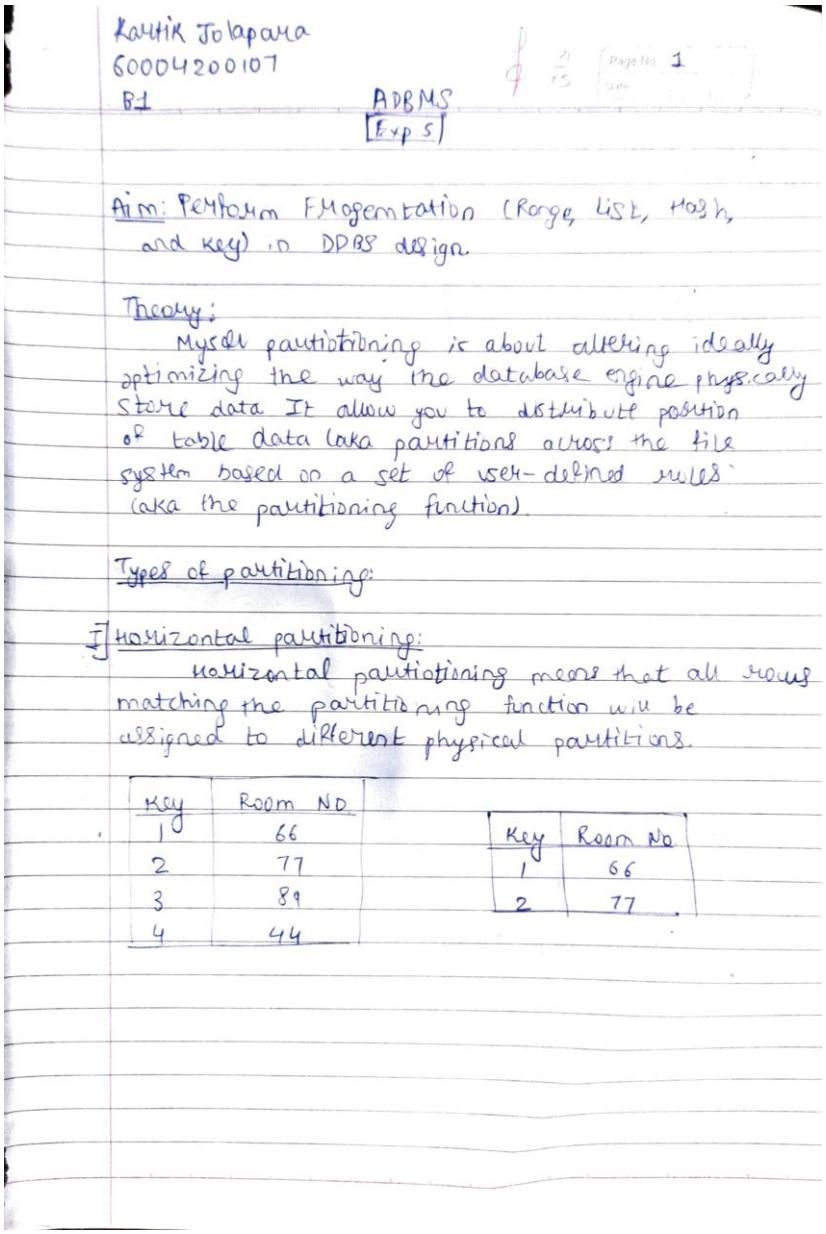
Exp5

Aim: To implement Fragmentation using Range, Key, Hash and List.

Theory:



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[Exp 5]

Aim: Perform Fragmentation (Range, List, Hash, and Key) in DDBS design.

Theory:

Mysql partitioning is about altering ideally optimizing the way the database engine physically store data. It allow you to distribute portion of table data (aka partitions) across the file system based on a set of user-defined rules (aka the partitioning function).

Types of partitioning:

1] Horizontal partitioning:

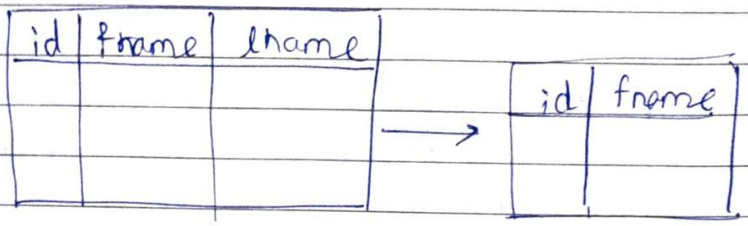
Horizontal partitioning means that all rows matching the partitioning function will be assigned to different physical partitions.

Key	Room No
1	66
2	77
3	89
4	44

Key	Room No
1	66
2	77

II] Vertical partitioning.

It allows different table columns to be split into different physical partitions.



Currently MySQL supports horizontal partitioning but not vertical

Partition Types:-

① Range

This type of partition assign rows to partitions based on column values that fall within a stated range

② List

Partitioning is similar to RANGE except that the partion is selected based on columns matching one of of set of discrete values.

③ Hash partitioning:

In hash partitioning a partition is selected based on the value returned by a user defined expression.

④ Key

This very similar to HASH partitioning but the hashing function is supplied by MySQL.

Conclusion: From personal experience, partitioning is the last part of an optimization process I'd pertain. In general, partitioning make the most sense when you are dealing with million record

Output:

Range:

```
alter table film_year
PARTITION BY RANGE (year(film_years))(
PARTITION p0 VALUES LESS THAN (2016),
PARTITION p1 VALUES LESS THAN (2017),
PARTITION p2 VALUES LESS THAN (2018),
PARTITION p3 VALUES LESS THAN (2020));



SELECT PARTITION_NAME, TABLE_ROWS
FROM INFORMATION_SCHEMA.PARTITIONS
WHERE TABLE_SCHEMA = 'sakila' AND TABLE_NAME = 'film_year';
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

PARTITION_NAME	TABLE_ROWS
p0	2
p1	2
p2	2
p3	0

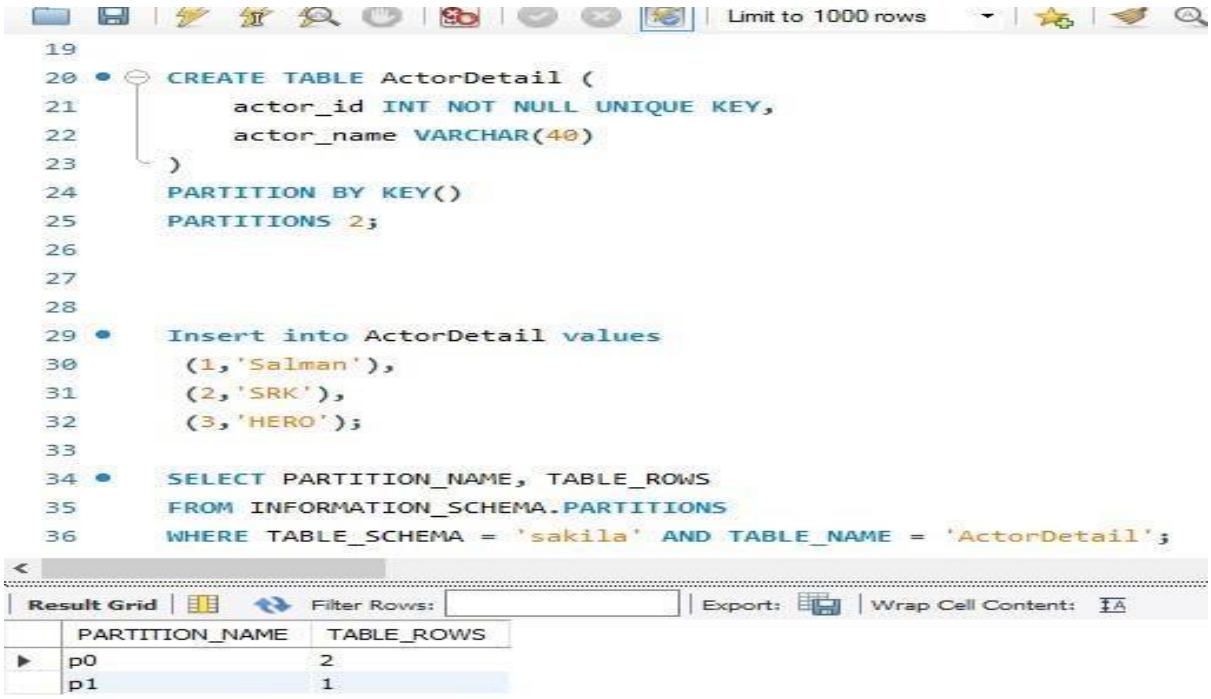
List:

```
CREATE TABLE film_genre (

    category_id INT PRIMARY KEY NOT NULL

)

PARTITION BY LIST(category_id) (
PARTITION horror VALUES IN (101, 103, 105),
PARTITION comedy VALUES IN (102, 104, 106),
PARTITION actions VALUES IN (107, 109, 111),
PARTITION romance VALUES IN (108, 110, 112));

