

Massively Parallel Computing on Peer-to-Peer Networks

Presentation 4

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Team Timeout

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Agenda

- Topic Area
- What we accomplished
- Program Design
- Demonstration
- Future Works
- Lessons Learned
- References

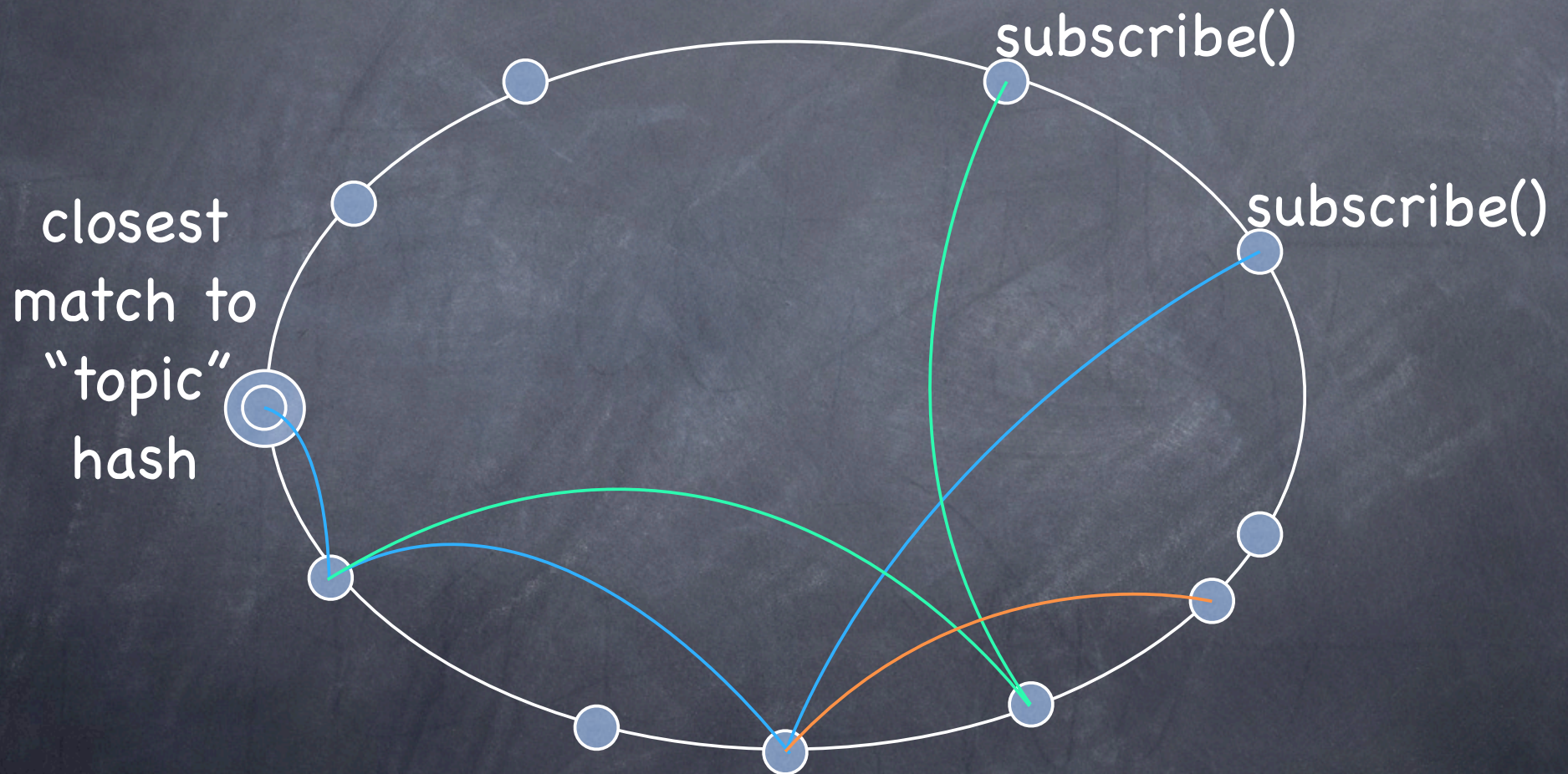
Fractal Image Generation on Pastry

- Peer to Peer System
- Decentralized
- Scalable
- Divide Images into Many Pieces
- Master Node sends the works to Worker Nodes
- Worker Nodes generate a part of the Fractal Image

