

- Установить ClickHouse.
- Подгрузить датасет для примера и сделать селект из таблицы.
- Для проверки отправить скрины работающего инстанса ClickHouse, созданной виртуальной машины и результата запроса `select count() from trips where payment_type = 1`.
  - Установка ClickHouse в WSL Ubuntu 22.04.5 LTS

```
rsolanov@Main: ~$ lsb_release -a
No LSB modules are available.
Distributor ID: Ubuntu
Description:    Ubuntu 22.04.5 LTS
Release:        22.04
Codename:       jammy
rsolanov@Main: ~$
```

```
rsolanov@Main: ~/projects/o
rsolanov@Main:~/projects/ots-ch$ clickhouse-client --config-file=config.xml
ClickHouse client version 24.3.5.47.altinitystable (altinity build).
Connecting to database default at localhost:9000 as user default.
Connected to ClickHouse server version 24.3.5.

Warnings:
 * Linux transparent hugepages are set to "always". Check /sys/kernel/mm/transparent_hugepage/enabled
 * Delay accounting is not enabled, OSIOWaitMicroseconds will not be gathered. You can enable it using `echo 1 > /proc/sys/kernel/t
ask_delayacct` or by using sysctl.

Main. :) |
```

```
rsolanov@Main:~/projects/otus-ch$ clickhouse-client --config-file=clickhouse.xml
ClickHouse client version 24.3.5.47.altinitystable (altinity build).
Connecting to database default at localhost:9000 as user default.
Connected to ClickHouse server version 24.3.5.

Warnings:
 * Linux transparent hugepages are set to "always". Check /sys/kernel/mm/transparent_hugepage/enabled
 * Delay accounting is not enabled, OSIOWaitMicroseconds will not be gathered. You can enable it using 'echo 1 > /proc/sys/kernel/t
ask_delayacct' or by using sysctl.

Main. :) exit
Bye.
rsolanov@Main:~/projects/otus-ch$ sudo service clickhouse-server status
[sudo] password for rsolanov:
● clickhouse-server.service - ClickHouse Server (analytic DBMS for big data)
   Loaded: loaded (/lib/systemd/system/clickhouse-server.service; enabled; vendor preset: enabled)
   Active: active (running) since Sun 2024-10-20 15:47:50 MSK; 23h ago
     Main PID: 298 (clickhouse-serv)
       Tasks: 704 (limit: 14999)
      Memory: 1.6G
     CGroup: /system.slice/clickhouse-server.service
             └─210 clickhouse-watchdog " " " " " " " " " " --config=/etc/clickhouse-server/config.xml --pid-file=/run/clickhouse-
               └─298 /usr/bin/clickhouse-server --config=/etc/clickhouse-server/config.xml --pid-file=/run/clickhouse-server/clickho

Oct 20 15:47:45 Main systemd[1]: Starting ClickHouse Server (analytic DBMS for big data)...
Oct 20 15:47:49 Main clickhouse-server[210]: Processing configuration file '/etc/clickhouse-server/config.xml'.
Oct 20 15:47:49 Main clickhouse-server[210]: Logging trace to /var/log/clickhouse-server/clickhouse-server.log
Oct 20 15:47:49 Main clickhouse-server[210]: Logging errors to /var/log/clickhouse-server/clickhouse-server.err.log
Oct 20 15:47:49 Main systemd[1]: clickhouse-server.service: Supervising process 298 which is not our child. We'll most likely not
Oct 20 15:47:50 Main systemd[1]: Started ClickHouse Server (analytic DBMS for big data).
lines 1-16/16 (END)
```

## ○ Установка ClickHouse из Docker'а

The screenshot shows the Docker Desktop interface. On the left, the 'Containers' tab is selected. The main area displays a table of running containers. One container named 'clickhouse' is running, using 0.39% CPU and 3.06GB memory. Below the table, there are 'Walkthroughs' for multi-container applications and containerizing applications. At the bottom, a terminal window shows the output of the 'clickhouse-client' command, indicating a successful connection to the ClickHouse server.

