A DSA Model For Data Access In Self-Organizing Systems

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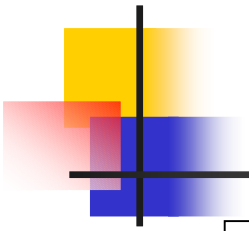
Self-Organizing System ?

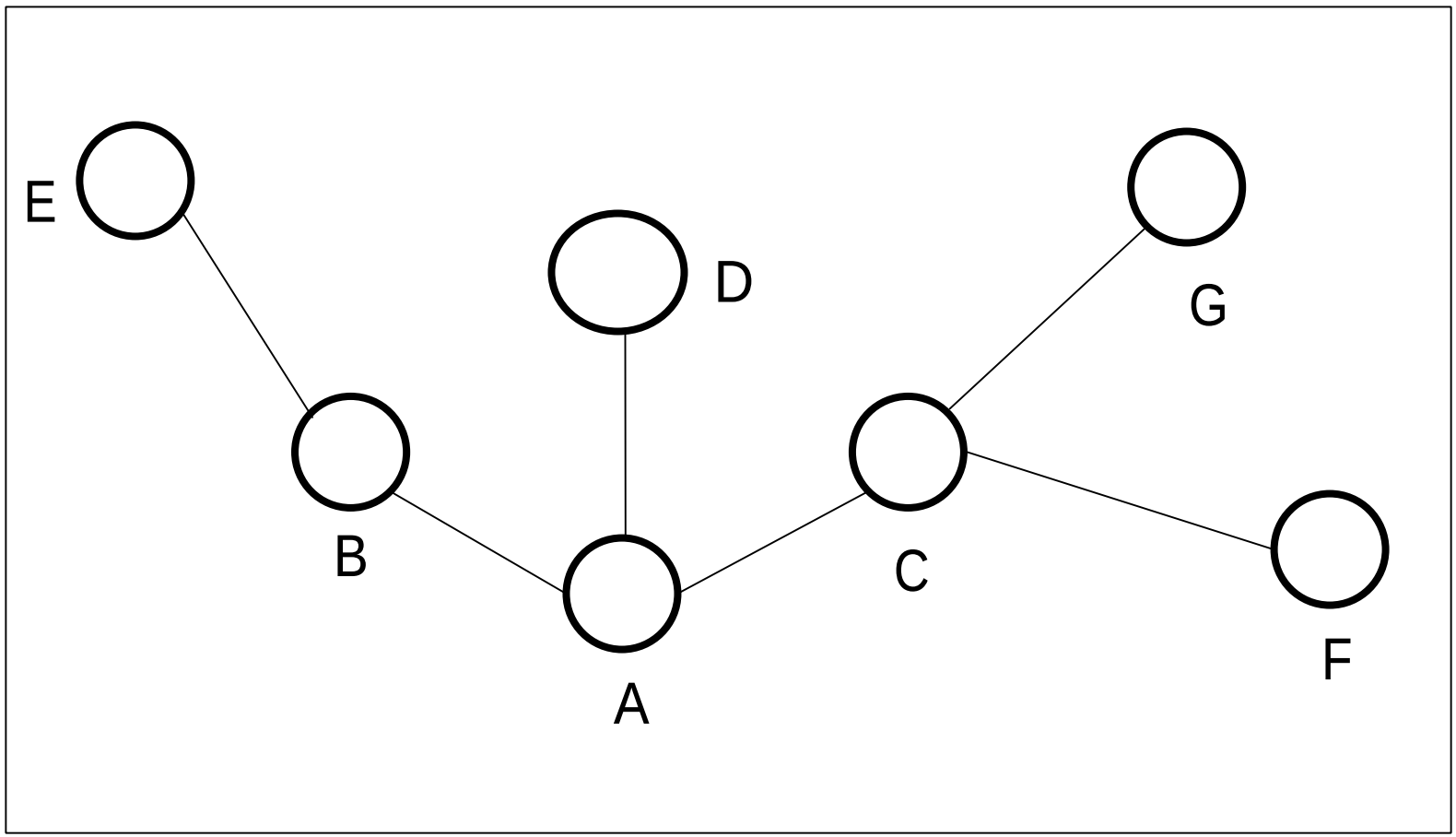
- Distributed system with:
- reactive characteristics
  - Ability to detect unusual behavior
- self-healing characteristics
  - Ability to carry out corrective actions in order to optimize the system's behavior
- Example of self-organizing system: Mobile Ad Hoc Network (MANET).



