PROJECT REPORT
VISUALIZING MPICH

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Introduction

MPICH is a standard software used for message-passing for distributed-memory applications used in parallel computing. MPICH is Free and open source software.

MPICH provides many MPI calls like Reduce , Broadcast , Send , Gather , etc to provide different functionality in parallel implementation of a code.

This project is to show a visual representation of underlying message passing that happens among the nodes for various different function calls and on different topologies.

Project objective

- Build a GUI application for the users to give configuration of the system
- Show different kind topologies
- Implement many different MPI calls on these topologies and show how the nodes are interacting among themselves for different functions
- Calculate number of hops messages take in each phase and in total
- Generate snapshots of event that happened during the communication for a specific function
- Gallery to show the snapshots
- Generate animated gif for a configuration

Target Audience

- Teachers that would like to show visual demonstration for the topologies and MPI calls
- Learners to self taught themself about these calls
- Researchers that would like to see changes in message passing pattern on different configuration

Contribution

Abhishek Gupta

- 2D Torus Topology representation
- Dragonfly Topology representation
- Send function for 2D Torus and Dragonfly
- Algorithms for Naive Bcast , Reduce , All Reduce , Gather , All Gather
- Reports and Presentation

Pranjal Jain

- Fat Tree topology representation
- Send Function for Fat Tree
- Algorithm for Recursive Doubling Bcast
- Gallery and image generation
- User Interface

