Shri Vile Parle Kelavani Mandal's
DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING
(Autonomous College Affiliated to the University of Mumbai)
NAAC Accredited with "A" Grade (CGPA : 3.18)

ADBMS LAB WORK

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EXPERIMENT 2

Aim: Run 10 MySQL Queries

DATABASE SCHEMA:

```
/*==============================================================*/
/* Table: Customer                                              */
/*==============================================================*/
create table Customer (
   Id                int                not null,
   FirstName         varchar(40)        not null,
   LastName          varchar(40)        not null,
   City              varchar(40)        null,
   Country           varchar(40)        null,
   Phone             varchar(20)        null,
   constraint PK_CUSTOMER primary key (Id)
)
;

/*==============================================================*/
/* Index: IndexCustomerName                                     */
/*==============================================================*/
create index IndexCustomerName on Customer (
LastName ASC,
FirstName ASC
)
;

/*==============================================================*/
/* Table: ShopOrder                                             */
/*==============================================================*/
create table ShopOrder (
   Id                int                not null,
   OrderDate         datetime           not null,
   OrderNumber       varchar(10)        null,
   CustomerId        int                not null,
   TotalAmount       decimal(12,2)      null default 0,
   constraint PK_ORDER primary key (Id)
)
;

/*==============================================================*/
```

```
/* Index: IndexOrderCustomerId                          */
/*==============================================================*/
create index IndexOrderCustomerId on ShopOrder (
CustomerId ASC
)
;

/*==============================================================*/
/* Index: IndexOrderOrderDate                           */
/*==============================================================*/
create index IndexOrderOrderDate on ShopOrder (
OrderDate ASC
)
;

/*==============================================================*/
/* Table: OrderItem                                     */
/*==============================================================*/
create table OrderItem (
   Id                int                not null,
   OrderId           int                not null,
   ProductId         int                not null,
   UnitPrice         decimal(12,2)      not null default 0,
   Quantity          int                not null default 1,
   constraint PK_ORDERITEM primary key (Id)
)
;

/*==============================================================*/
/* Index: IndexOrderItemOrderId                         */
/*==============================================================*/
create index IndexOrderItemOrderId on OrderItem (
OrderId ASC
)
;

/*==============================================================*/
/* Index: IndexOrderItemProductId                       */
/*==============================================================*/
create index IndexOrderItemProductId on OrderItem (
ProductId ASC
)
;

/*==============================================================*/
```

```
/* Table: Product                                */
/*==============================================================*/
create table Product (
   Id                int                not null,
   ProductName       varchar(50)        not null,
   SupplierId        int                not null,
   UnitPrice         decimal(12,2)      null default 0,
   Package           varchar(30)        null,
   IsDiscontinued    bit                not null default 0,
   constraint PK_PRODUCT primary key (Id)
)
;

/*==============================================================*/
/* Index: IndexProductSupplierId                                */
/*==============================================================*/
create index IndexProductSupplierId on Product (
SupplierId ASC
)
;

/*==============================================================*/
/* Index: IndexProductName                                      */
/*==============================================================*/
create index IndexProductName on Product (
ProductName ASC
)
;

/*==============================================================*/
/* Table: Supplier                                              */
/*==============================================================*/
create table Supplier (
   Id                int                not null,
   CompanyName       varchar(40)        not null,
   ContactName       varchar(50)        null,
   ContactTitle      varchar(40)        null,
   City              varchar(40)        null,
   Country           varchar(40)        null,
   Phone             varchar(30)        null,
   Fax               varchar(30)        null,
   constraint PK_SUPPLIER primary key (Id)
)
;
```

```
/*==============================================================*/
/* Index: IndexSupplierName                                     */
/*==============================================================*/
create index IndexSupplierName on Supplier (
CompanyName ASC
)
;

/*==============================================================*/
/* Index: IndexSupplierCountry                                  */
/*==============================================================*/
create index IndexSupplierCountry on Supplier (
Country ASC
)
;

alter table ShopOrder
  add constraint FK_ORDER_REFERENCE_CUSTOMER foreign key (CustomerId)
    references Customer (Id)
;

alter table OrderItem
  add constraint FK_ORDERITE_REFERENCE_ORDER foreign key (OrderId)
    references ShopOrder (Id)
;

alter table OrderItem
  add constraint FK_ORDERITE_REFERENCE_PRODUCT foreign key (ProductId)
    references Product (Id)
;

alter table Product
  add constraint FK_PRODUCT_REFERENCE_SUPPLIER foreign key (SupplierId)
    references Supplier (Id)
;
```

QUERIES:

```
SELECT * FROM agents;
```

Purpose: This is used to give details of all agents of the company.

```
A007|Ramasundar|Bangalore|0.15|077-25814763|
A003|Alex |London|0.13|075-12458969|
A008|Alford|New York|0.12|044-25874365|
A011|Ravi Kumar|Bangalore|0.15|077-45625874|
```

```
A010|Santakumar|Chennai|0.14|007-22388644|
A012|Lucida|San Jose|0.12|044-52981425|
A005|Anderson|Brisban|0.13|045-21447739|
A001|Subbarao|Bangalore|0.14|077-12346674|
A002|Mukesh|Mumbai|0.11|029-12358964|
A006|McDen|London|0.15|078-22255588|
A004|Ivan|Torento|0.15|008-22544166|
A009|Benjamin|Hampshair|0.11|008-22536178|
```

```
SELECT * FROM customer;
```

Purpose: This is used to give details of all the customers of the company/

```
C00013|Holmes|London|London|UK|2|6000|5000|7000|4000|BBBBBBB|A003
C00001|Micheal|New York|New York|USA|2|3000|5000|2000|6000|CCCCCCC|A008
C00020|Albert|New York|New York|USA|3|5000|7000|6000|6000|BBBBSBB|A008
C00025|Ravindran|Bangalore|Bangalore|India|2|5000|7000|4000|8000|AVAVAVA|A011
C00024|Cook|London|London|UK|2|4000|9000|7000|6000|FSDDSDF|A006
C00015|Stuart|London|London|UK|1|6000|8000|3000|11000|GFSGERS|A003
C00002|Bolt|New York|New York|USA|3|5000|7000|9000|3000|DDNRDRH|A008
C00018|Fleming|Brisban|Brisban|Australia|2|7000|7000|9000|5000|NHBGVFC|A005
C00021|Jacks|Brisban|Brisban|Australia|1|7000|7000|7000|7000|WERTGDF|A005
C00019|Yearannaidu|Chennai|Chennai|India|1|8000|7000|7000|8000|ZZZZBFV|A010
C00005|Sasikant|Mumbai|Mumbai|India|1|7000|11000|7000|11000|147-25896312|A002
C00007|Ramanathan|Chennai|Chennai|India|1|7000|11000|9000|9000|GHRDWSD|A010
C00022|Avinash|Mumbai|Mumbai|India|2|7000|11000|9000|9000|113-12345678|A002
C00004|Winston|Brisban|Brisban|Australia|1|5000|8000|7000|6000|AAAAAAA|A005
C00023|Karl|London|London|UK|0|4000|6000|7000|3000|AAAABAA|A006
C00006|Shilton|Torento|Torento|Canada|1|10000|7000|6000|11000|DDDDDDD|A004
C00010|Charles|Hampshair|Hampshair|UK|3|6000|4000|5000|5000|MMMMMMM|A009
C00017|Srinivas|Bangalore|Bangalore|India|2|8000|4000|3000|9000|AAAAAAB|A007
C00012|Steven|San Jose|San Jose|USA|1|5000|7000|9000|3000|KRFYGJK|A012
C00008|Karolina|Torento|Torento|Canada|1|7000|7000|9000|5000|HJKORED|A004
C00003|Martin|Torento|Torento|Canada|2|8000|7000|7000|8000|MJYURFD|A004
C00009|Ramesh|Mumbai|Mumbai|India|3|8000|7000|3000|12000|Phone No|A002
C00014|Rangarappa|Bangalore|Bangalore|India|2|8000|11000|7000|12000|AAAATGF|A001
C00016|Venkatpati|Bangalore|Bangalore|India|2|8000|11000|7000|12000|JRTVFDD|A007
C00011|Sundariya|Chennai|Chennai|India|3|7000|11000|7000|11000|PPHGRTS|A010
```

```
SELECT * FROM orders;
```

