Progress Presentation

Cyan: MinWoo Kim, HyeonSeo Park, JongWon Lee

Environment Setting

versions & library

- jdk 17 -> most widely used
- scala 2.13 -> stable library support
- sbt 1.11.7 -> latest
- grpc-java -> fast & easy
- scalaPB -> auto-compile protobuf to scala class
- sc-opt -> command line parsing

local environment (cannot use server together!)

- docker & docker compose -> cross platform, imitate network environment

server environment

- pssh: send same command or file to 20 workers
- install jdk, scala, sbt, pssh, gensort at ~/.local

input generation

- using shell script, create multiple files in multiple directory

current deploy process

- git pull on master -> make jar by ‘sbt assembly’
  -> pscp jar -> pssh ‘java -jar ~’

```yaml
networks:
  internal_net:
    driver: bridge
    ipam:
      config:
        - subnet: 2.2.2.0/24
          gateway: 2.2.2.1
```

```
-bash-4.2$ pssh -h hosts1-10.txt -i "echo hi"
[1] 02:43:46 [SUCCESS] cyan@2.2.2.104
hi
[2] 02:43:46 [SUCCESS] cyan@2.2.2.102
hi
[3] 02:43:46 [SUCCESS] cyan@2.2.2.101
hi
[4] 02:43:46 [SUCCESS] cyan@2.2.2.105
hi
[5] 02:43:46 [SUCCESS] cyan@2.2.2.103
hi
[6] 02:43:46 [SUCCESS] cyan@2.2.2.109
hi
[7] 02:43:46 [SUCCESS] cyan@2.2.2.106
hi
[8] 02:43:46 [SUCCESS] cyan@2.2.2.108
hi
[9] 02:43:46 [SUCCESS] cyan@2.2.2.107
hi
[10] 02:43:46 [SUCCESS] cyan@2.2.2.110
hi
```

```bash
for dir_num in $(seq 1 $NUM_DIRS); do
    DIR="/data${dir_num}/input"
    mkdir -p "$DIR"
    echo "Creating files in ${DIR}..."

    for file_num in $(seq 1 $FILES_PER_DIR); do
        OUTPUT_FILE="${DIR}/partition.${file_num}"
        HEX_STRING=$(head -c 20 /dev/urandom | od -An -tx1 |
        RAND_INT=$(echo "ibase=16;$HEX_STRING" | bc)
        echo "  Generating ${OUTPUT_FILE} (${RECORDS} record
        gensort -a -b${RAND_INT} ${RECORDS} "$OUTPUT_FILE"
    done
done
```

Git Convention

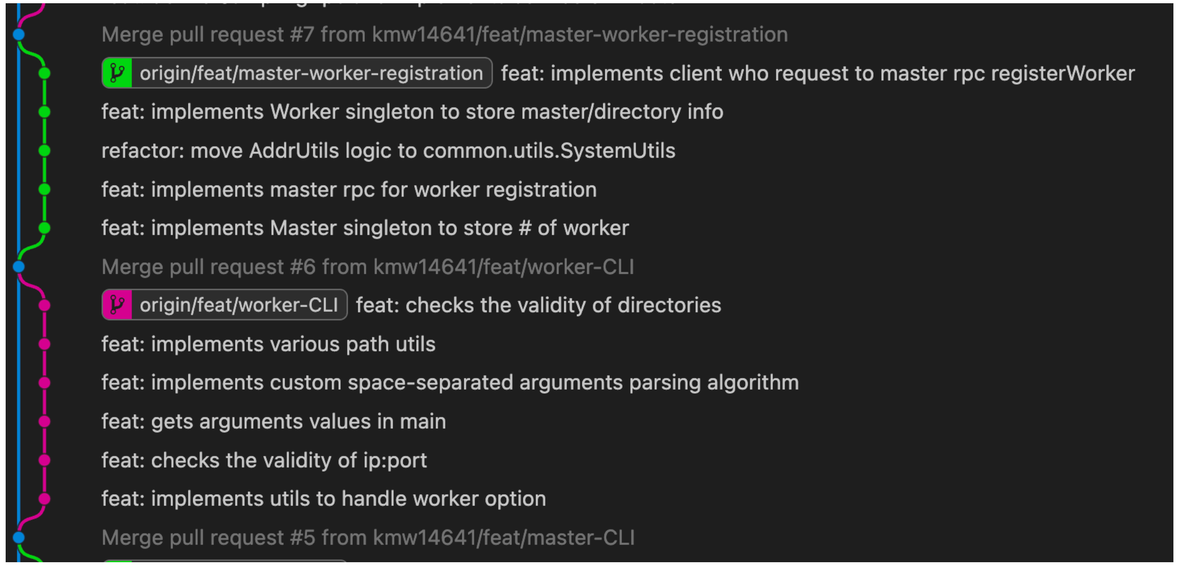
- feat: 새 기능을 추가할 때 사용합니다.
- fix: 이전에 작성된 "잘못된 코드"를 고칠 때 사용합니다.
- update: 이미 완성된 로직에서 변경사항이 일어났을 때 사용합니다.
- refactor: 로직 변경 없이 구조적인 변경만을 포함합니다.
- rename: 이름 변경만을 포함합니다.
- chore: style, comment, gitignore 등 잡다한 커밋을 담당합니다.
- docs: 문서 관련 커밋입니다.

