t”g

operation system:
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The run session:
Server:

```
magshimim@magshimim-pc:~/Downloads/OS_final-main/OS_final$ g++ ActiveObjectImpl.cpp MetricCalculator.cpp Graph.cpp Pipeline.cpp Kruskal.cpp Prim.cpp LeaderFollowerMetrics.cpp main.cpp MSTAlgorithms.cpp MSTFactory.cpp -o server -pthread
magshimim@magshimim-pc:~/Downloads/OS_final-main/OS_final$ ./server
Server listening on port 8080...
New client connected
New graph initialized with n = 5 and m = 6
New graph initialized with n = 5 and m = 6
Added new edge: (1, 2) with weight 1
Added new edge: (1, 3) with weight 2
Added new edge: (4, 5) with weight 4
Added new edge: (2, 5) with weight 6
Added new edge: (1, 5) with weight 5
Request for MST algorithm Kruskal enqueued.
Processing request for MST algorithm: Kruskal
Stage 1: Computing MST using Kruskal...
Using Kruskal algorithm to compute MST...
MST computation done.
Stage 2: Calculating metrics in parallel...
Metrics calculation completed.
Stage 3: Results are ready for retrieval.
MST Edges:
Edge from 1 to 2 with weight 1
Edge from 1 to 3 with weight 2
Edge from 4 to 5 with weight 4
Edge from 1 to 5 with weight 5
Total weight of MST: 12
Longest distance in MST: 11
Average distance between vertices: 5.8
Shortest distance between vertices in MST: 1
MST and metrics calculation for Kruskal completed.
```

Client:

```
magshimim@magshimim-pc:~/Downloads/OS_final-main/OS_final$ nc localhost 8080
Newgraph 5 6 1
Newgraph 5 6 1
Newedge 1 2 1
Newedge 1 3 2
Newedge 4 5 4
Newedge 2 5 6
Newedge 1 5 5
MST Kruskal
MST request is being processed using the Pipeline.
```

The running of the tests:

```
magshimim@magshimim-pc:~/Downloads/OS_final-main/OS_final$ ./test
[doctest] doctest version is "2.4.11"
[doctest] run with "--help" for options
===============================================================================
[doctest] test cases:  6 |  6 passed | 0 failed | 0 skipped
[doctest] assertions: 61 | 61 passed | 0 failed |
[doctest] Status: SUCCESS!
magshimim@magshimim-pc:~/Downloads/OS_final-main/OS_final$
```

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The vligrand session:
server:

```
magshimim@magshimim-pc:~/Downloads/OS_final-main/OS_final$ valgrind ./main
==22533== Memcheck, a memory error detector
==22533== Copyright (C) 2002-2017, and GNU GPL'd, by Julian Seward et al.
==22533== Using Valgrind-3.15.0 and LibVEX; rerun with -h for copyright info
==22533== Command: ./main
==22533==
Server listening on port 8080...
New client connected
New graph initialized with n = 5 and m = 6
Added new edge: (2, 5) with weight 6
Request for MST algorithm Kruskal enqueued.
Processing request for MST algorithm: Kruskal
Stage 1: Computing MST using Kruskal...
Using Kruskal algorithm to compute MST...
MST computation done.
Stage 2: Calculating metrics in parallel...
Metrics calculation completed.
Stage 3: Results are ready for retrieval.
MST Edges:
Edge from 2 to 5 with weight 6
Total weight of MST: 6
Longest distance in MST: 0
Average distance between vertices: -0.3
Shortest distance between vertices in MST: -1
MST and metrics calculation for Kruskal completed.
Removed edge: (1, 5)
No activity for 20 seconds. Shutting down server.
==22533==
==22533== HEAP SUMMARY:
==22533==     in use at exit: 520 bytes in 7 blocks
==22533==   total heap usage: 141 allocs, 134 frees, 86,944 bytes allocated
==22533==
==22533== LEAK SUMMARY:
==22533==    definitely lost: 0 bytes in 0 blocks
==22533==    indirectly lost: 0 bytes in 0 blocks
==22533==      possibly lost: 288 bytes in 1 blocks
==22533==    still reachable: 232 bytes in 6 blocks
==22533==         suppressed: 0 bytes in 0 blocks
==22533== Rerun with --leak-check=full to see details of leaked memory
==22533==
==22533== For lists of detected and suppressed errors, rerun with: -s
==22533== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)
```

client:

```
^C
magshimim@magshimim-pc:~/Downloads/OS_final-main/OS_final$ nc localhost 8080
Newgraph 5 6 1
Newgraph 5 6 1
Newedge 1 2 1
Newedge 2 5 6
Newedge 1 3 2
Newedge 4 5 4
Newedge 1 5 5
MST Kruskal
MST request is being processed using the Pipeline.
Removeedge 1 5 5
GetResults
MST Edges:
Edge from 2 to 5 with weight 6
Total weight of MST: 6
Longest distance in MST: 0
Average distance between vertices: -0.3
Shortest distance between vertices in MST: -1
```

