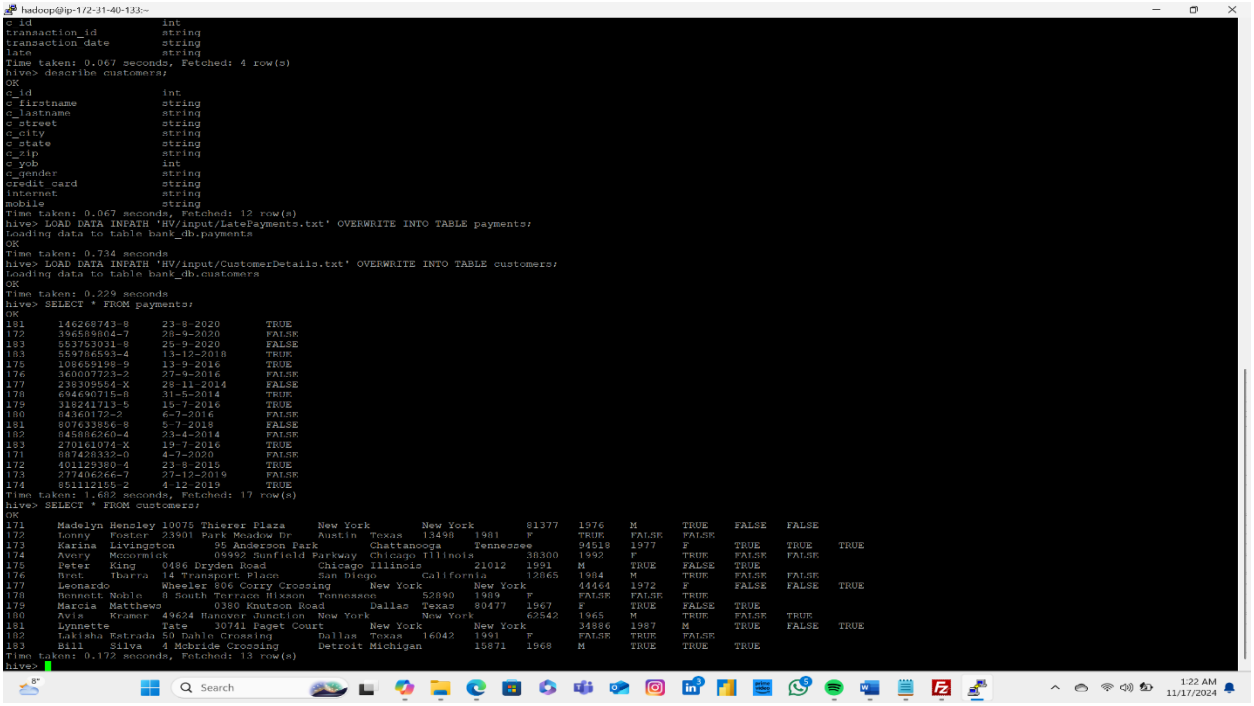
Tutorial A

Note: The commands in the image are visible when zoomed in.

Commands 1-14

Commands 15-20



Tutorial B

Command 1

```
hadoop@ip-172-31-40-133:~
183     Bill    Silva   4 Mcbride Crossing      Detr
Time taken: 0.172 seconds, Fetched: 13 row(s)
hive> select c_id, c_firstname, c_lastname
    > from customers
    > where c_state = 'New York';
OK
171     Madelyn Hensley
177     Leonardo        Wheeler
180     Avis    Kramer
181     Lynnette        Tate
Time taken: 0.579 seconds, Fetched: 4 row(s)
```

Command 2

hadoop@ip-172-31-40-133:~

```
Time taken: 0.579 seconds, Fetched: 4 row(s)
hive> select c_state, count(c_id) as total
    > from customers
    > group by c_state;
Query ID = hadoop_20241117072339_29b05345-faf2-4735-814f-58911b889152
Total jobs = 1
Launching Job 1 out of 1
Tez session was closed. Reopening...
Session re-established.
Session re-established.
Status: Running (Executing on YARN cluster with App id application_1731826520887_0002)

--------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 1 .......... container     SUCCEEDED      1          1        0        0       0       0
Reducer 2 ...... container     SUCCEEDED      2          2        0        0       0       0
--------------------------------------------------------------------------------
VERTICES: 02/02  [==========================>>] 100%  ELAPSED TIME: 6.82 s
--------------------------------------------------------------------------------
OK
Illinois        2
New York        4
California      1
Michigan        1
Tennessee       2
Texas   3
Time taken: 18.105 seconds, Fetched: 6 row(s)
```