Purpose: This is used to give details of all the orders of the company

```
200100|1000|600|2008-08-01|C00013|A003|SOD
200110|3000|500|2008-04-15|C00019|A010|SOD
200107|4500|900|2008-08-30|C00007|A010|SOD
200112|2000|400|2008-05-30|C00016|A007|SOD
200113|4000|600|-2008-06-10|C00022|A002|SOD
200102|2000|300|-2008-05-25|C00012|A012|SOD
200114|3500|2000|-2008-08-15|C00002|A008|SOD
200122|2500|400|2008-09-16|C00003|A004|SOD
200118|500|100|2008-07-20|C00023|A006|SOD
200119|4000|700|2008-09-16|C00007|A010|SOD
200121|1500|600|2008-09-23|C00008|A004|SOD
200130|2500|400|2008-07-30|C00025|A011|SOD
200134|4200|1800|2008-09-25|C00004|A005|SOD
200108|4000|600|2008-02-15|C00008|A004|SOD
200103|1500|700|2008-05-15|C00021|A005|SOD
200105|2500|500|2008-07-18|C00025|A011|SOD
200109|3500|800|2008-07-30|C00011|A010|SOD
200101|3000|1000|2008-07-15|C00001|A008|SOD
200111|1000|300|2008-07-10|C00020|A008|SOD
200104|1500|500|2008-03-13|C00006|A004|SOD
200106|2500|700|2008-04-20|C00005|A002|SOD
200125|2000|600|2008-10-10|C00018|A005|SOD
200117|800|200|2008-10-20|C00014|A001|SOD
200123|500|100|2008-09-16|C00022|A002|SOD
200120|500|100|2008-07-20|C00009|A002|SOD
200116|500|100|2008-07-13|C00010|A009|SOD
200124|500|100|2008-06-20|C00017|A007|SOD
200126|500|100|2008-06-24|C00022|A002|SOD
200129|2500|500|2008-07-20|C00024|A006|SOD
200127|2500|400|2008-07-20|C00015|A003|SOD
200128|3500|1500|2008-07-20|C00009|A002|SOD
200135|2000|800|2008-09-16|C00007|A010|SOD
200131|900|150|2008-08-26|C00012|A012|SOD
200133|1200|400|2008-06-29|C00009|A002|SOD
```

```
SELECT * FROM orders WHERE CUST_CODE="C00022";
```

Purpose: This is used to give details of all the orders belonging to a customer whose CUST_CODE is C00022

```
200113|4000|600|2008-06-10|C00022|A002|SOD
200123|500|100|2008-09-16|C00022|A002|SOD
200126|500|100|2008-06-24|C00022|A002|SOD
```

```
SELECT * FROM orders WHERE AGENT_CODE = 'A002';
```

Purpose: This is used to give details of all orders of agent with AGENT_CODE = A002

```
200113|4000|600|-2008-06-10|C00022|A002|SOD
200106|2500|700|2008-04-20|C00005|A002|SOD
200123|500|100|2008-09-16|C00022|A002|SOD
200120|500|100|2008-07-20|C00009|A002|SOD
200126|500|100|2008-06-24|C00022|A002|SOD
200128|3500|1500|2008-07-20|C00009|A002|SOD
200133|1200|400|2008-06-29|C00009|A002|SOD
```

```
SELECT * FROM orders WHERE ORD_DATE='2008-07-13';
```

Purpose: This is used to give details of all orders that took place on 13th July 2008

```
200113|4000|600|2008-06-10|C00022|A002|SOD
200106|2500|700|2008-04-20|C00005|A002|SOD
200123|500|100|2008-09-16|C00022|A002|SOD
200120|500|100|2008-07-20|C00009|A002|SOD
200126|500|100|2008-06-24|C00022|A002|SOD
200128|3500|1500|2008-07-20|C00009|A002|SOD
200133|1200|400|2008-06-29|C00009|A002|SOD
```

```
SELECT * FROM agents WHERE WORKING_AREA='London';
```

Purpose: This is used to show details of all agents working in London

```
A003|Alex |London|0.13|075-12458969|
A006|McDen|London|0.15|078-22255588|
```

```
SELECT * FROM agents order by COMMISSION ASC;
```

Purpose: This is used to show details of all agents arranged in ascending order of their commission. Can be used during audits or performance discussion meetings.

```
A002|Mukesh|Mumbai|0.11|029-12358964|
A009|Benjamin|Hampshair|0.11|008-22536178|
A008|Alford|New York|0.12|044-25874365|
A012|Lucida|San Jose|0.12|044-52981425|
A003|Alex |London|0.13|075-12458969|
A005|Anderson|Brisban|0.13|045-21447739|
A010|Santakumar|Chennai|0.14|007-22388644|
```

```
A001|Subbarao|Bangalore|0.14|077-12346674|
A007|Ramasundar|Bangalore|0.15|077-25814763|
A011|Ravi Kumar|Bangalore|0.15|077-45625874|
A006|McDen|London|0.15|078-22255588|
A004|Ivan|Torento|0.15|008-22544166|
```

```
SELECT AVG(OUTSTANDING_AMT) FROM customer WHERE OUTSTANDING_AMT>5000;
```

Purpose: This is used to show the average outstanding amount of all customers filtered by a range greater than 5000

```
9000.0
```

```
SELECT CUST_CODE, CUST_NAME, CUST_COUNTRY, MAX(OUTSTANDING_AMT) FROM customer;
```

Purpose: This is used to show details of that customer who has the maximum outstanding amount.

```
C00009|Ramesh|India|12000
```

```
SELECT * FROM customer GROUP  BY AGENT_CODE ORDER  BY COUNT(*) DESC;
```

