

OS Project 2

mapreduce

online link: <https://docs.google.com/document/d/1D5oyjUjJlmtz2xD-UvgInGyHxLAJbBCyZXQ7jC9YKSM/edit?usp=sharing>

Member:

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Design:

Master

Data structure

- workers: a dictionary to store the information about workers
format: {workers[ip_port]: ('Status', client)}
- jobs_tracker: a dictionary to store the information about jobs
format:

```
{ task_name:  
  { "mappers":  
    { mapper_id: [remote_call, mapper_ip_port, split_info, finished]},  
    "reducers":  
    { reducer_id: [remote_call, reducer_ip_port, finished]},  
    "num_mapper":  
    num_mapper,  
    "num_reducer":  
    num_reducer,  
    "task_file":  
    [filename, codes],  
    "split_infos":  
    split_infos,  
    "file_info":  
    file_info,  
    "output_file":  
    output_file  
    "done":  
    True/False  
  }  
}
```
- mapper_queue: free mapper queue
format: {(ip_port, remote_call)}
- reducer_queue: free reducer queue
format: {(ip_port, remote_call)}

Method

- controller:
 - Every 1s, ping every registered worker
- reassign_job:
 - If controller detects worker failure, reassign all jobs in that worker
- register:
 - Worker calls this to register in master
- register_async:

- Use gevent to handle register. Put the worker to free mapper queue and reducer queue
- do_job:
 - Client calls this to assign new job
- do_job_async:
 - Use gevent to handle assignment
- client_query:
 - Every 1s, client calls this to get progress from master
- split_file:
 - Use the assignment information to split file for mapper partition
- assign_mappers:
 - Assign mappers for new job. Should wait on mapper queue.
- assign_mapper:
 - Assign one mapper. When finished, notify all active reducer to retrieve intermediate data and return this mapper to free mapper queue.
- assign_reducers:
 - Assign reducers for new job. Should wait on Reducer queue.
- assign_reducer:
 - Assign one reducer. At first, check finished mapper and retrieve intermediate data. When finished, return this reducer to free reducer queue.
- reassign_mapper:
 - Reassign one map job
- reassign_reducer:
 - Reassign one reduce job
- get_result:
 - Collect call this to get final result

Worker

Data structure

- map_object: map class
- reduce_object: reduce class
- reducer_map_queue: finished mapper queue

Method

controller: Every 1s, print this state

ping: Master calls this to ping worker

do_map: Master calls this to assign map task to worker mapper slot

read_input: Read data according to the split information

read_data_from_file: A helper function to read data from file

read_map_task: Get the shipping code and import the map class

fetch_intermediate_file: Reducer calls this to get intermediate file

remove_intermediate_file: When collecting, remove the intermediate files

fetch_result_file: Master calls this to get output file

do_reduce: Master calls this to assign reduce task to worker reducer slot

notify_mapper_finish: Reducer is notified by master that the mapper has finished its job.

Put this mapper to reducer_map_queue

read_reduce_task: Get the shipping code and import the reduce class

Experiment

- word_count file_5M.txt
split_size = 1000000
num_reducers = 3
assigning 6 mappers, 3 reducers

Job location	Duration
Seq local	0:00:08.195916
MapReduce local	0:00:05.029442
MapReduce bass	0:00:07.032583
In memory local	0:00:00.456547
In memory bass	0:00:01.090183

- hamming_enc file_5M.txt
split_size = 1000000
num_reducers = 3
assigning 6 mappers, 3 reducers

Job location	Duration
Seq local	0:00:52.170602
MapReduce local	0:01:15.371142
MapReduce in bass	0:02:30.433386
In memory local	0:00:40.023820
In memory bass	0:02:08.076031

- hamming_dec file_5M.txt
split_size = 100000
num_reducers = 3
assigning 8 mappers, 3 reducers

Job location	Duration
Seq local	0:00:15.594236
MapReduce local	0:00:23.135828
MapReduce in bass	0:00:57.179940
In memory	0:00:14.043595
In memory bass	0:00:37.047637

- hamming_err file_5M.txt
split_size = 100000
num_reducers = 3
assigning 8 mappers, 3 reducers