Mobile Ad Hoc Network (MANET)

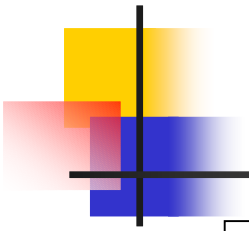
- Network deployed without pre-existing fixed infrastructure
- Consists of mobile nodes connected by wireless links
- Each node acts both as router and host
- Dynamic topology
- Fully decentralized

MANET characteristics
Dynamic topology



Data access requirements

- Learning about data availability
- Accessing those data



Data access issues

- Lack of centralized server
- Dynamic node constellation
- Changing link’s status

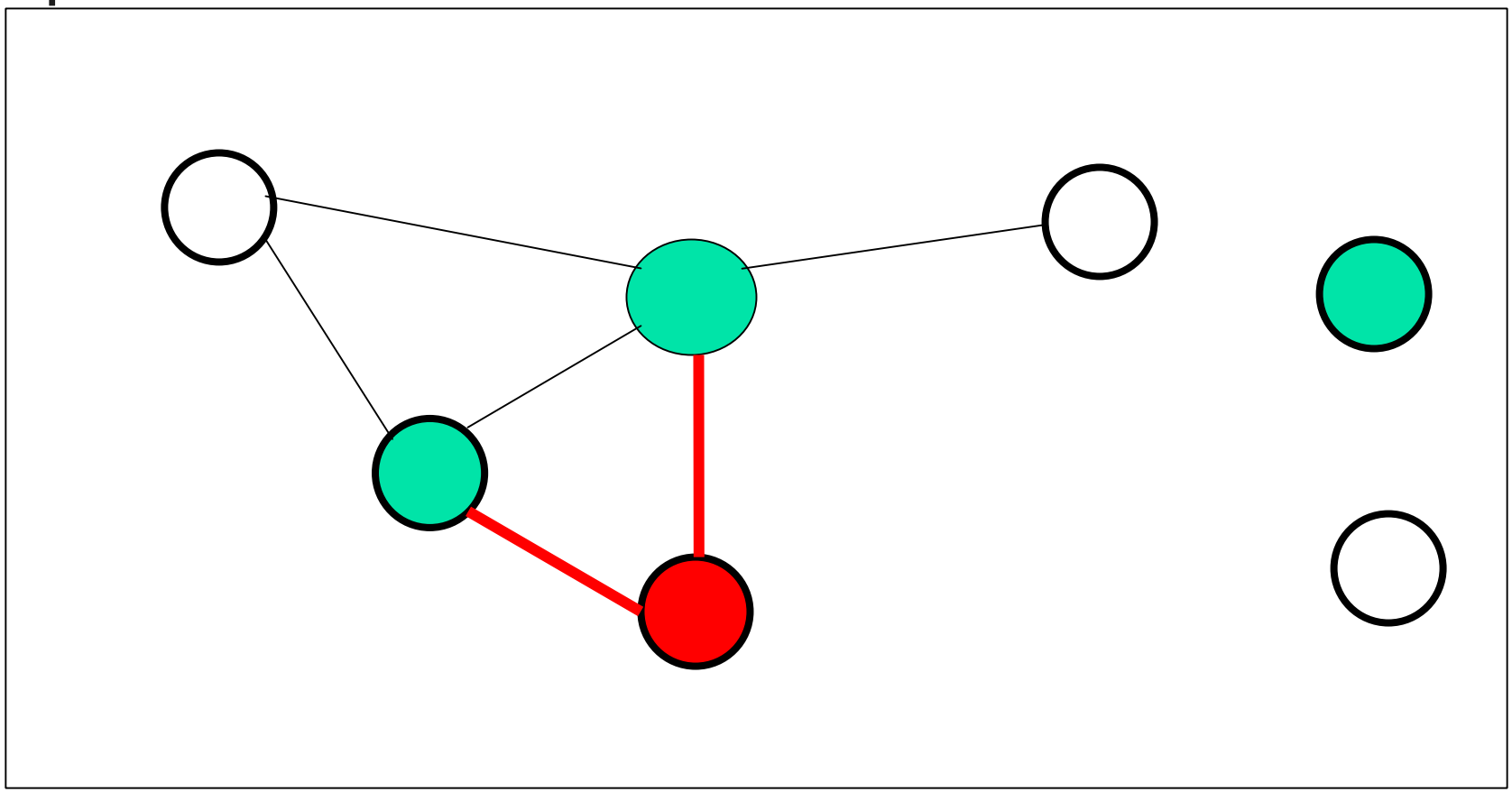
Data access issues(1)
Lack of centralized server

