Федеральное государственное автономное
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«СИБИРСКИЙ ФЕДЕРАЛЬНЫЙ УНИВЕРСИТЕТ»

Институт Космических и информационных технологий
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ОТЧЕТ ПО ПРАКТИЧЕСКОЙ РАБОТЕ №3

Индексы
тема

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1 Цель работы

Добавить индексы в таблицы.

2 Общая постановка задачи

Добавить индексы в таблицы.

3 Исходный код

Листинг 1 – Тестируемый запрос

```
      SELECT "SupportQuestions"."SupportTicketId",
       true "IsQuestion",
       "SupportQuestions"."SendTimestamp",
       "SupportQuestions"."ReadTimestamp",
       C."FirstName",
       C."LastName",
       "SupportQuestions"."Text"
FROM public."SupportQuestions"
         JOIN "SupportTickets" ST on ST."SupportTicketId" =
"SupportQuestions"."SupportTicketId"
         JOIN "Customers" C on C."CustomerId" = ST."CustomerId"
WHERE C."FirstName" = 'Юлия'
UNION
SELECT "SupportAnswers"."SupportTicketId",
       false,
       "SupportAnswers"."SendTimestamp",
       NULL,
       SO."FirstName",
       SO."LastName",
       "SupportAnswers"."Text"
FROM public."SupportAnswers"
         JOIN "SupportOperators" SO on SO."SupportOperatorId" =
"SupportAnswers"."SupportOperatorId"
WHERE SO."FirstName" = 'Юлия'
ORDER BY "SupportTicketId", "SendTimestamp";
```

Листинг 2 – Добавление и удаление индексов

```
      CREATE INDEX ON public."SupportOperators" ("FirstName");
CREATE INDEX ON public."Customers" ("FirstName");

DROP INDEX "SupportOperators_FirstName_idx";
DROP INDEX "Customers_FirstName_idx";
```

Листинг 3 – Explain Analyze без индексов

```
      Sort  (cost=25667.47..25678.24 rows=4309 width=329) (actual
time=79.551..79.737 rows=3999 loops=1)
```

```
"  Sort Key: ""SupportAnswers"".""SupportTicketId"",
""SupportAnswers"".""SendTimestamp"""
  Sort Method: quicksort  Memory: 679kB
  ->  HashAggregate  (cost=25364.26..25407.35 rows=4309 width=329) (actual
time=77.289..78.174 rows=3999 loops=1)
"        Group Key: ""SupportAnswers"".""SupportTicketId"", (false),
""SupportAnswers"".""SendTimestamp"", (NULL::timestamp with time zone),
so.""FirstName"", so.""LastName"", ""SupportAnswers"".""Text"""
        ->  Gather  (cost=1000.84..25288.86 rows=4309 width=329) (actual
time=4.281..99.984 rows=3999 loops=1)
              Workers Planned: 2
              Workers Launched: 2
              ->  Parallel Append  (cost=0.84..23857.96 rows=3787 width=329)
(actual time=4.851..48.265 rows=1333 loops=3)
                    ->  Parallel Hash Join  (cost=2899.38..5921.10 rows=1052
width=81) (actual time=4.708..12.714 rows=565 loops=3)
"                          Hash Cond: (""SupportAnswers"".""SupportOperatorId""
= so.""SupportOperatorId"")"
"                          ->  Parallel Seq Scan on ""SupportAnswers""
(cost=0.00..2766.86 rows=97086 width=48) (actual time=0.005..3.908 rows=55015
loops=3)"
                          ->  Parallel Hash  (cost=2889.18..2889.18 rows=816
width=32) (actual time=4.590..4.590 rows=448 loops=3)
                                Buckets: 2048  Batches: 1  Memory Usage: 112kB
"                                ->  Parallel Seq Scan on ""SupportOperators""
so  (cost=0.00..2889.18 rows=816 width=32) (actual time=0.015..13.489 rows=1343
loops=1)"
"                                      Filter: ((""FirstName"")::text =
'Юлия'::text)"
                                      Rows Removed by Filter: 126657
                    ->  Nested Loop  (cost=0.84..17874.83 rows=1050 width=88)
(actual time=0.336..53.207 rows=1153 loops=2)
                          ->  Nested Loop  (cost=0.42..17477.59 rows=700
width=32) (actual time=0.320..50.250 rows=772 loops=2)
"                                ->  Parallel Seq Scan on ""Customers"" c
(cost=0.00..13746.46 rows=2721 width=32) (actual time=0.159..44.458 rows=2853
loops=2)"
"                                      Filter: ((""FirstName"")::text =
'Юлия'::text)"
                                      Rows Removed by Filter: 288658
"                                ->  Index Scan using
""IX_SupportTickets_CustomerId"" on ""SupportTickets"" st  (cost=0.42..1.36
rows=1 width=8) (actual time=0.002..0.002 rows=0 loops=5706)"
"                                      Index Cond: (""CustomerId"" =
c.""CustomerId"")"
"                          ->  Index Scan using
""IX_SupportQuestions_SupportTicketId"" on ""SupportQuestions""
(cost=0.42..0.55 rows=2 width=59) (actual time=0.003..0.003 rows=1 loops=1543)"
"                                Index Cond: (""SupportTicketId"" =
st.""SupportTicketId"")"
Planning Time: 0.468 ms
Execution Time: 105.198 ms
```

