

Commands to build project

Make sure you have gtest installed on your device and also have Linux subsystem on your device

```
> make clean  
> make  
> make a42.out  
> ./a42.out
```

OR

You can also run the following commands

```
> ./runTestCases42.sh  
> make gtest  
> ./gtest.out
```

These are the automated unit tests.

Implementation

The functions in the NodeForQuery class are implemented as follows.

1. class JoinNode()

This class manages Join operation for Nodes

2. class NodeForQuery

This class implements the Query optimization requirements. This class is inherited by the specific node classes.

3. class SelectFileNode()

This class manages the SELECT FILE operation for Nodes.

4. class SumNode()

This class manages the Nodes for SUM operation.

5. class SelectPipeNode()

This class manages the Nodes for SELECT PIPE operation.

6. class GroupByNode()

This class manages the ©

The classes above will have the following three functions

i. Apply ()

This function is a recursive implementation that parses all nodes in the parseTree, calls the appropriate Run () method, depending on the relational operator found, and writes out the output schema. This applies to tree-based functions such as GroupBy, WriteOut, and DuplicateRemovalNode.

ii. printNode ()

Outputs node information such as leftID and output schema. Generated after "applying" the query optimizer.

iii. Generate CNF ()

This function creates a CNF form and creates a new record for each input. Returns the new CNF generated using the GrowFromParseTree.

The format of the output file generated is as per the output6.txt file provided in the starter code.

Testing

Run the following commands to run the test. Also make sure all .bin files have the .bin.meta. We have ensured that we have the a2-test.cc with the P4 code. This is being updates to generate the meta files for all the tables.

```
>make a42.out
```

```
> ./a42.out
```

OR run the following commands to run test cases,

```
> ./runTestCases42.sh
```

```
> make gtest
```

```
> ./gtest.out
```

runTestCases42.sh Results

 Command Prompt

```
C:\Users\13528\Desktop\DSI\P4>./a42.out
```

Test Case 1

```
OUTPUT.txt U X
OUTPUT.txt
1  ***** TC 1 *****
2
3  Enter your SQL:
4  SELECT n.n_nationkey
5  FROM nation AS n
6  WHERE (n.n_name = 'UNITED STATES')
7  ^D
8  You Sql has been parsed
9  Optimal Plan has been built
10
11 Current OUTPUT MODE: NONE
12 -----
13 #####
14 Select File operation
15 Input Pipe 0
16 Output Pipe 2
17
18 Output Schema:
19 Att n.n_nationkey: INT
20 Att n.n_name: STRING
21 Att n.n_regionkey: INT
22 Att n.n_comment: STRING
23
24 Corresponding CNF:
25 ( Att 1 from left record = Att 0 from literal record (String))
26 #####
27
28 #####
29 Project operation
30 Input Pipe 2
31 Output Pipe 3
32
33 Output Schema:
34 Att n.n_nationkey: INT
35
36 Attributes to keep:
37 (0)
```

Test Case 2

You Sql has been parsed
Optimal Plan has been built

Current OUTPUT MODE: NONE

#####

Select File operation

Input Pipe 0

Output Pipe 4

Output Schema:

Att n.n_nationkey: INT

Att n.n_name: STRING

Att n.n_regionkey: INT

Att n.n_comment: STRING

Corresponding CNF:

(Att 0 from left record > Att 0 from literal record (Int))

#####

#####

Join operation

Left Input Pipe 4

Right Input Pipe 2

Output Pipe 5

Output Schema:

Att n.n_nationkey: INT

Att n.n_name: STRING

Att n.n_regionkey: INT

Att n.n_comment: STRING

Att r.r_regionkey: INT

Att r.r_name: STRING

Att r.r_comment: STRING

Corresponding CNF:
(Att 2 from left record = Att 0 from right record (Int))
#####

Select File operation
Input Pipe 0
Output Pipe 2

Output Schema:
Att r.r_regionkey: INT
Att r.r_name: STRING
Att r.r_comment: STRING

Corresponding CNF:
#####

Project operation
Input Pipe 5
Output Pipe 6

Output Schema:
Att n.n_name: STRING

Attributes to keep:
(1)
#####

Test Case 3

***** TC 3 *****

You Sql has been parsed
Optimal Plan has been built

Current OUTPUT MODE: NONE

#####

Select File operation

Input Pipe 0

Output Pipe 4

Output Schema:

Att n.n_nationkey: INT

Att n.n_name: STRING

Att n.n_regionkey: INT

Att n.n_comment: STRING

Corresponding CNF:

(Att 1 from left record = Att 0 from literal record (String))

#####

#####

Join operation

Left Input Pipe 4

Right Input Pipe 2

Output Pipe 5

Output Schema:

Att n.n_nationkey: INT

Att n.n_name: STRING

Att n.n_regionkey: INT

Att n.n_comment: STRING

Att r.r_regionkey: INT

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≡ OUTPUT.txt

```
143 Att r.r_regionkey: INT
144 Att r.r_name: STRING
145 Att r.r_comment: STRING
146
147 Corresponding CNF:
148 ( Att 2 from left record = Att 0 from right record (Int))
149 #####
150
151 #####
152 Select File operation
153 Input Pipe 0
154 Output Pipe 2
155
156 Output Schema:
157 Att r.r_regionkey: INT
158 Att r.r_name: STRING
159 Att r.r_comment: STRING
160
161 Corresponding CNF:
162 #####
163
164 #####
165 Sum operation
166 Left Input Pipe 5
167 Output Pipe 6
168
169 Output Schema:
170 Att SUM: INT
171
172 Corresponding Function:
173 PushInt at index 0 for given record
174 Original litInput is: 0x0
175 returnsInt: 1
176 #####
177
178 ***** TC 3 ends *****
179
```

Test Case 4

You Sql has been parsed
Optimal Plan has been built

Current OUTPUT MODE: NONE

#####

Select File operation

Input Pipe 0

Output Pipe 4

Output Schema:

Att n.n_nationkey: INT

Att n.n_name: STRING

Att n.n_regionkey: INT

Att n.n_comment: STRING

Corresponding CNF:

(Att 1 from left record = Att 0 from literal record (String))

#####

#####

Join operation

Left Input Pipe 4

Right Input Pipe 2

Output Pipe 5

Output Schema:

Att n.n_nationkey: INT

Att n.n_name: STRING

Att n.n_regionkey: INT

Att n.n_comment: STRING

Att r.r_regionkey: INT

Att r.r_name: STRING

Att r.r_comment: STRING

≡ OUTPUT.txt U X

≡ OUTPUT.txt

```
217 Corresponding CNF:
218 ( Att 2 from left record = Att 0 from right record (Int))
219 #####
220
221 #####
222 Select File operation
223 Input Pipe 0
224 Output Pipe 2
225
226 Output Schema:
227 Att r.r_regionkey: INT
228 Att r.r_name: STRING
229 Att r.r_comment: STRING
230
231 Corresponding CNF:
232 #####
233
234 #####
235 GroupBy operation
236 Left Input Pipe 5
237 Output Pipe 6
238
239 Output Schema:
240 Att SUM: INT
241
242 Corresponding OrderMaker:
243 NumAtts = 1
244 | 0: 2 Int
245
246 Corresponding Function:
247 PushInt at index 2 for given record
248 Original litInput is: 0x0
249 returnsInt: 1
250 #####
251
```

Test Case 5

```
≡ OUTPUT.txt U X
≡ OUTPUT.txt
253
254  ***** TC 5 *****
255
256  You Sql has been parsed
257  Optimal Plan has been built
258
259  Current OUTPUT MODE: NONE
260  -----
261  #####
262  Select File operation
263  Input Pipe 0
264  Output Pipe 6
265
266  Output Schema:
267  Att n.n_nationkey: INT
268  Att n.n_name: STRING
269  Att n.n_regionkey: INT
270  Att n.n_comment: STRING
271
272  Corresponding CNF:
273  ( Att 0 from left record > Att 0 from literal record (Int))
274  #####
275
276  #####
277  Join operation
278  Left Input Pipe 6
279  Right Input Pipe 4
280  Output Pipe 7
281
282  Output Schema:
283  Att n.n_nationkey: INT
284  Att n.n_name: STRING
285  Att n.n_regionkey: INT
286  Att n.n_comment: STRING
287  Att r.r_regionkey: INT
288  Att r.r_name: STRING
289  Att r.r_comment: STRING
```

