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)

Department of Computer Science and Engineering (Data Science)

Subject: Big Data Engineering (DJ19DSL604)

AY: 2023-24

Experiment 7

(No SQL Data Store)

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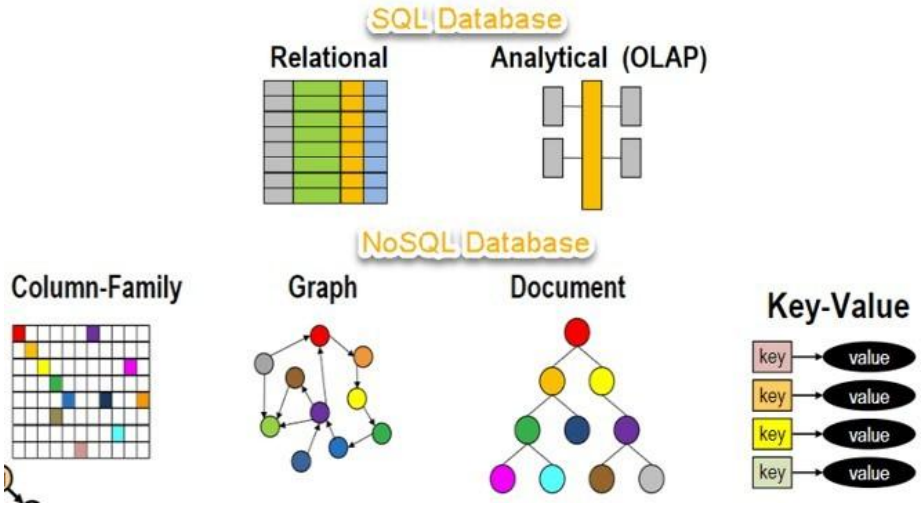
Aim: Implement No SQL Data Store using HBase.

Theory:

NoSQL:

NoSQL Database is a non-relational Data Management System, that does not require a fixed schema. It avoids joins, and is easy to scale. The major purpose of using a NoSQL database is for distributed data stores with humongous data storage needs. NoSQL is used for Big data and real-time web apps. For example, companies like Twitter, Facebook and Google collect terabytes of user data every single day. **NoSQL database** stands for "Not Only SQL" or "Not SQL."



Difference between SQL and NoSQL data stores:

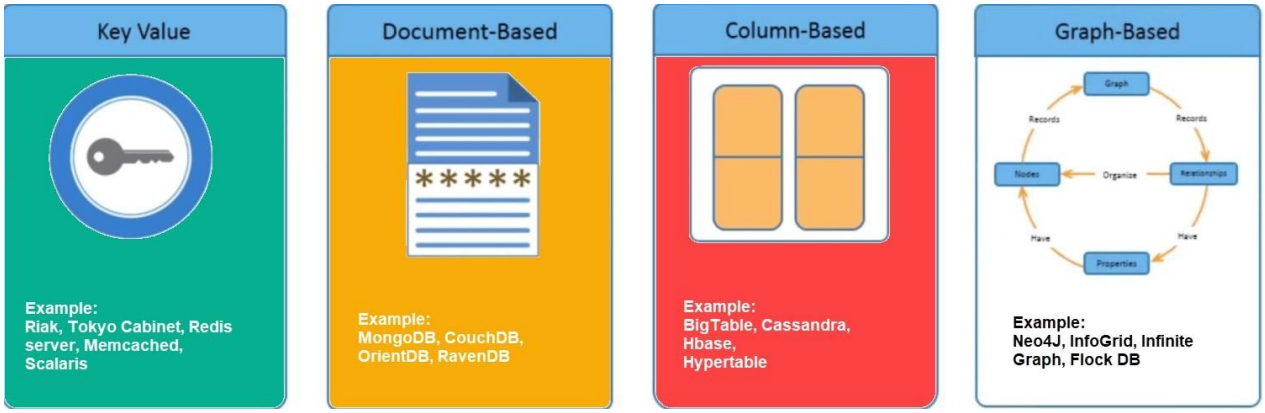
- SQL databases are relational, and NoSQL databases are non-relational.
- SQL databases use structured query language (SQL) and have a predefined schema. NoSQL databases have dynamic schemas for unstructured data.
- SQL databases are vertically scalable, while NoSQL databases are horizontally scalable.

- SQL databases are table-based, while NoSQL databases are document, key-value, graph, or wide-column stores.
- SQL databases are better for multi-row transactions, while NoSQL is better for unstructured data like documents or JSON.

Types of NoSQL Databases

NoSQL Databases are mainly categorized into four types: Key-value pair, Column-oriented, Graph-based and Document-oriented. Every category has its unique attributes and limitations. None of the above-specified database is better to solve all the problems. Users should select the database based on their product needs.
Types of NoSQL Databases:

- Key-value Pair Based
- Column-oriented Graph
- Graphs based
- Document-oriented



Introduction to HBase

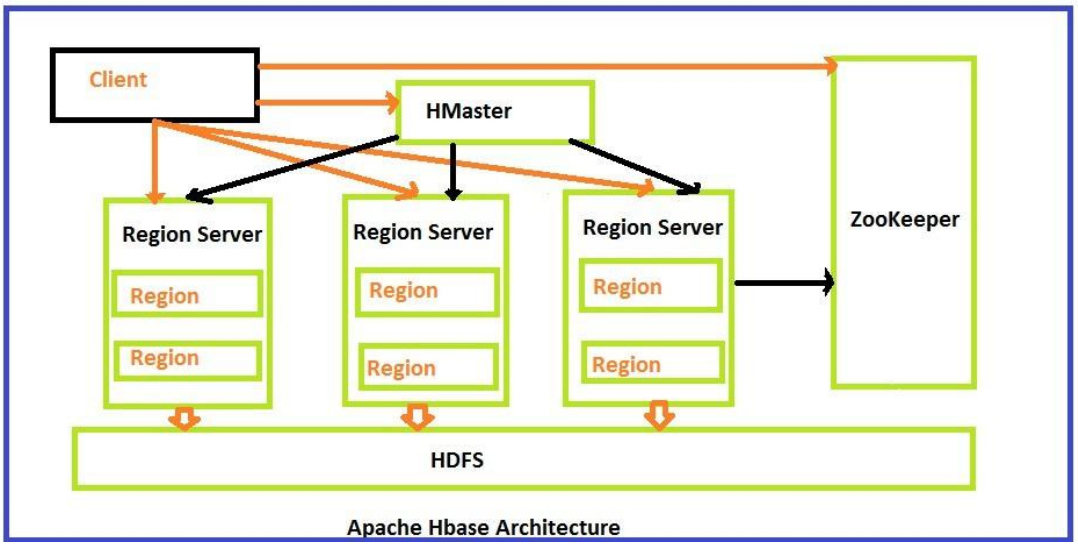
HBase is a distributed column-oriented database built on top of the Hadoop file system. It is an open-source project and is horizontally scalable.

HBase is a data model that is similar to Google's big table designed to provide quick random access to huge amounts of structured data. It leverages the fault tolerance provided by the Hadoop File System (HDFS).