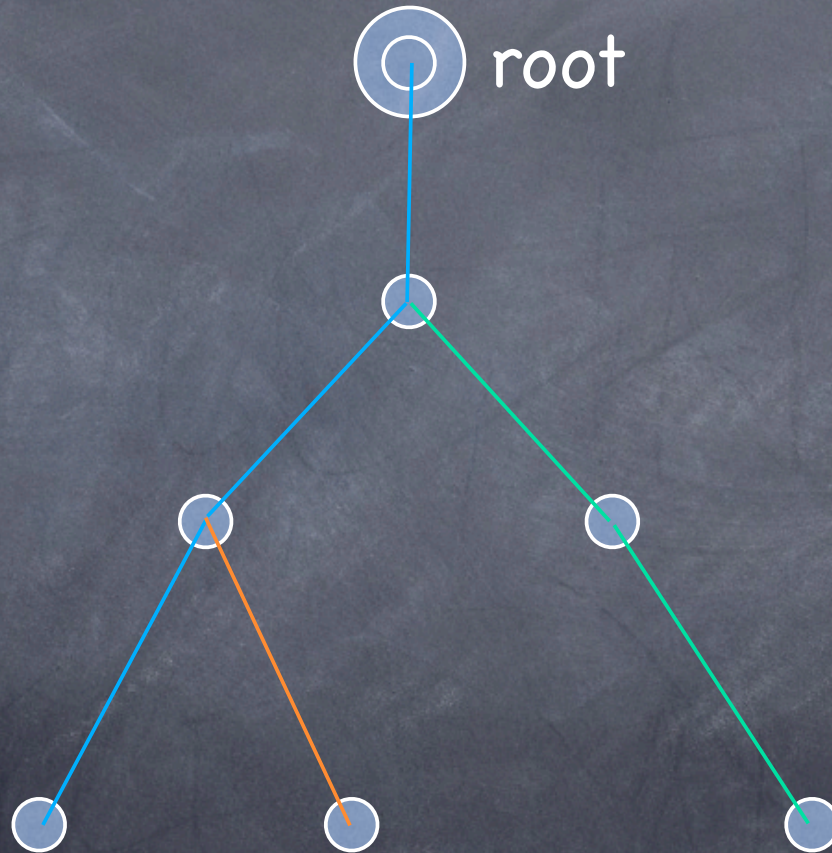
Accomplishment

- In depth study of Pastry API
- Implemented Direct Static Distribution Algorithm for Work Distribution
- Successfully implemented Distributed Fractal Image Generation
- Successfully implemented Detection of Node Failures
- Basic implementation of Migration of Roles