≡ OUTPUT.txt U X

≡ OUTPUT.txt

```
289 Att r.r_comment: STRING
290
291 Corresponding CNF:
292 ( Att 2 from left record = Att 0 from right record (Int))
293 #####
294
295 #####
296 Select File operation
297 Input Pipe 0
298 Output Pipe 4
299
300 Output Schema:
301 Att r.r_regionkey: INT
302 Att r.r_name: STRING
303 Att r.r_comment: STRING
304
305 Corresponding CNF:
306 #####
307
308 #####
309 Join operation
310 Left Input Pipe 7
311 Right Input Pipe 2
312 Output Pipe 8
313
314 Output Schema:
315 Att n.n_nationkey: INT
316 Att n.n_name: STRING
317 Att n.n_regionkey: INT
318 Att n.n_comment: STRING
319 Att r.r_regionkey: INT
320 Att r.r_name: STRING
321 Att r.r_comment: STRING
322 Att c.c_custkey: INT
323 Att c.c_name: STRING
324 Att c.c_address: STRING
325 Att c.c_nationkey: INT
326 Att c.c_phone: STRING
```

OUTPUT.txt U X

OUTPUT.txt

```
329 Att c.c_comment: STRING
330
331 Corresponding CNF:
332 ( Att 0 from left record = Att 3 from right record (Int))
333 #####
334
335 #####
336 Select File operation
337 Input Pipe 0
338 Output Pipe 2
339
340 Output Schema:
341 Att c.c_custkey: INT
342 Att c.c_name: STRING
343 Att c.c_address: STRING
344 Att c.c_nationkey: INT
345 Att c.c_phone: STRING
346 Att c.c_acctbal: DOUBLE
347 Att c.c_mktsegment: STRING
348 Att c.c_comment: STRING
349
350 Corresponding CNF:
351 #####
352
353 #####
354 Duplicate remove operation
355 Left Input Pipe 8
356 Output Pipe 9
357
358 Output Schema:
359 Att n.n_nationkey: INT
360 Att n.n_name: STRING
361 Att n.n_regionkey: INT
362 Att n.n_comment: STRING
363 Att r.r_regionkey: INT
364 Att r.r_name: STRING
365 Att r.r_comment: STRING
366 Att r.r_custkey: INT
```

```
File Edit Selection View Go Run Terminal Help
OUTPUT.txt U X
OUTPUT.txt
366 Att c.c_custkey: INT
367 Att c.c_name: STRING
368 Att c.c_address: STRING
369 Att c.c_nationkey: INT
370 Att c.c_phone: STRING
371 Att c.c_acctbal: DOUBLE
372 Att c.c_mktsegment: STRING
373 Att c.c_comment: STRING
374 #####
375
376 #####
377 GroupBy operation
378 Left Input Pipe 9
379 Output Pipe 10
380
381 Output Schema:
382 Att SUM: INT
383
384 Corresponding OrderMaker:
385 NumAtts = 1
386 | 0: 4 Int
387
388 Corresponding Function:
389 PushInt at index 0 for given record
390 Original litInput is: 0x0
391 PushInt at index 4 for given record
392 Original litInput is: 0x0
393 IntPlus at index 0 for given record
394 Original litInput is: 0x0
395 returnsInt: 1
396 #####
397
398 ***** TC 5 ends *****
```

GTest Results

Make sure you have gtest installed on your device. Then the Makefile is updated to build the teste written in Gtest. Run the following commands

```
>make clean && make gtest  
> ./gtest.out
```

The gtest have been written to test the constructor and the destructor for the below mentioned classes.

JoinNode()

SelectFileNode()

```
[=====] Running 2 tests from 1 test suite.  
[-----] Global test environment set-up.  
[-----] 2 tests from a5GTest  
[ RUN      ] a5GTest.ConstructorTest  
[          OK ] a5GTest.ConstructorTest (125 ms)  
[ RUN      ] a5GTest.DestructorTest  
[          OK ] a5GTest.DestructorTest (178 ms)  
[-----] 2 tests from a5GTest (304 ms total)  
  
[-----] Global test environment tear-down  
[=====] 2 tests from 1 test suite ran. (304 ms total)  
[ PASSED   ] 2 tests.  
Siddhis-MacBook-Pro:P5 siddhiw$
```