MPI File Transfer Practical Work

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1 Introduction

The purpose of this practical is to implement a file transfer system using Message Passing Interface (MPI). The system involves multiple processes communicating and transferring files efficiently using MPI primitives.

2 Protocol Design

The file transfer protocol using MPI involves:

- Dividing the file into chunks.
- Using one process (rank 0) as the master to distribute chunks to other processes.
- Collecting the chunks at the receiver side and reconstructing the file.

3 Implementation

The implementation involves an MPI-based Python script using the `mpi4py` library.

3.1 MPI Code

The MPI script handles both sending and receiving:

```
from mpi4py import MPI
import os

comm = MPI.COMM_WORLD
rank = comm.Get_rank()
size = comm.Get_size()

filename = "example.txt"
chunk_size = 1024  # Size of each chunk in bytes

if rank == 0:
```

```
    # Master process: read file and distribute chunks
    with open(filename, 'rb') as file:
        file_content = file.read()
    file_size = len(file_content)
    print(f"File size: {file_size} bytes")

    for i in range(1, size):
        start_index = (i - 1) * chunk_size
        end_index = min(start_index + chunk_size, file_size)
        comm.send(file_content[start_index:end_index], dest=i, tag=11)
    print("File chunks sent to workers.")

else:
    # Worker processes: receive chunks and save to file
    chunk = comm.recv(source=0, tag=11)
    with open(f"received_{rank}.txt", 'wb') as file:
        file.write(chunk)
    print(f"Process {rank} received and saved chunk.")

if rank == 0:
    # Master process: reassemble chunks at the receiver
    with open("received_file.txt", 'wb') as output_file:
        for i in range(1, size):
            with open(f"received_{i}.txt", 'rb') as input_file:
                output_file.write(input_file.read())
    print("File reassembled successfully.")
```

4 Results

The MPI-based file transfer system was successfully tested. The following results were obtained:

- File transferred: ‘example.txt‘
- File size: 58 B
- Number of processes: 4
- Transfer time: 1 second

5 Roles

Contributed to this project:

- Ha Tan Minh: Developed the master-worker MPI code.
- Ha Tan Minh: Tested the file transfer with multiple processes.

- Ha Tan Minh: Prepared the report in LaTeX.