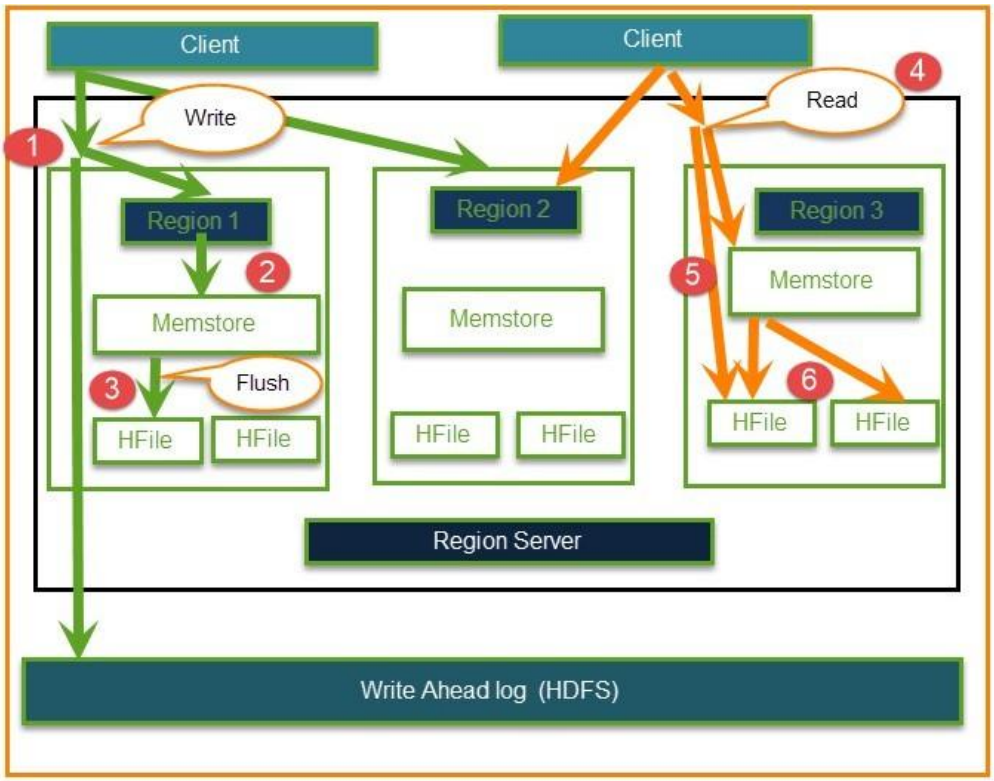
It is a part of the Hadoop ecosystem that provides random real-time read/write access to data in the Hadoop File System.

One can store the data in HDFS either directly or through HBase. Data consumer reads/accesses the data in HDFS randomly using HBase. HBase sits on top of the Hadoop File System and provides read and write access.

HBASE Architecture

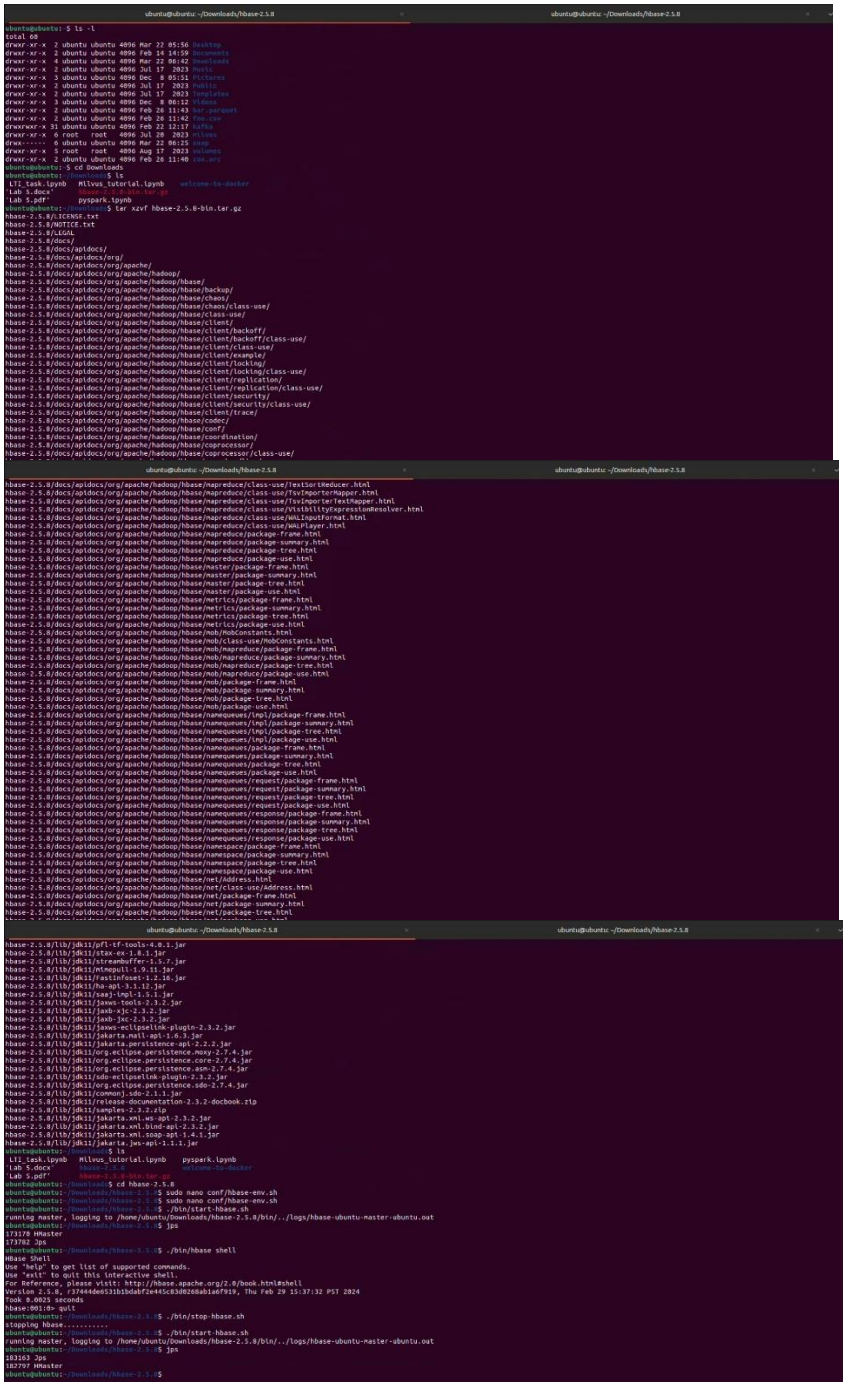


HBase Read and Write Data



Lab Assignment:

1. Installation of HBase on standalone mode.



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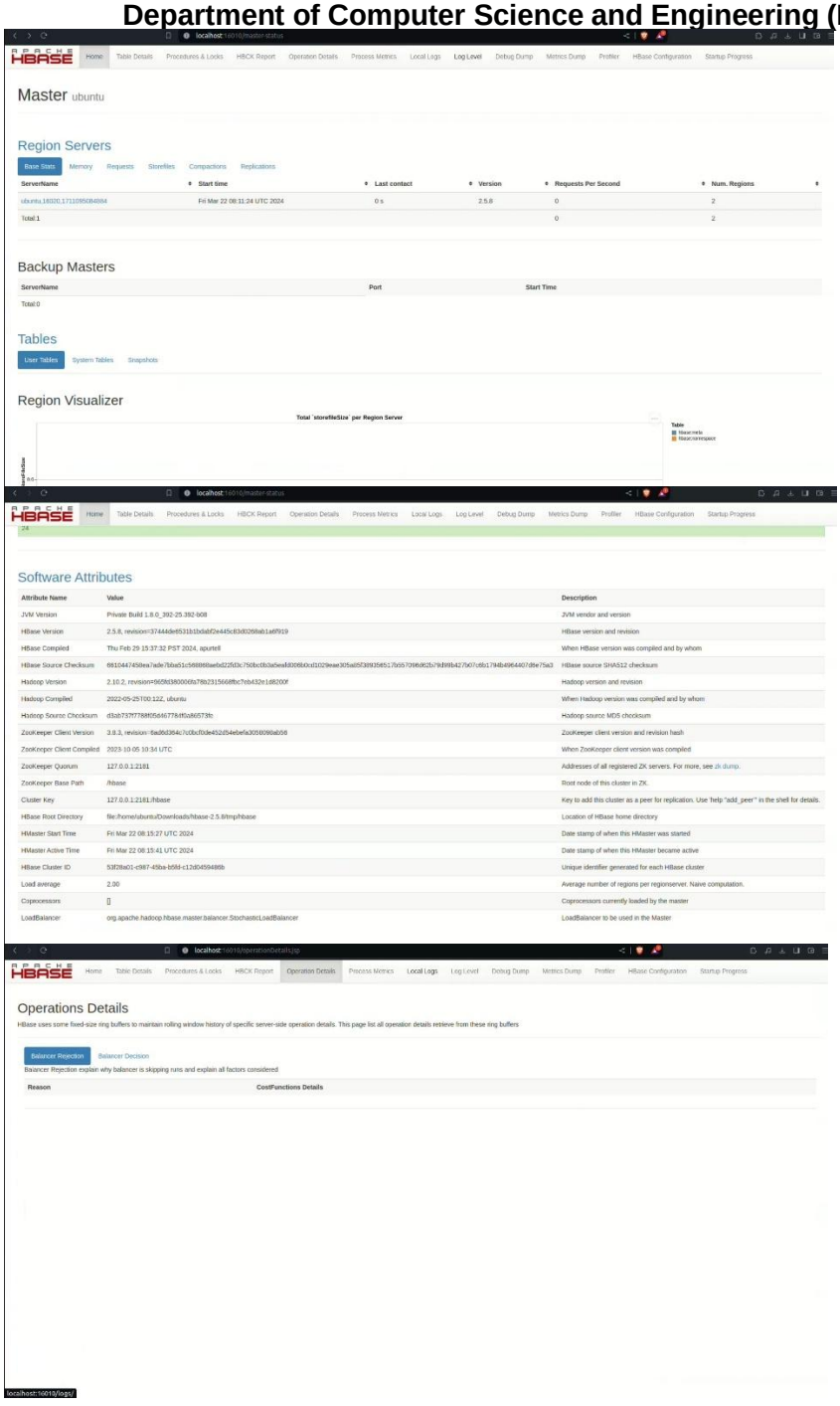

