APPENDIX: ChatGPT Prompt

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In python MPI programing, How can worker do more than one task?

ChatGPT

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In Python MPI programming, workers can perform multiple tasks by implementing a message passing system where the master node dispatches tasks to the worker nodes, and the workers execute those tasks. Here's a basic outline of how you can achieve this:

1. **Initialize MPI**: Ensure all processes (master and workers) are initialized properly using MPI.
2. **Identify Master and Workers**: In MPI, each process has a rank. Rank 0 typically represents the master process, and the other ranks represent the worker processes.
3. **Master-Worker Communication**: The master process (rank 0) distributes tasks to the worker processes using MPI communication routines like `send` and `recv`.
4. **Worker Task Execution**: Worker processes (ranks other than 0) receive tasks from the master process and execute them.
5. **Looping for Multiple Tasks**: Workers can enter a loop where they repeatedly receive tasks from the master until there are no more tasks to perform. This loop continues until the master signals that there are no more tasks left.

Here's a simplified example of how you can structure your code:

```
from mpi4py import MPI

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

def master():
    tasks = [...]  # List of tasks to be executed
    num_tasks = len(tasks)
    num_workers = size - 1

    for i in range(num_tasks):
        task = tasks[i]
        worker_rank = (i % num_workers) + 1  # Assign task to workers in a round-robin manner
        comm.send(task, dest=worker_rank)

    # Signal workers that no more tasks are remaining
    for i in range(1, size):
        comm.send(None, dest=i)
```

```
def worker():
    while True:
        task = comm.recv(source=0)  # Receive task from master
        if task is None:  # Signal to exit loop when no more tasks
            break
        # Execute the task
        print(f"Worker {rank} executing task: {task}")

if rank == 0:
    master()
else:
    worker()
```

In this example, the master process distributes tasks to worker processes, and workers continuously receive and execute tasks until the master signals that there are no more tasks left. You need to replace `[...]` with your actual list of tasks to be executed.