

Distributed Operating System Project

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Steps to run:

1. The name of project is *LucasPyramidMultipleSystems*
2. First to run the server type – `dotnet fsi – langversion:preview server.fsx`
3. To run the client type - `dotnet fsi –langversion:preview client.fsx <N> <k> <serverIp> <port>`

Design:

Server Design:

1. Created a server actor which waits for the mail from the client.
2. Once the server receives message from client work message is kept in server Dispatcher mailbox.
3. Dispatcher actor will divide the problem and distributes the work among the available worker actors.
4. Result is kept back into the client mailbox.
5. Once the server computation is done it will send an End message to the client Mailbox.

Client Design:

1. On Client startup client actor is created and “init” message will be kept in client mailbox.
2. Client actor will divide the job into subparts and sends some part of work to the server mailbox and other part is computed locally by creating dispatcher actor.
3. Client actor will also handle the data coming from the server and prints the screen.
4. Once Client actor gets job done message from server and localJobDone is set true and kills the actor system and program terminates.

Hardware Info:

Machine 1: Intel-i7 8-Core Machine

Machine 2: Intel-i7 8-Core Machine

Observations:

1. We have made 8 workers. Work is equally divided among these workers such that each worker gets $N/8$ unit of the work from the boss actor. Cases with 8(system cores), 16, 32, 64, 128, 256, 512, 1024 workers have been run, but the maximum ratio of CPU to real time ratio of 6.36829 was achieved when using 8 workers for input ($10^8, 24$). Each worker gets a work unit of approximately 10^7

2. Result of *dotnet fsi --langversion:preview LucasPyramidValues.fsx 10^6 4* is null and doesn't return any value.

Server Console:

```
PS C:\Users\Sanjay\OneDrive - University of Florida\Fall 2020\DOS\Fall20-DOS-Fsharp\remotetest\remotetest>
dotnet fsi --langversion:preview server.fsx

server.fsx(89,41): warning FS0020: The result of this expression has type 'Threading.Tasks.Task' and is implicitly ignored. Consider using 'ignore' to discard this value explicitly, e.g. 'expr |> ignore', or 'let' to bind the result to a name, e.g. 'let result = expr'.

[INFO][9/22/2020 2:34:07 AM][Thread 0001][remoting (akka://RemoteFSharp)] Starting remoting
[INFO][9/22/2020 2:34:08 AM][Thread 0001][remoting (akka://RemoteFSharp)] Remoting started; listening on addresses : [akka.tcp://RemoteFSharp@192.168.0.96:8777]
[INFO][9/22/2020 2:34:08 AM][Thread 0001][remoting (akka://RemoteFSharp)] Remoting now listens on addresses : [akka.tcp://RemoteFSharp@192.168.0.96:8777]
Job,500000,1000000,4
In Dispatcher
Received Dispatcher command from server
[INFO][9/22/2020 2:34:19 AM][Thread 0012][remoting-terminator] Shutting down remote daemon.
[INFO][9/22/2020 2:34:19 AM][Thread 0012][remoting-terminator] Remote daemon shut down; proceeding with flushing remote transports.
[INFO][9/22/2020 2:34:19 AM][Thread 0013][akka.tcp://RemoteFSharp@192.168.0.96:8777/system/endpointManager/reliableEndpointWriter-akka.tcp%3A%2F%2FClientFSharp%40localhost%3A8778-1] Removing receive buffers for [akka.tcp://RemoteFSharp@192.168.0.96:8777]->[akka.tcp://ClientFSharp@localhost:8778]
[INFO][9/22/2020 2:34:19 AM][Thread 0021][remoting (akka://RemoteFSharp)] Remoting shut down
[INFO][9/22/2020 2:34:19 AM][Thread 0010][remoting-terminator] Remoting shut down.
PS C:\Users\Sanjay\OneDrive - University of Florida\Fall 2020\DOS\Fall20-DOS-Fsharp\remotetest\remotetest>
```

Client Console:

```
C:\Users\Deepthi\DOS>dotnet fsi --langversion:preview client.fsx 1000000 4 192.168.0.96 8777
Real: 00:00:00.000, CPU: 00:00:00.000, GC gen0: 0, gen1: 0, gen2: 0
akka.tcp://RemoteFSharp@192.168.0.96:8777/user/server
[INFO][9/22/2020 2:34:18 AM][Thread 0001][remoting (akka://ClientFSharp)] Starting remoting
[INFO][9/22/2020 2:34:18 AM][Thread 0001][remoting (akka://ClientFSharp)] Remoting started; listening on addresses : [akka.tcp://ClientFSharp@localhost:8778]
[INFO][9/22/2020 2:34:18 AM][Thread 0001][remoting (akka://ClientFSharp)] Remoting now listens on addresses: [akka.tcp://ClientFSharp@localhost:8778]
init
EndN : 500000
ProcessingDone
-ProcessingDone-
[INFO][9/22/2020 2:34:19 AM][Thread 0013][akka.tcp://ClientFSharp@localhost:8778/system/endpointManager/reliableEndpointWriter-akka.tcp%3A%2F%2FRemoteFSharp%40192.168.0.96%3A8777-1] Removing receive buffers for [akka.tcp://ClientFSharp@localhost:8778]->[akka.tcp://RemoteFSharp@192.168.0.96:8777]
```

3. Result of *dotnet fsi --langversion:preview LucasPyramidValues.fsx 10^6 4* is:
 - a. Real - 0.376s
 - b. CPU - 0.485s
 - c. Ratio - 1.28