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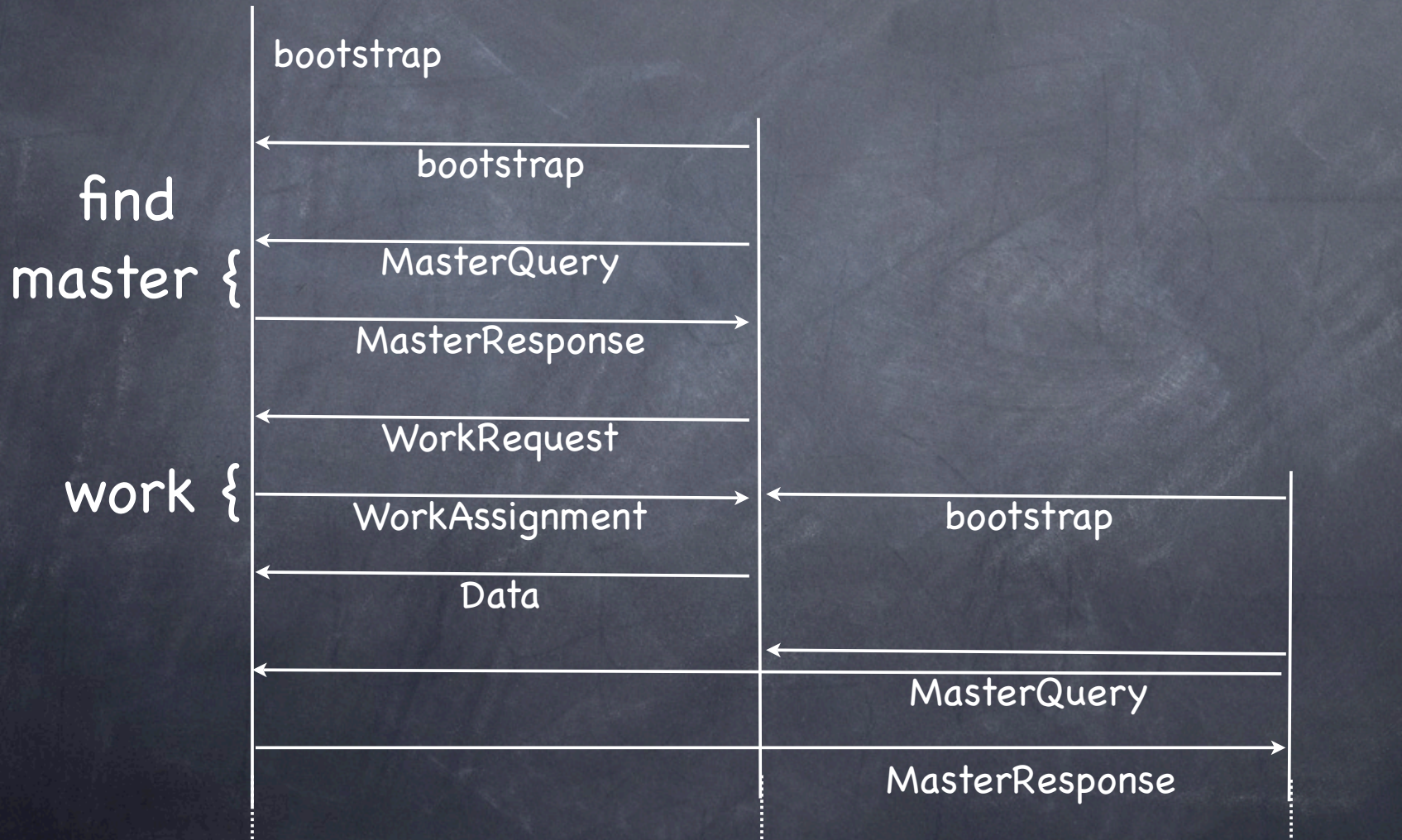


Normal Functionality

Node A (master)