Technology Used

Python

- Whole application is built upon python using different packages and 1 KLOC
  - Tkinter   : For UI
  - Matplotlib   : To generate images
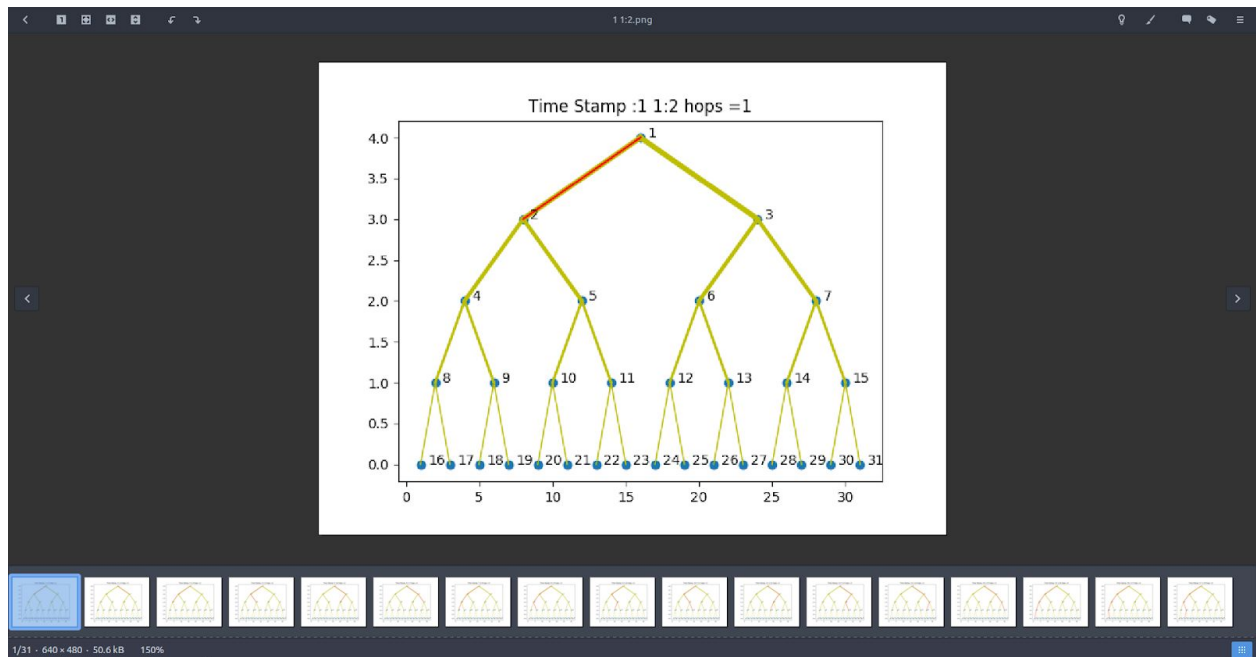 - OS   : To execute some system commands
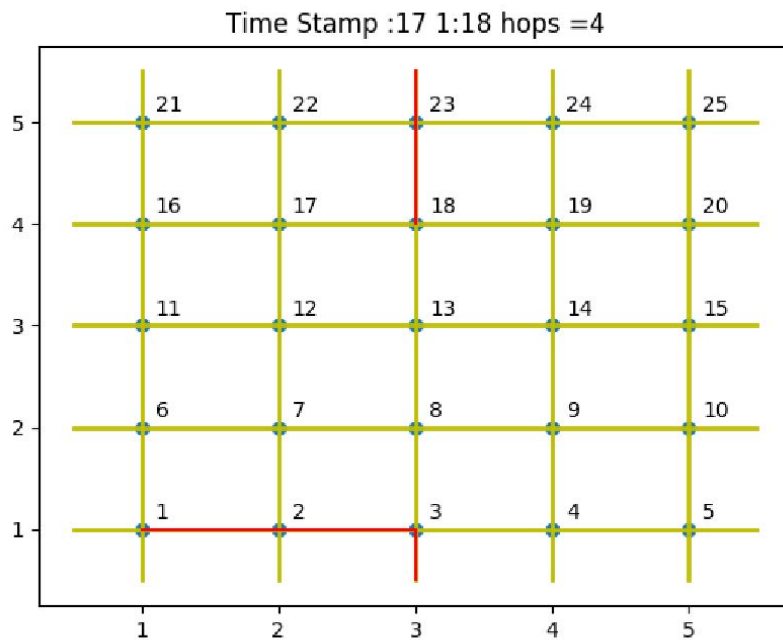
Screenshots
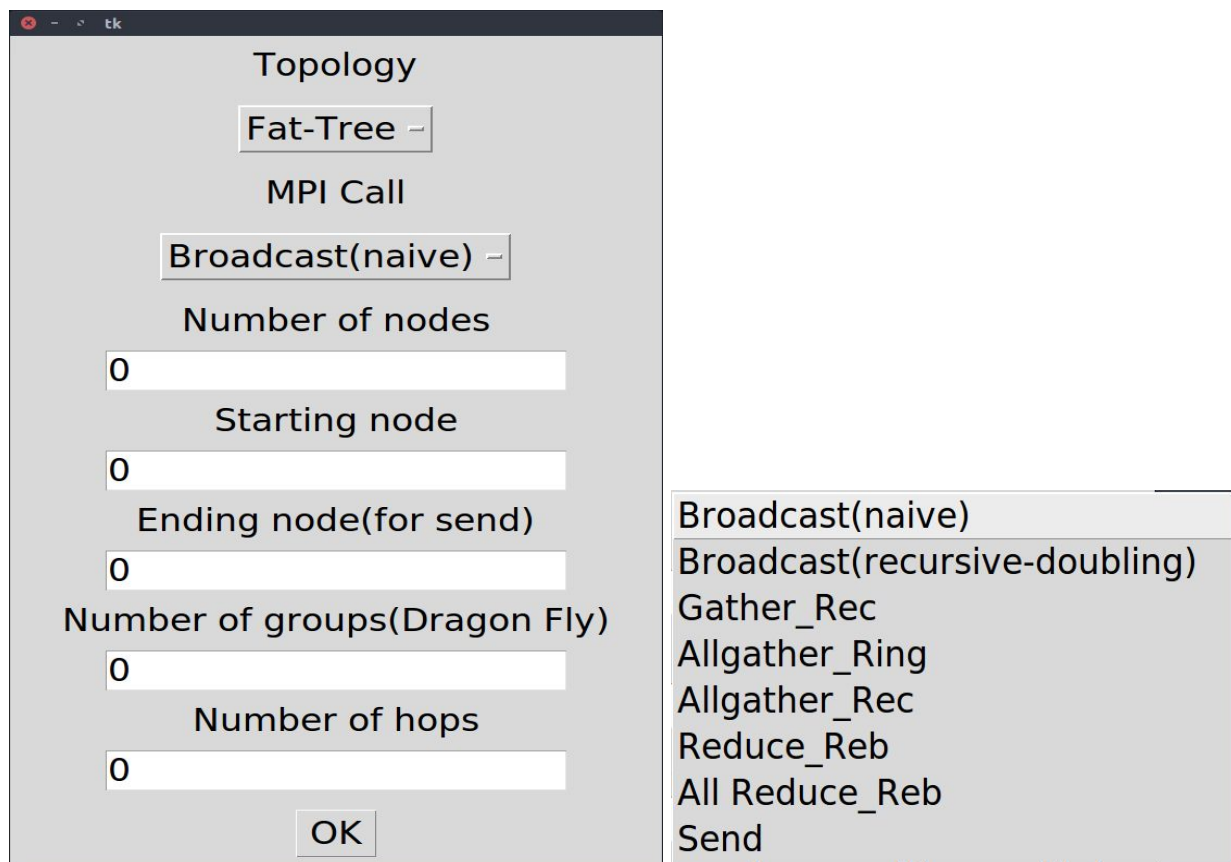