Листинг 4 – Explain Analyze с индексами

```
      Sort  (cost=20141.81..20152.58 rows=4309 width=329) (actual
time=51.517..51.627 rows=3999 loops=1)
"  Sort Key: ""SupportQuestions"".""SupportTicketId"",
""SupportQuestions"".""SendTimestamp"""
  Sort Method: quicksort  Memory: 679kB
  ->  HashAggregate  (cost=19838.61..19881.70 rows=4309 width=329) (actual
time=49.422..50.231 rows=3999 loops=1)
"        Group Key: ""SupportQuestions"".""SupportTicketId"", (true),
""SupportQuestions"".""SendTimestamp"", ""SupportQuestions"".""ReadTimestamp"",
c.""FirstName"", c.""LastName"", ""SupportQuestions"".""Text"""
        ->  Append  (cost=10078.32..19763.20 rows=4309 width=329) (actual
time=5.273..47.594 rows=3999 loops=1)
              ->  Nested Loop  (cost=10078.32..13881.02 rows=2521 width=88)
(actual time=5.272..27.154 rows=2305 loops=1)
                    ->  Hash Join  (cost=10077.90..12927.65 rows=1680 width=32)
(actual time=5.258..23.491 rows=1543 loops=1)
"                          Hash Cond: (st.""CustomerId"" = c.""CustomerId"")"
"                          ->  Seq Scan on ""SupportTickets"" st
(cost=0.00..2456.00 rows=150000 width=8) (actual time=0.008..7.454 rows=149999
loops=1)"
                          ->  Hash  (cost=9996.28..9996.28 rows=6530 width=32)
(actual time=5.218..5.218 rows=5706 loops=1)
                                Buckets: 8192  Batches: 1  Memory Usage: 388kB
"                                ->  Bitmap Heap Scan on ""Customers"" c
(cost=159.03..9996.28 rows=6530 width=32) (actual time=1.300..4.421 rows=5706
loops=1)"
"                                      Recheck Cond: ((""FirstName"")::text =
'Юлия'::text)"
                                      Heap Blocks: exact=4227
"                                      ->  Bitmap Index Scan on
""Customers_FirstName_idx""  (cost=0.00..157.40 rows=6530 width=0) (actual
time=0.937..0.937 rows=5706 loops=1)"
"                                            Index Cond: ((""FirstName"")::text
= 'Юлия'::text)"
"                    ->  Index Scan using
""IX_SupportQuestions_SupportTicketId"" on ""SupportQuestions""
(cost=0.42..0.55 rows=2 width=59) (actual time=0.002..0.002 rows=1 loops=1543)"
"                          Index Cond: (""SupportTicketId"" =
st.""SupportTicketId"")"
              ->  Hash Join  (cost=1937.81..5817.54 rows=1788 width=81) (actual
time=1.118..20.232 rows=1694 loops=1)
"                    Hash Cond: (""SupportAnswers"".""SupportOperatorId"" =
so.""SupportOperatorId"")"
"                    ->  Seq Scan on ""SupportAnswers""  (cost=0.00..3446.47
rows=165047 width=48) (actual time=0.021..8.682 rows=165046 loops=1)"
                    ->  Hash  (cost=1920.48..1920.48 rows=1387 width=32) (actual
time=1.082..1.082 rows=1343 loops=1)
                          Buckets: 2048  Batches: 1  Memory Usage: 98kB
"                          ->  Bitmap Heap Scan on ""SupportOperators"" so
(cost=35.17..1920.48 rows=1387 width=32) (actual time=0.364..0.930 rows=1343
loops=1)"
"                                Recheck Cond: ((""FirstName"")::text =
'Юлия'::text)"
                                Heap Blocks: exact=955
"                                ->  Bitmap Index Scan on
""SupportOperators_FirstName_idx""  (cost=0.00..34.82 rows=1387 width=0) (actual
time=0.289..0.289 rows=1343 loops=1)"
"                                      Index Cond: ((""FirstName"")::text =
'Юлия'::text)"
Planning Time: 2.364 ms
Execution Time: 52.089 ms
```