Node B

Node C

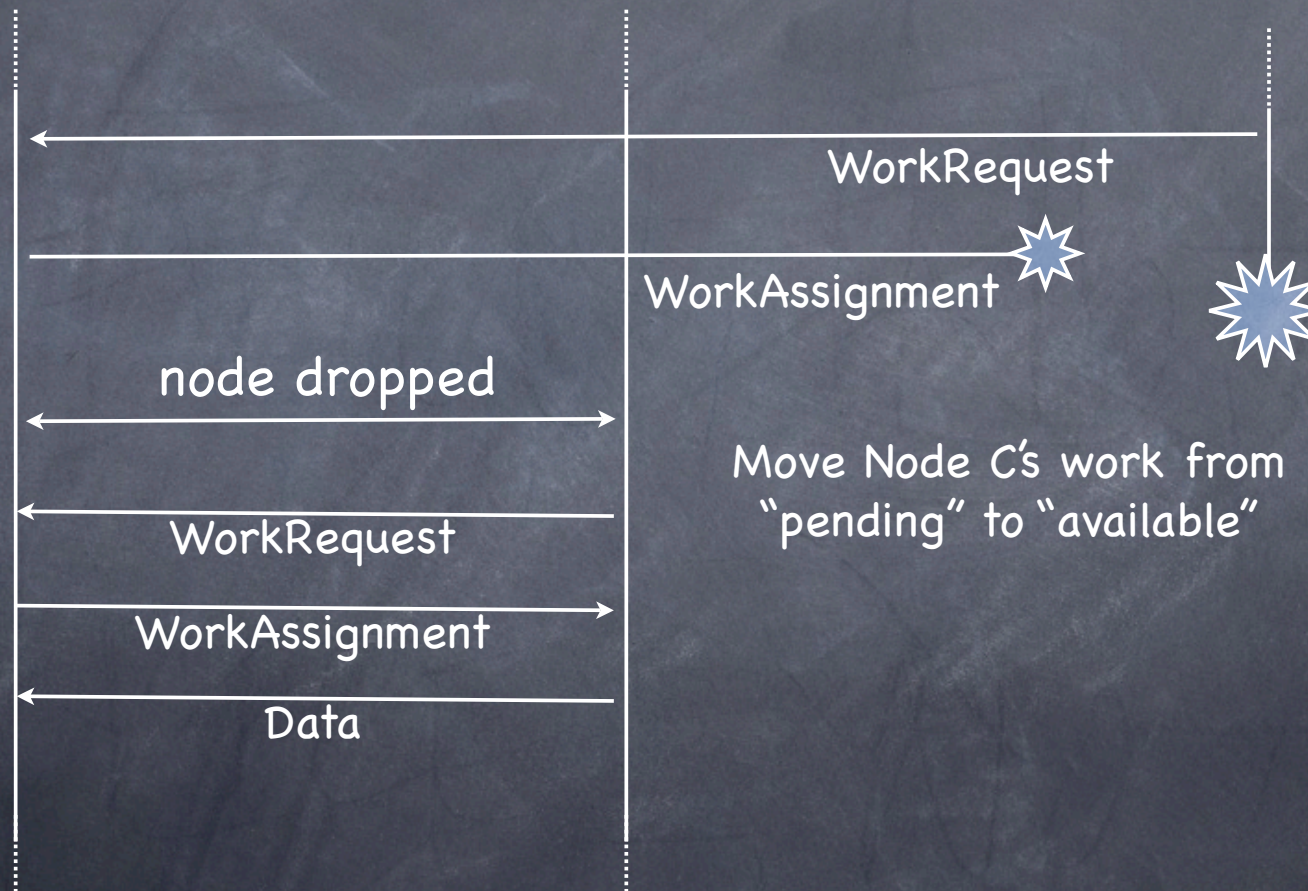


Lost Node

Node A (master)

