Assignment 2

Computação em Larga Escala

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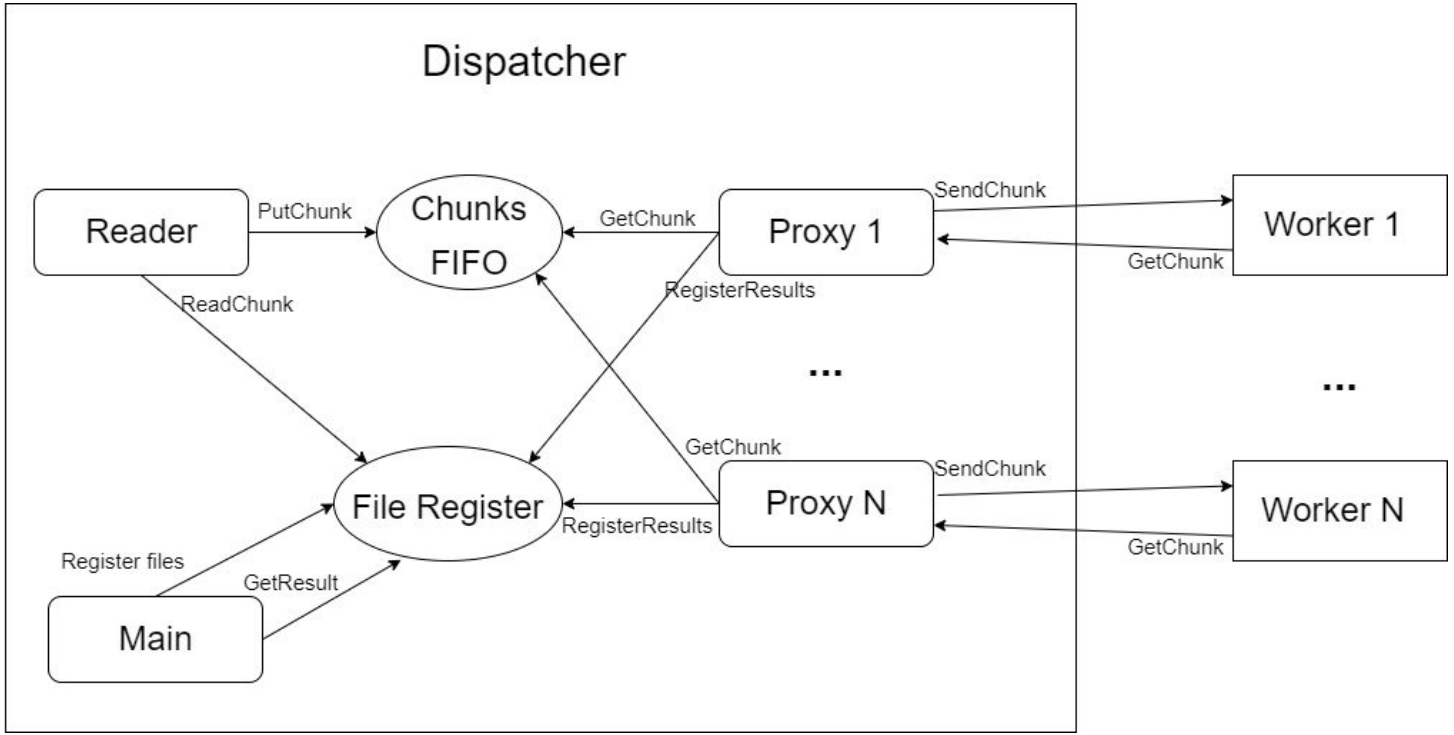
Problem 1 - Decomposition

Legenda:

Process

Thread

Data structure



Dispatcher (main thread)

```
{
   char** fileNames = parseFileNames();
   tf_initialize(fileNames);
   launchReadThread();
   launchProxyThread();
   waitReadThread();
   waitProxyThread();
   Results res = tf_getResults();
   printResults(res);
   tf_close();
}
```

Dispatcher (read thread)

```
   while(moreChunks)
   {
      tf_readChunk(&dataChunk, &moreChunks);
      if(moreChunks)
          fifo_putChunk(dataChunk);
   }
   fifo_doneReading();
```

Worker

```
forever
{
   MPI_Recv(data, CHUNK_SIZE, 0);
   if(getDataSize(data) == 0)
       break;
   processChunk(data, result);
   MPI_Send(result, RES_SIZE, 0);
}
```

Dispatcher (proxy thread)