Command 3

hadoop@ip-172-31-40-133:~

```
Time taken: 18.105 seconds, Fetched: 6 row(s)
hive> select c.c_id, c.c_firstname, c.c_lastname, p.transaction_id, p.transaction_date
    > from customers c join payments p on c.c_id = p.c_id
    > where p.late = 'TRUE';
Query ID = hadoop_20241117072418_ea99b505-9697-4ce7-92de-a98a23bc56b7
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1731826520887_0002)

--------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 2 .......... container     SUCCEEDED      1          1        0        0       0       0
Map 1 .......... container     SUCCEEDED      1          1        0        0       0       0
--------------------------------------------------------------------------------
VERTICES: 02/02  [==========================>>] 100%  ELAPSED TIME: 10.70 s
--------------------------------------------------------------------------------
OK
172     Lonny   Foster  401129380-4     23-8-2015
174     Avery   Mccormick       851112155-2     4-12-2019
175     Peter   King    108659198-9     13-9-2016
178     Bennett Noble   694690715-8     31-5-2014
179     Marcia  Matthews        318241713-5     15-7-2016
181     Lynnette        Tate    146268743-8     23-8-2020
183     Bill    Silva   270161074-X     19-7-2016
183     Bill    Silva   559786593-4     13-12-2018
Time taken: 11.517 seconds, Fetched: 8 row(s)
```

Command 4

hadoop@ip-172-31-40-133:~

```
Time taken: 11.517 seconds, Fetched: 8 row(s)
hive> select c_state, count(c_id)
    > from customers
    > where credit_card = 'FALSE'
    > group by c_state;
Query ID = hadoop_20241117072447_63025eee-f516-4c90-8296-f581b4f42274
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1731826520887_0002)

--------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 1 .......... container     SUCCEEDED      1          1        0        0       0       0
Reducer 2 ...... container     SUCCEEDED      2          2        0        0       0       0
--------------------------------------------------------------------------------
VERTICES: 02/02  [==========================>>] 100%  ELAPSED TIME: 6.55 s
--------------------------------------------------------------------------------
OK
New York        1
Tennessee       1
Texas   1
Time taken: 7.002 seconds, Fetched: 3 row(s)
```

Command 5

hadoop@ip-172-31-40-133:~

```
Time taken: 7.002 seconds, Fetched: 3 row(s)
hive> select c.c_state, count(c.c_id) as total
    > from customers c join payments p on c.c_id = p.c_id
    > where p.late = 'TRUE'
    > group BY c.c_state;
Query ID = hadoop_20241117072507_f2885d2a-2aa7-4e0b-8474-43cb7dbb449a
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1731826520887_0002)

--------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 3 .......... container     SUCCEEDED      1          1        0        0       0       0
Map 1 .......... container     SUCCEEDED      1          1        0        0       0       0
Reducer 2 ...... container     SUCCEEDED      2          2        0        0       0       0
--------------------------------------------------------------------------------
VERTICES: 03/03  [==========================>>] 100%  ELAPSED TIME: 13.92 s
--------------------------------------------------------------------------------
OK
Illinois        2
New York        1
Michigan        2
Tennessee       1
Texas   2
Time taken: 14.591 seconds, Fetched: 5 row(s)
```

Command 6

```
hadoop@ip-172-31-40-133:~
Time taken: 14.591 seconds, Fetched: 5 row(s)
hive> select *
    > from customers
    > where mobile = 'FALSE';
OK
171     Madelyn Hensley 10075 Thierer Plaza     New York        New York        81377   1976    M       TRUE    FALSE   FALSE
172     Lonny   Foster  23901 Park Meadow Dr    Austin  Texas   13498   1981    F       TRUE    FALSE   FALSE
174     Avery   Mccormick       09992 Sunfield Parkway  Chicago Illinois        38300   1992    F       TRUE    FALSE   FALSE
176     Bret    Ibarra  14 Transport Place      San Diego       California      12865   1984    M       TRUE    FALSE   FALSE
182     Lakisha Estrada 50 Dahle Crossing       Dallas  Texas   16042   1991    F       FALSE   TRUE    FALSE
Time taken: 0.224 seconds, Fetched: 5 row(s)
```