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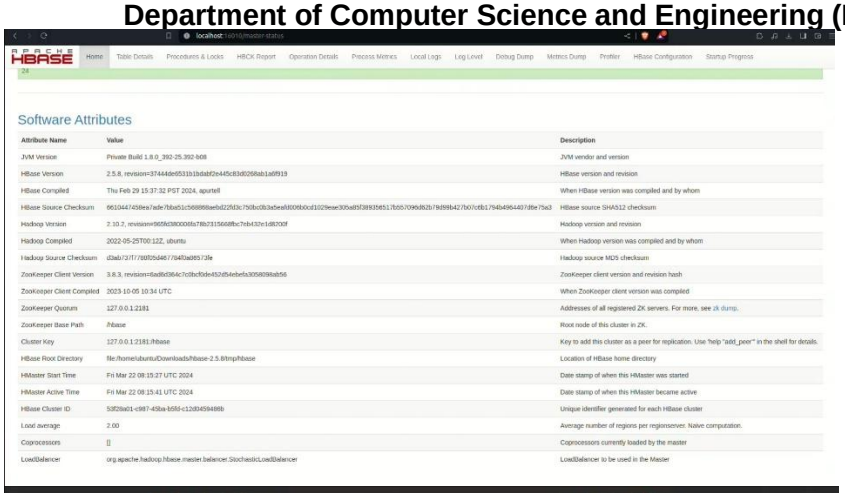
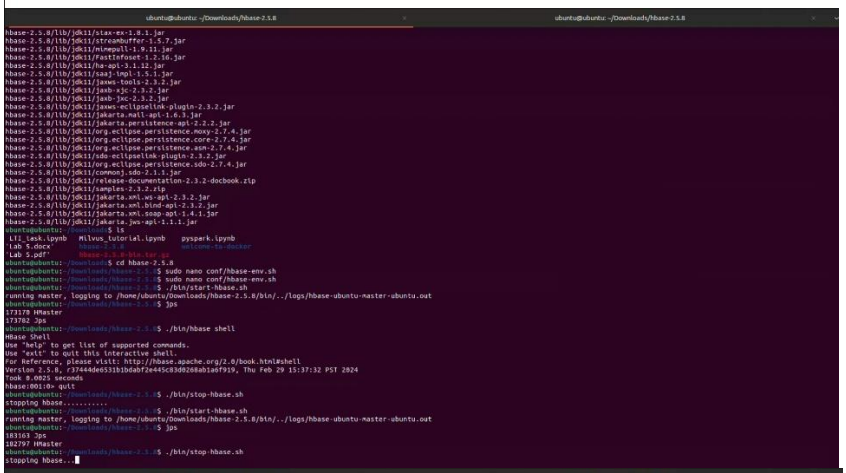
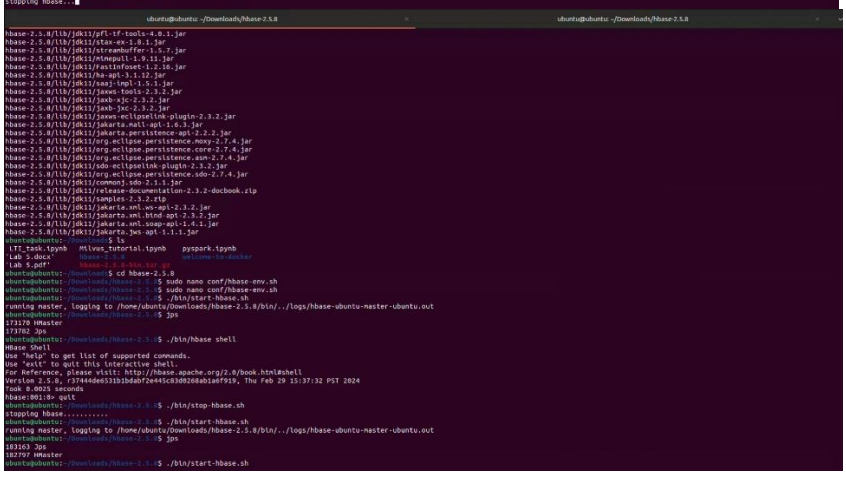
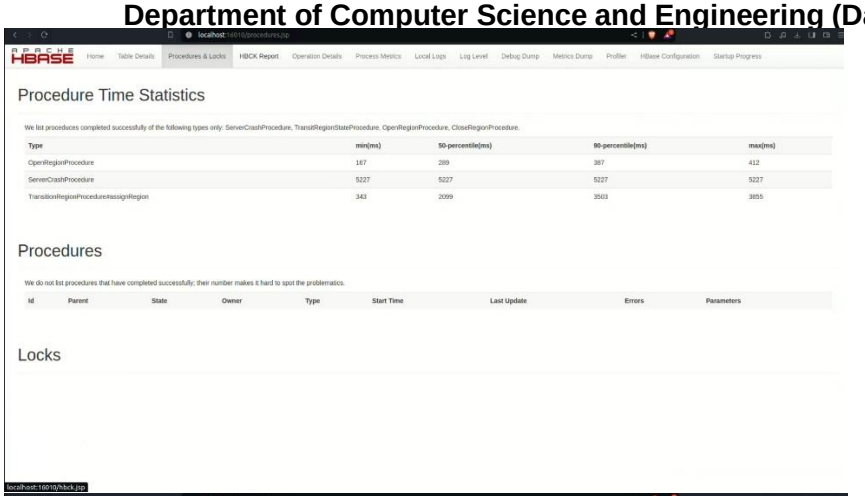
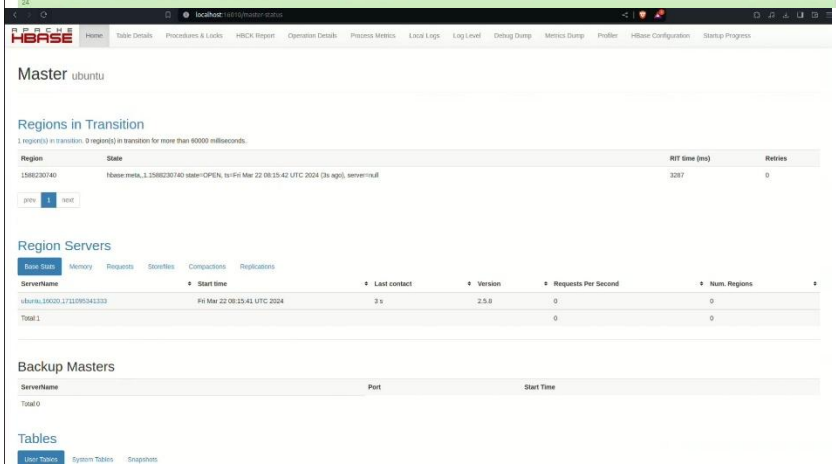