Purpose: This shows details of all customers grouped by AGENT_CODE ordered in descending order.

```
C00009|Ramesh|Mumbai|Mumbai|India|3|8000|7000|3000|12000|Phone No|A002
C00003|Martin|Torento|Torento|Canada|2|8000|7000|7000|8000|MJYURFD|A004
C00004|Winston|Brisban|Brisban|Australia|1|5000|8000|7000|6000|AAAAAAA|A005
C00002|Bolt|New York|New York|USA|3|5000|7000|9000|3000|DDNRDRH|A008
C00011|Sundariya|Chennai|Chennai|India|3|7000|11000|7000|11000|PPHGRTS|A010
C00015|Stuart|London|London|UK|1|6000|8000|3000|11000|GFSGERS|A003
C00023|Karl|London|London|UK|0|4000|6000|7000|3000|AAAABAA|A006
C00016|Venkatpati|Bangalore|Bangalore|India|2|8000|11000|7000|12000|JRTVFDD|A007
C00014|Rangarappa|Bangalore|Bangalore|India|2|8000|11000|7000|12000|AAAATGF|A001
C00010|Charles|Hampshair|Hampshair|UK|3|6000|4000|5000|5000|MMMMMMM|A009
C00025|Ravindran|Bangalore|Bangalore|India|2|5000|7000|4000|8000|AVAVAVA|A011
C00012|Steven|San Jose|San Jose|USA|1|5000|7000|9000|3000|KRFYGJK|A012
```

```
SELECT * FROM customer where CUST_CODE IN (SELECT CUST_CODE FROM orders
WHERE ORD_AMOUNT>4000);
```

Purpose: This is a nested query. It shows details of all customers whose order amount is greater than 4000

```
C00004|Winston|Brisban|Brisban|Australia|1|5000|8000|7000|6000|AAAAAAA|A005
C00007|Ramanathan|Chennai|Chennai|India|1|7000|11000|9000|9000|GHRDWSD|A010
```

```
SELECT customer.CUST_NAME, orders.ORD_AMOUNT, orders.ORD_DATE from orders
INNER JOIN customer on orders.CUST_CODE=customer.CUST_CODE;
```

Purpose: This query does an inner join of the Customer table and the order table.

```
Holmes|1000|2008-08-01
Yearannaidu|3000|2008-04-15
Ramanathan|4500|2008-08-30
Venkatpati|2000|2008-05-30
Avinash|4000|-2008-06-10
Steven|2000|-2008-05-25
Bolt|3500|-2008-08-15
Martin|2500|2008-09-16
Karl|500|2008-07-20
Ramanathan|4000|2008-09-16
Karolina|1500|2008-09-23
Ravindran|2500|2008-07-30
Winston|4200|2008-09-25
Karolina|4000|2008-02-15
Jacks|1500|2008-05-15
Ravindran|2500|2008-07-18
Sundariya|3500|2008-07-30
Micheal|3000|2008-07-15
Albert|1000|2008-07-10
Shilton|1500|2008-03-13
Sasikant|2500|2008-04-20
Fleming|2000|2008-10-10
Rangarappa|800|2008-10-20
Avinash|500|2008-09-16
Ramesh|500|2008-07-20
Charles|500|2008-07-13
Srinivas|500|2008-06-20
Avinash|500|2008-06-24
Cook|2500|2008-07-20
Stuart|2500|2008-07-20
```

```
Ramesh|3500|2008-07-20
Ramanathan|2000|2008-09-16
Steven|900|2008-08-26
Ramesh|1200|2008-06-29
```

EXPERIMENT 3

INDEXING

A database index is a data structure that improves the speed of operations in a table. Indexes can be created using one or more columns, providing the basis for both rapid random lookups and efficient ordering of access to records.

While creating an index, it should be taken into consideration which all columns will be used to make SQL queries and create one or more indexes on those columns.

Practically, indexes are also a type of tables, which keep the primary key or index field and a pointer to each record into the actual table.

The users cannot see the indexes, they are just used to speed up queries and will be used by the Database Search Engine to locate records very fast.

The INSERT and UPDATE statements take more time on tables having indexes, whereas the SELECT statements become fast on those tables. The reason is that while doing insert or update, a database needs to insert or update the index values as well.

By default, MySQL allows index type **BTREE** if we have not specified the type of index. The following table shows the different types of an index based on the storage engine of the table.

SYNTAX:

CREATE INDEX [index_name] **ON** [table_name] (**column** names)

CODE:

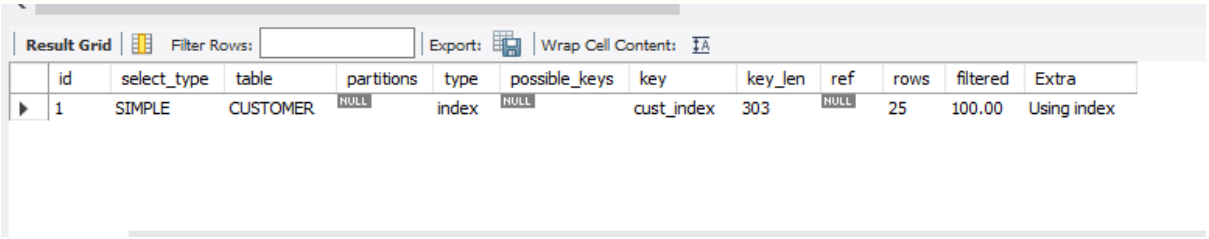
```
CREATE INDEX cust_index ON CUSTOMER (CUST_NAME, CUST_CITY);
```

```
SHOW INDEXES FROM CUSTOMER;
```

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

Table	Non_unique	Key_name	Seq_in_index	Column_name	Collation	Cardinality	Sub_part	Packed	Null	Index_type	Comment	Index_comment	Visible	Expr
customer	0	PRIMARY	1	CUST_CODE	A	25	NULL	NULL		BTREE			YES	NULL
customer	1	cust_index	1	CUST_NAME	A	25	NULL	NULL		BTREE			YES	NULL
customer	1	cust_index	2	CUST_CITY	A	25	NULL	NULL	YES	BTREE			YES	NULL

```
EXPLAIN SELECT CUST_NAME FROM CUSTOMER;
```



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

id	select_type	table	partitions	type	possible_keys	key	key_len	ref	rows	filtered	Extra
1	SIMPLE	CUSTOMER	NULL	index	NULL	cust_index	303	NULL	25	100.00	Using index

EXPERIMENT 4

PARTITIONING

THEORY:
Partitioning in MySQL is used to split or partition the rows of a table into separate tables in different locations, but still, it is treated as a single table. It distributes the portions of the table's data across a file system based on the rules we have set as our requirement. The rule that we have set to accomplish the division of table data is called a partitioning function (modulus, a linear or internal hashing function, etc.). The selected function is based on the partitioning type we have specified and takes a user-supplied expression as its parameter. The user- expression can be a column value or a function acting on column values, depending on the type of partitioning used.

MySQL has mainly two forms of partitioning:

1. Horizontal Partitioning

This partitioning split the rows of a table into multiple tables based on our logic. In horizontal partitioning, the number of columns is the same in each table, but no need to keep the same number of rows. It physically divides the table but logically treated as a whole. Currently, MySQL supports this partitioning only.

2. Vertical Partitioning

This partitioning splits the table into multiple tables with fewer columns from the original table. It uses an additional table to store the remaining columns. Currently, MySQL does not provide supports for this partitioning.

Benefits of Partitioning

The following are the benefits of partitioning in MySQL:

- It optimizes the query performance. When we query on the table, it scans only the portion of a table that will satisfy the particular statement.
- It is possible to store extensive data in one table that can be held on a single disk or file system partition.
- It provides more control to manage the data in your database.

How can we partition the table in MySQL?