Node B

Node C

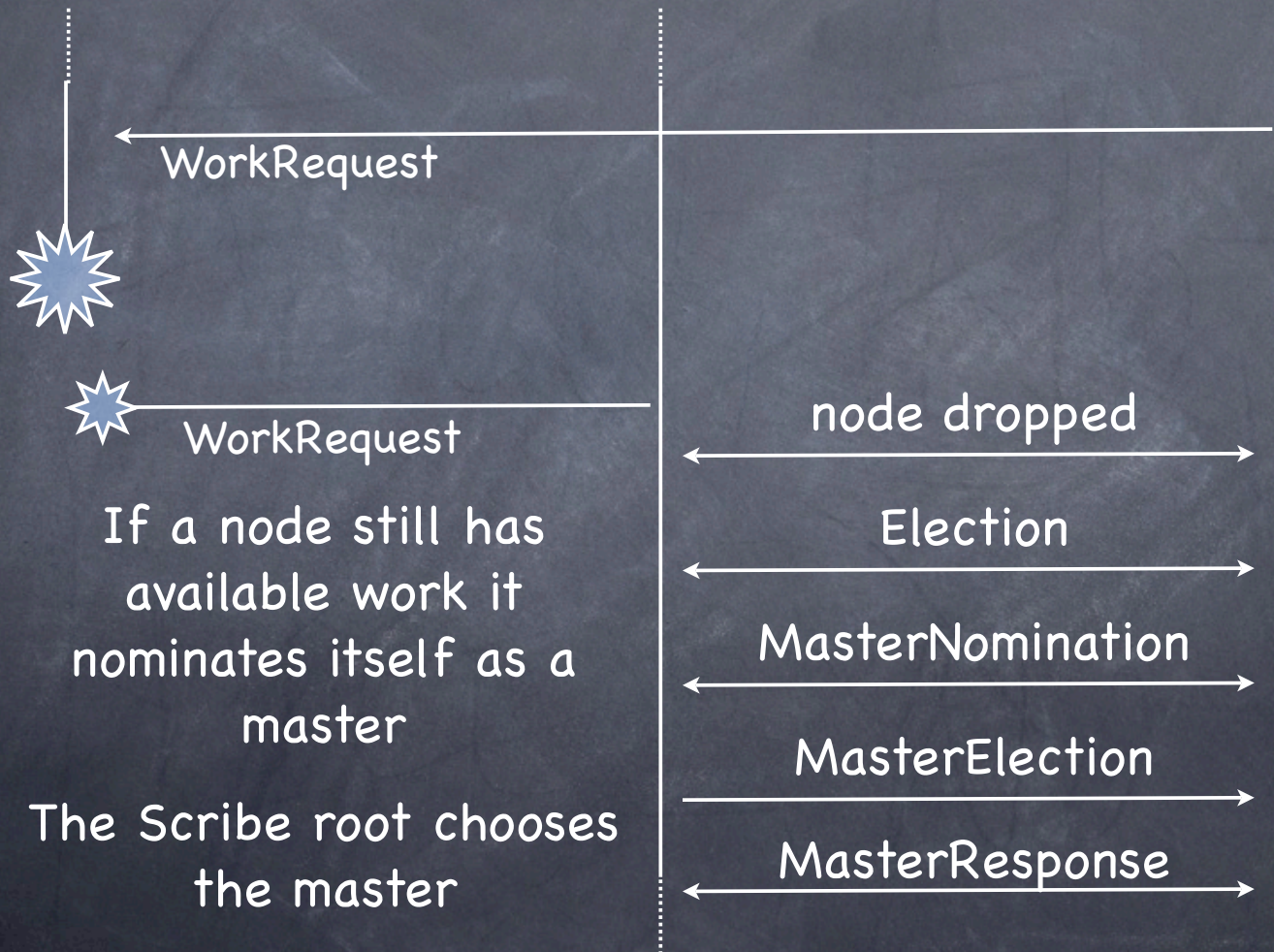


Lost Master

Node A (master)