Job location	Duration
Seq local	0:00:21.997117
MapReduce local	0:00:44.213765 (before adding gevent.sleep(0) 0:00:18.097443)
MapReduce in bass	0:01:16.232216
In memory local	0:00:11.899041

- hamming_chk file_5M.txt
split_size = 100000
num_reducers = 3
assigning 8 mappers, 3 reducers

Job location	Duration
Seq local	0:01:48.766325
MapReduce local	0:01:14.365505
MapReduce in bass	
In memory local	0:01:46.586561

- hamming_fix file_5M.txt
split_size = 100000
num_reducers = 3
assigning 8 mappers, 3 reducers

Job location	Duration
Seq local	0:01:55.035967
MapReduce local	0:01:27.406702
MapReduce in bass	
In memory local	0:01:55.111347

Screenshot:

```
project02 — wfang2@bass18:~/USF/CS636/project02 — ssh — 80x24
Task 20150323203123 : mapper 4 finished
Mapper 5 is notifying reducer 0 done
Mapper 5 is notifying reducer 1
Mapper 5 is notifying reducer 1 done
10.0.0.224:25002 returns to free mapper queue.
Mapper 4 is notifying reducer 0
Mapper 4 is notifying reducer 0 done
Mapper 4 is notifying reducer 1
Mapper 4 is notifying reducer 1 done
10.0.0.217:25001 returns to free mapper queue.
Task 20150323203123 : reducer 0 finished
10.0.0.217:25001 returns to free reducer queue.
Task 20150323203123 : reducer id 2 assigned to 10.0.0.217:25001
[Master:READY]
(10.0.0.224:25002, READY)
(10.0.0.217:25001, READY)
Task 20150323203123 : reducer 1 finished
10.0.0.224:25002 returns to free reducer queue.
Task 20150323203123 : reducer 2 finished
10.0.0.217:25001 returns to free reducer queue.
[Master:READY]
(10.0.0.224:25002, READY)
(10.0.0.217:25001, READY)
Task 20150323203123 finished

project02 — wfang2@bass17:~/USF/CS636/project02 — ssh — 80x24
Task 20150323203123 R 0: get intermediate data from mapper 5: 10.0.0.224:25002
Task 20150323203123 R 0: get intermediate data from mapper 4: 10.0.0.217:25001
Task 20150323203123 R 0: do reduce successfully
Task 20150323203123 R 0: write result to file successfully
Task 20150323203123 R 0: delete temp_script word_count.pyr0
Task 20150323203123 R 0: Finished
Get task 20150323203123 from master, current reducer id is 2
Task 20150323203123 R 2: read user reduce function successfully
Task 20150323203123 R 2: get intermediate data from mapper 0: 10.0.0.217:25001
[Worker: 10.0.0.217:25001]: READY
[Worker] Ping from Master
Task 20150323203123 R 2: get intermediate data from mapper 1: 10.0.0.224:25002
Task 20150323203123 R 2: get intermediate data from mapper 2: 10.0.0.217:25001
Task 20150323203123 R 2: get intermediate data from mapper 3: 10.0.0.224:25002
Task 20150323203123 R 2: get intermediate data from mapper 4: 10.0.0.217:25001
Task 20150323203123 R 2: get intermediate data from mapper 5: 10.0.0.224:25002
Task 20150323203123 R 2: do reduce successfully
Task 20150323203123 R 2: write result to file successfully
Task 20150323203123 R 2: delete temp_script word_count.pyr2
Task 20150323203123 R 2: Finished
[Worker: 10.0.0.217:25001]: READY
[Worker] Ping from Master
[Worker: 10.0.0.217:25001]: READY
[Worker] Ping from Master

project02 — wfang2@bass23:~/USF/CS636/project02 — ssh — 80x24
03/23/2015 20:31:27
Mappers finish/assign/need : 5 / 6 / 6
Reducers finish/assign/need : 0 / 2 / 3

##### job_tracker : task name:20150323203123 #####
03/23/2015 20:31:28
Mappers finish/assign/need : 6 / 6 / 6
Reducers finish/assign/need : 0 / 2 / 3

##### job_tracker : task name:20150323203123 #####
03/23/2015 20:31:29
Mappers finish/assign/need : 6 / 6 / 6
Reducers finish/assign/need : 2 / 3 / 3