- use prefix

-> save reviewer's time, reduce hidden buggy code

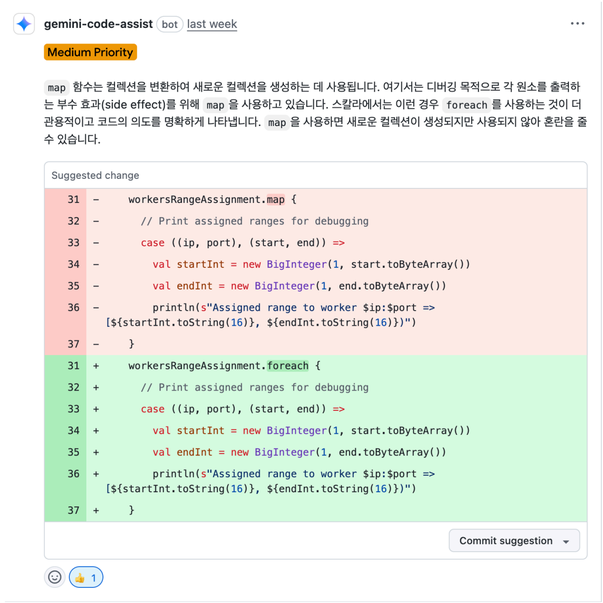
- unit of commit: not code-specific. feature-focused.
  - define proto file, implement server function, register function to server builder -> X
  - implement file download, implement parallel request, implement fault tolerance for request -> O

- use rebase, leave clean merge commit
  - reduce bug while resolving conflict
  - no nested merge commit

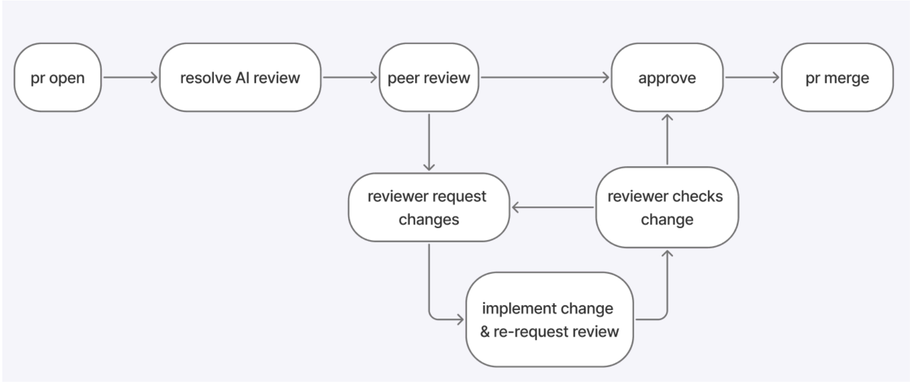


Code Review

- use ai review
  - for each comment, reviewee should verify correctness
  - 👍 for good comment after fix, 👎 for non-sense, otherwise leave text