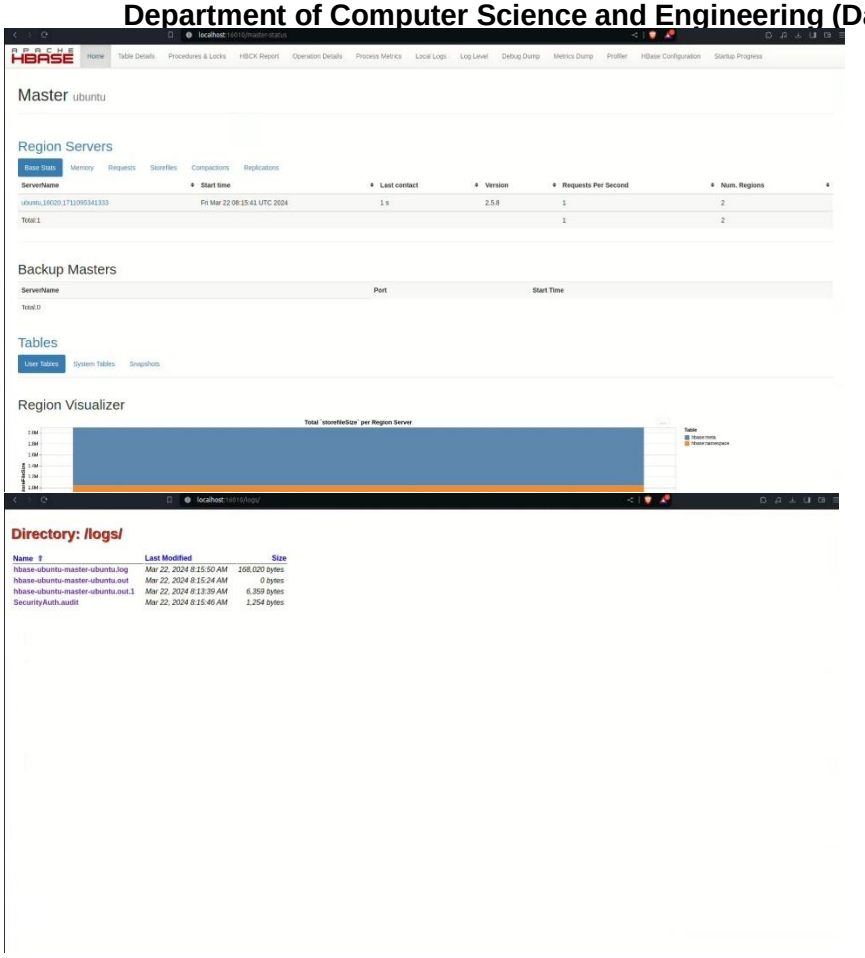




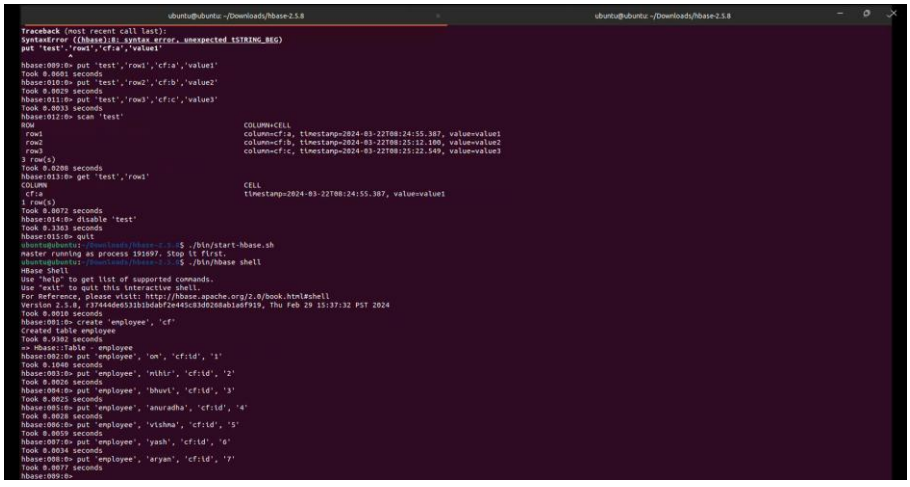
Department of Computer Science and Engineering (Data Science)