Command 7

```
hadoop@ip-172-31-40-133:~
Time taken: 0.224 seconds, Fetched: 5 row(s)
hive> select c.c_id, c.c_firstname, c.c_lastname, c.c_street, c.c_city, c.c_state, c.c_zip, c.c_yob, c.c_gender, c.credit_card, c.internet, c.mobile
    > from customers c join payments p on c.c_id = p.c_id
    > where p.late = 'TRUE';
Query ID = hadoop_20241117072546_15926144-0bfb-4b33-9585-b9aa3fe6da42
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1731826520887_0002)

--------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 2 ..... container     SUCCEEDED      1          1        0        0       0       0
Map 1 ..... container     SUCCEEDED      1          1        0        0       0       0
--------------------------------------------------------------------------------
VERTICES: 02/02  [==========================>>] 100%  ELAPSED TIME: 10.98 s
--------------------------------------------------------------------------------
OK
172     Lonny   Foster  23901 Park Meadow Dr    Austin  Texas   13498   1981    F       TRUE    FALSE   FALSE
174     Avery   Mccormick       09992 Sunfield Parkway  Chicago Illinois        38300   1992    F       TRUE    FALSE   FALSE
175     Peter   King    0486 Dryden Road        Chicago Illinois        21012   1991    M       TRUE    FALSE   TRUE
178     Bennett Noble   8 South Terrace Hixson  Tennessee       52890   1989    F       FALSE   FALSE   TRUE
179     Marcia  Matthews        0380 Knutson Road       Dallas  Texas   80477   1967    F       TRUE    FALSE   TRUE
181     Lynnette        Tate    30741 Paget Court       New York        New York        34886   1987    M       TRUE    FALSE   TRUE
183     Bill    Silva   4 Mcbride Crossing      Detroit Michigan        15871   1968    M       TRUE    TRUE    TRUE
183     Bill    Silva   4 Mcbride Crossing      Detroit Michigan        15871   1968    M       TRUE    TRUE    TRUE
Time taken: 11.635 seconds, Fetched: 8 row(s)
```

Command 8

```
hadoop@ip-172-31-40-133:~
Time taken: 11.635 seconds, Fetched: 8 row(s)
hive> select c.c_id, c.c_firstname, c.c_lastname, c.c_city, c.c_state
    > from customers c join payments p on c.c_id = p.c_id
    > where p.late = 'FALSE'
    > group by c.c_id, c.c_firstname, c.c_lastname, c.c_city, c.c_state;
Query ID = hadoop_20241117072613_5eac1ddd-526d-49cc-a583-901cfa49e89b
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1731826520887_0002)

--------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 3 ..... container     SUCCEEDED      1          1        0        0       0       0
Map 1 ..... container     SUCCEEDED      1          1        0        0       0       0
Reducer 2 ..... container     SUCCEEDED      2          2        0        0       0       0
--------------------------------------------------------------------------------
VERTICES: 03/03  [==========================>>] 100%  ELAPSED TIME: 12.28 s
--------------------------------------------------------------------------------
OK
171     Madelyn Hensley New York        New York
172     Lonny   Foster  Austin  Texas
173     Karina  Livingston      Chattanooga     Tennessee
176     Bret    Ibarra  San Diego       California
177     Leonardo        Wheeler New York        New York
180     Avis    Kramer  New York        New York
181     Lynnette        Tate    New York        New York
182     Lakisha Estrada Dallas  Texas
183     Bill    Silva   Detroit Michigan
Time taken: 13.068 seconds, Fetched: 9 row(s)
```