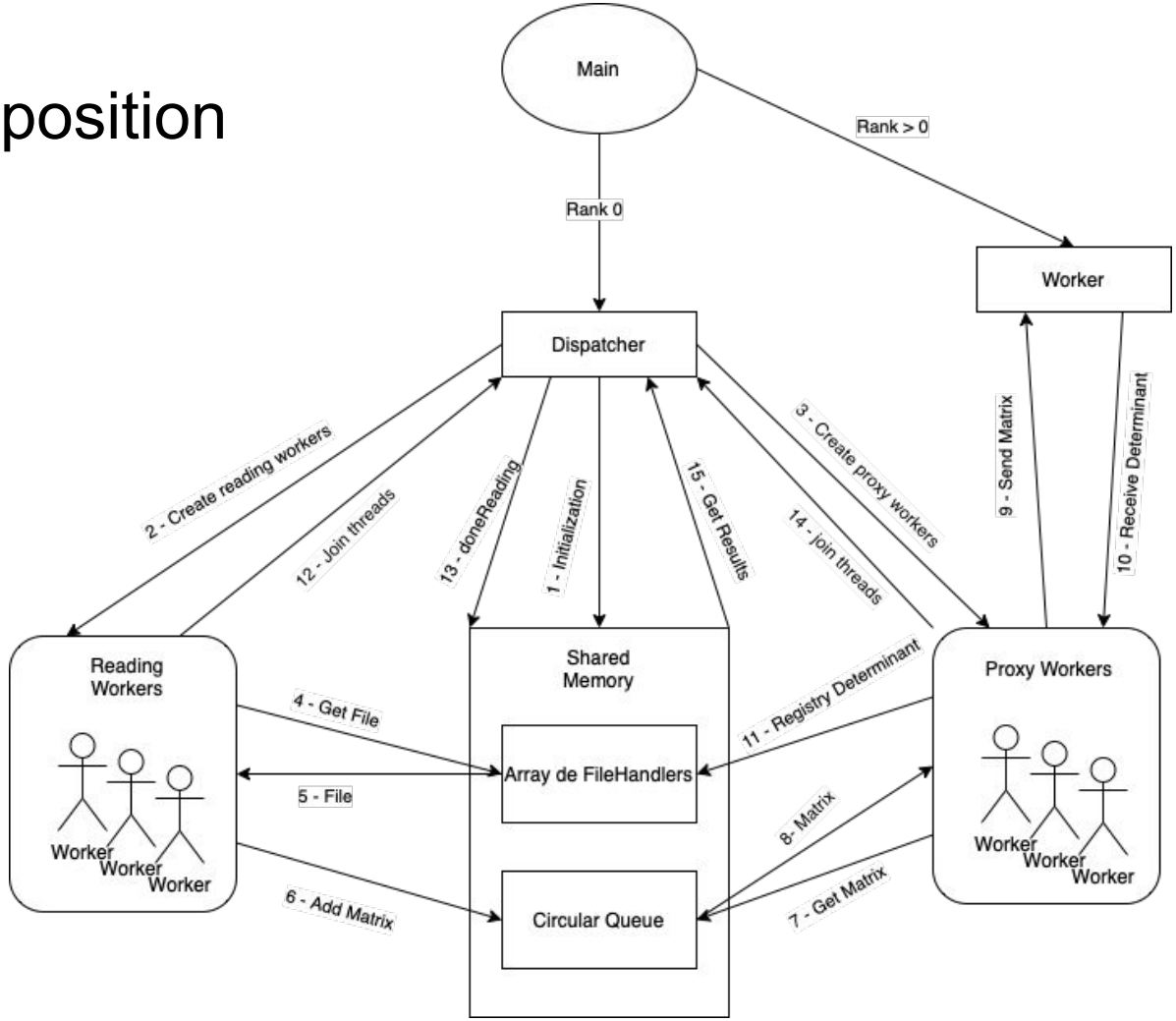
```
forever
{
   moreChunks = getChunk(&chunk, &fileHandler);
   if(!moreChunk)
   {
         MPI_Send(specialChunk, CHUNK_SIZE, workerId)
         break;
    }
   MPI_Send(chunk, CHUNK_SIZE, workerId);
   MPI_Recv(result, RES_SIZE, workerId);
   tf_registerResult(result, fileHandler);
}
```

Problem 1 timing results

- The results were obtained by averaging 5 measurements (all 4 text files , buffer size: 4kB)

	Processing time (ms)	Proc. Time (st. deviation)	Initialization time (ms)	Init. Time (st.deviation)	Speedup
1 worker	1.5	0.05	1.1	0.07	1
2 workers	0.9	0.14	2	0.59	0.93
4 workers	0.8	0.17	3	0.90	0.71
8 workers	5	1.14	11	0.36	0.17

Problem 2 - Decomposition



Threads

Main

```
{
        initMPI();
        if(rank == 0) dispatcher();
        else worker();
}
```

Dispatcher

```
{
        fileNames = parseFileNames()
        initializeSharedMemory(fileNames);
        startComputingWorkers();
        startReadingWorkers();
        joinReadingWorkers();
        doneReading()
        joinComputingWorkers();
        print(getResults())
        freeMemory()
}
```

Read File Worker

```
{
  forever
  {
        continue = getFile(&fileHandler);
        if(!continue) break;
        file = open(fileHandler->fileName);
        fread(fileHandler->nMatrices, file);
        fread(fileHandler->order, file);
        for(int i=0;i<nMatrices;i++) {
                fread(fileHandler->matrix[i], file);
                putMatrix(fileHandler->matrix[i]);
        }
  }
}
```

Proxy Worker

```
{
  forever
  {
        continue = getMatrix(&matrix);
        if(!continue) break;
        SendToWorker(matrix);
        receiveFromWorker(determinant);
        registerResult(matrix, determinant);
        // also frees the memory in the fifo
        corresponding with that matrix
  }
}
```

Worker

```
{
        forever {
                receiveMatrix(matrix, source);
                if(matrix.order == 0) break;
                determinant = computeMatrix(matrix);
                sendDeterminant(determinant);
        }
}
```

Problem 2 timing results

- The results were obtained by averaging 5 measurements, file 512_256.bin

	Processing time (s)	Proc. Time (st. deviation)	Initialization time (s)	Init. Time (st.deviation)	Speedup
1 worker	9.20	2.8e-2	0.19	4.2e-4	1
2 workers	4.79	3.5e-2	0.35	1.9e-3	1.83
4 workers	2.82	7.1e-2	0.65	4.4e-3	2.71
8 workers	2.01	3.4e-2	1.29	3.1e-3	2.84