We can create a partition in MySQL using the CREATE TABLE or ALTER TABLE statement. Below is the syntax of creating partition using CREATE TABLE command:

```
CREATE TABLE [IF NOT EXISTS] table_name
(column_definitions)
[table_options]
[partition_options]
```

The below is the syntax of creating partition using ALTER TABLE command:

```
ALTER TABLE [IF EXISTS] tab_name
(colm_definitions)
[tab_options]
[partition_options]
```

Types of MySQL Partitioning

MySQL has mainly six types of partitioning, which are given below:

- RANGE Partitioning
- LIST Partitioning
- COLUMNS Partitioning
- HASH Partitioning
- KEY Partitioning
- Subpartitioning

MySQL RANGE Partitioning

This partitioning allows us to partition the rows of a table based on column values that fall within a specified range. The given range is always in a contiguous form but should not overlap each other, and also uses the VALUES LESS THAN operator to define the ranges.

CODE:

```
CREATE TABLE Sales ( cust_id INT NOT NULL, name VARCHAR(40),
store_id VARCHAR(20) NOT NULL, bill_no INT NOT NULL,
bill_date DATE PRIMARY KEY NOT NULL, amount DECIMAL(8,2) NOT NULL)
PARTITION BY RANGE (year(bill_date))(
PARTITION p0 VALUES LESS THAN (2016),
```

```
PARTITION p1 VALUES LESS THAN (2017),
PARTITION p2 VALUES LESS THAN (2018),
PARTITION p3 VALUES LESS THAN (2020));

INSERT INTO Sales VALUES
(1, 'Mike', 'S001', 101, '2015-01-02', 125.56),
(2, 'Robert', 'S003', 103, '2015-01-25', 476.50),
(3, 'Peter', 'S012', 122, '2016-02-15', 335.00),
(4, 'Joseph', 'S345', 121, '2016-03-26', 787.00),
(5, 'Harry', 'S234', 132, '2017-04-19', 678.00),
(6, 'Stephen', 'S743', 111, '2017-05-31', 864.00),
(7, 'Jacson', 'S234', 115, '2018-06-11', 762.00),
(8, 'Smith', 'S012', 125, '2019-07-24', 300.00),
(9, 'Adam', 'S456', 119, '2019-08-02', 492.20);

SELECT TABLE_NAME, PARTITION_NAME, TABLE_ROWS, AVG_ROW_LENGTH,
DATA_LENGTH
FROM INFORMATION_SCHEMA.PARTITIONS
WHERE TABLE_SCHEMA = 'partitioning' AND TABLE_NAME = 'Sales';
```

OUTPUT:

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

TABLE_NAME	PARTITION_NAME	TABLE_ROWS	AVG_ROW_LENGTH	DATA_LENGTH
sales	p0	2	8192	16384
sales	p1	2	8192	16384
sales	p2	2	8192	16384
sales	p3	3	5461	16384

Query Statistics

Timing (as measured at client side):
Execution time: 0:00:0.01600000

Timing (as measured by the server):
Execution time: 0:00:0.00683610
Table lock wait time: 0:00:0.00396400

Errors:
Had Errors: NO
Warnings: 0

Rows Processed:
Rows affected: 0
Rows sent to client: 4
Rows examined: 7

Temporary Tables:
Temporary disk tables created: 0
Temporary tables created: 0

Joins per Type:
Full table scans (Select_scan): 1
Joins using table scans (Select_full_join): 0
Joins using range search (Select_full_range_join): 0
Joins with range checks (Select_range_check): 0
Joins using range (Select_range): 0

Sorting:
Sorted rows (Sort_rows): 0
Sort merge passes (Sort_merge_passes): 0
Sorts with ranges (Sort_range): 0
Sorts with table scans (Sort_scan): 0

Index Usage:
At least one Index was used

Other Info:
Event Id: 160
Thread Id: 49

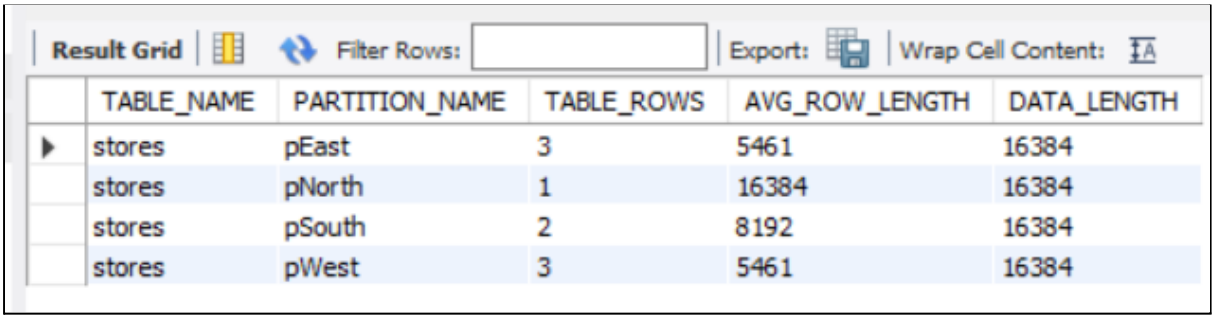
MySQL LIST Partitioning

It is the same as Range Partitioning. Here, the partition is defined and selected based on columns matching one of a set of discrete value lists rather than a set of a contiguous range of values. It is performed by the PARTITION BY LIST(exp) clause. The exp is an expression or column value that returns an integer value. The VALUES IN(value_lists) statement will be used to define each partition.

CODE:

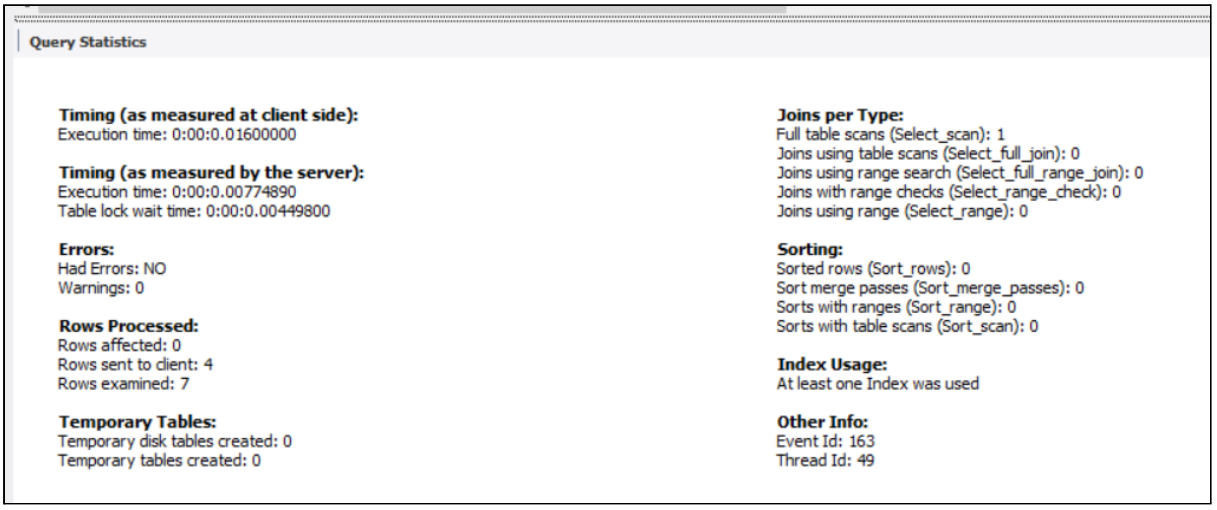
```
CREATE TABLE Stores (
    cust_name VARCHAR(40),
    bill_no VARCHAR(20) NOT NULL,
    store_id INT PRIMARY KEY NOT NULL,
    bill_date DATE NOT NULL,
    amount DECIMAL(8,2) NOT NULL
)
PARTITION BY LIST(store_id) (
PARTITION pEast VALUES IN (101, 103, 105),
PARTITION pWest VALUES IN (102, 104, 106),
PARTITION pNorth VALUES IN (107, 109, 111),
PARTITION pSouth VALUES IN (108, 110, 112));

INSERT INTO Stores VALUES
("Mike", "1", 101, "2015-01-25", 100.00),
("Joseph", "2", 102, "2015-01-25", 100.00),
("Robert", "3", 103, "2015-01-25", 100.00),
("Peter", "4", 104, "2015-01-25", 100.00),
("Joseph", "5", 105, "2015-01-25",100.00),
("Harry", "6", 106, "2015-01-25", 100.00),
("Jacson", "7", 107, "2015-01-25", 100.00),
("Smith", "8", 108, "2015-01-25", 100.00),
("Adam", "9", 110, "2015-01-25", 100.00);

SELECT TABLE_NAME, PARTITION_NAME, TABLE_ROWS, AVG_ROW_LENGTH,
DATA_LENGTH
FROM INFORMATION_SCHEMA.PARTITIONS
WHERE TABLE_SCHEMA = 'partitioning' AND TABLE_NAME = 'Stores';
```