##### job_tracker : task name:20150323203123 #####
03/23/2015 20:31:30
Mappers finish/assign/need : 6 / 6 / 6
Reducers finish/assign/need : 3 / 3 / 3
Job finished
Duration: 0:00:07.032583
\nPress Enter to continue

start collect
Collect job finished

project02 — wfang2@bass24:~/USF/CS636/project02 — ssh — 80x24
Task 20150323203123 M 3: delete temp_script word_count.pyr3
Task 20150323203123 M 3: Finished
[Worker] Ping from Master
[Worker: 10.0.0.224:25002]: READY
Task 20150323203123 R 1: get intermediate data from mapper 2: 10.0.0.217:25001
Task 20150323203123 R 1: get intermediate data from mapper 3: 10.0.0.224:25002
Get task 20150323203123 from master, current mapper id is 5
Task 20150323203123 M 5: read user map function successfully
Task 20150323203123 M 5: read input successfully
Task 20150323203123 M 5: do map successfully
Task 20150323203123 M 5: combine intermediate result successfully
Task 20150323203123 M 5: write result to file successfully
Task 20150323203123 M 5: delete temp_script word_count.pyr5
Task 20150323203123 M 5: Finished
[Worker: 10.0.0.224:25002]: READY
[Worker] Ping from Master
Task 20150323203123 R 1: get intermediate data from mapper 5: 10.0.0.224:25002
[Worker: 10.0.0.224:25002]: READY
Task 20150323203123 R 1: get intermediate data from mapper 4: 10.0.0.217:25001
Task 20150323203123 R 1: do reduce successfully
Task 20150323203123 R 1: write result to file successfully
Task 20150323203123 R 1: delete temp_script word_count.pyr1
Task 20150323203123 R 1: Finished
[Worker] Ping from Master
```

```
project02 — wfang2@bass18:~/USF/CS636/project02 — ssh — 80x24
(10.0.0.217:25001, READY)
Task bin_hamaing_err.py get
Task 20150323234543 : assigning 0 mappers, 3 reducers
Task 20150323234543 : mappers 0 assigned to 10.0.0.224:25002
Task 20150323234543 : mappers 1 assigned to 10.0.0.222:25003
Task 20150323234543 : mappers 2 assigned to 10.0.0.217:25001
Task 20150323234543 : reducer 0 assigned to 10.0.0.224:25002
Task 20150323234543 : reducer 1 assigned to 10.0.0.222:25003
Task 20150323234543 : reducer id 2 assigned to 10.0.0.217:25001
[Master:READY]
(10.0.0.224:25002, READY)
(10.0.0.222:25003, READY)
(10.0.0.217:25001, READY)
Task 20150323234543 : mapper 0 finished
Mapper 0 is notifying reducer 0
Task 20150323234543 : mapper 2 finished
Task 20150323234543 : mapper 0 finished
Mapper 1 is notifying reducer 0 done
Mapper 1 is notifying reducer 1
Mapper 1 is notifying reducer 1 done
Mapper 1 is notifying reducer 2
Mapper 1 is notifying reducer 2 done
10.0.0.222:25003 returns to free mapper queue.
Mapper 2 is notifying reducer 0

project02 — wfang2@bass17:~/USF/CS636/project02 — ssh — 80x24
[Worker] Ping from Master
[Worker: 10.0.0.217:25001]: READY
[Worker] Ping from Master
[Worker: 10.0.0.217:25001]: READY
[Worker] Ping from Master
[Worker: 10.0.0.217:25001]: READY
[Worker] Ping from Master
Task 20150323234157 R 0: get intermediate data from mapper 4: 10.0.0.222:25003
Task 20150323234157 M 3: do map successfully
Task 20150323234157 M 3: combine intermediate result successfully
Task 20150323234157 M 3: write result to file successfully
Task 20150323234157 M 3: delete temp_script bin_hamaing_err.pyr3
Task 20150323234157 M 3: Finished
Task 20150323234157 R 0: get intermediate data from mapper 3: 10.0.0.217:25001
[Worker: 10.0.0.217:25001]: READY
[Worker] Ping from Master
[Worker: 10.0.0.217:25001]: READY
[Worker] Ping from Master
[Worker: 10.0.0.217:25001]: READY
[Worker] Ping from Master