Command 9

```
Time taken: 13.068 seconds, Fetched: 9 row(s)
hive> select c.c_firstname, c.c_firstname, c.c_city, c.c_state
    > from customers c join payments p on c.c_id = p.c_id
    > where p.late = 'TRUE' and c.c_yob > 1985;
Query ID = hadoop_20241117072642_1cbd1556-0026-4367-9be8-ae42f372e542
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1731826520887_0002)

--------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 2 .......... container     SUCCEEDED      1          1        0        0       0       0
Map 1 .......... container     SUCCEEDED      1          1        0        0       0       0
--------------------------------------------------------------------------------
VERTICES: 02/02  [==========================>>] 100%  ELAPSED TIME: 10.48 s
--------------------------------------------------------------------------------
OK
Avery   Avery   Chicago Illinois
Peter   Peter   Chicago Illinois
Bennett Bennett Hixson  Tennessee
Lynnette        Lynnette        New York        New York
Time taken: 11.304 seconds, Fetched: 4 row(s)
```

Command 10

```
Time taken: 11.304 seconds, Fetched: 4 row(s)
hive> select c.c_id, c.c_firstname, c.c_lastname, c.c_city, c.c_state
    > from customers c join payments p on c.c_id = p.c_id
    > where p.late = 'FALSE' and c.internet = 'TRUE'
    > group by c.c_id, c.c_firstname, c.c_lastname, c.c_city, c.c_state;
Query ID = hadoop_20241117072710_30e4db71-53f8-4f19-8753-37b7f8468beb
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1731826520887_0002)

--------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 3 .......... container     SUCCEEDED      1          1        0        0       0       0
Map 1 .......... container     SUCCEEDED      1          1        0        0       0       0
Reducer 2 ...... container     SUCCEEDED      2          2        0        0       0       0
--------------------------------------------------------------------------------
VERTICES: 03/03  [==========================>>] 100%  ELAPSED TIME: 11.45 s
--------------------------------------------------------------------------------
OK
173     Karina  Livingston      Chattanooga     Tennessee
182     Lakisha Estrada Dallas  Texas
183     Bill    Silva   Detroit Michigan
Time taken: 12.02 seconds, Fetched: 3 row(s)
hive>
```

Q. What are the similarities and differences of Hive versus traditional RDBMSs?

Similarities:

1. **SQL-Like Query Language**: Both Hive and traditional RDBMSs use SQL or SQL-like languages for database operations. In Hive, you used HiveQL commands, which are like SQL commands in RDBMSs.
    - Example: CREATE DATABASE, CREATE TABLE, SELECT statements.
2. **Data Organization**: Both systems organize data in tables, rows, and columns.
    - Example: Creating tables like payments, payments_ptn, and customers.
3. **Schema Enforcement**: Both enforce schemas to define the structure of data.
    - Example: Defining column data types and table structures in Hive.

Differences:

1. **Data Storage**:
    - **RDBMS**: Typically store data in proprietary formats optimized for quick read and write operations.
    - **Hive**: Designed to work with large datasets stored in Hadoop Distributed File System (HDFS) or other distributed storage systems, handling semi-structured and unstructured data.
    - **Example**: External table stored in HDFS (customers_ext).
2. **Processing Model**:
    - **RDBMS**: Executes queries directly using their own storage engines. Optimized for real-time transactional processing.
    - **Hive**: Translates queries into MapReduce jobs or other Hadoop-based processing tasks, optimized for batch processing and large-scale data analysis.
    - **Example**: Loading data into Hive tables and performing batch queries.
3. **Data Volume**:
    - **RDBMS**: Best suited for handling gigabytes to terabytes of data.
    - **Hive**: Designed to handle petabytes of data distributed across a cluster of machines.
    - **Example**: Partitioned table payments_ptn for efficient querying of large datasets.

4. **Performance**:
    - **RDBMS**: Generally faster for transactional queries due to optimized storage engines and indexing techniques.
    - **Hive**: Slower for real-time queries since it translates queries into MapReduce or other batch processing jobs.
    - **Example**: Executing joins and aggregations in Hive, which may be slower compared to RDBMS.

5. **ACID Transactions**:
    - **RDBMS**: Supports ACID (Atomicity, Consistency, Isolation, Durability) properties for transactions.
    - **Hive**: Initially did not support full ACID properties; newer versions have transactional capabilities but are still more limited compared to RDBMSs.
    - **Example**: Loading data into Hive tables without full ACID support.
6. **Schema-on-Write vs. Schema-on-Read**:
    - **RDBMS**: Follows schema-on-write, where the schema is enforced when data is written to the database.
    - **Hive**: Uses schema-on-read, where the schema is applied when data is read.
    - **Example**: Defining table schemas in Hive but applying them during query execution.