OUTPUT:



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

TABLE_NAME	PARTITION_NAME	TABLE_ROWS	AVG_ROW_LENGTH	DATA_LENGTH
stores	pEast	3	5461	16384
stores	pNorth	1	16384	16384
stores	pSouth	2	8192	16384
stores	pWest	3	5461	16384



Query Statistics

Timing (as measured at client side):
Execution time: 0:00:0.01600000

Timing (as measured by the server):
Execution time: 0:00:0.00774890
Table lock wait time: 0:00:0.00449800

Errors:
Had Errors: NO
Warnings: 0

Rows Processed:
Rows affected: 0
Rows sent to client: 4
Rows examined: 7

Temporary Tables:
Temporary disk tables created: 0
Temporary tables created: 0

Joins per Type:
Full table scans (Select_scan): 1
Joins using table scans (Select_full_join): 0
Joins using range search (Select_full_range_join): 0
Joins with range checks (Select_range_check): 0
Joins using range (Select_range): 0

Sorting:
Sorted rows (Sort_rows): 0
Sort merge passes (Sort_merge_passes): 0
Sorts with ranges (Sort_range): 0
Sorts with table scans (Sort_scan): 0

Index Usage:
At least one Index was used

Other Info:
Event Id: 163
Thread Id: 49

MySQL HASH Partitioning

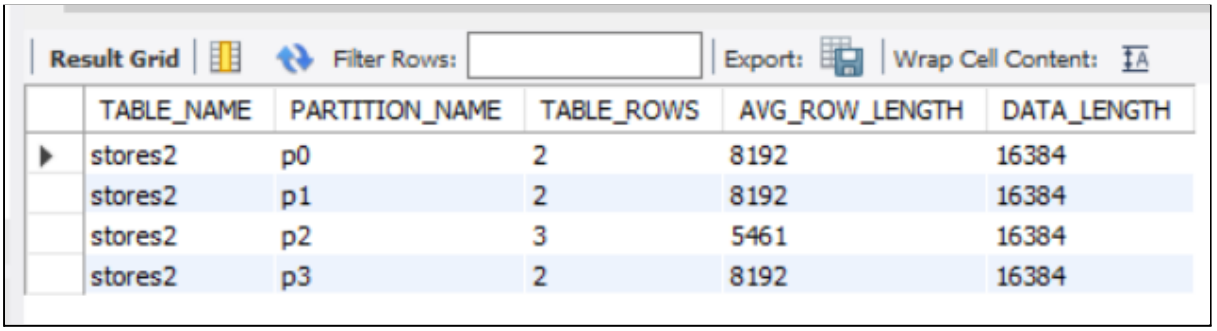
This partitioning is used to distribute data based on a predefined number of partitions. In other words, it splits the table as of the value returned by the user-defined expression. It is mainly used to distribute data evenly into the partition. It is performed with the PARTITION BY HASH(expr) clause. Here, we can specify a column value based on the column_name to be hashed and the number of partitions into which the table is divided.

CODE:

```
CREATE TABLE Stores2 (
    cust_name VARCHAR(40),
    bill_no VARCHAR(20) NOT NULL,
    store_id INT PRIMARY KEY NOT NULL,
    bill_date DATE NOT NULL,
    amount DECIMAL(8,2) NOT NULL
)
PARTITION BY HASH(store_id)
PARTITIONS 4;

INSERT INTO Stores2 VALUES
```

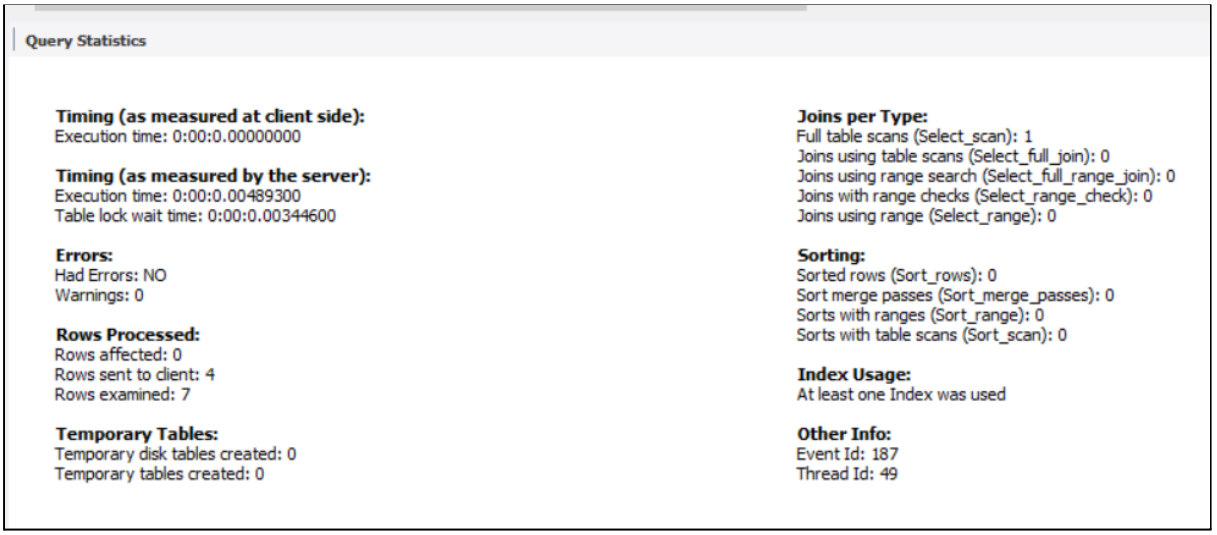
```
("Mike", "1", 101, "2015-01-25", 100.00),
("Joseph", "2", 102, "2015-01-25", 100.00),
("Robert", "3", 103, "2015-01-25", 100.00),
("Peter", "4", 104, "2015-01-25", 100.00),
("Joseph", "5", 105, "2015-01-25",100.00),
("Harry", "6", 106, "2015-01-25", 100.00),
("Jacson", "7", 107, "2015-01-25", 100.00),
("Smith", "8", 108, "2015-01-25", 100.00),
("Adam", "9", 110, "2015-01-25", 100.00);

SELECT TABLE_NAME, PARTITION_NAME, TABLE_ROWS, AVG_ROW_LENGTH,
DATA_LENGTH
FROM INFORMATION_SCHEMA.PARTITIONS
WHERE TABLE_SCHEMA = 'partitioning' AND TABLE_NAME = 'Stores2';
```

