1 Motivation

This document primarily introduces the core working principles of the functionality introduced by Flip-370, as well as the key test cases that cross-team testing should focus on to verify the correctness of the feature.

2 You may need to be familiar with the core logic of balanced scheduling

Please refer to this page.

3 Constructing and validating test cases

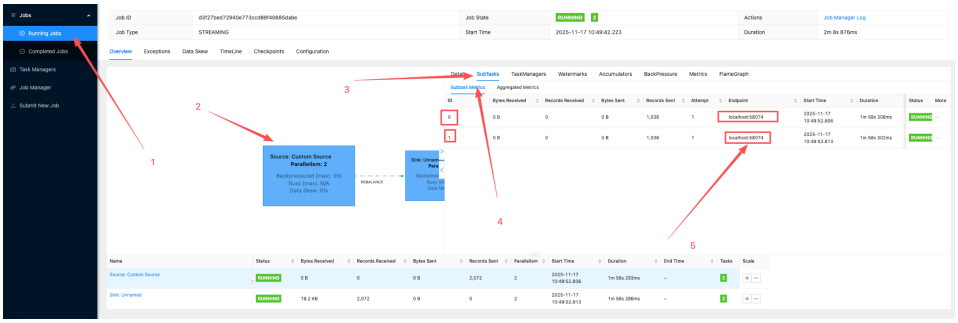
As stated in the FLIP document, task balanced scheduling is based on the SlotPool perspective of the JobMaster to perform balanced task scheduling for a job. Therefore, all test cases in this test can be verified under the application execution mode (regardless of whether resources come from onYarn/onKubernetes).
Testing jobs: https://github.com/RocMarshal/flip370-testing-jobs

3.1 Test for a job that contains a slot sharing group

3.1.1 Regular job test

- Test case code
  - Entry-point class: *flip370.testing.slotsharinggroup.single.FlinkTestingJob*
  - Code description: FlinkTestingJob describes a streaming job that contains a default slot sharing group. The job includes a source operator with a parallelism of 10 and a sink operator with a parallelism of 20.
  - Job-level startup parameters: N.A
- Description of the necessary configurations for an application cluster
  - *taskmanager.load-balance.mode: TASKS*
  - *taskmanager.numberOfTaskSlots: 2*
  - *restart-strategy.fixed-delay.attempts: 32*
  - *restart-strategy.fixed-delay.delay: 10s*
  - *jobmanager.scheduler: Adaptive/Default*
- Submit the flink job.
- Verification results

- For jobmanager.scheduler: Adaptive
  - ☐ Obtain the taskmanager on which each task is located through the following steps



  - ☐ Does it meet the balanced scheduling result (each task manager contains 3 tasks)？
- For jobmanager.scheduler: Default
  - ☐ Does it meet the balanced scheduling result (each task manager contains 3 tasks)？

3.1.2 Failover scenario test

3.1.2.1 Failover scenario test triggered by tasks

- Test case code
  - Entry-point class：
    flip370.testing.slotsharinggroup.single.FlinkTestingJob
  - Code description: FlinkTestingJob describes a streaming job that contains a default slot sharing group. The job includes a source operator with a parallelism of 10 and a sink operator with a parallelism of 20.
  - Job-level startup parameters are as follows: pass 300000 as a parameter to the Flink job entry class, which indicates that the 0th subtask of the source operator will throw a task exception every 5 minutes to trigger a job failover.
    flip370.testing.slotsharinggroup.single.FlinkTestingJob 300000

- Description of the necessary configurations for an application cluster
  - *taskmanager.load-balance.mode: TASKS*
  - *taskmanager.numberOfTaskSlots: 2*
  - *restart-strategy.fixed-delay.attempts: 32*
  - *restart-strategy.fixed-delay.delay: 10s*
  - *jobmanager.scheduler: Adaptive/Default*
- Submit the flink job.
- Wait the task's exception and failover completed

- Verification results
  - For jobmanager.scheduler: Adaptive
    - [ ] Does it meet the balanced scheduling result (each task manager contains 3 tasks)?
  - For jobmanager.scheduler: Default
    - [ ] Does it meet the balanced scheduling result (each task manager contains 3 tasks)?