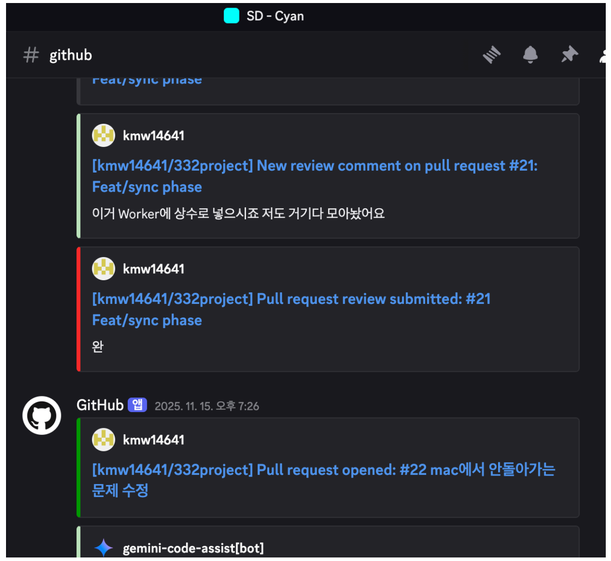


- peer review lifecycle

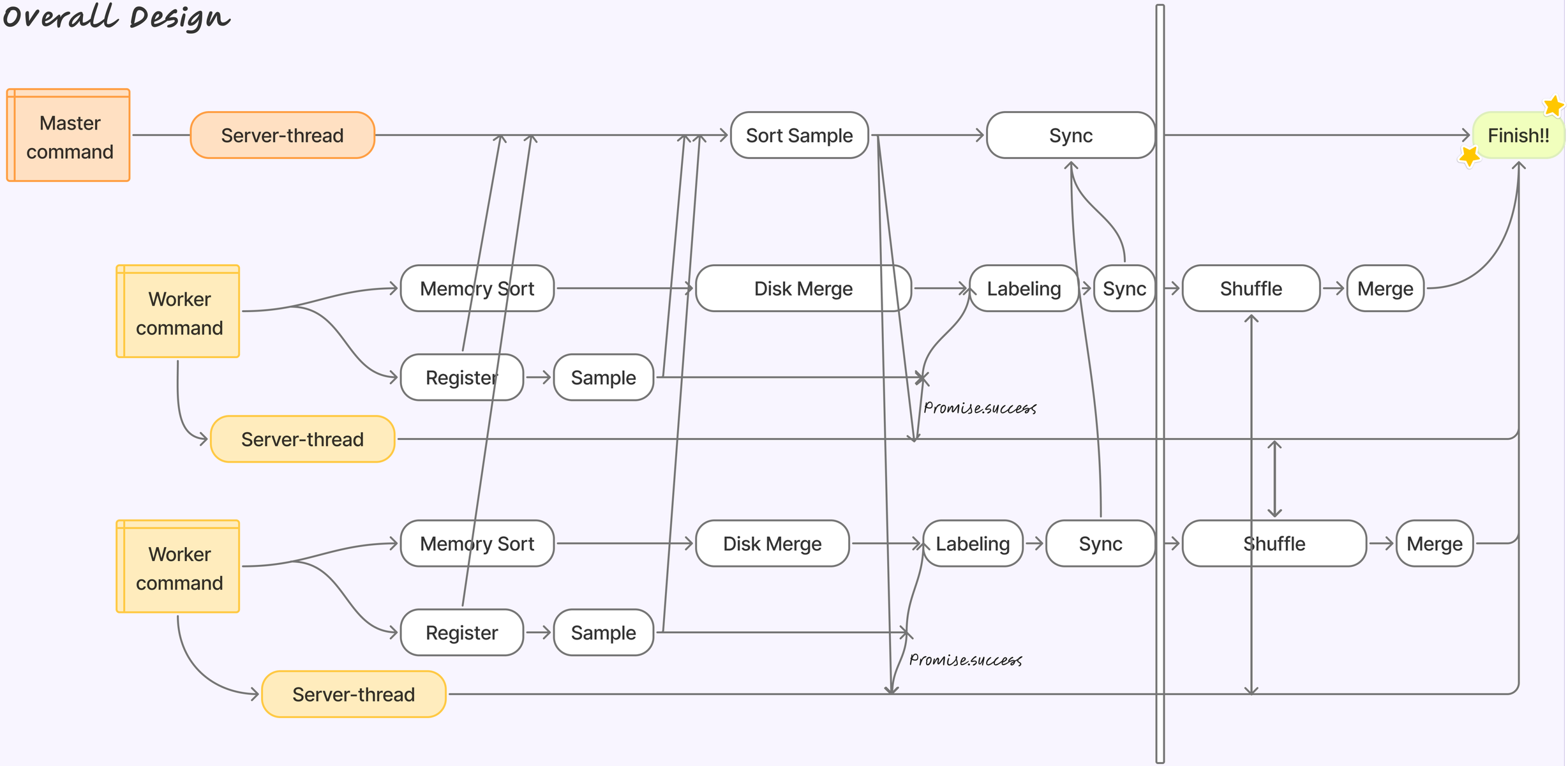


- use issues for future improvements

- github-discord webhook for notifications about pull request



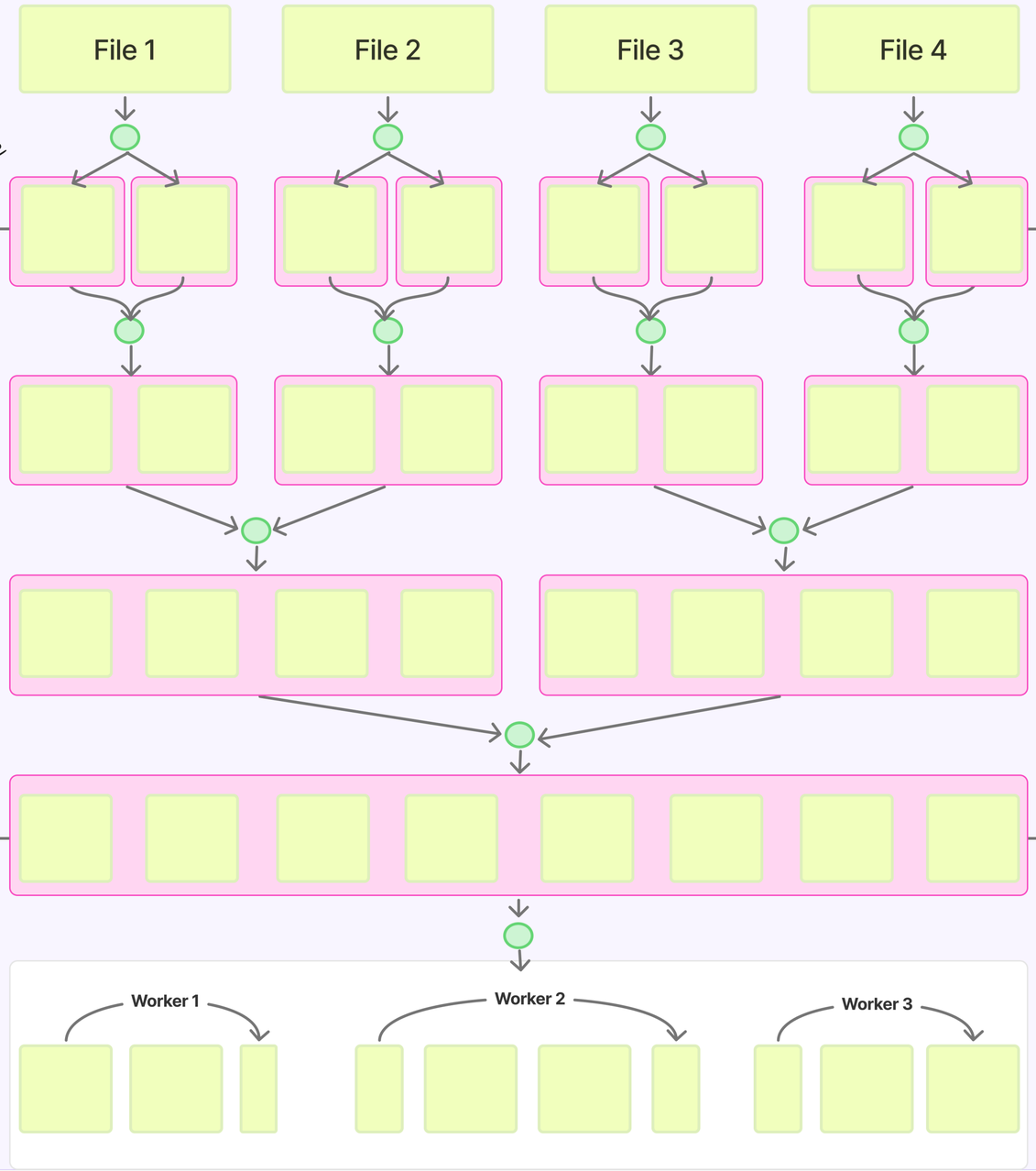
Overall Design

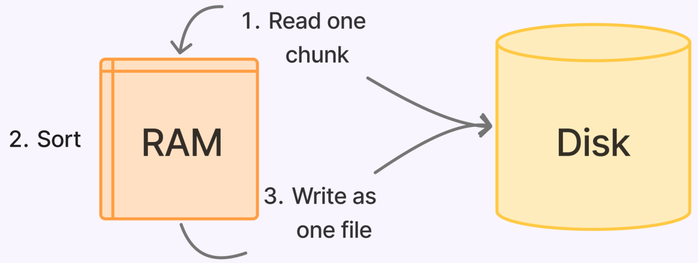


Disk based merge sort

<memory sort>

output file size = safe chunk size



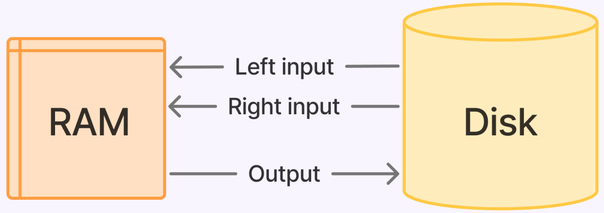


3 * file size on memory

2 for read, 1 for write

<Disk merge sort>

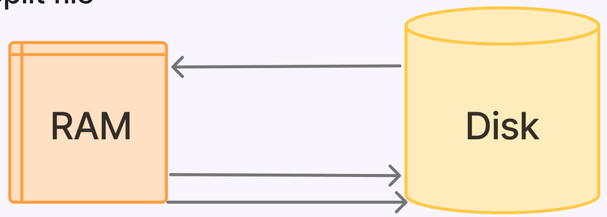
Additional handling of file size, thread pool size for low memory case