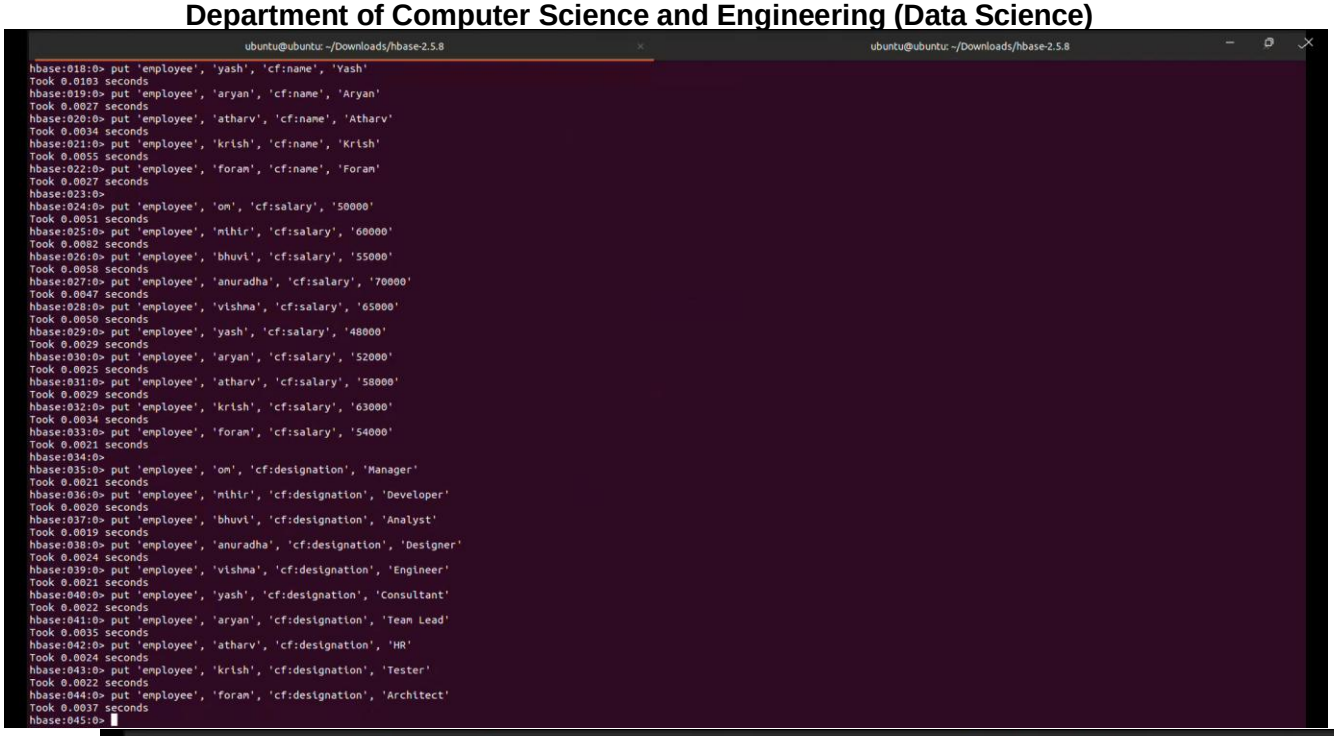




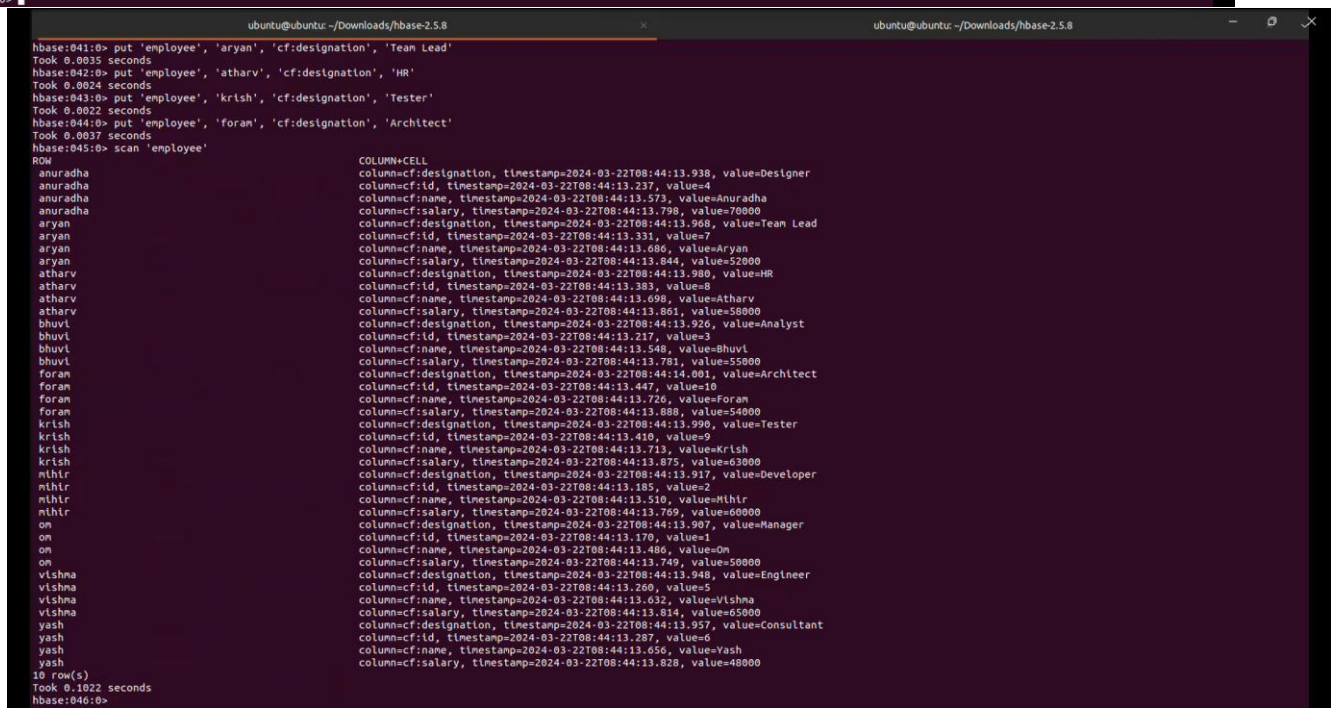


2. Implementation of HBase Create Table with Java API & Shell.
3. Implement HBase Shell Commands and dynamic scaling:
    a. General commands
    b. Tables Managements commands
    c. Data manipulation commands
    d. Cluster Replication Commands






```
hbase:018:0> put 'employee', 'yash', 'cf:name', 'Yash'
Took 0.0103 seconds
hbase:019:0> put 'employee', 'aryan', 'cf:name', 'Aryan'
Took 0.0027 seconds
hbase:020:0> put 'employee', 'atharv', 'cf:name', 'Atharv'
Took 0.0034 seconds
hbase:021:0> put 'employee', 'krish', 'cf:name', 'Krish'
Took 0.0055 seconds
hbase:022:0> put 'employee', 'foram', 'cf:name', 'Foram'
Took 0.0027 seconds
hbase:023:0>
hbase:024:0> put 'employee', 'om', 'cf:salary', '50000'
Took 0.0051 seconds
hbase:025:0> put 'employee', 'mihir', 'cf:salary', '60000'
Took 0.0082 seconds
hbase:026:0> put 'employee', 'bhuvi', 'cf:salary', '55000'
Took 0.0058 seconds
hbase:027:0> put 'employee', 'anuradha', 'cf:salary', '70000'
Took 0.0047 seconds
hbase:028:0> put 'employee', 'vishma', 'cf:salary', '65000'
Took 0.0058 seconds
hbase:029:0> put 'employee', 'yash', 'cf:salary', '48000'
Took 0.0029 seconds
hbase:030:0> put 'employee', 'aryan', 'cf:salary', '52000'
Took 0.0025 seconds
hbase:031:0> put 'employee', 'atharv', 'cf:salary', '58000'
Took 0.0029 seconds
hbase:032:0> put 'employee', 'krish', 'cf:salary', '63000'
Took 0.0034 seconds
hbase:033:0> put 'employee', 'foram', 'cf:salary', '54000'
Took 0.0021 seconds
hbase:034:0>
hbase:035:0> put 'employee', 'om', 'cf:designation', 'Manager'
Took 0.0021 seconds
hbase:036:0> put 'employee', 'mihir', 'cf:designation', 'Developer'
Took 0.0020 seconds
hbase:037:0> put 'employee', 'bhuvi', 'cf:designation', 'Analyst'
Took 0.0019 seconds
hbase:038:0> put 'employee', 'anuradha', 'cf:designation', 'Designer'
Took 0.0024 seconds
hbase:039:0> put 'employee', 'vishma', 'cf:designation', 'Engineer'
Took 0.0021 seconds
hbase:040:0> put 'employee', 'yash', 'cf:designation', 'Consultant'
Took 0.0022 seconds
hbase:041:0> put 'employee', 'aryan', 'cf:designation', 'Team Lead'
Took 0.0035 seconds
hbase:042:0> put 'employee', 'atharv', 'cf:designation', 'HR'
Took 0.0024 seconds
hbase:043:0> put 'employee', 'krish', 'cf:designation', 'Tester'
Took 0.0022 seconds
hbase:044:0> put 'employee', 'foram', 'cf:designation', 'Architect'
Took 0.0037 seconds
hbase:045:0>
```