Node B

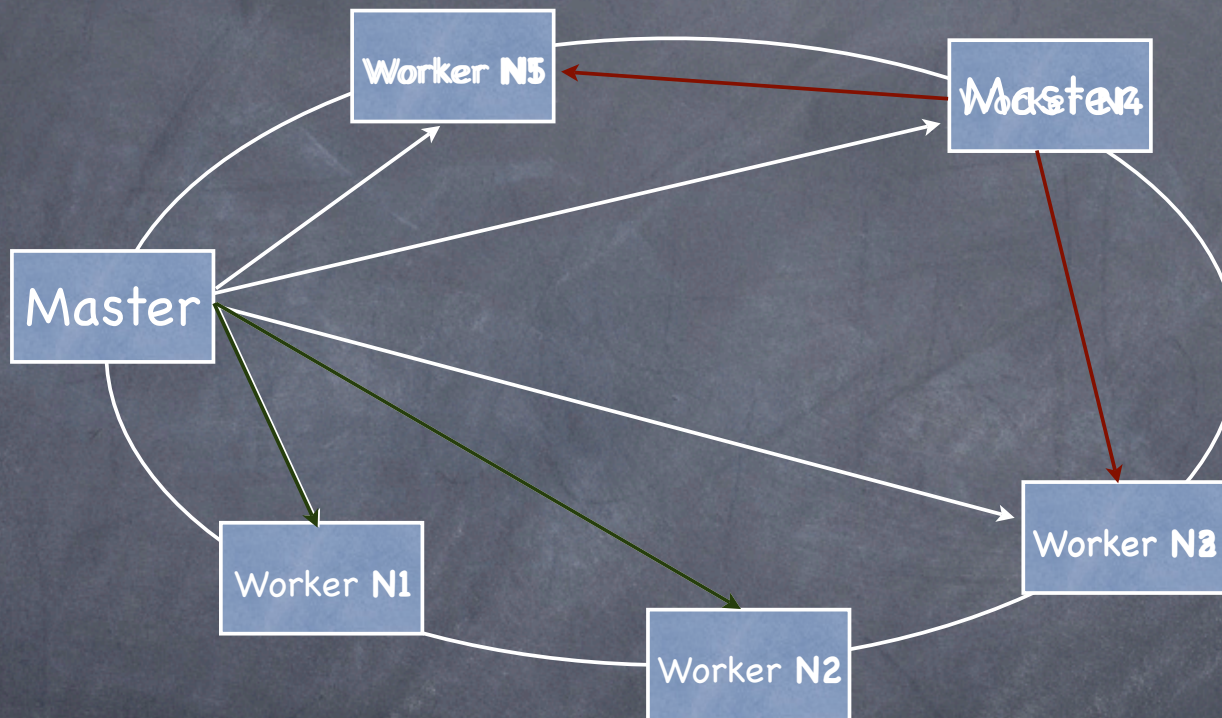
Node C



Demonstration

Future Work

[1] Multiple groups inside the Pastry ring



- > Borrowing ideas Scribe Architecture
- > Multiple "Topics" will be created
- > Different sets of Nodes would subscribe to a "Topic".
- > Master would contact the Nodes using multicast or unicast.

Future Work

[2] Decreasing the Latency in Node message passing

- Application level Socket Interface

- > Connecting to a Socket

- Route (msg, key)

- > Accepting a Socket

- > Read/Write from a Socket

- `sendMsgDirect()`

Future Work

[3] More Reliability in Migration of Roles

- > Further analysis of Scribe Implementation
- > A verbose output of the processes taking place

[4] Performance Measurement

- > Comparing the efficiency of this implementation with a Client-Server Architecture or even a P2P Architecture which does not have "Work Distribution" in terms of
 - time taken to complete a job
 - performance in case of Node failures etc.

Lesson Learned

◉ P2P Architecture

- > Analysis of different P2P Systems like Chord, Pastry etc.
- > Characteristics of P2P system:
Decentralization, Scalability, Anonymity, Self-Organization, Fault Resilience etc.
- > Popular P2P Algorithms: Centralized Directory, Flooded Request and Document Routing Models

Lesson Learned

- ◉ In depth analysis of Pastry
 - > Pastry Design
 - > Routing Algorithm
 - > Pastry API from Rice University:
Free Pastry

Lesson Learned

- Load Balancing and Work Distribution
 - > Different Load Balancing strategies: Static and Dynamic
 - > Work Distribution Strategies: Direct, Predictive and Dynamic Distribution
- Fractal Image Generation Algorithms
 - > Mandelbrot
 - > Julia

References

- [1] "Dynamic Load Balancing in Parallel Processing on Non-Homogeneous Clusters". De Guisti A. E., Naiouf M. R., De Giusti L. C., Chichizola F. JCS&T Vol. 5, No 4. December, 2005.
- [2] D.S. Milojevic, V. Kalogeraki, R. Lukose, K. Nagaraja, J. Pruyne, B. Richard, S. Rollins, Z. Xu, "Peer-to-Peer Computing". HP Laboratories, Palo Alto, March, 2002.
- [3] A. Rowstron and P. Druschel, "Pastry: Scalable, distributed object location and routing for large-scale peer-to-peer systems". IFIP/ACM International Conference on Distributed Systems Platforms (Middleware), Heidelberg, Germany, pages 329-350, November, 2001.

Questions ?