OUTPUT:



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

TABLE_NAME	PARTITION_NAME	TABLE_ROWS	AVG_ROW_LENGTH	DATA_LENGTH
stores2	p0	2	8192	16384
stores2	p1	2	8192	16384
stores2	p2	3	5461	16384
stores2	p3	2	8192	16384



Query Statistics

Timing (as measured at client side):
Execution time: 0:00:0.00000000

Timing (as measured by the server):
Execution time: 0:00:0.00489300
Table lock wait time: 0:00:0.00344600

Errors:
Had Errors: NO
Warnings: 0

Rows Processed:
Rows affected: 0
Rows sent to client: 4
Rows examined: 7

Temporary Tables:
Temporary disk tables created: 0
Temporary tables created: 0

Joins per Type:
Full table scans (Select_scan): 1
Joins using table scans (Select_full_join): 0
Joins using range search (Select_full_range_join): 0
Joins with range checks (Select_range_check): 0
Joins using range (Select_range): 0

Sorting:
Sorted rows (Sort_rows): 0
Sort merge passes (Sort_merge_passes): 0
Sorts with ranges (Sort_range): 0
Sorts with table scans (Sort_scan): 0

Index Usage:
At least one Index was used

Other Info:
Event Id: 187
Thread Id: 49

MySQL COLUMN Partitioning

This partitioning allows us to use the multiple columns in partitioning keys. The purpose of these columns is to place the rows in partitions and determine which partition will be validated for matching rows. It is mainly divided into two types:

RANGE Columns Partitioning

LIST Columns Partitioning

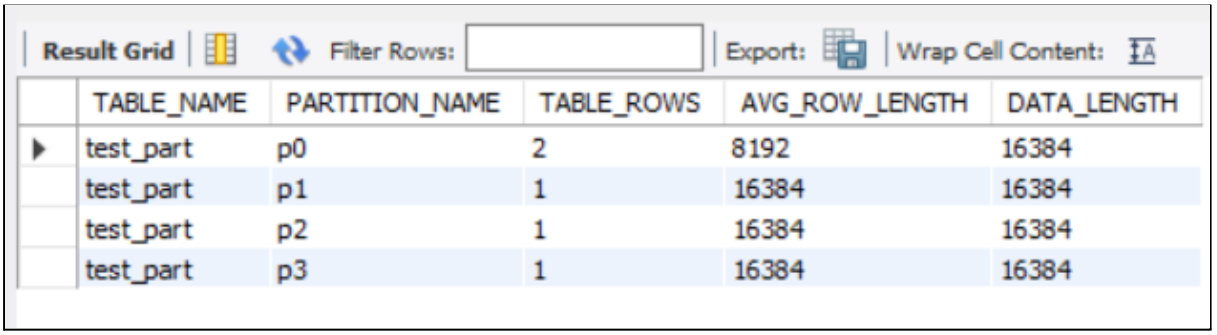
They provide supports for the use of non-integer columns to define the ranges or value lists. They support the following data types:

All Integer Types: TINYINT, SMALLINT, MEDIUMINT, INT (INTEGER), and BIGINT.
String Types: CHAR, VARCHAR, BINARY, and VARBINARY.
DATE and DATETIME data types.
Range Column Partitioning: It is similar to the range partitioning with one difference. It defines partitions using ranges based on various columns as partition keys. The defined ranges are of column types other than an integer type.

CODE:

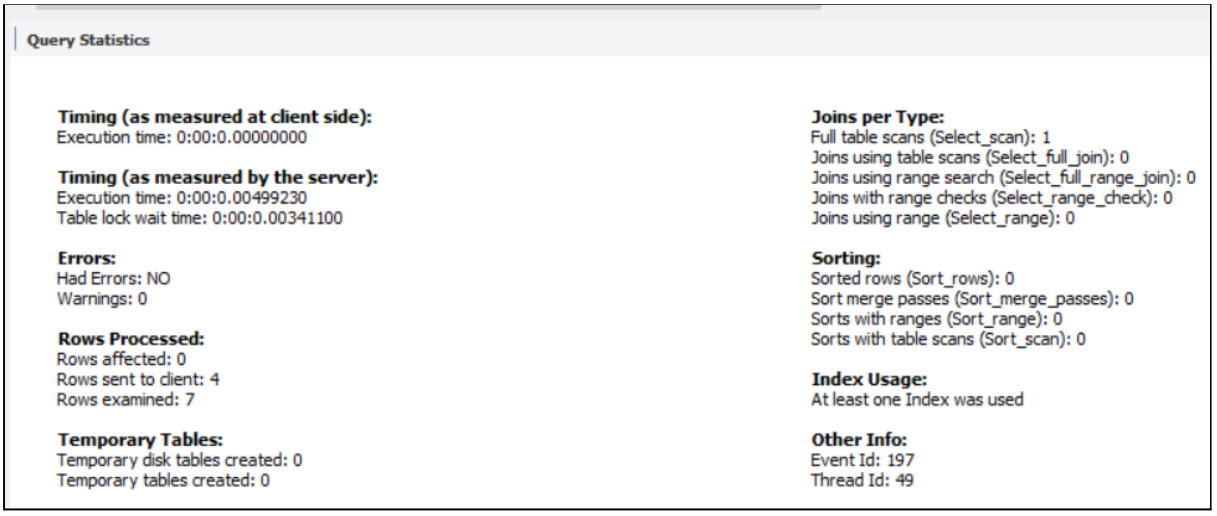
```
CREATE TABLE test_part (A INT, B CHAR(5), C INT, D INT)
PARTITION BY RANGE COLUMNS(A, B, C)
 (PARTITION p0 VALUES LESS THAN (50, 'test1', 100),
 PARTITION p1 VALUES LESS THAN (100, 'test2', 200),
 PARTITION p2 VALUES LESS THAN (150, 'test3', 300),
 PARTITION p3 VALUES LESS THAN (MAXVALUE, MAXVALUE, MAXVALUE));

 INSERT INTO test_part VALUES
 (10, 'a', 50, 3),
 (30, 'test1', 150, 3),
 (55, 'test1', 175, 3),
 (123, 'test2', 233, 3),
 (160, 'test4', 333, 3);

SELECT TABLE_NAME, PARTITION_NAME, TABLE_ROWS, AVG_ROW_LENGTH,
DATA_LENGTH
FROM INFORMATION_SCHEMA.PARTITIONS
WHERE TABLE_SCHEMA = 'partitioning' AND TABLE_NAME = 'test_part';
```

OUTPUT:



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

TABLE_NAME	PARTITION_NAME	TABLE_ROWS	AVG_ROW_LENGTH	DATA_LENGTH
test_part	p0	2	8192	16384
test_part	p1	1	16384	16384
test_part	p2	1	16384	16384
test_part	p3	1	16384	16384