<Labeling>

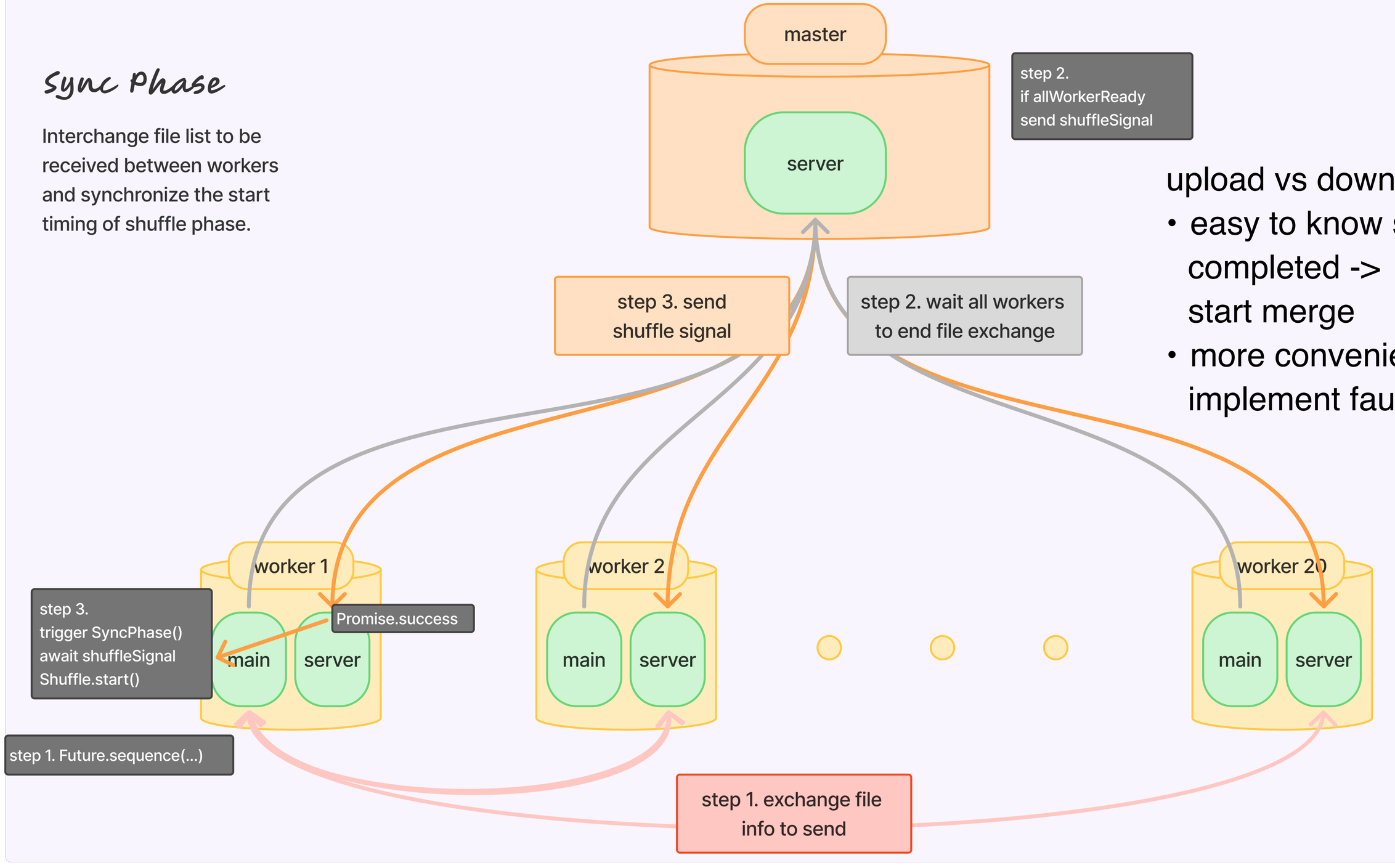
use binary searcy to find pivot point

Split file



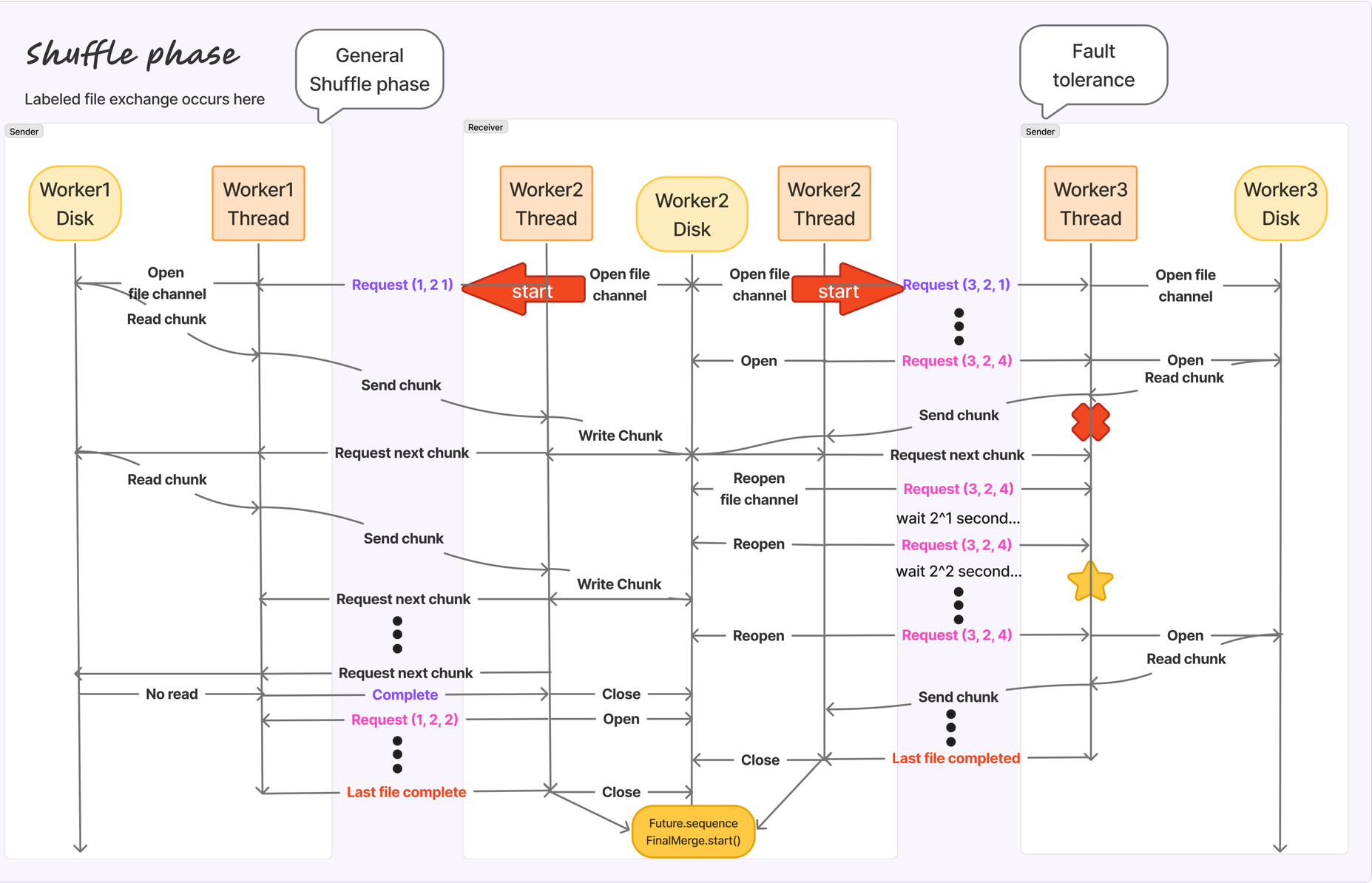
Sync Phase

Interchange file list to be received between workers and synchronize the start timing of shuffle phase.



upload vs download

- easy to know shuffle completed -> start merge
- more convenient to implement fault tolerance



protobuf:

```
returns (stream DownloadResponse);
```

on scale 0.1, 10 minute

- increase file size -> 9 minute (?)
- global disk lock -> 7 minute
- increase chunk size -> 6 minute

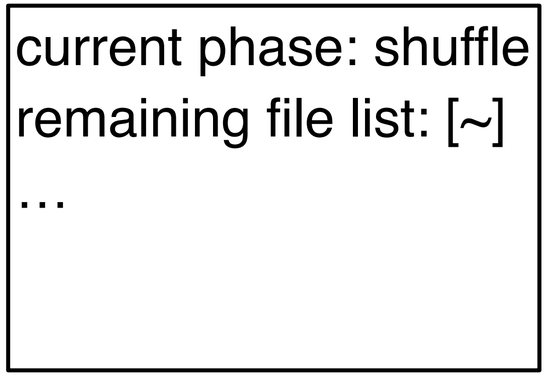
State restoration (Design)

- Worker has global state

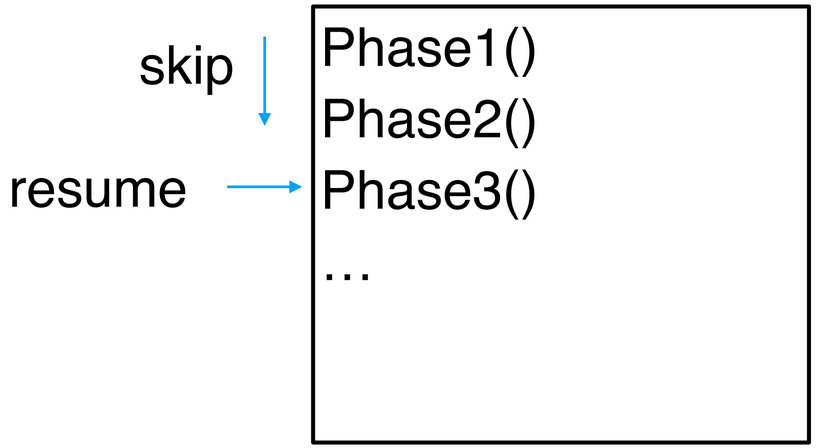
- Each phase records current progress after some work