Name	Image	Status	Port(s)	CPU (%)	Last started	Actions
clickhouse	clickhouse/clickhouse	Running (1/1)	8123:8123 9000:9000 9005:9005	0.39%	22 hours ago	[Stop] [Refresh] [Delete]

```
rsolanov@Main: ~/projects/o
rsolanov@Main:~/projects/otus-ch$ clickhouse-client --host host.docker.internal --port 9000 --user admin --password admin
ClickHouse client version 24.3.5.47.altinitystable (altinity build).
Connecting to host.docker.internal:9000 as user admin.
Connected to ClickHouse server version 23.8.16.

ClickHouse server version is older than ClickHouse client. It may indicate that the server is out of date and can be upgraded.

Warnings:
* Linux transparent hugepages are set to "always". Check /sys/kernel/mm/transparent_hugepage/enabled

272e60631116 :) |
```

## ○ Загрузка датасета

```
CREATE TABLE trips (
    trip_id          UInt32,
    pickup_datetime  DateTime,
    dropoff_datetime DateTime,
    pickup_longitude Nullable(Float64),
    pickup_latitude  Nullable(Float64),
    dropoff_longitude Nullable(Float64),
    dropoff_latitude Nullable(Float64),
    passenger_count  UInt8,
    trip_distance    Float32,
    fare_amount      Float32,
    extra            Float32,
    tip_amount       Float32,
    tolls_amount     Float32,
    total_amount     Float32,
    payment_type     Enum('CSH' = 1, 'CRE' = 2, 'NOC' = 3, 'DIS' = 4, 'UNK' = 5),
    pickup_ntaname   LowCardinality(String),
    dropoff_ntaname  LowCardinality(String)
)
ENGINE = MergeTree
PRIMARY KEY (pickup_datetime, dropoff_datetime);
```

The screenshot shows a database management tool with a SQL editor and a statistics window.

**SQL Editor:**

```
CREATE TABLE trips (
    trip_id          UInt32,
    pickup_datetime  DateTime,
    dropoff_datetime DateTime,
    pickup_longitude Nullable(Float64),
    pickup_latitude  Nullable(Float64),
    dropoff_longitude Nullable(Float64),
    dropoff_latitude  Nullable(Float64),
    passenger_count  UInt8,
    trip_distance     Float32,
    fare_amount       Float32,
    extra             Float32,
    tip_amount        Float32,
    tolls_amount       Float32,
    total_amount      Float32,
    payment_type      Enum('CSH' = 1, 'CRE' = 2, 'NOC' = 3, 'DIS' = 4, 'UNK' = 5),
    pickup_ntaname    LowCardinality(String),
    dropoff_ntaname    LowCardinality(String)
)
ENGINE = MergeTree
PRIMARY KEY (pickup_datetime, dropoff_datetime);
```

**Statistics 1 x:**

Name	Value
Updated Rows	0
Query	CREATE TABLE trips (         trip_id          UInt32,

```
INSERT INTO trips
SELECT
    trip_id,
    pickup_datetime,
    dropoff_datetime,
    pickup_longitude,
    pickup_latitude,
    dropoff_longitude,
    dropoff_latitude,
    passenger_count,
    trip_distance,
    fare_amount,
    extra,
    tip_amount,
    tolls_amount,
    total_amount,
    payment_type,
    pickup_ntaname,
    dropoff_ntaname
FROM gcs(
    'https://storage.googleapis.com/clickhouse-public-datasets/nyc-
taxi/trips_{0..2}.gz',
    'TabSeparatedWithNames'
);
```

SQL query editor showing an INSERT INTO statement for a table named 'trips'.

```
INSERT INTO trips
SELECT
    trip_id,
    pickup_datetime,
    dropoff_datetime,
    pickup_longitude,
    pickup_latitude,
    dropoff_longitude,
    dropoff_latitude,
    passenger_count,
    trip_distance,
    fare_amount,
    extra,
    tip_amount,
    tolls_amount,
    total_amount,
    payment_type,
    pickup_ntaname,
    dropoff_ntaname
FROM gcs(
    'https://storage.googleapis.com/clickhouse-public-datasets/nyc-taxi/trips_{0..2}.gz',
    'TabSeparatedWithNames'
);
```