- Maintaining ones is

  - unreliable, and

  - expensive because of the unpredictable topology (nodes can join and leave the network without warning)

Data access issues(2)
Dynamic node constellation



Data access issues(3)
Potential change of link's status

- Connectivity between two nodes may change over time:
  - symmetric

    Node A and B can receive messages from each other.
  - Asymmetric

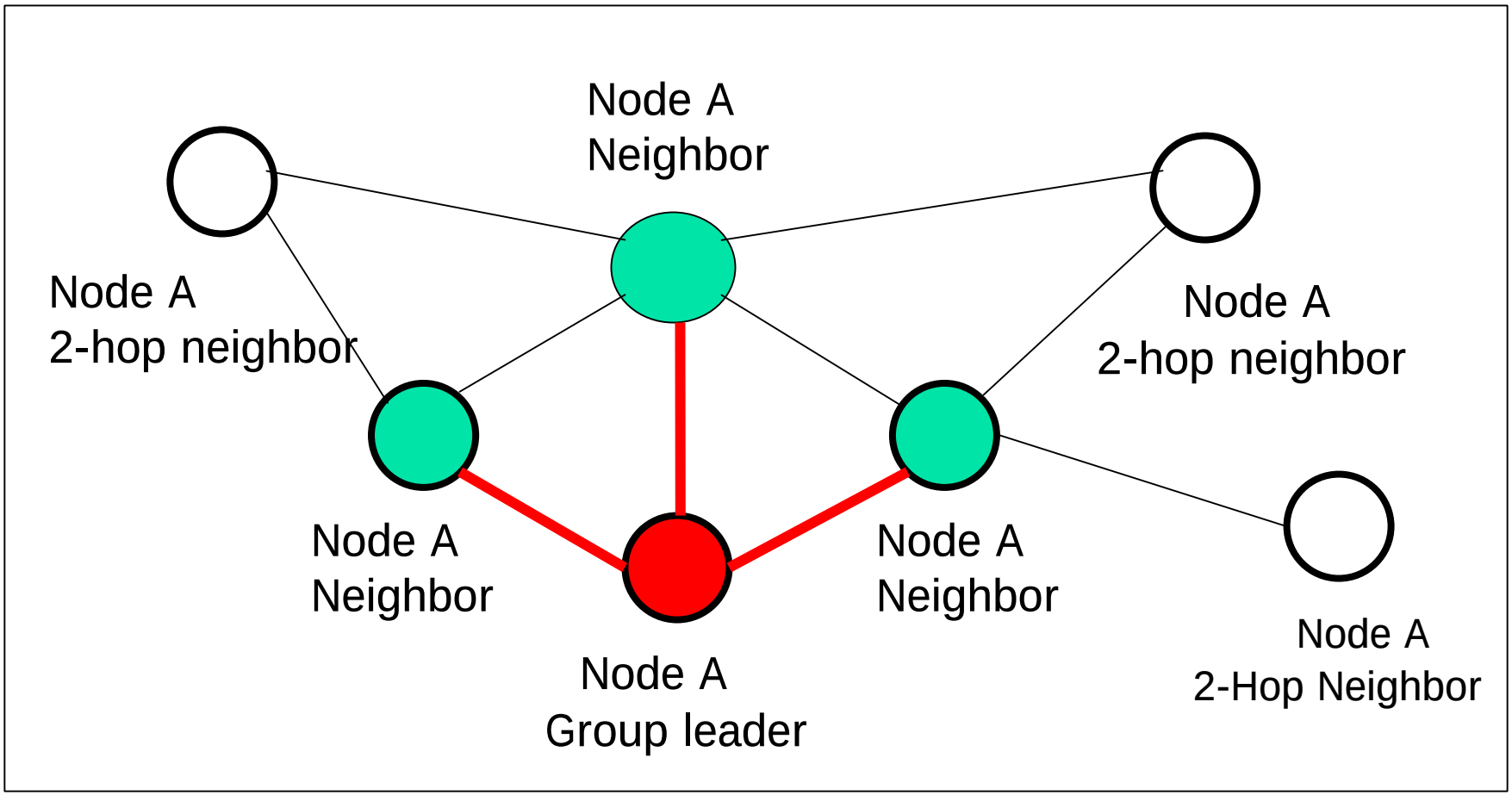
    Node A can receive messages from B, then B may not necessarily receives messages from A.