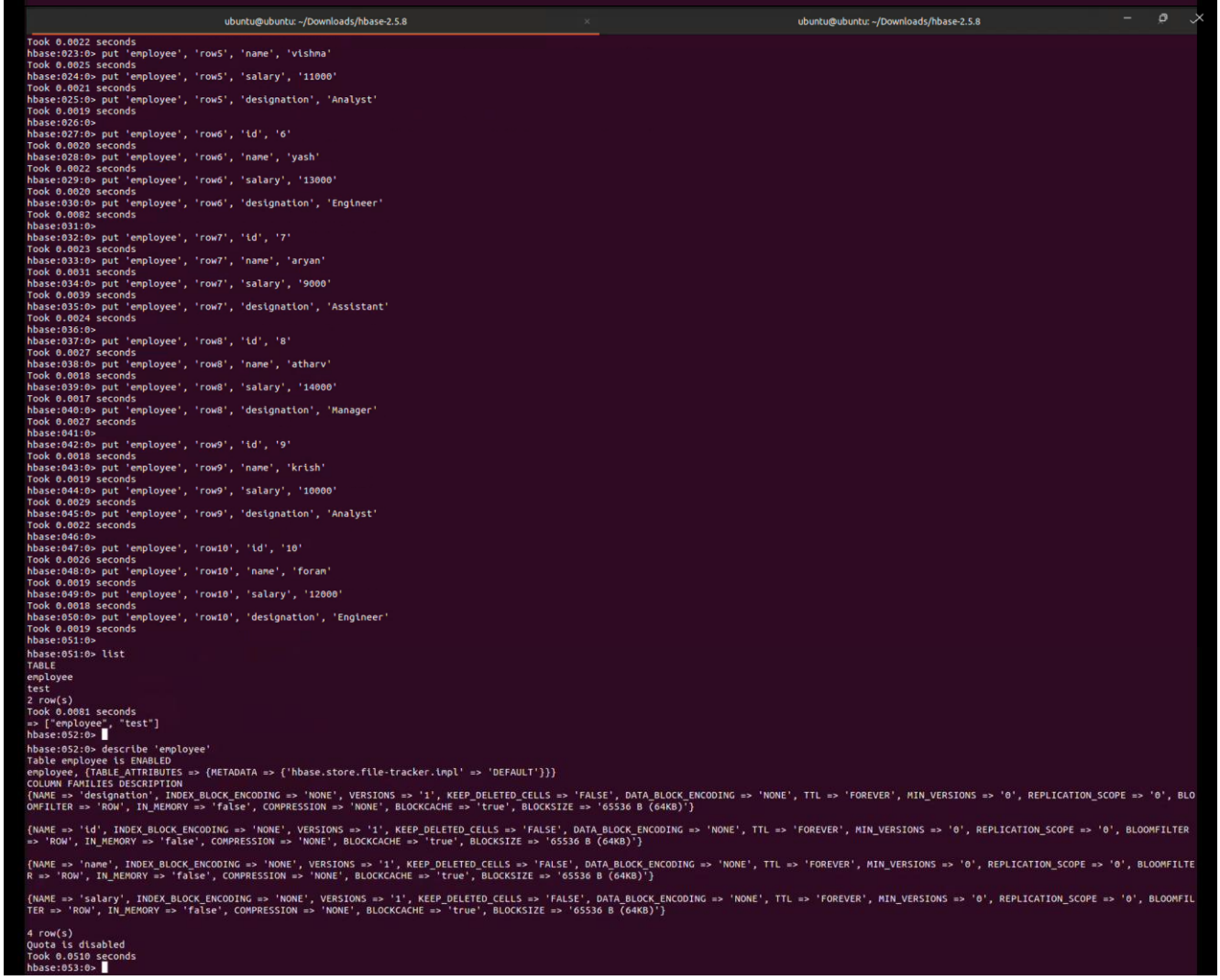

```
hbase:041:0> put 'employee', 'aryan', 'cf:designation', 'Team Lead'
Took 0.0035 seconds
hbase:042:0> put 'employee', 'atharv', 'cf:designation', 'HR'
Took 0.0024 seconds
hbase:043:0> put 'employee', 'krish', 'cf:designation', 'Tester'
Took 0.0022 seconds
hbase:044:0> put 'employee', 'foram', 'cf:designation', 'Architect'
Took 0.0037 seconds
hbase:045:0> scan 'employee'
ROW                                     COLUMN+CELL
 anuradha                               column=cf:designation, timestamp=2024-03-22T08:44:13.938, value=Designer
 anuradha                               column=cf:id, timestamp=2024-03-22T08:44:13.237, value=4
 anuradha                               column=cf:name, timestamp=2024-03-22T08:44:13.573, value=Anuradha
 anuradha                               column=cf:salary, timestamp=2024-03-22T08:44:13.798, value=70000
 aryan                                  column=cf:designation, timestamp=2024-03-22T08:44:13.968, value=Team Lead
 aryan                                  column=cf:id, timestamp=2024-03-22T08:44:13.331, value=7
 aryan                                  column=cf:name, timestamp=2024-03-22T08:44:13.686, value=Aryan
 aryan                                  column=cf:salary, timestamp=2024-03-22T08:44:13.844, value=52000
 atharv                                 column=cf:designation, timestamp=2024-03-22T08:44:13.980, value=HR
 atharv                                 column=cf:id, timestamp=2024-03-22T08:44:13.383, value=8
 atharv                                 column=cf:name, timestamp=2024-03-22T08:44:13.698, value=Atharv
 atharv                                 column=cf:salary, timestamp=2024-03-22T08:44:13.861, value=58000
 bhuvi                                  column=cf:designation, timestamp=2024-03-22T08:44:13.926, value=Analyst
 bhuvi                                  column=cf:id, timestamp=2024-03-22T08:44:13.217, value=3
 bhuvi                                  column=cf:name, timestamp=2024-03-22T08:44:13.548, value=Bhuvi
 bhuvi                                  column=cf:salary, timestamp=2024-03-22T08:44:13.781, value=55000
 foram                                  column=cf:designation, timestamp=2024-03-22T08:44:14.001, value=Architect
 foram                                  column=cf:id, timestamp=2024-03-22T08:44:13.447, value=10
 foram                                  column=cf:name, timestamp=2024-03-22T08:44:13.726, value=Foram
 foram                                  column=cf:salary, timestamp=2024-03-22T08:44:13.888, value=54000
 krish                                  column=cf:designation, timestamp=2024-03-22T08:44:13.990, value=Tester
 krish                                  column=cf:id, timestamp=2024-03-22T08:44:13.410, value=9
 krish                                  column=cf:name, timestamp=2024-03-22T08:44:13.713, value=Krish
 krish                                  column=cf:salary, timestamp=2024-03-22T08:44:13.875, value=63000
 mihir                                  column=cf:designation, timestamp=2024-03-22T08:44:13.917, value=Developer
 mihir                                  column=cf:id, timestamp=2024-03-22T08:44:13.185, value=2
 mihir                                  column=cf:name, timestamp=2024-03-22T08:44:13.510, value=Mihir
 mihir                                  column=cf:salary, timestamp=2024-03-22T08:44:13.769, value=60000
 om                                     column=cf:designation, timestamp=2024-03-22T08:44:13.907, value=Manager
 om                                     column=cf:id, timestamp=2024-03-22T08:44:13.170, value=1
 om                                     column=cf:name, timestamp=2024-03-22T08:44:13.486, value=Om
 om                                     column=cf:salary, timestamp=2024-03-22T08:44:13.749, value=50000
 vishma                                 column=cf:designation, timestamp=2024-03-22T08:44:13.948, value=Engineer
 vishma                                 column=cf:id, timestamp=2024-03-22T08:44:13.260, value=5
 vishma                                 column=cf:name, timestamp=2024-03-22T08:44:13.632, value=Vishma
 vishma                                 column=cf:salary, timestamp=2024-03-22T08:44:13.814, value=65000
 yash                                   column=cf:designation, timestamp=2024-03-22T08:44:13.957, value=Consultant
 yash                                   column=cf:id, timestamp=2024-03-22T08:44:13.287, value=6
 yash                                   column=cf:name, timestamp=2024-03-22T08:44:13.656, value=Yash
 yash                                   column=cf:salary, timestamp=2024-03-22T08:44:13.828, value=48000
10 row(s)
Took 0.1022 seconds
hbase:046:0>
```

```
ubuntu@ubuntu: ~/Downloads/hbase-2.5.8                ubuntu@ubuntu: ~/Downloads/hbase-2.5.8
hbase:045:0> scan 'employee'
ROW                                   COLUMN+CELL
 anuradha                             column=cf:designation, timestamp=2024-03-22T08:44:13.938, value=Designer
 anuradha                             column=cf:id, timestamp=2024-03-22T08:44:13.237, value=4
 anuradha                             column=cf:name, timestamp=2024-03-22T08:44:13.573, value=Anuradha
 anuradha                             column=cf:salary, timestamp=2024-03-22T08:44:13.798, value=70000
 aryan                                column=cf:designation, timestamp=2024-03-22T08:44:13.968, value=Team Lead
 aryan                                column=cf:id, timestamp=2024-03-22T08:44:13.331, value=7
 aryan                                column=cf:name, timestamp=2024-03-22T08:44:13.686, value=Aryan
 aryan                                column=cf:salary, timestamp=2024-03-22T08:44:13.844, value=52000
 atharv                               column=cf:designation, timestamp=2024-03-22T08:44:13.980, value=HR
 atharv                               column=cf:id, timestamp=2024-03-22T08:44:13.383, value=8
 atharv                               column=cf:name, timestamp=2024-03-22T08:44:13.698, value=Atharv