SELECT PARTITION_NAME, TABLE_ROWS
FROM INFORMATION_SCHEMA.PARTITIONS
WHERE TABLE_SCHEMA = 'sakila' AND TABLE_NAME = 'film_genre';
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

PARTITION_NAME	TABLE_ROWS
actions	0
comedy	0
horror	0
romance	0

Hash:

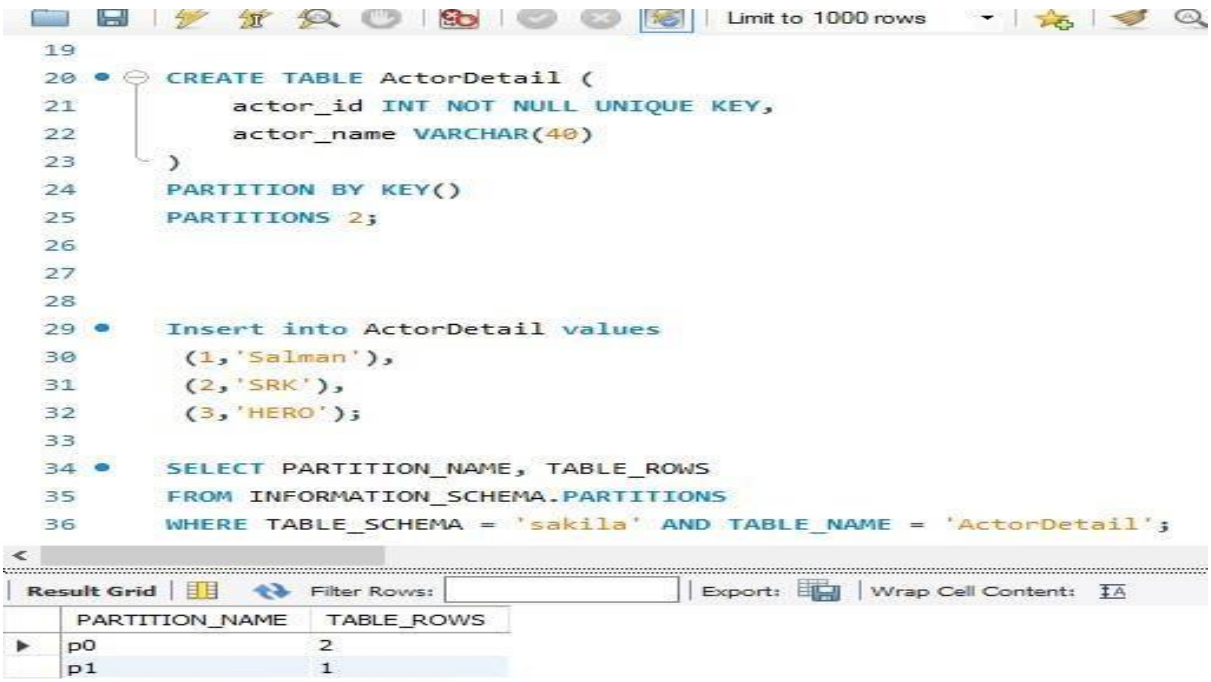


```
19
20 • CREATE TABLE ActorDetail (
21       actor_id INT NOT NULL UNIQUE KEY,
22       actor_name VARCHAR(40)
23   )
24   PARTITION BY KEY()
25   PARTITIONS 2;
26
27
28
29 •  Insert into ActorDetail values
30    (1,'Salman'),
31    (2,'SRK'),
32    (3,'HERO');
33
34 •  SELECT PARTITION_NAME, TABLE_ROWS
35   FROM INFORMATION_SCHEMA.PARTITIONS
36   WHERE TABLE_SCHEMA = 'sakila' AND TABLE_NAME = 'ActorDetail';
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

PARTITION_NAME	TABLE_ROWS
p0	2
p1	1

Key:



```
19
20 • CREATE TABLE ActorDetail (
21       actor_id INT NOT NULL UNIQUE KEY,
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23   )
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25   PARTITIONS 2;
26
27
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29 •  Insert into ActorDetail values
30    (1,'Salman'),
31    (2,'SRK'),
32    (3,'HERO');
33
34 •  SELECT PARTITION_NAME, TABLE_ROWS
35   FROM INFORMATION_SCHEMA.PARTITIONS
36   WHERE TABLE_SCHEMA = 'sakila' AND TABLE_NAME = 'ActorDetail';
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

PARTITION_NAME	TABLE_ROWS
p0	2
p1	1

Conclusion:

Thus, we implemented fragmentation using different techniques.

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Exp6

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Exp 6

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Date

Aim: Implementation of 2-Phase Protocol

Theory:
The two-phase commit protocol breaks a database commit into two phases to ensure correctness & fault tolerance in a distributed database system

Phase I - prepare Phase
- After each slave has locally completed its transaction, it sends a "DONE" message to the controlling site
- When the controlling sit has received "DONE" message from all slaves, it sends a "Prepare" message to slaves
- The slaves vote on whether they still want to commit or not
- If a slave ~~commits~~ wants to send or commit it sends "Ready" message
- otherwise, it sends "Not Ready" message

Phase II : Commit/Abort Phase
- After each controlling site has received "Ready" message from all slaves:-
  1. The controlling site sends "Global commit" msg to slaves
  2. The slaves apply the transaction & send a "Commit Ack" message to controlling site

Disadvantages:

1] The major disadvantage of the Two-phase commit protocol is failed when co-ordinator site failure may result in blocking, so a decision either to commit or abort Transaction (T) may have to be postponed until co-ordinator recovers again.

2] Consider a scenario if a Transaction (T) holds lock on data items of active sites, but amid the execution, if coordinator fails and the active states keep no additional log-record except <need T T> like <abort> or <commit> So, it becomes impossible to determine what decision has been made to <commit> / <abort>

Conclusion:

Thus, we successfully studied and implemented the 2-phase Protocol.

Code:

Client

```
import java.io.*; import java.net.*;
public class Client implements Runnable
```

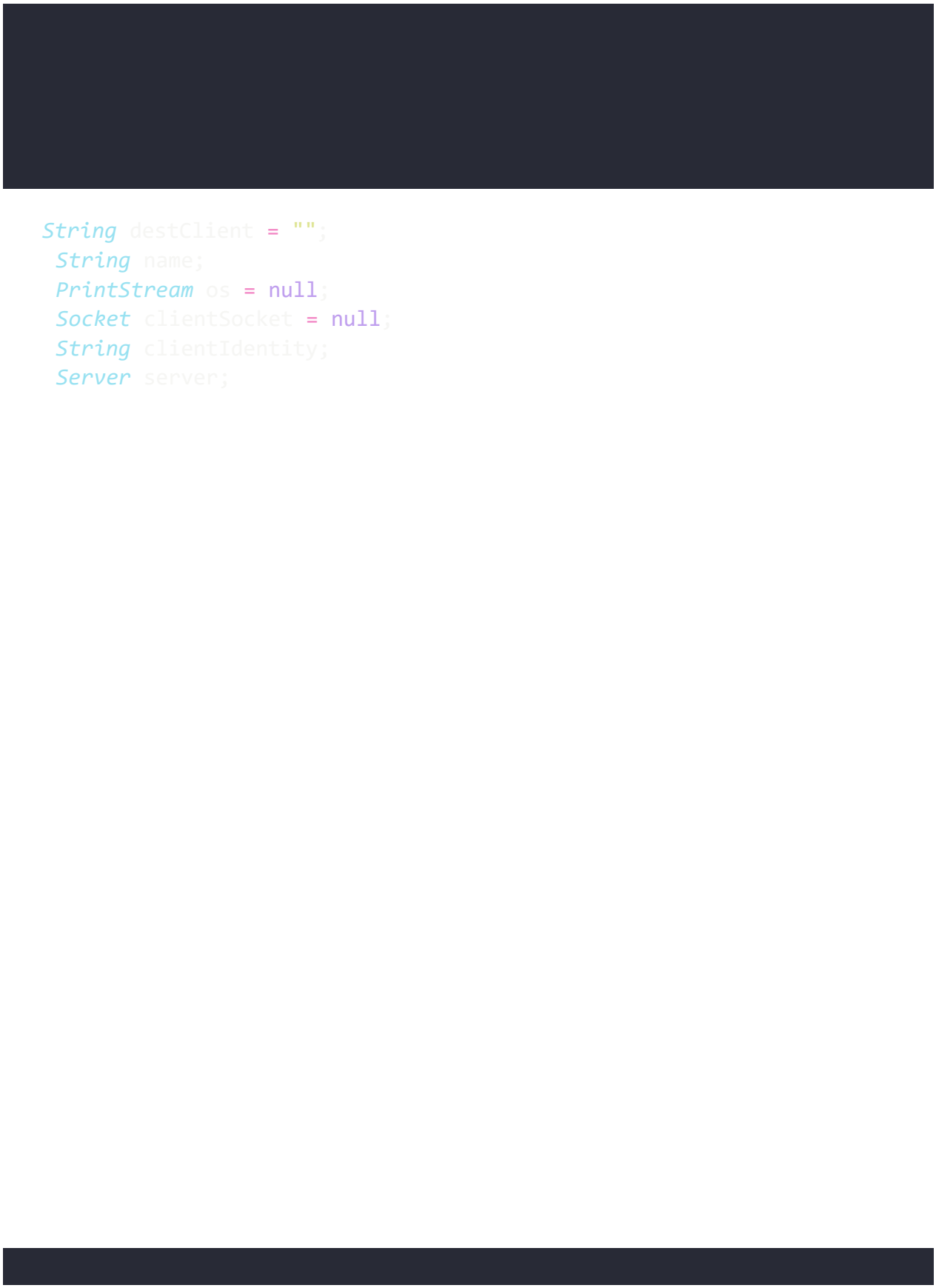
```
{
    static Socket clientSocket = null;
static PrintStream os = null;      static
DataInputStream is = null;     static
BufferedReader inputLine = null;     static
boolean closed = false;     public static
void main(String[] args)
    {
        int port_number=1111;            String
host="localhost";          try {
clientSocket = new Socket(host, port_number);
            inputLine = new BufferedReader(new
InputStreamReader(System.in));
            os = new PrintStream(clientSocket.getOutputStream());
is = new DataInputStream(clientSocket.getInputStream());
        } catch (Exception e)
        {   System.out.println("Exception occurred : "+e.getMessage());
}

        if (clientSocket != null && os != null && is != null)
        {
            try
{
                new Thread(new Client()).start();
while (!closed)
                {
                    os.println(inputLine.readLine());
                }
                os.close();
is.close();
                clientSocket.close();
            } catch (IOException e)
            {
                System.err.println("IOException:  " + e);
```

```
        }
    }
}
@SuppressWarnings("deprecation")
public void run()      {
    String responseLine;
        try
        {
            while ((responseLine = is.readLine()) != null)
            {
                System.out.println("\n"+responseLine);
                if (responseLine.equalsIgnoreCase("GLOBAL_COMMIT")==true
|| responseLine.equalsIgnoreCase("GLOBAL_ABORT")==true )
                {
                    break;
                }
            }
            closed=true;
        }
        catch (IOException e)
        {
            System.err.println("IOException:  " + e);
        }
    }
}
```