Query Statistics

Timing (as measured at client side):
Execution time: 0:00:0.00000000

Timing (as measured by the server):
Execution time: 0:00:0.00499230
Table lock wait time: 0:00:0.00341100

Errors:
Had Errors: NO
Warnings: 0

Rows Processed:
Rows affected: 0
Rows sent to client: 4
Rows examined: 7

Temporary Tables:
Temporary disk tables created: 0
Temporary tables created: 0

Joins per Type:
Full table scans (Select_scan): 1
Joins using table scans (Select_full_join): 0
Joins using range search (Select_full_range_join): 0
Joins with range checks (Select_range_check): 0
Joins using range (Select_range): 0

Sorting:
Sorted rows (Sort_rows): 0
Sort merge passes (Sort_merge_passes): 0
Sorts with ranges (Sort_range): 0
Sorts with table scans (Sort_scan): 0

Index Usage:
At least one Index was used

Other Info:
Event Id: 197
Thread Id: 49

LIST Columns Partitioning

It takes a list of single or multiple columns as partition keys. It enables us to use various columns of types other than integer types as partitioning columns. In this partitioning, we can use String data types, DATE, and DATETIME columns.

CODE:

```
CREATE TABLE AgentDetail (
agent_id VARCHAR(10),
agent_name VARCHAR(40),
city VARCHAR(10))
PARTITION BY LIST COLUMNS(agent_id) (
PARTITION pNewyork VALUES IN('A1', 'A2', 'A3'),
PARTITION pTexas VALUES IN('B1', 'B2', 'B3'),
PARTITION pCalifornia VALUES IN ('C1', 'C2', 'C3'));

INSERT INTO AgentDetail VALUES
('A1', 'DummyName', 'CityName'),
('A2', 'DummyName', 'CityName'),
('A3', 'DummyName', 'CityName'),
```

```
('B1', 'DummyName', 'CityName'),
('B2', 'DummyName', 'CityName'),
('B3', 'DummyName', 'CityName'),
('C1', 'DummyName', 'CityName'),
('C2', 'DummyName', 'CityName'),
('C3', 'DummyName', 'CityName'),
('A1', 'DummyName', 'CityName'),
('C2', 'DummyName', 'CityName'),
('B1', 'DummyName', 'CityName');

SELECT TABLE_NAME, PARTITION_NAME, TABLE_ROWS, AVG_ROW_LENGTH,
DATA_LENGTH
FROM INFORMATION_SCHEMA.PARTITIONS
WHERE TABLE_SCHEMA = 'partitioning' AND TABLE_NAME = 'AgentDetail';
```

OUTPUT:

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

TABLE_NAME	PARTITION_NAME	TABLE_ROWS	AVG_ROW_LENGTH	DATA_LENGTH
agentdetail	pCalifornia	4	4096	16384
agentdetail	pNewyork	4	4096	16384
agentdetail	pTexas	4	4096	16384

Query Statistics

Timing (as measured at client side):
Execution time: 0:00:0.01600000

Timing (as measured by the server):
Execution time: 0:00:0.01013060
Table lock wait time: 0:00:0.00426000

Errors:
Had Errors: NO
Warnings: 0

Rows Processed:
Rows affected: 0
Rows sent to client: 3
Rows examined: 6

Temporary Tables:
Temporary disk tables created: 0
Temporary tables created: 0

Joins per Type:
Full table scans (Select_scan): 1
Joins using table scans (Select_full_join): 0
Joins using range search (Select_full_range_join): 0
Joins with range checks (Select_range_check): 0
Joins using range (Select_range): 0

Sorting:
Sorted rows (Sort_rows): 0
Sort merge passes (Sort_merge_passes): 0
Sorts with ranges (Sort_range): 0
Sorts with table scans (Sort_scan): 0

Index Usage:
At least one Index was used

Other Info:
Event Id: 207
Thread Id: 49

MySQL KEY Partitioning

It is similar to the HASH partitioning where the hash partitioning uses the user-specified expression, and MySQL server supplied the hashing function for key. If we use other storage engines, the MySQL server employs its own internal hashing function that is performed by

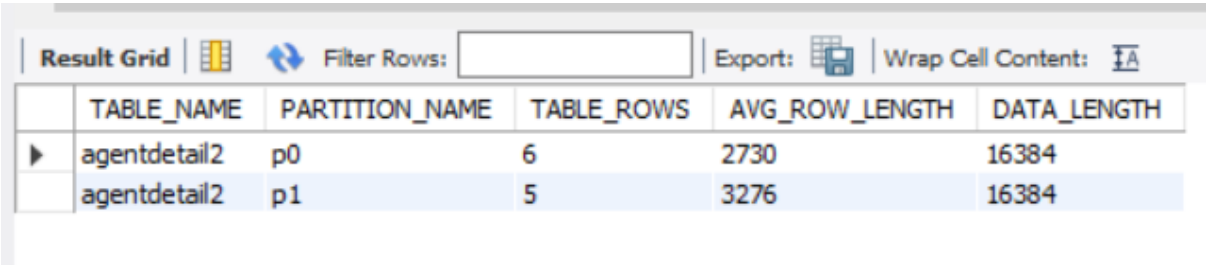
using the PARTITION BY KEY clause. Here, we will use KEY rather than HASH that can accept only a list of zero or more column names.

If the table contains a PRIMARY KEY and we have not specified any column for partition, then the primary key is used as partitioning key.

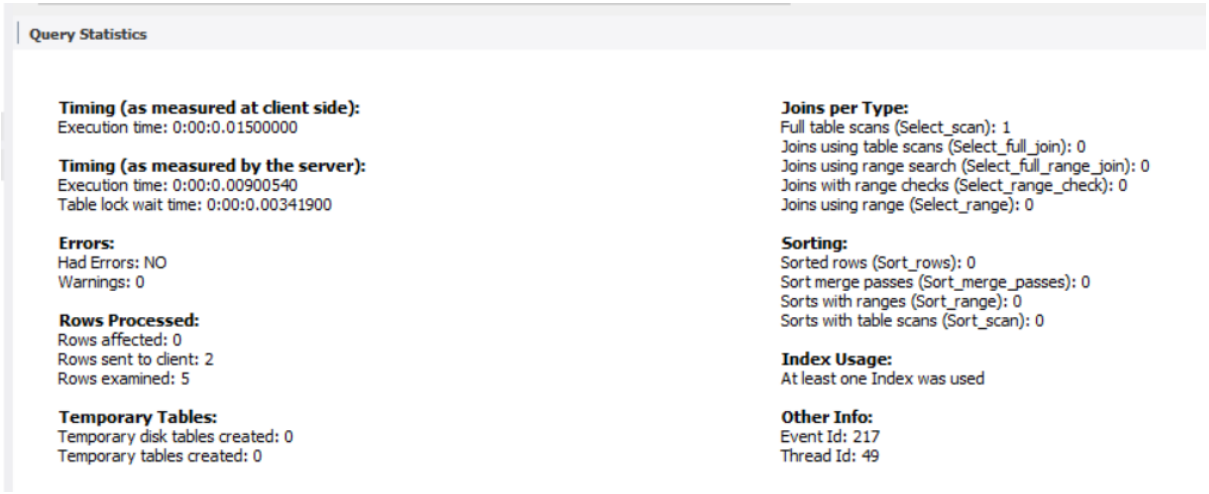
CODE:

```
CREATE TABLE AgentDetail2 (
    agent_id INT NOT NULL PRIMARY KEY,
    agent_name VARCHAR(40)
)
PARTITION BY KEY()
PARTITIONS 2;

INSERT INTO AgentDetail2 VALUES
(1, "Name"),
(2, "Name"),
(3, "Name"),
(4, "Name"),
(5, "Name"),
(6, "Name"),
(7, "Name"),
(8, "Name"),
(9, "Name"),
(10, "Name"),
(11, "Name");

SELECT TABLE_NAME, PARTITION_NAME, TABLE_ROWS, AVG_ROW_LENGTH,
DATA_LENGTH
FROM INFORMATION_SCHEMA.PARTITIONS
WHERE TABLE_SCHEMA = 'partitioning' AND TABLE_NAME = 'AgentDetail2';
```