 atharv                               column=cf:salary, timestamp=2024-03-22T08:44:13.861, value=58000
 bhuvi                                column=cf:designation, timestamp=2024-03-22T08:44:13.926, value=Analyst
 bhuvi                                column=cf:id, timestamp=2024-03-22T08:44:13.217, value=3
 bhuvi                                column=cf:name, timestamp=2024-03-22T08:44:13.548, value=Bhuvi
 bhuvi                                column=cf:salary, timestamp=2024-03-22T08:44:13.781, value=55000
 foram                                column=cf:designation, timestamp=2024-03-22T08:44:14.001, value=Architect
 foram                                column=cf:id, timestamp=2024-03-22T08:44:13.447, value=10
 foram                                column=cf:name, timestamp=2024-03-22T08:44:13.726, value=Foram
 foram                                column=cf:salary, timestamp=2024-03-22T08:44:13.888, value=54000
 krish                                column=cf:designation, timestamp=2024-03-22T08:44:13.990, value=Tester
 krish                                column=cf:id, timestamp=2024-03-22T08:44:13.410, value=9
 krish                                column=cf:name, timestamp=2024-03-22T08:44:13.713, value=Krish
 krish                                column=cf:salary, timestamp=2024-03-22T08:44:13.875, value=63000
 mihir                                column=cf:designation, timestamp=2024-03-22T08:44:13.917, value=Developer
 mihir                                column=cf:id, timestamp=2024-03-22T08:44:13.185, value=2
 mihir                                column=cf:name, timestamp=2024-03-22T08:44:13.510, value=Mihir
 mihir                                column=cf:salary, timestamp=2024-03-22T08:44:13.769, value=60000
 om                                   column=cf:designation, timestamp=2024-03-22T08:44:13.907, value=Manager
 om                                   column=cf:id, timestamp=2024-03-22T08:44:13.170, value=1
 om                                   column=cf:name, timestamp=2024-03-22T08:44:13.486, value=Om
 om                                   column=cf:salary, timestamp=2024-03-22T08:44:13.749, value=50000
 vishma                               column=cf:designation, timestamp=2024-03-22T08:44:13.948, value=Engineer
 vishma                               column=cf:id, timestamp=2024-03-22T08:44:13.260, value=5
 vishma                               column=cf:name, timestamp=2024-03-22T08:44:13.632, value=Vishma
 vishma                               column=cf:salary, timestamp=2024-03-22T08:44:13.814, value=65000
 yash                                 column=cf:designation, timestamp=2024-03-22T08:44:13.957, value=Consultant
 yash                                 column=cf:id, timestamp=2024-03-22T08:44:13.287, value=6
 yash                                 column=cf:name, timestamp=2024-03-22T08:44:13.656, value=Yash
 yash                                 column=cf:salary, timestamp=2024-03-22T08:44:13.828, value=48000
10 row(s)
Took 0.1022 seconds
hbase:046:0> get 'employee', 'om'
COLUMN                                CELL
 cf:designation                       timestamp=2024-03-22T08:44:13.907, value=Manager
 cf:id                                timestamp=2024-03-22T08:44:13.170, value=1
 cf:name                              timestamp=2024-03-22T08:44:13.486, value=Om
 cf:salary                            timestamp=2024-03-22T08:44:13.749, value=50000
1 row(s)
Took 0.0206 seconds
hbase:047:0>
```

```
hbase:047:0> disable 'employee'
Took 0.3387 seconds
hbase:048:0> drop 'employee'
Took 0.3352 seconds
```

```
ubuntu@ubuntu: ~/Downloads/hbase-2.5.8                ubuntu@ubuntu: ~/Downloads/hbase-2.5.8
ubuntu@ubuntu:~/Downloads/hbase-2.5.8$ ./bin/hbase shell
HBase Shell
Use "help" to get list of supported commands.
Use "exit" to quit this interactive shell.
For Reference, please visit: http://hbase.apache.org/2.0/book.html#shell
Version 2.5.8, r37444de6531b1bdabf2e445c83d0268ab1a6f919, Thu Feb 29 15:37:32 PST 2024
Took 0.0010 seconds
hbase:001:0> status
1 active master, 0 backup masters, 1 servers, 0 dead, 2.0000 average load
Took 0.3099 seconds
hbase:002:0> version
2.5.8, r37444de6531b1bdabf2e445c83d0268ab1a6f919, Thu Feb 29 15:37:32 PST 2024
Took 0.0002 seconds
hbase:003:0> table_help
Help for table-reference commands.

You can either create a table via 'create' and then manipulate the table via commands like 'put', 'get', etc.
See the standard help information for how to use each of these commands.

However, as of 0.96, you can also get a reference to a table, on which you can invoke commands.
For instance, you can get create a table and keep around a reference to it via:

   hbase> t = create 't', 'cf'

Or, if you have already created the table, you can get a reference to it:

   hbase> t = get_table 't'

You can do things like call 'put' on the table:

  hbase> t.put 'r', 'cf:q', 'v'

which puts a row 'r' with column family 'cf', qualifier 'q' and value 'v' into table t.

To read the data out, you can scan the table:

  hbase> t.scan

which will read all the rows in table 't'.

Essentially, any command that takes a table name can also be done via table reference.
Other commands include things like: get, delete, deleteall,
get_all_columns, get_counter, count, incr. These functions, along with
the standard JRuby object methods are also available via tab completion.

For more information on how to use each of these commands, you can also just type:

   hbase> t.help 'scan'

which will output more information on how to use that command.

You can also do general admin actions directly on a table; things like enable, disable,
flush and drop just by typing:

   hbase> t.enable
   hbase> t.flush
   hbase> t.disable
   hbase> t.drop

Note that after dropping a table, your reference to it becomes useless and further usage
is undefined (and not recommended).
Took 0.0003 seconds
hbase:004:0> whoami
ubuntu (auth:SIMPLE)
    groups: ubuntu, adm, cdrom, sudo, dip, plugdev, kvm, lpadmin, lxd, sambashare
Took 0.0259 seconds
hbase:005:0>
```