Server

```
import java.io.*; import
java.net.*; import
java.util.*;

public class Server {     boolean closed = false,
inputFromAll = false;
    List<ClientThread> thread;
    List<String> data;
    List<String> decision;

    Server() {
        thread = new ArrayList<ClientThread>();
        data = new ArrayList<String>();
        decision= new ArrayList<String>();
  }   public static void main(String args[])
```

```
    {
        Socket clientSocket = null;
        ServerSocket serverSocket = null;
int port_number = 1111;          Server
server = new Server();          try
{
            serverSocket = new ServerSocket(port_number);
        } catch (IOException e) {
            System.out.println(e);
        }
        while (!server.closed)
        {              try {
clientSocket = serverSocket.accept();
                    ClientThread clientThread = new ClientThread(server,
clientSocket);
                    (server.thread).add(clientThread);
                    System.out.println("\nNow Total clients are : " +
(server.thread).size());
                    (server.data).add("NOT_SENT");
(server.decision).add("NOT_SENT");
clientThread.start();
            } catch (IOException e) { }
        }
try {
            serverSocket.close();
        } catch (Exception e1) { }
    }
}
class ClientThread extends Thread
{
    DataInputStream is = null;
   String line;
```


String destClient = "";
String name;
PrintStream os = null;
Socket clientSocket = null;
String clientIdentity;
Server server;

```
    public ClientThread(Server server, Socket clientSocket)
    {
        this.clientSocket = clientSocket;
this.server = server;
    }

    @SuppressWarnings("deprecation")
public void run()
    {         try {             is = new
DataInputStream(clientSocket.getInputStream());             os = new
PrintStream(clientSocket.getOutputStream());
os.println("Enter your name.");             name = is.readLine();
clientIdentity = name;             os.println("Welcome " + name + "
to this 2 Phase
Application.\nYou will receive a vote Request now...");
os.println("Send Ready or Not Ready after local transaction..");
            while (true)
            {
                line = is.readLine();
if (line.equalsIgnoreCase("NOT READY"))
                {
                    System.out.println("\nFrom '" + clientIdentity
                            + "' : NOT READY\n\nSince NOT READY we will not
wait for inputs from other clients.");
                    System.out.println("\nAborted....");

                    for (int i = 0; i < (server.thread).size(); i++) {
                        ((server.thread).get(i)).os.println("GLOBAL_ABORT"
);
                        ((server.thread).get(i)).os.close();
                        ((server.thread).get(i)).is.close();
                    }
break;
```

```
            if (line.equalsIgnoreCase("READY"))
        {
```

```
                    System.out.println("\nFrom '" + clientIdentity + "' :
READY");
                    if ((server.thread).contains(this))
                    {
                        (server.data).set((server.thread).indexOf(this),
"READY");
                        for (int j = 0; j < (server.data).size(); j++)
                        {
if
(!(((server.data).get(j)).equalsIgnoreCase("NOT_SENT")))
                            {
                                server.inputFromAll = true;
continue;
                            }
else{                                   server.inputFromAll =
false;
                                System.out.println("\nWaiting for inputs
from other clients.");                                  break;
                            }
}
                        if (server.inputFromAll)
                        {
                            System.out.println("All Ready..");
                        }
                    }
                }
                os.println("VOTE_REQUEST\nPlease enter COMMIT or ABORT to
proceed : ");                   line = is.readLine();                   if
(line.equalsIgnoreCase("ABORT"))
                {
                    System.out.println("\nFrom   '"   +   clientIdentity
+ "' : ABORT\n\nSince ABORT we will not wait for inputs from other
clients.");
                    System.out.println("\nAborted....");

                    for (int i = 0; i < (server.thread).size(); i++) {
((server.thread).get(i)).os.println("GLOBAL_ABORT"
```

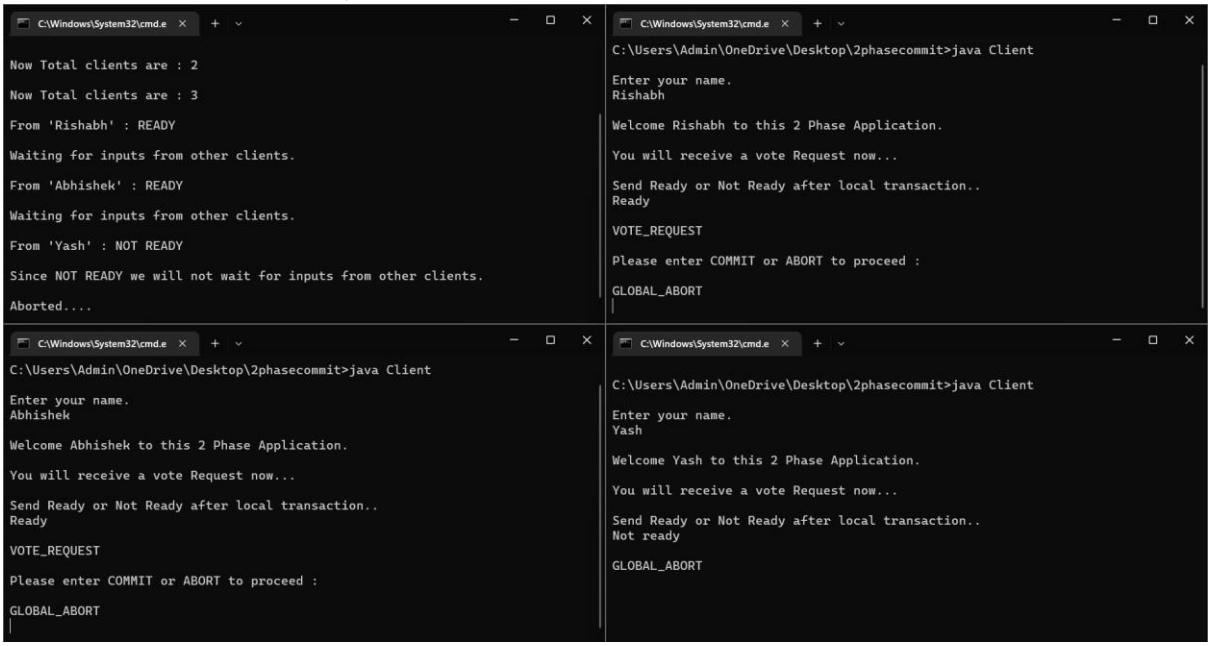
```
);
                    ((server.thread).get(i)).os.close();
```

```
                        ((server.thread).get(i)).is.close();
                    }
break;
                }
                if (line.equalsIgnoreCase("COMMIT")){
                    System.out.println("\nFrom '" + clientIdentity + "' :
COMMIT");
                    if ((server.thread).contains(this))
                    {
                        (server.decision).set((server.thread).indexOf(this
), "COMMIT");
                        for (int j = 0; j < (server.decision).size(); j++)
                        {
if
(!(((server.decision).get(j)).equalsIgnoreCase("NOT_SENT")))
                            {
                                server.inputFromAll = true;
continue;
                            }
else{                                   server.inputFromAll =
false;
                                System.out.println("\nWaiting for inputs
from other clients.");                                  break;
                            }
}
                        if (server.inputFromAll){
                            System.out.println("\n\nCommited....");
for (int i = 0; i < (server.thread).size(); i++)
                            {
                                ((server.thread).get(i)).os.println("GLOBA
L_COMMIT");
                                ((server.thread).get(i)).os.close();
                                ((server.thread).get(i)).is.close();
                            }
break;
                        }
                    }
                }
            }
```