➔ Need for a real-time lookup service

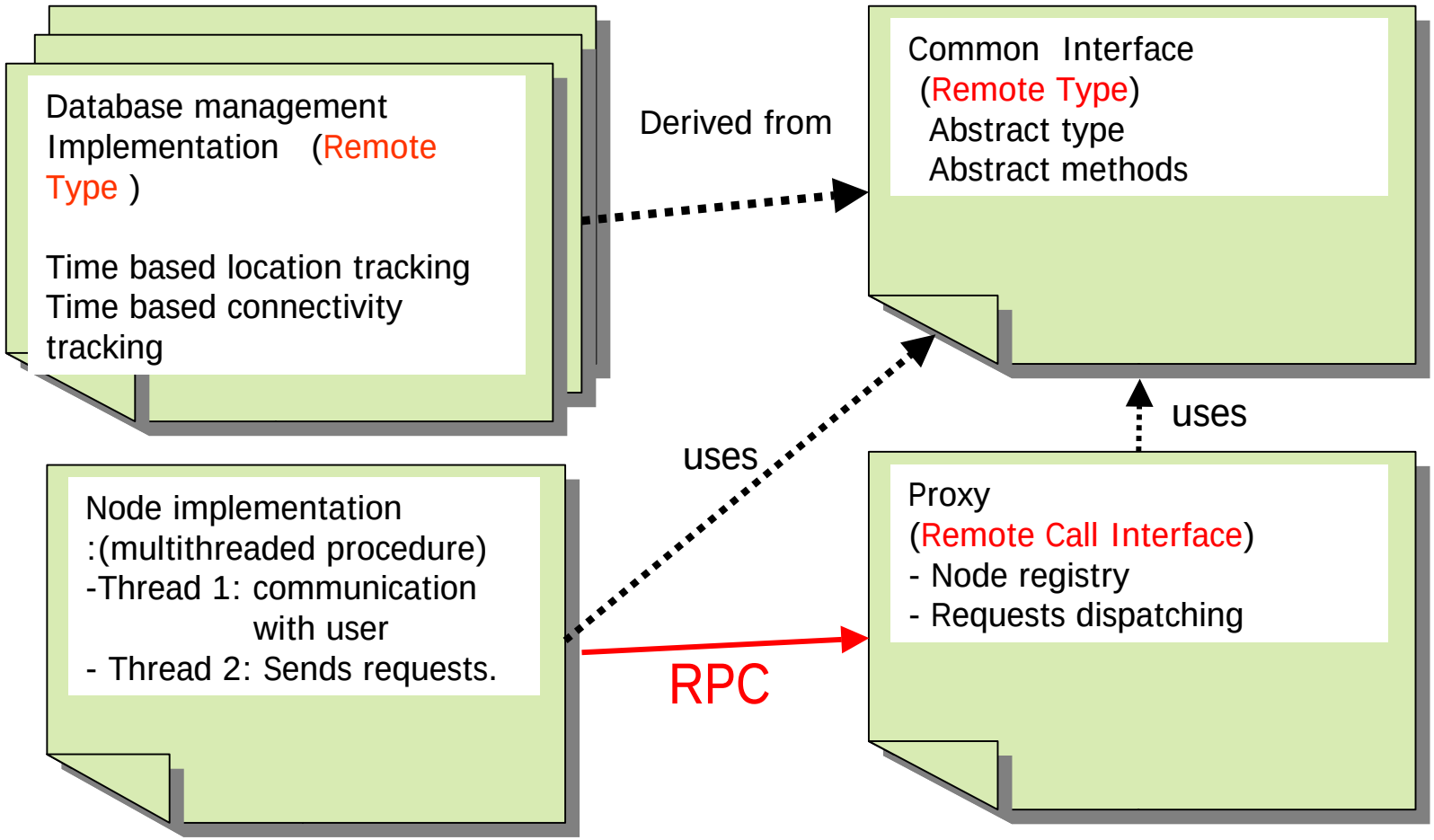
Key concepts for the design of the data access API