ubuntu@ubuntu: ~/Downloads/hbase-2.5.8
ubuntu@ubuntu: ~/Downloads/hbase-2.5.8
ubuntu@ubuntu:~/Downloads/hbase-2.5.8$ ./bin/hbase shell
HBase Shell
Use "help" to get list of supported commands.
Use "exit" to quit this interactive shell.
For Reference, please visit: http://hbase.apache.org/2.0/book.html#shell
Version 2.5.8, r37444de6531b1bdabf2e445c83d0268ab1a6f919, Thu Feb 29 15:37:32 PST 2024
Took 0.0009 seconds
hbase:001:0> create 'employee', {NAME => 'id'}, {NAME => 'name'}, {NAME => 'salary'}, {NAME => 'designation'}
Created table employee
Took 0.8801 seconds
=> Hbase::Table - employee
hbase:002:0>


ubuntu@ubuntu: ~/Downloads/hbase-2.5.8
ubuntu@ubuntu: ~/Downloads/hbase-2.5.8
Took 0.0022 seconds
hbase:023:0> put 'employee', 'row5', 'name', 'vishma'
Took 0.0025 seconds
hbase:024:0> put 'employee', 'row5', 'salary', '11000'
Took 0.0021 seconds
hbase:025:0> put 'employee', 'row5', 'designation', 'Analyst'
Took 0.0019 seconds
hbase:026:0>
hbase:027:0> put 'employee', 'row6', 'id', '6'
Took 0.0020 seconds
hbase:028:0> put 'employee', 'row6', 'name', 'yash'
Took 0.0022 seconds
hbase:029:0> put 'employee', 'row6', 'salary', '13000'
Took 0.0020 seconds
hbase:030:0> put 'employee', 'row6', 'designation', 'Engineer'
Took 0.0082 seconds
hbase:031:0>
hbase:032:0> put 'employee', 'row7', 'id', '7'
Took 0.0023 seconds
hbase:033:0> put 'employee', 'row7', 'name', 'aryan'
Took 0.0031 seconds
hbase:034:0> put 'employee', 'row7', 'salary', '9000'
Took 0.0039 seconds
hbase:035:0> put 'employee', 'row7', 'designation', 'Assistant'
Took 0.0024 seconds
hbase:036:0>
hbase:037:0> put 'employee', 'row8', 'id', '8'
Took 0.0027 seconds
hbase:038:0> put 'employee', 'row8', 'name', 'atharv'
Took 0.0018 seconds
hbase:039:0> put 'employee', 'row8', 'salary', '14000'
Took 0.0017 seconds
hbase:040:0> put 'employee', 'row8', 'designation', 'Manager'
Took 0.0027 seconds
hbase:041:0>
hbase:042:0> put 'employee', 'row9', 'id', '9'
Took 0.0018 seconds
hbase:043:0> put 'employee', 'row9', 'name', 'krish'
Took 0.0019 seconds
hbase:044:0> put 'employee', 'row9', 'salary', '10000'
Took 0.0029 seconds
hbase:045:0> put 'employee', 'row9', 'designation', 'Analyst'
Took 0.0022 seconds
hbase:046:0>
hbase:047:0> put 'employee', 'row10', 'id', '10'
Took 0.0026 seconds
hbase:048:0> put 'employee', 'row10', 'name', 'foram'
Took 0.0019 seconds
hbase:049:0> put 'employee', 'row10', 'salary', '12000'
Took 0.0018 seconds
hbase:050:0> put 'employee', 'row10', 'designation', 'Engineer'
Took 0.0019 seconds
hbase:051:0>
hbase:051:0> list
TABLE
employee
test
2 row(s)
Took 0.0081 seconds
=> ["employee", "test"]
hbase:052:0>
hbase:052:0> describe 'employee'
Table employee is ENABLED
employee, {TABLE_ATTRIBUTES => {METADATA => {'hbase.store.file-tracker.impl' => 'DEFAULT'}}}
COLUMN FAMILIES DESCRIPTION
{NAME => 'designation', INDEX_BLOCK_ENCODING => 'NONE', VERSIONS => '1', KEEP_DELETED_CELLS => 'FALSE', DATA_BLOCK_ENCODING => 'NONE', TTL => 'FOREVER', MIN_VERSIONS => '0', REPLICATION_SCOPE => '0', BLO
OMFILTER => 'ROW', IN_MEMORY => 'false', COMPRESSION => 'NONE', BLOCKCACHE => 'true', BLOCKSIZE => '65536 B (64KB)'}
{NAME => 'id', INDEX_BLOCK_ENCODING => 'NONE', VERSIONS => '1', KEEP_DELETED_CELLS => 'FALSE', DATA_BLOCK_ENCODING => 'NONE', TTL => 'FOREVER', MIN_VERSIONS => '0', REPLICATION_SCOPE => '0', BLOOMFILTER
=> 'ROW', IN_MEMORY => 'false', COMPRESSION => 'NONE', BLOCKCACHE => 'true', BLOCKSIZE => '65536 B (64KB)'}
{NAME => 'name', INDEX_BLOCK_ENCODING => 'NONE', VERSIONS => '1', KEEP_DELETED_CELLS => 'FALSE', DATA_BLOCK_ENCODING => 'NONE', TTL => 'FOREVER', MIN_VERSIONS => '0', REPLICATION_SCOPE => '0', BLOOMFILTE
R => 'ROW', IN_MEMORY => 'false', COMPRESSION => 'NONE', BLOCKCACHE => 'true', BLOCKSIZE => '65536 B (64KB)'}
{NAME => 'salary', INDEX_BLOCK_ENCODING => 'NONE', VERSIONS => '1', KEEP_DELETED_CELLS => 'FALSE', DATA_BLOCK_ENCODING => 'NONE', TTL => 'FOREVER', MIN_VERSIONS => '0', REPLICATION_SCOPE => '0', BLOOMFIL
TER => 'ROW', IN_MEMORY => 'false', COMPRESSION => 'NONE', BLOCKCACHE => 'true', BLOCKSIZE => '65536 B (64KB)'}
4 row(s)
Quota is disabled
Took 0.0510 seconds
hbase:053:0>

```
hbase:053:0> disable 'employee'
Took 0.3194 seconds
hbase:054:0> enable 'employee'
Took 0.6280 seconds
hbase:055:0> drop 'employee'

ERROR: Table employee is enabled. Disable it first.

For usage try 'help "drop"'

Took 0.0129 seconds
hbase:056:0> disable 'employee'
Took 0.3134 seconds
hbase:057:0>
hbase:057:0> drop 'employee'
Took 0.1184 seconds
hbase:058:0> list
TABLE
test
1 row(s)
Took 0.0036 seconds
=> ["test"]
hbase:059:0>
```

```
ubuntu@ubuntu: ~/Downloads/hbase-2.5.8                    ubuntu@ubuntu: ~/Downloads/hbase-2.5.8
ubuntu@ubuntu:~/Downloads/hbase-2.5.8$ ./bin/hbase shell
HBase Shell
Use "help" to get list of supported commands.
Use "exit" to quit this interactive shell.
For Reference, please visit: http://hbase.apache.org/2.0/book.html#shell
Version 2.5.8, r37444de6531b1bdabf2e445c83d0268ab1a6f919, Thu Feb 29 15:37:32 PST 2024
Took 0.0014 seconds
hbase:001:0> get 'employees', '1'
COLUMN                                          CELL
 personal_info:id                               timestamp=2024-03-22T09:16:25.428, value=1
 personal_info:name                             timestamp=2024-03-22T09:16:25.437, value=om
 personal_info:salary                           timestamp=2024-03-22T09:16:25.447, value=10000
 professional_info:designation                  timestamp=2024-03-22T09:16:25.455, value=Manager
1 row(s)
Took 0.3212 seconds
hbase:002:0> get 'employees', '1', {COLUMN => 'personal_info:name'}
COLUMN                                          CELL
 personal_info:name                             timestamp=2024-03-22T09:16:25.437, value=om
1 row(s)
Took 0.0042 seconds
hbase:003:0> scan 'employees'
ROW                                             COLUMN+CELL
 1                                              column=personal_info:id, timestamp=2024-03-22T09:16:25.428, value=1
 1                                              column=personal_info:name, timestamp=2024-03-22T09:16:25.437, value=om
 1                                              column=personal_info:salary, timestamp=2024-03-22T09:16:25.447, value=10000
 1                                              column=professional_info:designation, timestamp=2024-03-22T09:16:25.455, value=Manager
 10                                             column=personal_info:id, timestamp=2024-03-22T09:16:25.732, value=10
 10                                             column=personal_info:name, timestamp=2024-03-22T09:16:25.739, value=foram
 10                                             column=personal_info:salary, timestamp=2024-03-22T09:16:25.746, value=12000
 10                                             column=professional_info:designation, timestamp=2024-03-22T09:16:25.753, value=Engineer
 2                                              column=personal_info:id, timestamp=2024-03-22T09:16:25.467, value=2
 2                                              column=personal_info:name, timestamp=2024-03-22T09:16:25.476, value=mihir
 2                                              column=personal_info:salary, timestamp=2024-03-22T09:16:25.484, value=12000
 2                                              column=professional_info:designation, timestamp=2024-03-22T09:16:25.492, value=Engineer
 3                                              column=personal_info:id, timestamp=2024-03-22T09:16:25.504, value=3
 3                                              column=personal_info:name, timestamp=2024-03-22T09:16:25.512, value=bhuvi
 3                                              column=personal_info:salary, timestamp=2024-03-22T09:16:25.520, value=8000
 3                                              column=professional_info:designation, timestamp=2024-03-22T09:16:25.528, value=Assistant
 4                                              column=personal_info:id, timestamp=2024-03-22T09:16:25.540, value=4
hbase:004:0> scan 'employees', {COLUMNS => ['personal_info:name', 'personal_info:salary']}
ROW                                             COLUMN+CELL
 1                                              column=personal_info:name, timestamp=2024-03-22T09:16:25.437, value=om
 1                                              column=personal_info:salary, timestamp=2024-03-22T09:16:25.447, value=10000
 10                                             column=personal_info:name, timestamp=2024-03-22T09:16:25.739, value=foram
 10                                             column=personal_info:salary, timestamp=2024-03-22T09:16:25.746, value=12000
 2                                              column=personal_info:name, timestamp=2024-03-22T09:16:25.476, value=mihir
 2                                              column=personal_info:salary, timestamp=2024-03-22T09:16:25.484, value=12000
 3                                              column=personal_info:name, timestamp=2024-03-22T09:16:25.512, value=bhuvi
 3                                              column=personal_info:salary, timestamp=2024-03-22T09:16:25.520, value=8000
 4                                              column=personal_info:name, timestamp=2024-03-22T09:16:25.547, value=anuradha
 4                                              column=personal_info:salary, timestamp=2024-03-22T09:16:25.555, value=15000
 5                                              column=personal_info:name, timestamp=2024-03-22T09:16:25.580, value=vishna
 5                                              column=personal_info:salary, timestamp=2024-03-22T09:16:25.587, value=11000
 6                                              column=personal_info:name, timestamp=2024-03-22T09:16:25.611, value=yash
 6                                              column=personal_info:salary, timestamp=2024-03-22T09:16:25.618, value=13000
 7                                              column=personal_info:name, timestamp=2024-03-22T09:16:25.645, value=aryan
 7                                              column=personal_info:salary, timestamp=2024-03-22T09:16:25.652, value=9000
 8                                              column=personal_info:name, timestamp=2024-03-22T09:16:25.676, value=atharv
 8                                              column=personal_info:salary, timestamp=2024-03-22T09:16:25.683, value=14000
 9                                              column=personal_info:name, timestamp=2024-03-22T09:16:25.707, value=krish
 9                                              column=personal_info:salary, timestamp=2024-03-22T09:16:25.714, value=10000
10 row(s)
Took 0.0668 seconds
hbase:005:0>
hbase:005:0> deleteall 'employees', '1'
Took 0.0278 seconds
hbase:006:0> delete 'employees', '1', 'personal_info:name'
Took 0.0027 seconds
hbase:007:0>
```

Conclusion: HBase has been utilised as a no-SQL database to implement queries for retrieval & modification of data & for cluster replication.