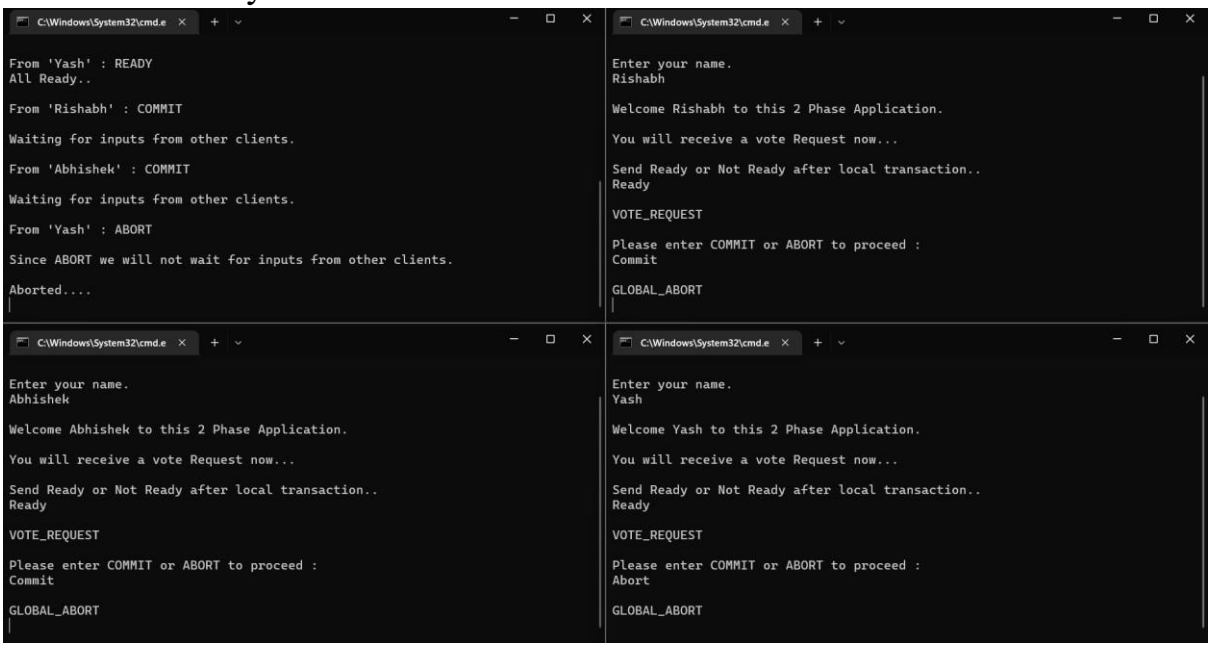
```
server.closed = true;
clientSocket.close();
        } catch (IOException e) { }

    }
}
```

Output:

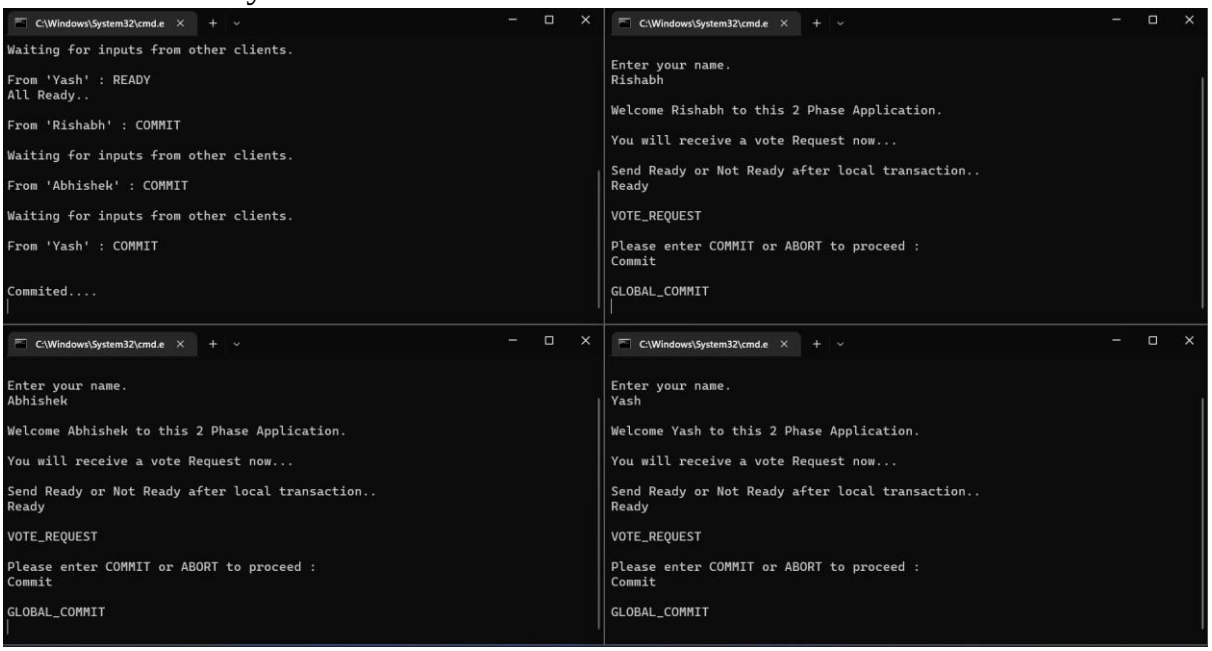
Scenario: One "not ready”



Scenario: all ready but one “Abort”



Scenario: all ready and all commit



Conclusion:

Thus, we successfully studied and implemented 2PL protocol.

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DIV: B/B1

ADBMS
Exp7

Aim: Query Execution on an XML database

Theory:

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ADBMS
Exp 7

Page No. 1
Date

Aim: Query Execution on XML Database

Theory:
- XML Database is used to store huge amount of information in XML format.
- As the use of XML is increasing in every field it is required to have a secured place to store XML documents
- The data stored in db can be queried using XQuery, serialized and exported into a desired format.
- There are 2 major types of XML databases which are:-

A] XML enabled
The extension provided for conversion of XML document. It is a relational database

B] Native XML
Based on the container rather than table format. It can store large amount of XML document & data

- XML makes it easier to express metadata a portable, reusable format.
- Also XML stores the data in plain text format.
- It does this so that the data can be easily understood by it's users.

- For this we have to make sure multiple browsers can manage XML documents just like HTML documents.
- XML provides a software & hardware independent way of storing, transporting & sharing data.
- XML also makes it easier to expand or upgrade to new OS.

Conclusion:

A book catalog, consisting of information about books was initially XML.