Statistics 1 x

Name	Value
Updated Rows	3000317
Query	INSERT INTO trips SELECT

select count() from trips where payment\_type = 1

SQL query editor showing a query to count rows where payment\_type is 1.

```
select count() from trips where payment_type = 1
```

trips 1 x

select count() from trips where payment\_ty | Enter a SQL expression to filter

Grid	123 count()
1	1,850,287

- Провести тестирование производительности и сохранить результаты

```
rsolanov@Main: ~/projects/o X + v
rsolanov@Main:~/projects/otus-ch$ echo "select * from default.cell_towers LIMIT 10000000 offset 10000000" | clickhouse-benchmark -i
10 --user default --password [REDACTED]
Loaded 1 queries.

Queries executed: 10.

localhost:9000, queries: 10, QPS: 61.616, RPS: 0.000, MiB/s: 0.000, result RPS: 0.000, result MiB/s: 0.000.

0.000%      0.001 sec.
10.000%     0.001 sec.
20.000%     0.001 sec.
30.000%     0.001 sec.
40.000%     0.001 sec.
50.000%     0.001 sec.
60.000%     0.001 sec.
70.000%     0.001 sec.
80.000%     0.001 sec.
90.000%     0.001 sec.
95.000%     0.007 sec.
99.000%     0.007 sec.
99.900%     0.007 sec.
99.990%     0.007 sec.

rsolanov@Main:~/projects/otus-ch$
```

Queries executed: 10.

localhost:9000, queries: 10, QPS: 61.616, RPS: 0.000, MiB/s: 0.000, result RPS: 0.000, result MiB/s: 0.000.

0.000%	0.001 sec.
10.000%	0.001 sec.
20.000%	0.001 sec.
30.000%	0.001 sec.
40.000%	0.001 sec.
50.000%	0.001 sec.
60.000%	0.001 sec.
70.000%	0.001 sec.
80.000%	0.001 sec.
90.000%	0.001 sec.
95.000%	0.007 sec.
99.000%	0.007 sec.
99.900%	0.007 sec.
99.990%	0.007 sec.

#### Внесенные изменения:

- Увеличение количества открытых файловых дескрипторов: увеличение значения параметра "ulimit -n" не менее чем до 100000;
- Увеличение объема разделяемой памяти: увеличение значения параметра "kernel.shmmax" не менее чем до 1 Гб

```
max_memory_usage = 8000000000;  
max_execution_time = 1800;  
force_primary_key = 1;  
max_threads = 16;  
max_insert_threads = 16;  
max_final_threads = 16;  
max_insert_block_size = 268435456; --from 1MB to 256MB  
max_compress_block_size = 104857600; -- from 1MB to 100MB  
min_insert_block_size_rows = 1048449;  
min_insert_block_size_bytes = 268435456; -- 256MB
```

```
localhost:9000, queries: 10, QPS: 68.638, RPS: 0.000, MiB/s: 0.000, result RPS: 0.000, result MiB/s: 0.000.  
0.000%      0.001 sec.  
10.000%     0.001 sec.  
20.000%     0.001 sec.  
30.000%     0.001 sec.  
40.000%     0.001 sec.  
50.000%     0.001 sec.  
60.000%     0.001 sec.  
70.000%     0.001 sec.  
80.000%     0.001 sec.  
90.000%     0.001 sec.  
95.000%     0.001 sec.  
99.000%     0.001 sec.  
99.900%     0.001 sec.  
99.990%     0.001 sec.  
  
rsolanov@Main:~$
```

```
0.000%      0.001 sec.  
10.000%     0.001 sec.  
20.000%     0.001 sec.  
30.000%     0.001 sec.  
40.000%     0.001 sec.  
50.000%     0.001 sec.  
60.000%     0.001 sec.  
70.000%     0.001 sec.  
80.000%     0.001 sec.  
90.000%     0.001 sec.  
95.000%     0.001 sec.  
99.000%     0.001 sec.  
99.900%     0.001 sec.  
99.990%     0.001 sec.
```

После применения изменения настроек видно, что увеличился параметр QPS с 61616 до 68638