- Network partitioning
  - Group (group leader, group leader elector)
- Each node maintains a database
  - neighbor set, 2-hop neighbor set, group leader set, group leader elector set
  - status of links between nodes
- Time based database management
- Database consistency through exchange of messages between nodes

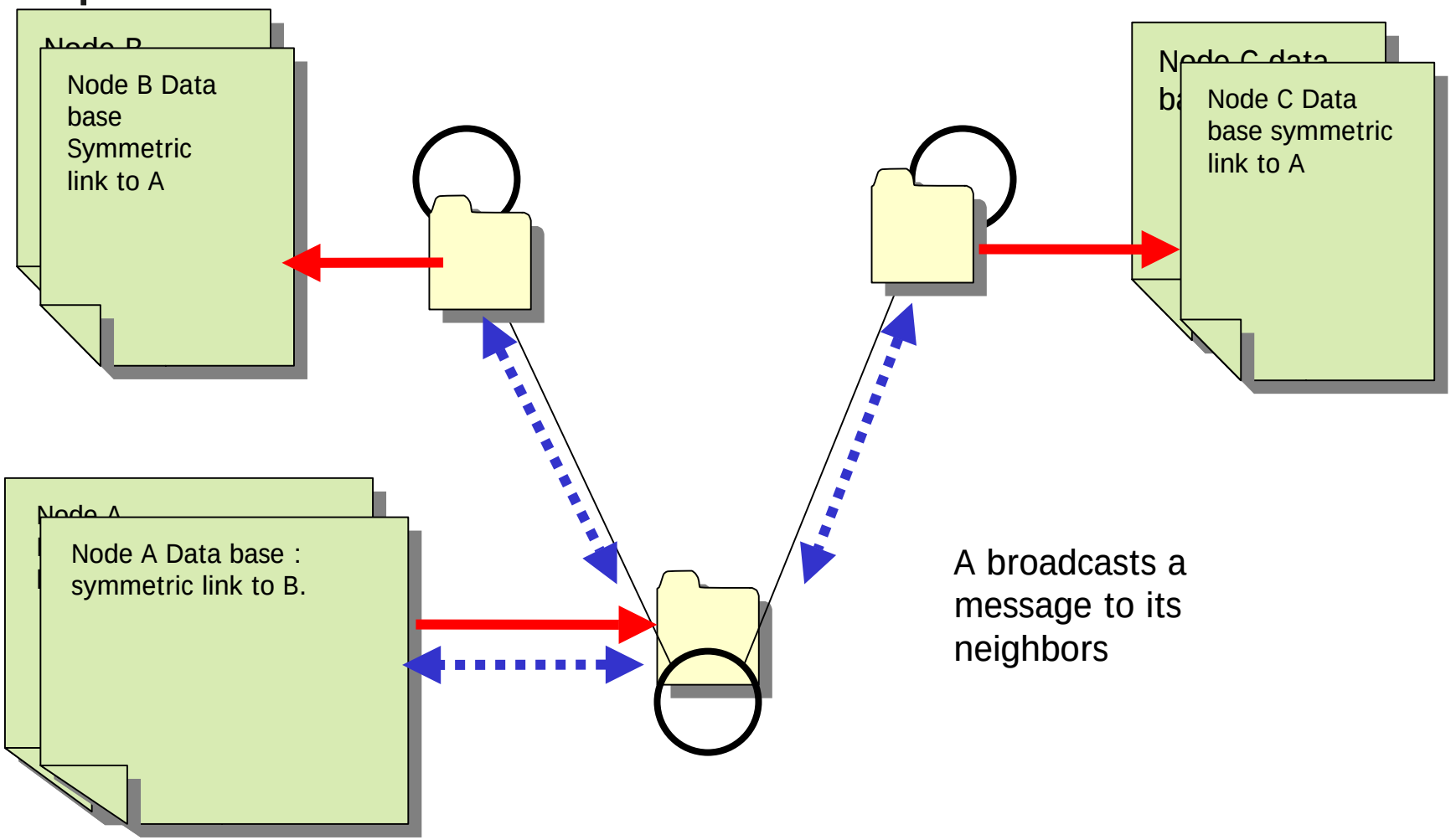