Code:

```
<html>
<head> <style> table, th,
td {   border: 1px solid
black;   border-
collapse:collapse;
margin: 5px;
} th, td {
padding: 5px;
} input {   margin-
bottom: 5px;
}
</style>
</head>
<body>

<button type="button" onclick="loadXMLDoc()">View
Information about the Books</button>
<br><br>

<table id="data-table"></table>

<script>
 function loadXMLDoc() {   var xmlhttp = new
XMLHttpRequest();   xmlhttp.onreadystatechange =
function() {     if (this.readyState == 4 &&
this.status == 200) {
```

```
      myFunction(this);
    }   };   xmlhttp.open("GET",
"books.xml", true);   xmlhttp.send();
} function myFunction(xml) {   var i;   var xmlDoc =
xml.responseXML;   var
table="<tr><th>Title</th><th>Author</th><th>Genre</th
><th>Price</th><th>Publish
Date</th><th>Description</th></tr>";   var x =
xmlDoc.getElementsByTagName("book");
    for (i = 0; i <x.length; i++)
{
        table +=
"<tr><td>" +

x[i].getElementsByTagName("title")[0].childNodes[0].n
odeValue +     "</td><td>" +

x[i].getElementsByTagName("author")[0].childNodes[0].
nodeValue +
"</td><td>" +

x[i].getElementsByTagName("genre")[0].childNodes[0].n
odeValue +     "</td><td>"+

x[i].getElementsByTagName("price")[0].childNodes[0].n
```

```
odeValue +
"</td><td>"+

x[i].getElementsByTagName("publish_date")[0].childNod
es[0].nodeValue +
    "</td><td>"+

x[i].getElementsByTagName("description")[0].childNode
s[0].nodeValue +
    "</td></tr>";


   }                document.getElementById("data-
table").innerHTML = table;

}

</script>

</body>
</html>
```

XML used:

```
<?xml version="1.0"?>
<catalog>
   <book id="bk101">
      <author>Gambardella, Matthew</author>
      <title>XML Developer's Guide</title>
      <genre>Computer</genre>
      <price>44.95</price>
      <publish_date>2000-10-01</publish_date>
      <description>An in-depth look at creating applications      with
XML.</description>
   </book>
```

```
   <book id="bk102">
      <author>Ralls, Kim</author>
```

```
      <title>Midnight Rain</title>
      <genre>Fantasy</genre>
      <price>5.95</price>
      <publish_date>2000-12-16</publish_date>
      <description>A former architect battles corporate zombies,
an evil sorceress, and her own childhood to become queen       of
the world.</description>
   </book>
   <book id="bk103">
      <author>Corets, Eva</author>
      <title>Maeve Ascendant</title>
      <genre>Fantasy</genre>
      <price>5.95</price>
      <publish_date>2000-11-17</publish_date>
      <description>After the collapse of a nanotechnology
society in England, the young survivors lay the       foundation
for a new society.</description>
   </book>
   <book id="bk104">
      <author>Corets, Eva</author>
      <title>Oberon's Legacy</title>
      <genre>Fantasy</genre>
      <price>5.95</price>
      <publish_date>2001-03-10</publish_date>
      <description>In post-apocalypse England, the mysterious
agent known only as Oberon helps to create a new life       for
the inhabitants of London. Sequel to Maeve
      Ascendant.</description>
   </book>
   <book id="bk105">
      <author>Corets, Eva</author>
      <title>The Sundered Grail</title>
      <genre>Fantasy</genre>
      <price>5.95</price>
      <publish_date>2001-09-10</publish_date>
      <description>The two daughters of Maeve, half-sisters,
battle one another for control of England. Sequel to
      Oberon's Legacy.</description>
   </book>
   <book id="bk106">
      <author>Randall, Cynthia</author>
      <title>Lover Birds</title>
      <genre>Romance</genre>
      <price>4.95</price>
      <publish_date>2000-09-02</publish_date>
      <description>When Carla meets Paul at an ornithology
      conference, tempers fly as feathers get ruffled.</description>
</book>
   <book id="bk107">
      <author>Thurman, Paula</author>
      <title>Splish Splash</title>
      <genre>Romance</genre>
      <price>4.95</price>
      <publish_date>2000-11-02</publish_date>
```

```
      <description>A deep sea diver finds true love twenty
thousand leagues beneath the sea.</description>
   </book>
   <book id="bk108">
```

```
      <author>Knorr, Stefan</author>
      <title>Creepy Crawlies</title>
      <genre>Horror</genre>
      <price>4.95</price>
      <publish_date>2000-12-06</publish_date>
      <description>An anthology of horror stories about roaches,
centipedes, scorpions  and other insects.</description>
   </book>
   <book id="bk109">
      <author>Kress, Peter</author>
      <title>Paradox Lost</title>
      <genre>Science Fiction</genre>
      <price>6.95</price>
      <publish_date>2000-11-02</publish_date>
      <description>After an inadvertant trip through a Heisenberg
Uncertainty Device, James Salway discovers the problems       of
being quantum.</description>
   </book>
   <book id="bk110">
      <author>O'Brien, Tim</author>
      <title>Microsoft .NET: The Programming Bible</title>
      <genre>Computer</genre>
      <price>36.95</price>
      <publish_date>2000-12-09</publish_date>
      <description>Microsoft's .NET initiative is explored in
detail in this deep programmer's reference.</description>
   </book>
   <book id="bk111">
      <author>O'Brien, Tim</author>
      <title>MSXML3: A Comprehensive Guide</title>
      <genre>Computer</genre>
      <price>36.95</price>
      <publish_date>2000-12-01</publish_date>
      <description>The Microsoft MSXML3 parser is covered in
      detail, with attention to XML DOM interfaces, XSLT processing,
      SAX and more.</description>
   </book>
   <book id="bk112">
      <author>Galos, Mike</author>
      <title>Visual Studio 7: A Comprehensive Guide</title>
      <genre>Computer</genre>
      <price>49.95</price>
      <publish_date>2001-04-16</publish_date>
      <description>Microsoft Visual Studio 7 is explored in depth,
looking at how Visual Basic, Visual C++, C#, and ASP+ are
integrated into a comprehensive development
environment.</description>
   </book>
</catalog>
```

Output:

View Information about the Books

Search a title midnight

Search an author

Search a genre

Search a price

Search a Publish Date

Title	Author	Genre	Price	Publish Date	Description
XML Developer's Guide	Gambardella, Matthew	Computer	44.95	2000-10-01	An in-depth look at creating applications with XML.
Midnight Rain	Ralls, Kim	Fantasy	5.95	2000-12-16	A former architect battles corporate zombies, an evil sorceress, and her own childhood to become queen of the world.
Maeve Ascendant	Corets, Eva	Fantasy	5.95	2000-11-17	After the collapse of a nanotechnology society in England, the young survivors lay the foundation for a new society.
Oberon's Legacy	Corets, Eva	Fantasy	5.95	2001-03-10	In post-apocalypse England, the mysterious agent known only as Oberon helps to create a new life for the inhabitants of London. Sequel to Maeve Ascendant.
The Sundered Grail	Corets, Eva	Fantasy	5.95	2001-09-10	The two daughters of Maeve, half-sisters, battle one another for control of England. Sequel to Oberon's Legacy.
Lover Birds	Randall, Cynthia	Romance	4.95	2000-09-02	When Carla meets Paul at an ornithology conference, tempers fly as feathers get ruffled.
Splish Splash	Thurman, Paula	Romance	4.95	2000-11-02	A deep sea diver finds true love twenty thousand leagues beneath the sea.
Creepy Crawlies	Knorr, Stefan	Horror	4.95	2000-12-06	An anthology of horror stories about roaches, centipedes, scorpions and other insects.
Paradox Lost	Kress, Peter	Science Fiction	6.95	2000-11-02	After an inadvertant trip through a Heisenberg Uncertainty Device, James Salway discovers the problems of being quantum.
Microsoft .NET: The Programming Bible	O'Brien, Tim	Computer	36.95	2000-12-09	Microsoft's .NET initiative is explored in detail in this deep programmer's reference.
MSXML3: A Comprehensive Guide	O'Brien, Tim	Computer	36.95	2000-12-01	The Microsoft MSXML3 parser is covered in detail, with attention to XML DOM interfaces, XSLT processing, SAX and more.
Visual Studio 7: A Comprehensive Guide	Galos, Mike	Computer	49.95	2001-04-16	Microsoft Visual Studio 7 is explored in depth, looking at how Visual Basic, Visual C++, C#, and ASP+ are integrated into a comprehensive development environment.

Result

Title	Author	Genre	Price	Publish Date	Description
Midnight Rain	Ralls, Kim	Fantasy	5.95	2000-12-16	A former architect battles corporate zombies, an evil sorceress, and her own childhood to become queen of the world.

Conclusion:

Thus, we studied and implemented Query Execution on XML database.