OUTPUT:



TABLE_NAME	PARTITION_NAME	TABLE_ROWS	AVG_ROW_LENGTH	DATA_LENGTH
agentdetail2	p0	6	2730	16384
agentdetail2	p1	5	3276	16384



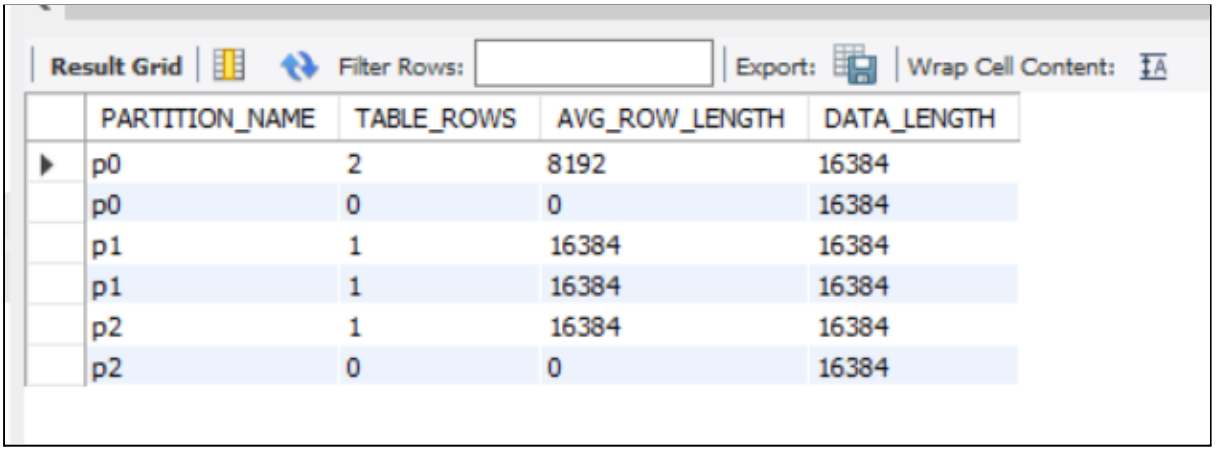
SUBPARTITIONING

It is a composite partitioning that further splits each partition in a partition table.

CODE:

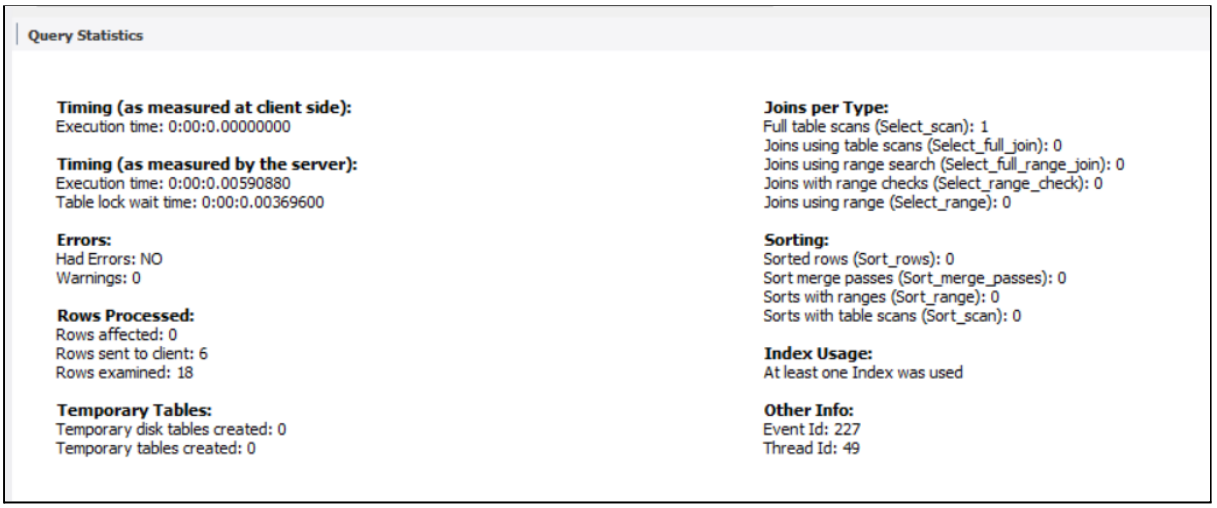
```
CREATE TABLE Person (
    id INT NOT NULL,
    name VARCHAR(40),
    purchased DATE,
    PRIMARY KEY (`id`, `purchased`)
)
 PARTITION BY RANGE( YEAR(purchased) )
    SUBPARTITION BY HASH( TO_DAYS(purchased) )
    SUBPARTITIONS 2 (
        PARTITION p0 VALUES LESS THAN (2015),
        PARTITION p1 VALUES LESS THAN (2020),
        PARTITION p2 VALUES LESS THAN MAXVALUE
    );

INSERT INTO Person VALUES
(1, "Name", "2013-01-13"),
(2, "Name2", "2014-04-22"),
(3, "Name3", "2015-02-25"),
(4, "Name4", "2018-05-05"),
(5, "Name5", "2020-02-04");

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

OUTPUT:



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

PARTITION_NAME	TABLE_ROWS	AVG_ROW_LENGTH	DATA_LENGTH
p0	2	8192	16384
p0	0	0	16384
p1	1	16384	16384
p1	1	16384	16384
p2	1	16384	16384
p2	0	0	16384



Query Statistics

Timing (as measured at client side):
Execution time: 0:00:0.00000000

Timing (as measured by the server):
Execution time: 0:00:0.00590880
Table lock wait time: 0:00:0.00369600

Errors:
Had Errors: NO
Warnings: 0

Rows Processed:
Rows affected: 0
Rows sent to client: 6
Rows examined: 18

Temporary Tables:
Temporary disk tables created: 0
Temporary tables created: 0

Joins per Type:
Full table scans (Select_scan): 1
Joins using table scans (Select_full_join): 0
Joins using range search (Select_full_range_join): 0
Joins with range checks (Select_range_check): 0
Joins using range (Select_range): 0

Sorting:
Sorted rows (Sort_rows): 0
Sort merge passes (Sort_merge_passes): 0
Sorts with ranges (Sort_range): 0
Sorts with table scans (Sort_scan): 0

Index Usage:
At least one Index was used

Other Info:
Event Id: 227
Thread Id: 49

EXPERIMENT 5

DDBMS