network partitioning



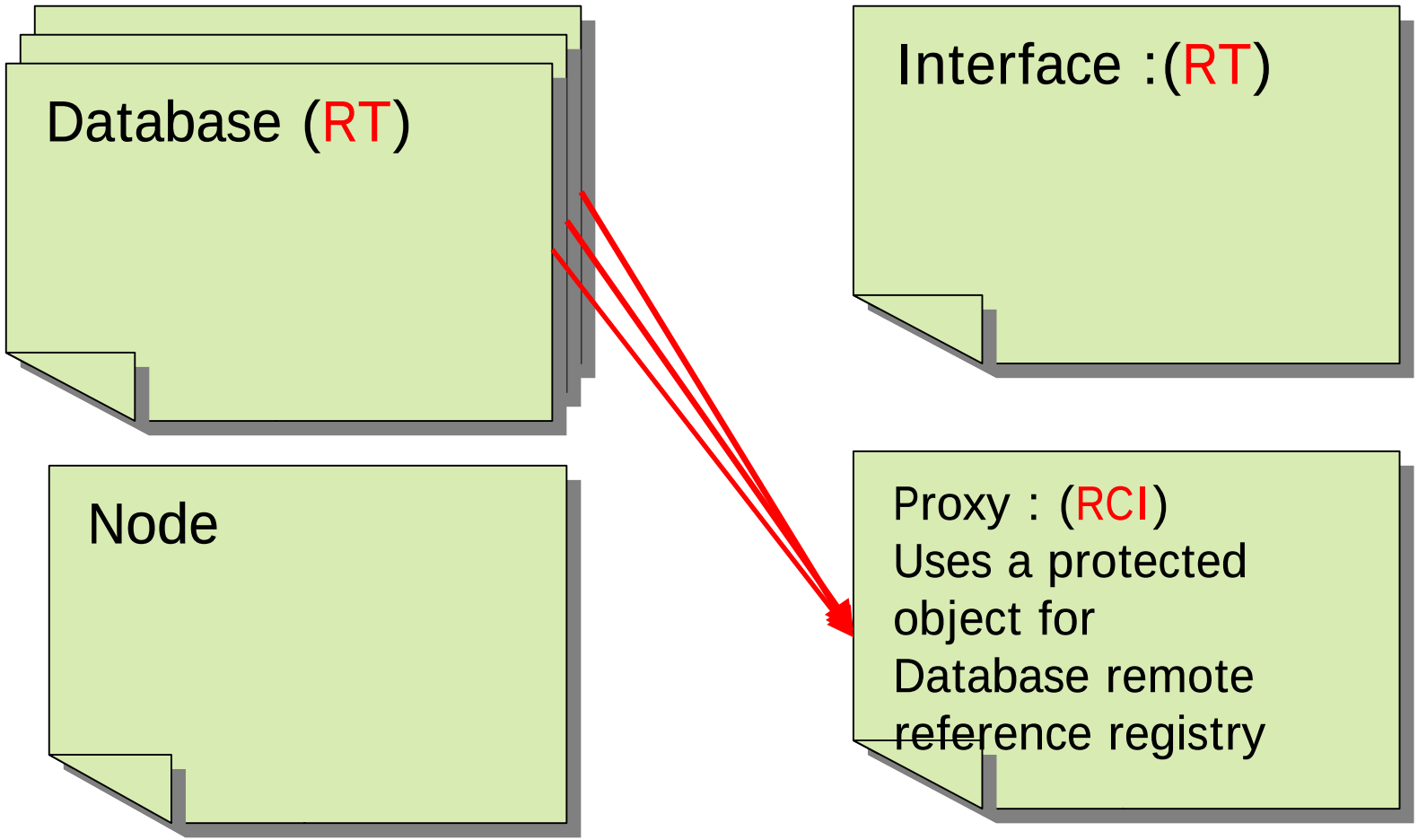
DSA access API
Overall architecture



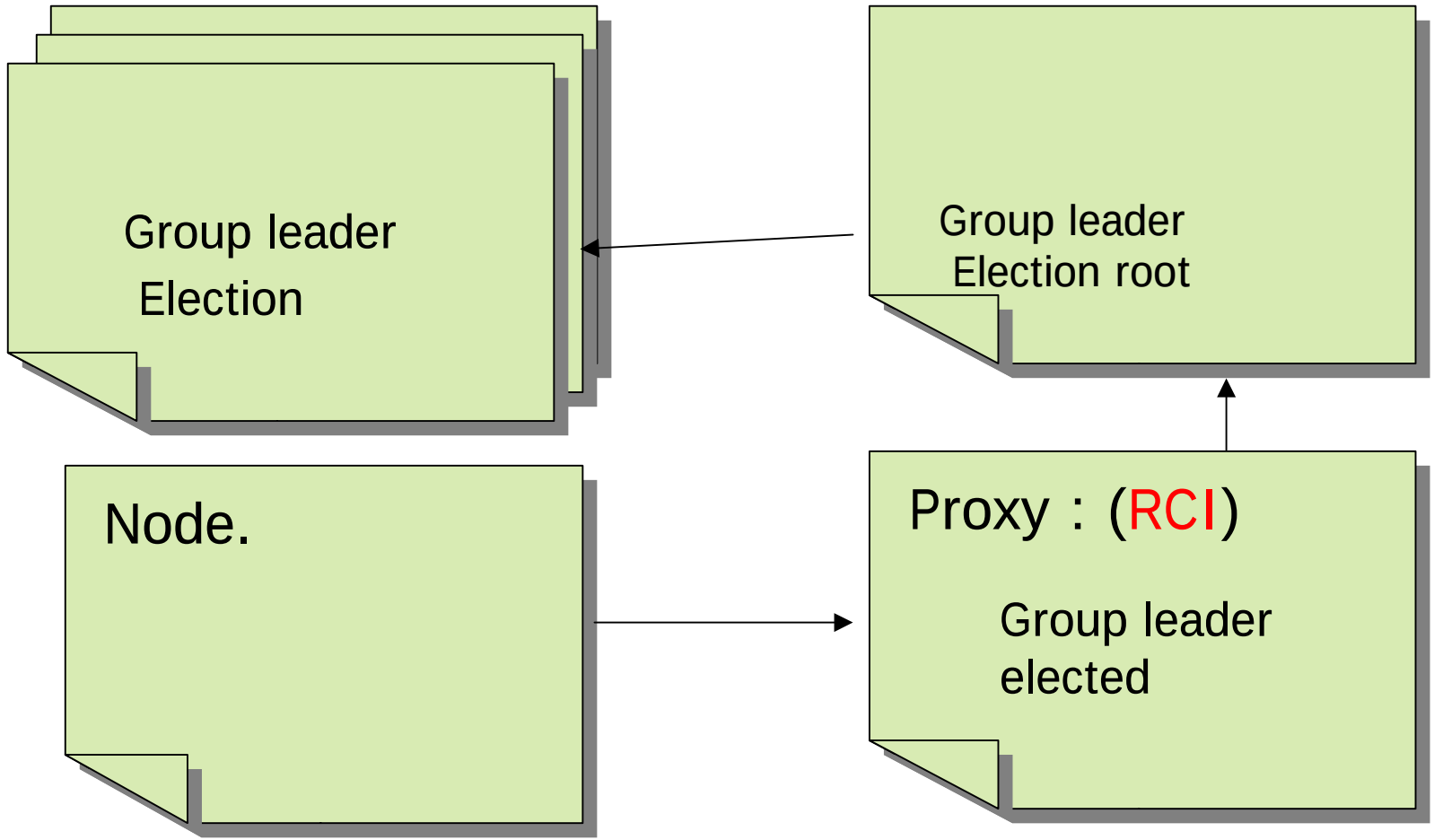
Managing connectivity

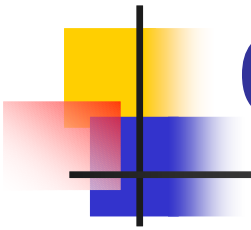


DSA data access API services: Node registry



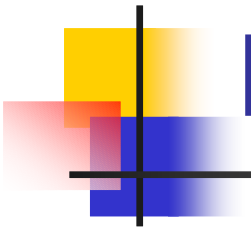
DSA data access API services: group leader election.





Conclusion

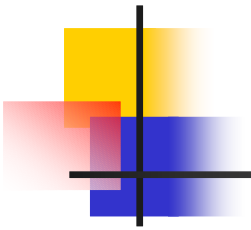
- API implemented
- Works on network of PC running Linux



Future work

- Implementing multicast communication between nodes
- Requires to extend Glade ??? .

- Implementing a GUI (GTK does not support tasking)



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