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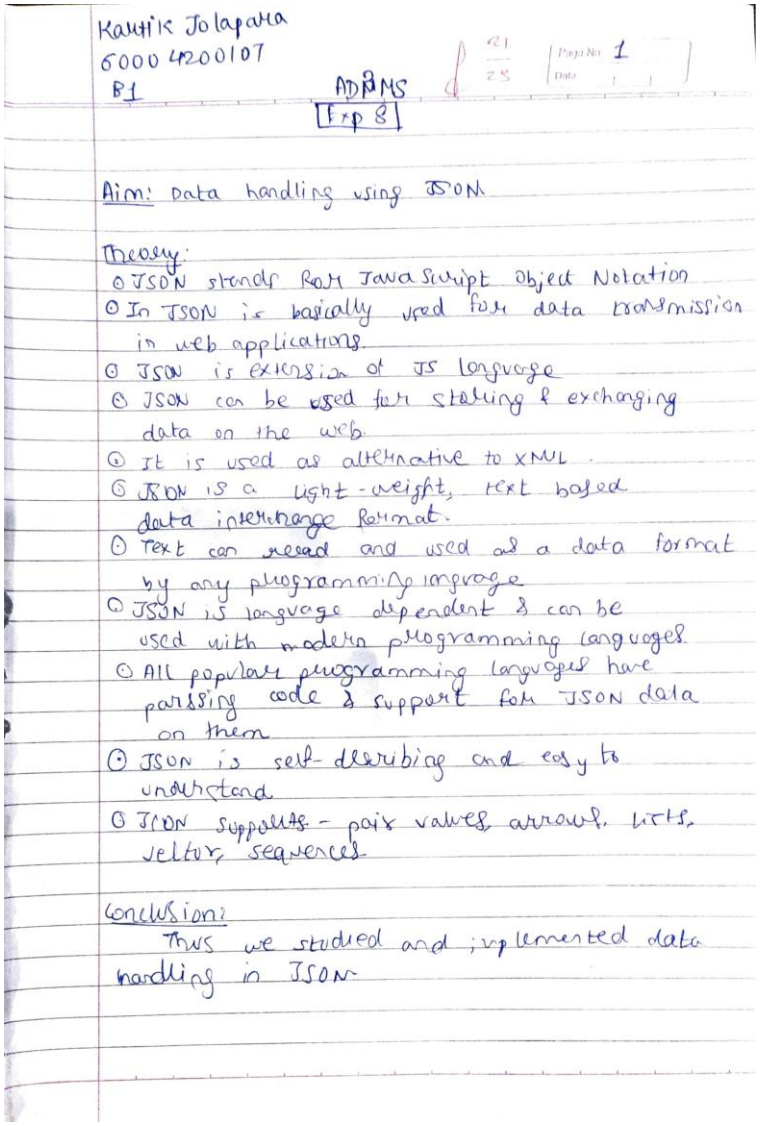
ADBMS
Exp8

Aim: Data handling using JSON. (Display user information from JSON file downloaded from Mobile)

Theory:



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B1
ADBMS
Exp 8

Aim: Data handling using JSON

Theory:
- JSON stands for JavaScript Object Notation
- In JSON is basically used for data transmission in web applications
- JSON is extension of JS language
- JSON can be used for storing & exchanging data on the web
- It is used as alternative to XML
- JSON is a light-weight, text based data interchange format.
- Text can read and used as a data format by any programming language
- JSON is language dependent & can be used with modern programming languages
- All popular programming languages have parsing code & support for JSON data on them
- JSON is self-describing and easy to understand
- JSON supports - pair values array, lists, vector, sequences.

Conclusion:
Thus we studied and implemented data handling in JSON.

Implementing Queries-
Selecting a DB

```
test> use reddit;
switched to db reddit
reddit>
```

Showing all Databases

```
reddit> show dbs;
admin   100.00 KiB
config   60.00 KiB
local    72.00 KiB
reddit    8.00 KiB
reddit>
```

Dropping a Database

```
reddit> use twitter;
switched to db twitter
twitter> db.dropDatabase();
{ ok: 1, dropped: 'twitter' }
twitter>
```

Creating a collection

```
reddit> db.createCollection("posts");
{ ok: 1 }
reddit>
```

Dropping a collection

```
reddit> db.comments.drop();
true
reddit>
```

Inserting multiple documents

```
reddit> db.posts.insertMany([{ title: "Funny Meme", image: "https://wikipedia.com/troll_face", votes: 123, posted_by: "l
ca_tejas" }, { title: "Damn: reddit", text: "Your reddit is damn: reddit", votes: 12, posted_by: "meetp90" }]);
{
  acknowledged: true,
  insertedIds: {
    '0': ObjectId("6389fde4880a8e67b5db4a3b"),
    '1': ObjectId("6389fde4880a8e67b5db4a3c")
  }
}
reddit>
```

Updating documents

```
reddit> db.posts.update({ posted_by: "meetp90" }, { $set: { title: "How to get stuff back!" } });
DeprecationWarning: Collection.update() is deprecated. Use updateOne, updateMany, or bulkWrite.
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}
reddit> db.posts.find();
[
  {
    _id: ObjectId("6389fde4880a8e67b5db4a3b"),
    title: 'Funny Meme',
    image: 'https://wikipedia.com/troll_face',
    votes: 123,
    posted_by: 'lca_tejas'
  },
  {
    _id: ObjectId("6389fde4880a8e67b5db4a3c"),
    title: 'How to get stuff back!',
    text: 'Your reddit is damn: reddit',
    votes: 12,
    posted_by: 'meetp90'
  }
]
```

Querying the documents

```
reddit> db.posts.find({ votes: { $gt: 1000 }, image: { $exists: true } });
[
  {
    _id: ObjectId("638a0009880a8e67b5db4a3f"),
    title: 'Soggy cat',
    image: 'https://preview.redd.it/cxjsjx27g7j81.jpg?auto=webp&s=d09b1a5e785562455e3661a186087e398c0546d0',
    votes: 33213,
    posted_by: 'lca_tejas'
  }
]
reddit> db.posts.find({ votes: { $gt: 1000 }, text: { $exists: true }, posted_by: 'meetp90' });
[
  {
    _id: ObjectId("6389ff86880a8e67b5db4a3e"),
    title: 'Emojis bad',
    text: 'Emojis bad, please laugh',
    votes: 1212,
    posted_by: 'meetp90'
  },
  {
    _id: ObjectId("638a0009880a8e67b5db4a40"),
    title: 'We did it',
    text: 'We did it reddit! We broke the stock markets around the world and dilluted all the world currency!',
    votes: 12134,
    posted_by: 'meetp90'
  }
]
```

Deleting documents

```
reddit> db.posts.remove({ votes: { $lt: 100 } });
DeprecationWarning: Collection.remove() is deprecated. Use deleteOne, deleteMany, findOneAndDelete, or bulkWrite.
{ acknowledged: true, deletedCount: 1 }
```

Importing json

```
# mongoimport --db reddit --collection posts --jsonArray --authenticationDatabase admin -u root -p pass@123 --file ./pos
ts.json
2022-12-02T14:42:23.925+0000    connected to: mongodb://localhost/
2022-12-02T14:42:23.932+0000    3 document(s) imported successfully. 0 document(s) failed to import.
#
```

```
  {
    _id: ObjectId("638a0ecfecbf380e4d3fafc3"),
    title: 'Hass lo guys, very funny',
    image: 'https://www.google.com/url?sa=i&url=https%3A%2F%2Fknowyourmeme.com%2Fmemes%2Fwalter-white-breaks-down&psig=A
OvVaw3-rrXAvEUTQclpJMPUNmWy&ust=1670075371754000&source=images&cd=vfe&ved=0CA0QjRxqFwoTCNDptOaJ2_sCFQAAAAAdAAAAABAD',
    votes: 2234,
    posted_by: 'kunaljx86'
  },
  {
    _id: ObjectId("638a0ecfecbf380e4d3fafc4"),
    title: 'No idea',
    text: 'What is this post even',
    votes: 3234,
    posted_by: 'lca_tejas'
  },
  {
    _id: ObjectId("638a0ecfecbf380e4d3fafc5"),
    title: 'bruh!',
    image: 'bruh sound effect (x100)',
    votes: 22342,
    posted_by: 'meetp90'
  }
```

Exporting as json

```
# mongoexport --db reddit --collection posts --out ./posts_db.json --authenticationDatabase admin -u root -p pass@123
2022-12-02T14:46:53.394+0000    connected to: mongodb://localhost/
2022-12-02T14:46:53.402+0000    exported 8 records
```

```
# cat posts_db.json
{"_id":{"$oid":"6389fde4880a8e67b5db4a3b"},"title":"Funny Meme","image":"https://wikipedia.com/troll_face","votes":123,"
posted_by":"lca_tejas"}
{"_id":{"$oid":"6389ff86880a8e67b5db4a3d"},"title":"Jharkhand is not real","text":"Jharkhand is not real guys. It is a p
ropoganda tool","votes":3321,"posted_by":"lca_tejas"}
{"_id":{"$oid":"6389ff86880a8e67b5db4a3e"},"title":"Emojis bad","text":"Emojis bad, please laugh","votes":1212,"posted_b
y":"meetp90"}
{"_id":{"$oid":"638a0009880a8e67b5db4a3f"},"title":"Soggy cat","image":"https://preview.redd.it/cxjsjx27g7j81.jpg?auto=w
ebp&s=d09b1a5e785562455e3661a186087e398c0546d0","votes":33213,"posted_by":"lca_tejas"}
{"_id":{"$oid":"638a0009880a8e67b5db4a40"},"title":"We did it","text":"We did it reddit! We broke the stock markets arou
nd the world and dilluted all the world currency!","votes":12134,"posted_by":"meetp90"}
{"_id":{"$oid":"638a0ecfecbf380e4d3fafc3"},"title":"Hass lo guys, very funny","image":"https://www.google.com/url?sa=i&u
rl=https%3A%2F%2Fknowyourmeme.com%2Fmemes%2Fwalter-white-breaks-down&psig=AOvVaw3-rrXAvEUTQclpJMPUNmWy&ust=1670075371754
000&source=images&cd=vfe&ved=0CA0QjRxqFwoTCNDptOaJ2_sCFQAAAAAdAAAAABAD","votes":2234,"posted_by":"kunaljx86"}
{"_id":{"$oid":"638a0ecfecbf380e4d3fafc4"},"title":"No idea","text":"What is this post even","votes":3234,"posted_by":"l
ca_tejas"}
{"_id":{"$oid":"638a0ecfecbf380e4d3fafc5"},"title":"bruh!","image":"bruh sound effect (x100)","votes":22342,"posted_by":
"meetp90"}
```

Conclusion:

Thus, we successfully implemented data handling using JSON.