[Worker: 10.0.0.217:25001]: READY
[Worker] Ping from Master
[Worker: 10.0.0.217:25001]: READY

project02 — wfang2@bass22:~/USF/CS636/project02 — ssh — 80x24
Task 20150323233985 R 2: get intermediate data from mapper 2: 10.0.0.224:25002
[Worker] Ping from Master
Task 20150323233985 R 2: get intermediate data from mapper 3: 10.0.0.222:25003
[Worker: 10.0.0.222:25003]: READY
Get task 20150323233985 from master, current mapper id is 6
Task 20150323233985 M 6: read user map function successfully
Task 20150323233985 M 6: read input successfully
Task 20150323233985 M 6: do map successfully
Task 20150323233985 M 6: combine intermediate result successfully
Task 20150323233985 M 6: write result to file successfully
Task 20150323233985 M 6: delete temp_script bin_hamaing_err.pyr6
Task 20150323233985 M 6: Finished
[Worker] Ping from Master
[Worker: 10.0.0.222:25003]: READY
Task 20150323233985 R 2: get intermediate data from mapper 4: 10.0.0.217:25001
Task 20150323233985 R 2: get intermediate data from mapper 5: 10.0.0.224:25002
[Worker: 10.0.0.224:25002]: READY
[Worker] Ping from Master
Task 20150323233985 R 2: get intermediate data from mapper 7: 10.0.0.217:25001
Task 20150323233985 R 2: get intermediate data from mapper 6: 10.0.0.222:25003
[Worker: 10.0.0.222:25003]: READY
[Worker] Ping from Master
[Worker: 10.0.0.222:25003]: READY
[Worker] Ping from Master

project02 — wfang2@bass23:~/USF/CS636/project02 — ssh — 80x24
Reducers finish/assign/need : 1 / 3 / 3

##### job_tracker : task name:20150323234543 #####
03/23/2015 23:46:48
Mappers finish/assign/need : 8 / 8 / 8
Reducers finish/assign/need : 1 / 3 / 3

##### job_tracker : task name:20150323234543 #####
03/23/2015 23:46:50
Mappers finish/assign/need : 8 / 8 / 8
Reducers finish/assign/need : 1 / 3 / 3

##### job_tracker : task name:20150323234543 #####
03/23/2015 23:46:51
Mappers finish/assign/need : 8 / 8 / 8
Reducers finish/assign/need : 1 / 3 / 3

##### job_tracker : task name:20150323234543 #####
03/23/2015 23:46:52
Mappers finish/assign/need : 8 / 8 / 8
Reducers finish/assign/need : 1 / 3 / 3

##### job_tracker : task name:20150323234543 #####
03/23/2015 23:46:53
Mappers finish/assign/need : 8 / 8 / 8
Reducers finish/assign/need : 1 / 3 / 3

project02 — wfang2@bass24:~/USF/CS636/project02 — ssh — 80x24
[Worker] Ping from Master
[Worker: 10.0.0.224:25002]: READY
Get task 20150323233985 from master, current mapper id is 5
Task 20150323233985 M 5: read user map function successfully
Task 20150323233985 M 5: read input successfully
Task 20150323233985 M 5: do map successfully
Task 20150323233985 M 5: combine intermediate result successfully
Task 20150323233985 M 5: write result to file successfully
Task 20150323233985 M 5: delete temp_script bin_hamaing_err.pyr5
Task 20150323233985 M 5: Finished
[Worker: 10.0.0.224:25002]: READY
Task 20150323233985 R 0: get intermediate data from mapper 0: 10.0.0.222:25003
Task 20150323233985 R 0: get intermediate data from mapper 1: 10.0.0.217:25001
Task 20150323233985 R 0: get intermediate data from mapper 2: 10.0.0.224:25002
[Worker: 10.0.0.224:25002]: READY
[Worker] Ping from Master
Task 20150323233985 R 0: get intermediate data from mapper 3: 10.0.0.222:25003
[Worker: 10.0.0.224:25002]: READY
[Worker] Ping from Master
Task 20150323233985 R 0: get intermediate data from mapper 4: 10.0.0.217:25001
Task 20150323233985 R 0: get intermediate data from mapper 5: 10.0.0.224:25002
[Worker: 10.0.0.217:25001]: READY
[Worker] Ping from Master
```