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The run of gcov:

```
magshimim@magshimim-pc:~/OS_final-main/OS_final$ gcov -o . main.cpp
File 'main.cpp'
Lines executed:77.50% of 120
Creating 'main.cpp.gcov'

File '/usr/include/c++/9/tuple'
Lines executed:100.00% of 43
Creating 'tuple.gcov'

File '/usr/include/c++/9/bits/invoke.h'
Lines executed:80.00% of 5
Creating 'invoke.h.gcov'

File '/usr/include/c++/9/bits/move.h'
Lines executed:100.00% of 9
Creating 'move.h.gcov'

File '/usr/include/c++/9/thread'
Lines executed:61.54% of 26
Creating 'thread.gcov'

File '/usr/include/c++/9/iostream'
No executable lines
Removing 'iostream.gcov'

File '/usr/include/c++/9/bits/stl_iterator_base_funcs.h'
Lines executed:100.00% of 5
Creating 'stl_iterator_base_funcs.h.gcov'

File '/usr/include/c++/9/bits/stl_iterator_base_types.h'
Lines executed:100.00% of 2
Creating 'stl_iterator_base_types.h.gcov'

File '/usr/include/c++/9/ext/type_traits.h'
Lines executed:100.00% of 2
Creating 'type_traits.h.gcov'

File '/usr/include/c++/9/bits/unique_ptr.h'
Lines executed:97.73% of 44
Creating 'unique_ptr.h.gcov'

File '/usr/include/c++/9/bits/basic_string.tcc'
Lines executed:69.23% of 13
Creating 'basic_string.tcc.gcov'

File '/usr/include/c++/9/bits/basic_string.h'
Lines executed:81.82% of 11
Creating 'basic string.h.gcov'
```


```
File '/usr/include/c++/9/bits/basic_string.tcc'
Lines executed:69.23% of 13
Creating 'basic_string.tcc.gcov'

File '/usr/include/c++/9/bits/basic_string.h'
Lines executed:81.82% of 11
Creating 'basic_string.h.gcov'
```


```
File '/usr/include/c++/9/ext/new_allocator.h'
Lines executed:0.00% of 2
Creating 'new_allocator.h.gcov'

File '/usr/include/c++/9/chrono'
Lines executed:100.00% of 14
Creating 'chrono.gcov'

File '/usr/include/c++/9/bits/std_mutex.h'
Lines executed:0.00% of 12
Creating 'std_mutex.h.gcov'

File '/usr/include/c++/9/bits/atomic_base.h'
Lines executed:20.00% of 10
Creating 'atomic_base.h.gcov'

File '/usr/include/c++/9/bits/char_traits.h'
Lines executed:33.33% of 12
Creating 'char_traits.h.gcov'

File '/usr/include/c++/9/atomic'
Lines executed:50.00% of 4
Creating 'atomic.gcov'

File '/usr/include/c++/9/bits/ios_base.h'
Lines executed:100.00% of 2
Creating 'ios_base.h.gcov'

File '/usr/include/x86_64-linux-gnu/c++/9/bits/gthr-default.h'
Lines executed:0.00% of 10
Creating 'gthr-default.h.gcov'
```

input.txt

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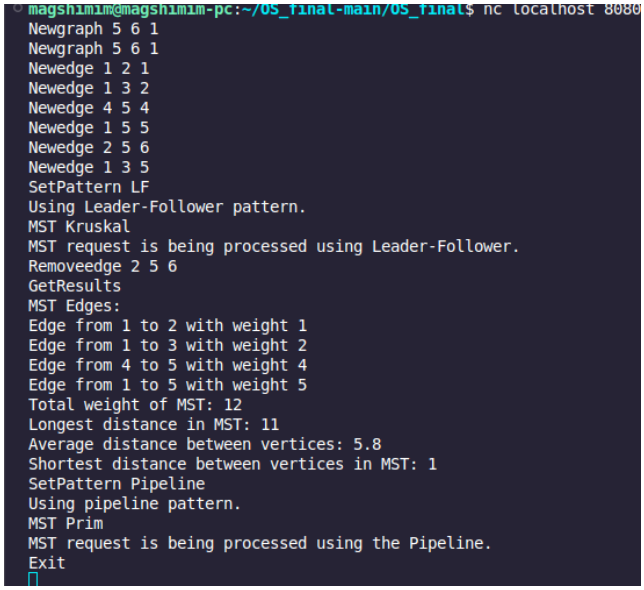
magshimim@magshimim-pc:~/OS_final-main/OS_final$ nc localhost 8080
Newgraph 5 6 1
Newgraph 5 6 1
Newedge 1 2 1
Newedge 1 3 2
Newedge 4 5 4
Newedge 1 5 5
Newedge 2 5 6
Newedge 1 3 5
SetPattern LF
Using Leader-Follower pattern.
MST Kruskal
MST request is being processed using Leader-Follower.
Removeedge 2 5 6
GetResults
MST Edges:
Edge from 1 to 2 with weight 1
Edge from 1 to 3 with weight 2
Edge from 4 to 5 with weight 4
Edge from 1 to 5 with weight 5
Total weight of MST: 12
Longest distance in MST: 11
Average distance between vertices: 5.8
Shortest distance between vertices in MST: 1
SetPattern Pipeline
Using pipeline pattern.
MST Prim
MST request is being processed using the Pipeline.
Exit