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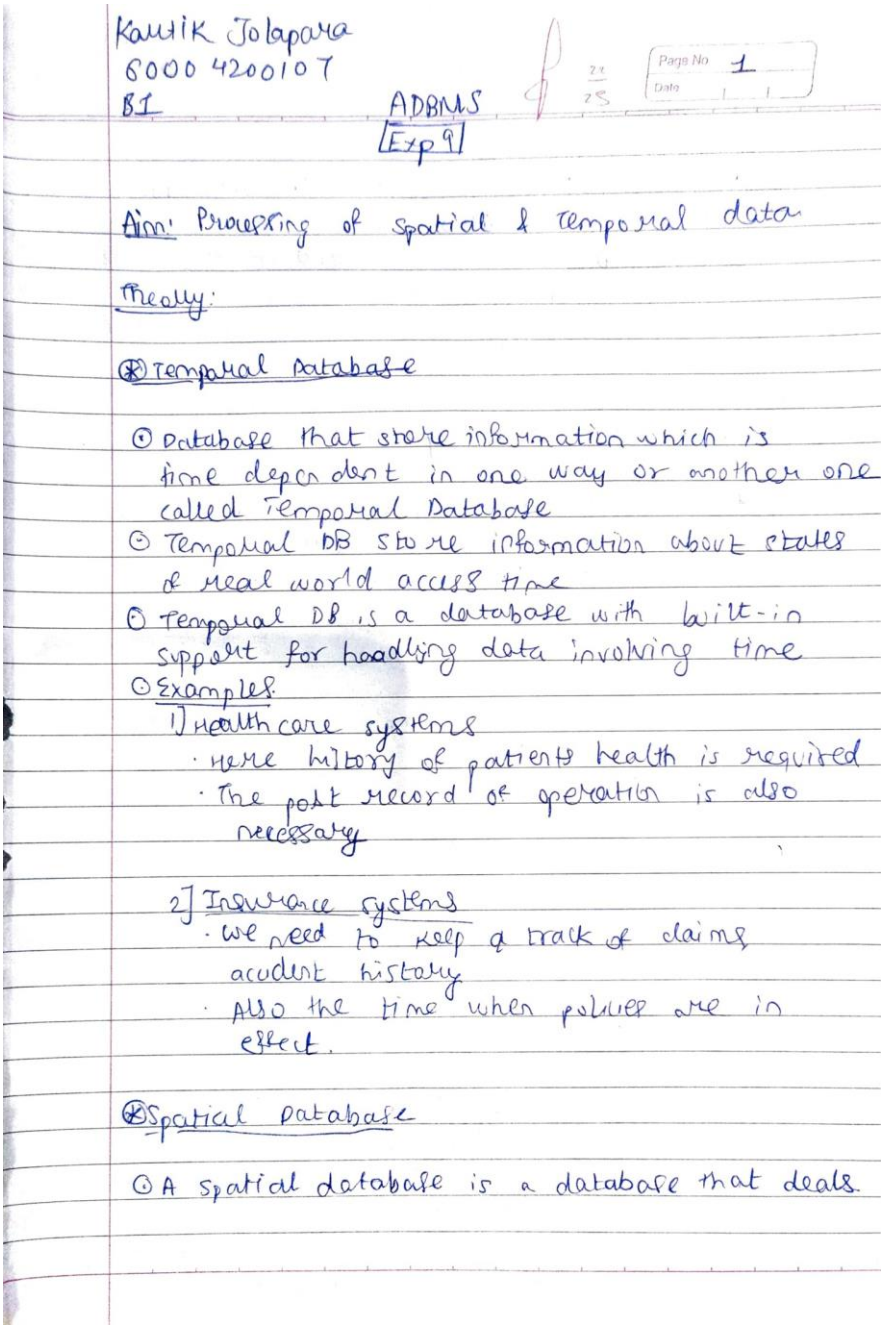
ADBMS
Exp9

Aim: Processing of Spatial and Temporal data

Theory:



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Aim: Processing of spatial & temporal data

Theory:

Temporal Database

- Database that store information which is time dependent in one way or another one called Temporal Database
- Temporal DB store information about states of real world across time
- Temporal DB is a database with built-in support for handling data involving time
- Examples:
  1] Health care systems
  - Here history of patients health is required
  - The past record of operation is also necessary

  2] Insurance systems
  - We need to keep a track of claims accident history
  - Also the time when policies are in effect.

Spatial Database

- A spatial database is a database that deals

with information associated with geographical locations such as cities, towns etc

- A Spatial Database is optimized to store & query data representing objects
- These are the objects which are defined in a geometric space
- Spatial data is majorly of 3 types.
  - Vector data :- data represented as discrete pts, lines & polygon
  - Raster data :- Data represented as matrix of square cells.
  - Image data :- Data typically form of images.

Conclusion

This, we studied & implemented spatial & temporal data

Queries:

Temporal:

```
mysql> select * from 2022_july where start_time < "04:00:00";
+------------+------------+----------+----------------------+------------+-------------------------------+
| start_date | start_time | distance | mode                 | confidence | Places                        |
+------------+------------+----------+----------------------+------------+-------------------------------+
| 02-07-2022 |            |    18716 | IN_PASSENGER_VEHICLE | MEDIUM     |                               |
| 06-07-2022 | 03:23:42   |     1669 | MOTORCYCLING         | LOW        |                               |
| 06-07-2022 | 03:35:46   |    11483 | IN_TRAIN             | LOW        |                               |
| 06-07-2022 | 03:58:13   |     1069 | MOTORCYCLING         | MEDIUM     |                               |
| 08-07-2022 | 03:11:39   |      461 | MOTORCYCLING         | LOW        |                               |
| 08-07-2022 | 03:26:15   |     1099 | IN_PASSENGER_VEHICLE | LOW        |                               |
| 08-07-2022 | 03:42:42   |     7548 | IN_TRAIN             | MEDIUM     | Anhad Misal                   |
| 11-07-2022 | 03:48:22   |     1609 | IN_BUS               | MEDIUM     | Kandivali Bus Station (W)     |
| 13-07-2022 | 03:19:59   |      905 | WALKING              | LOW        |                               |
| 13-07-2022 | 03:48:02   |     1896 | IN_BUS               | LOW        | Kandivali Railway Station (W) |
| 14-07-2022 | 03:54:54   |     8949 | IN_BUS               | HIGH       |                               |
| 15-07-2022 | 03:48:49   |     8500 | IN_PASSENGER_VEHICLE | LOW        |                               |
| 16-07-2022 | 03:44:35   |     9838 | IN_BUS               | MEDIUM     | Laxmi Industrial Colony       |
| 18-07-2022 | 03:51:31   |     1292 | IN_BUS               | LOW        |                               |
| 18-07-2022 | 03:57:47   |     9400 | IN_BUS               | LOW        | Anhad Misal                   |
| 19-07-2022 | 03:54:30   |    10085 | IN_BUS               | MEDIUM     | Lotus Business Park           |
| 20-07-2022 | 03:32:29   |     1721 | IN_BUS               | MEDIUM     | Bajaj Municipal School        |
| 20-07-2022 | 03:47:40   |     9487 | IN_TRAIN             | MEDIUM     | Andheri Police Station        |
| 21-07-2022 | 03:46:02   |     8698 | UNKNOWN_ACTIVITY_TYPE | LOW       | Sun-n-Sand Hotel              |
| 23-07-2022 | 03:45:05   |    11590 | IN_PASSENGER_VEHICLE | LOW        |                               |
| 25-07-2022 | 03:34:52   |    10629 | IN_BUS               | MEDIUM     | Doolally Taproom - Andheri    |
| 26-07-2022 | 03:52:48   |    10072 | IN_BUS               | MEDIUM     | Doolally Taproom - Andheri    |
| 27-07-2022 | 03:48:55   |     9483 | IN_BUS               | LOW        | Doolally Taproom - Andheri    |
| 28-07-2022 | 03:29:48   |     9599 | IN_BUS               | MEDIUM     | RikÄ? - Terrace Bar & Grill   |
| 29-07-2022 | 03:31:35   |     1948 | MOTORCYCLING         | LOW        | Kandivali Bus Station (W)     |
| 29-07-2022 | 03:47:34   |     9579 | IN_TRAIN             | MEDIUM     |                               |
+------------+------------+----------+----------------------+------------+-------------------------------+
26 rows in set (0.00 sec)
```