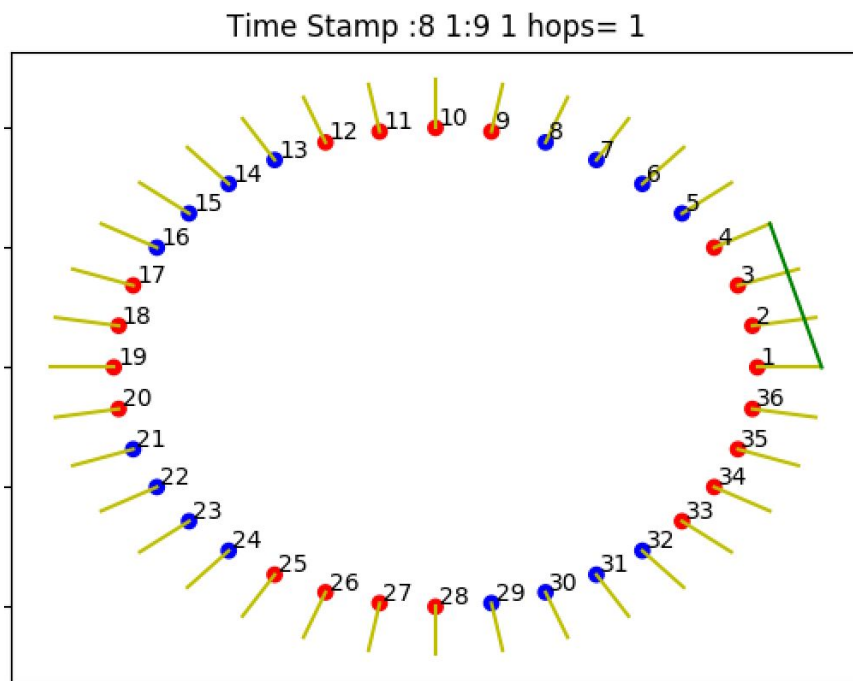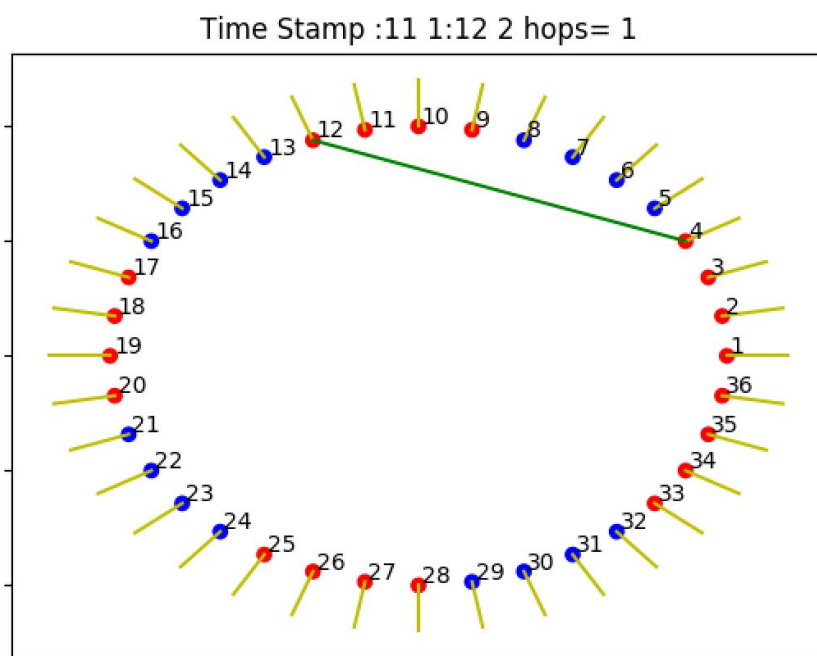User Interface

MPI Functions

Generated Images

Fat Tree Communication (In Gallery)

Torus Communication Representation

Dragonfly Intra Group Communication

Dragonfly Inter Group Communication

References

- https://en.wikipedia.org/wiki/MPICH
- https://www.mpich.org/
- Lecture Slides by Dr Preeti Malakar
- https://matplotlib.org/