  - ex) remaining file list for shuffle phase

- State is also stored in disk file

- When machine restarts
  - Broadcast new port
  - Execute program from start
  - For each phase, skip if already processed
  - In phase, skip already processed work, and resume



file: worker_state



Review on Progress

Week 1

- setup github
- get server access

Week 2

- create design draft

Week 3

- complete design documentation
- setting milestone
- distribute individual work

Week 4

- build setting
- local environment setting
- gensort automation
- CLI parser
- sampling phase
- shuffle phase

Week 5

- sync phase
- disk-merge phase
- server environment setting
- duration measurement and basic optimization

Project Milestones, Future Works

Milestone 1: Setting development environment

1-1: Setting server environment

- Execution environment update (completed)
- Install code or binary (almost)

1-2: Setting local environment (completed)

Milestone 2: Complete Implementation

2-1: Entrypoint of program (completed)

2-2: Sampling phase (completed)

2-3: Sort on local machine (reviewing)

2-4: Synchronization phase (considering fault tolerance) (reviewing)

2-5: Shuffle phase (considering fault tolerance) (reviewing)

2-6: State restoration

2-7: Final merge phase

Milestone 3: Debugging

Check correctness of program

Milestone 4: Test

Unit test & Integration test

Test fault tolerance scenario

Milestone 5: Optimization

Parallel operation, etc

Additional Objectives

Refactoring

- more OOP style, error handling convention, …

Logging