Spatial:

```
mysql> select * from 2022_july where distance>10000;
+------------+------------+----------+----------------------+------------+-----------------------------+
| start_date | start_time | distance | mode                 | confidence | Places                      |
+------------+------------+----------+----------------------+------------+-----------------------------+
| 02-07-2022 |            |    18716 | IN_PASSENGER_VEHICLE | MEDIUM     |                             |
| 06-07-2022 | 03:35:46   |    11483 | IN_TRAIN             | LOW        |                             |
| 13-07-2022 | 13:44:17   |    11855 | IN_TRAIN             | LOW        | Kandivali Station (W)       |
| 19-07-2022 | 03:54:30   |    10085 | IN_BUS               | MEDIUM     | Lotus Business Park         |
| 21-07-2022 | 18:59:35   |    41236 | UNKNOWN_ACTIVITY_TYPE | LOW       | Jay's Dosa & Paratha Center |
| 23-07-2022 | 03:45:05   |    11590 | IN_PASSENGER_VEHICLE | LOW        |                             |
| 24-07-2022 | 06:56:09   |    10674 | MOTORCYCLING         | LOW        | Axis Bank ATM               |
| 25-07-2022 | 03:34:52   |    10629 | IN_BUS               | MEDIUM     | Doolally Taproom - Andheri  |
| 26-07-2022 | 03:52:48   |    10072 | IN_BUS               | MEDIUM     | Doolally Taproom - Andheri  |
+------------+------------+----------+----------------------+------------+-----------------------------+
9 rows in set (0.03 sec)
```

```
mysql> select * from 2022_july where Places="Doolally Taproom - Andheri";
+------------+------------+----------+--------+------------+-----------------------------+
| start_date | start_time | distance | mode   | confidence | Places                      |
+------------+------------+----------+--------+------------+-----------------------------+
| 25-07-2022 | 03:34:52   |    10629 | IN_BUS | MEDIUM     | Doolally Taproom - Andheri  |
| 26-07-2022 | 03:52:48   |    10072 | IN_BUS | MEDIUM     | Doolally Taproom - Andheri  |
| 27-07-2022 | 03:48:55   |     9483 | IN_BUS | LOW        | Doolally Taproom - Andheri  |
+------------+------------+----------+--------+------------+-----------------------------+
3 rows in set (0.00 sec)
```

Data:

```
mysql> select * from 2022_july;
+------------+------------+----------+----------------------+------------+-----------------------------------------------------+
| start_date | start_time | distance | mode                 | confidence | Places                                              |
+------------+------------+----------+----------------------+------------+-----------------------------------------------------+
| 02-07-2022 |            |    18716 | IN_PASSENGER_VEHICLE | MEDIUM     |                                                     |
| 06-07-2022 | 03:23:42   |     1669 | MOTORCYCLING         | LOW        |                                                     |
| 06-07-2022 | 03:35:46   |    11483 | IN_TRAIN             | LOW        |                                                     |
| 06-07-2022 | 03:58:13   |     1069 | MOTORCYCLING         | MEDIUM     |                                                     |
| 08-07-2022 | 03:11:39   |      461 | MOTORCYCLING         | LOW        |                                                     |
| 08-07-2022 | 03:26:15   |     1099 | IN_PASSENGER_VEHICLE | LOW        |                                                     |
| 08-07-2022 | 03:42:42   |     7548 | IN_TRAIN             | MEDIUM     | Anhad Misal                                         |
| 11-07-2022 | 03:48:22   |     1609 | IN_BUS               | MEDIUM     | Kandivali Bus Station (W)                           |
| 11-07-2022 | 04:11:17   |     9363 | IN_TRAIN             | MEDIUM     | Agarkar Chowk                                       |
| 11-07-2022 | 04:39:15   |     2125 | IN_SUBWAY            | LOW        | SAMMOHI BY MOKSHA & HIRAL                           |
| 11-07-2022 | 04:48:18   |      896 | IN_PASSENGER_VEHICLE | LOW        | Trumpet Sky Lounge                                  |
| 11-07-2022 | 12:22:26   |     2972 | IN_PASSENGER_VEHICLE | LOW        | McDonald's                                          |
| 11-07-2022 | 12:48:32   |     9467 | IN_TRAIN             | MEDIUM     | Kandivali Bus Depot                                 |
| 11-07-2022 | 13:10:00   |     2203 | IN_PASSENGER_VEHICLE | LOW        | State Bank of India                                 |
| 13-07-2022 | 03:19:59   |      905 | WALKING              | LOW        |                                                     |
| 13-07-2022 | 03:48:02   |     1896 | IN_BUS               | LOW        | Kandivali Railway Station (W)                       |
| 13-07-2022 | 04:04:12   |     9348 | IN_TRAIN             | MEDIUM     | Agarkar Chowk / Pinky Cinema                        |
| 13-07-2022 | 04:33:49   |     3270 | IN_PASSENGER_VEHICLE | LOW        | Lotus Business Park                                 |
| 13-07-2022 | 13:06:26   |     5297 | IN_BUS               | LOW        | Villa Decor - Premium Bed, Bath & Mattresses Store  |
| 13-07-2022 | 13:44:17   |    11855 | IN_TRAIN             | LOW        | Kandivali Station (W)                               |
| 13-07-2022 | 14:15:27   |     1969 | IN_PASSENGER_VEHICLE | MEDIUM     | State Bank of India                                 |
| 14-07-2022 | 03:54:54   |     8949 | IN_BUS               | HIGH       |                                                     |
| 14-07-2022 | 04:39:02   |      578 | WALKING              | MEDIUM     | UK Realty                                           |
| 14-07-2022 | 14:12:01   |     6005 | IN_BUS               | LOW        | Yoko Sizzlers                                       |
| 14-07-2022 | 14:58:50   |     4087 | UNKNOWN_ACTIVITY_TYPE | LOW        | Xth Central Mall                                    |
| 15-07-2022 | 03:48:49   |     8500 | IN_PASSENGER_VEHICLE | LOW        |                                                     |
| 15-07-2022 | 04:41:11   |     9105 | IN_BUS               | LOW        | RikÃ? - Terrace Bar & Grill                         |
| 15-07-2022 | 14:15:09   |     5691 | IN_BUS               | MEDIUM     | D Mart                                              |
| 15-07-2022 | 15:08:26   |     4933 | IN_BUS               | MEDIUM     | La Pino'z Pizza Kandivali                           |
| 16-07-2022 | 03:44:35   |     9838 | IN_BUS               | MEDIUM     | Laxmi Industrial Colony                             |
| 16-07-2022 | 13:08:07   |     2965 | MOTORCYCLING         | LOW        | Andheri Station (W)                                 |
| 16-07-2022 | 13:32:44   |     9292 | IN_TRAIN             | MEDIUM     | Kandivali West                                      |
| 16-07-2022 | 13:53:02   |     2074 | IN_PASSENGER_VEHICLE | LOW        | La Pino'z Pizza Kandivali                           |
| 17-07-2022 | 08:38:08   |      880 | MOTORCYCLING         | LOW        | Malad Industrial Estate                             |
| 17-07-2022 | 10:23:08   |     1492 | IN_PASSENGER_VEHICLE | LOW        | Aadhar Center                                       |
| 17-07-2022 | 10:57:46   |     1294 | MOTORCYCLING         | MEDIUM     | La Pino'z Pizza Kandivali                           |
| 17-07-2022 | 11:38:53   |     5829 | MOTORCYCLING         | LOW        | State Bank Of India ATM                             |
| 18-07-2022 | 03:51:31   |     1292 | IN_BUS               | LOW        |                                                     |
| 18-07-2022 | 03:57:47   |     9400 | IN_BUS               | LOW        | Anhad Misal                                         |
```

Conclusion:

We successfully implemented spatial and temporal queries to make the database more efficient for the user.

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Aim: Case study on Database security issue and patents related to it.

Patent: US. 11263335B2 United States
Inventor: Rajesh Krish Nageswara Pathasarathy
Title: Integrated system and method for sensitive data security
Publication year: 2019

Abstract: A system and a method are provided for integrating a sensitive data discovery engine, a data anonymization engine, a data monitoring module and a data retirement module and managing sensitive data security its lifecycle. The system generates and distributes one or more templates including the sensitive data discovery intelligence with metadata discovery results, and data security rules to the DAE, the DMM and the DRM developed on error data sources.

Claims Exploration: A system for interesting and managing security of sensitive data comprises of computer program instructions defined by modules of an integrated platform to run and execute one or more applications. A system for integrating and managing security of sensitive data this includes a sensitive data discovering engine that determines sensitive

data using match operations in a scanning pathway on data in each of plurality of similarity and variety of data sources and application.

Conclusion:

After performing a detailed analysis on sensitive data security and its solutions by using integrated system, the issue and claims mentioned in patent were learned and explained

Reference:

Rajesh, KP (2019). Integrated system and method for sensitive data security US11263335B2 United States.