3.1.2.2 Failover scenario test triggered by TaskManagers

- Test case code
  - Entry-point class: *flip370.testing.slotsharinggroup.single.FlinkTestingJob*
  - Code description: FlinkTestingJob describes a streaming job that contains a default slot sharing group. The job includes a source operator with a parallelism of 10 and a sink operator with a parallelism of 20.
  - Job-level startup parameters: N.A.
- Description of the necessary configurations for an application cluster
  - *taskmanager.load-balance.mode: TASKS*
  - *taskmanager.numberOfTaskSlots: 2*
  - *restart-strategy.fixed-delay.attempts: 32*
  - *restart-strategy.fixed-delay.delay: 10s*
  - *jobmanager.scheduler: Adaptive/Default*
- Submit the flink job.
- How to simulate TaskManager-level failures？
  - Manually kill any one or more TaskManager instances/containers in the job cluster.
- Wait for the failover to be completed.
- Verification results
  - For jobmanager.scheduler: Adaptive
    - [ ] Does it meet the balanced scheduling result (each task manager contains 3 tasks)?
  - For jobmanager.scheduler: Default
    - [ ] Does it meet the balanced scheduling result (each task manager contains 3 tasks)?

3.2 Test for a job that contains multiple slot sharing groups

3.2.1 Regular job test

- Test case code
  - Entry-point class: *flip370.testing.slotsharinggroup.multiple.FlinkTestingJob*

    - Code description: FlinkTestingJob describes a streaming job that contains a default slot sharing group and an ssg2 slot sharing group. Each slot sharing group contains a source operator with a parallelism of 10 and a sink operator with a parallelism of 20.
    - Job-level startup parameters: N.A.
- Description of the necessary configurations for an application cluster
    - *taskmanager.load-balance.mode: TASKS*
    - *taskmanager.numberOfTaskSlots: 2*
    - *restart-strategy.fixed-delay.attempts: 32*
    - *restart-strategy.fixed-delay.delay: 10s*
    - *jobmanager.scheduler: Adaptive/Default*
- Submit the flink job.
- Verification results
    - For jobmanager.scheduler: Adaptive
        - ☐ Does it meet the balanced scheduling result (each task manager contains 3 tasks)?
    - For jobmanager.scheduler: Default
        - ☐ Does it meet the balanced scheduling result (each task manager contains 3 tasks)?

3.2.2 Failover scenario test

3.2.2.1 Failover scenario test triggered by tasks

- Test case code
    - Entry-point class: *flip370.testing.slotsharinggroup.multiple.FlinkTestingJob*
    - Code description: FlinkTestingJob describes a streaming job that contains a default slot sharing group and an ssg2 slot sharing group. Each slot sharing group contains a source operator with a parallelism of 10 and a sink operator with a parallelism of 20.
    - Job-level startup parameters are as follows: pass 300000 as a parameter to the Flink job entry class, which indicates that the 0th subtask of the source operator will throw a task exception every 5 minutes to trigger a job failover. *flip370.testing.slotsharinggroup.single.FlinkTestingJob 300000*

- Description of the necessary configurations for an application cluster
    - *taskmanager.load-balance.mode: TASKS*
    - *taskmanager.numberOfTaskSlots: 2*
    - *restart-strategy.fixed-delay.attempts: 32*
    - *restart-strategy.fixed-delay.delay: 10s*
    - *jobmanager.scheduler: Adaptive/Default*

- Submit the flink job.
- Wait the task's exception and failover completed
- Verification results
    - For jobmanager.scheduler: Adaptive
        - ☐ Does it meet the balanced scheduling result (each task manager contains 3 tasks)?
    - For jobmanager.scheduler: Default
        - ☐ Does it meet the balanced scheduling result (each task manager contains 3 tasks)?

3.2.2.2 Failover scenario test triggered by TaskManagers

- Test case code
    - Entry-point class: *flip370.testing.slotsharinggroup.multiple.FlinkTestingJob*
    - Code description: FlinkTestingJob describes a streaming job that contains a default slot sharing group and an ssg2 slot sharing group. Each slot sharing group contains a source operator with a parallelism of 10 and a sink operator with a parallelism of 20.
    - Job-level startup parameters: N.A.
- Description of the necessary configurations for an application cluster
    - *taskmanager.load-balance.mode: TASKS*
    - *taskmanager.numberOfTaskSlots: 2*
    - *restart-strategy.fixed-delay.attempts: 32*
    - *restart-strategy.fixed-delay.delay: 10s*
    - *jobmanager.scheduler: Adaptive/Default*
- Submit the flink job.
- How to simulate TaskManager-level failures？
    - Manually kill any one or more TaskManager instances/containers in the job cluster.
- Wait for the failover to be completed.
- Verification results
    - For jobmanager.scheduler: Adaptive
        - ☐ Does it meet the balanced scheduling result (each task manager contains 3 tasks)?
    - For jobmanager.scheduler: Default
        - ☐ Does it meet the balanced scheduling result (each task manager contains 3 tasks)?

4 Ping Yuepeng Pan by slack if there’re any issues during the testing

Thank you!