

Spatial Reuse on Multi-Ring Networks

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Outline

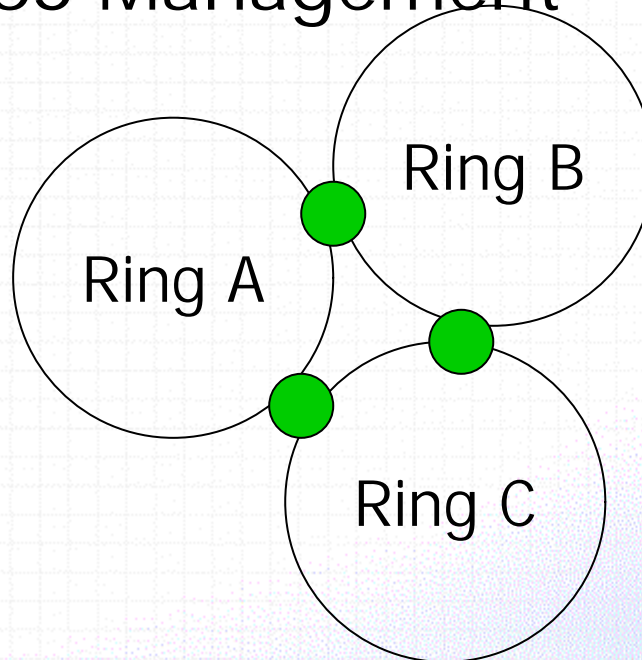
- How do we connect multi-rings? :
Router or Bridge?
- Issues of Bridge
- Basic idea :
Hierarchical Addressing
- Implementation example #1 :
Example of hierarchical routing
- Implementation example #2 :
Example of spatial reuse
- Conclusion

How do we connect multi-rings?

- Router or Bridge?

Router

- Layer3 Routing
- Layer2/3 Hybrid QoS Management



Bridge

- Layer2 Broadcast & Learning
- Layer2 Single QoS Management

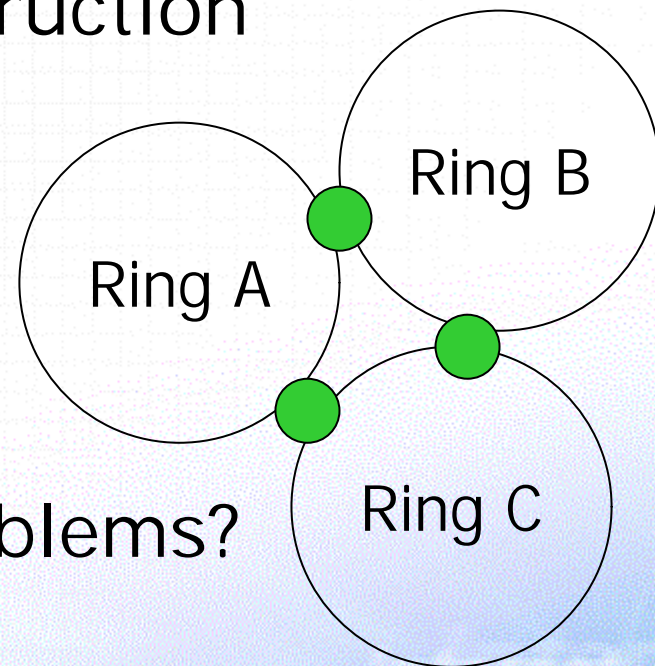
Issues of Bridge

Issues

- Slow failure recovery due to slow spanning tree construction
- Spanning tree doesn't support spatial reuse
- Big routing table size



How do we solve these problems?



Basic Idea

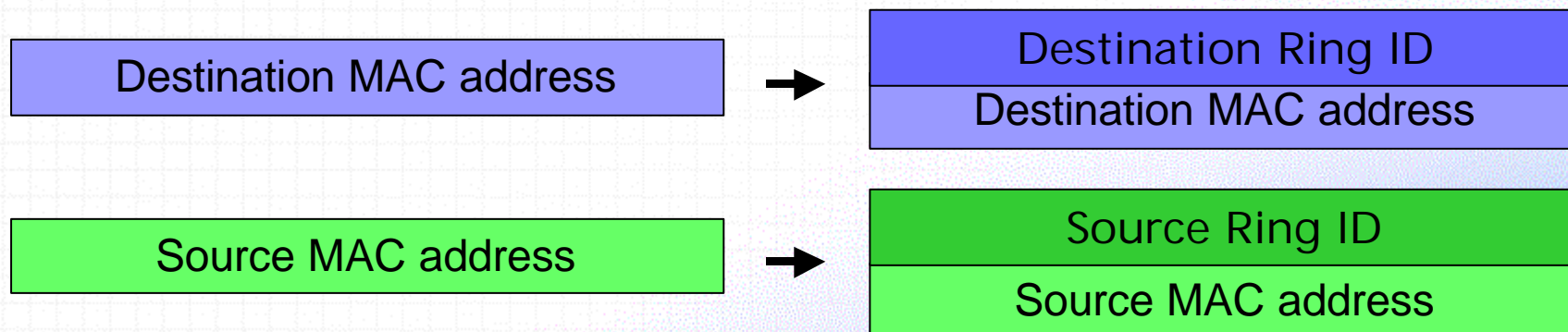
- Hierarchical Addressing

Hybrid address: Ring ID + MAC address

Ring ID based routing for multi-ring.

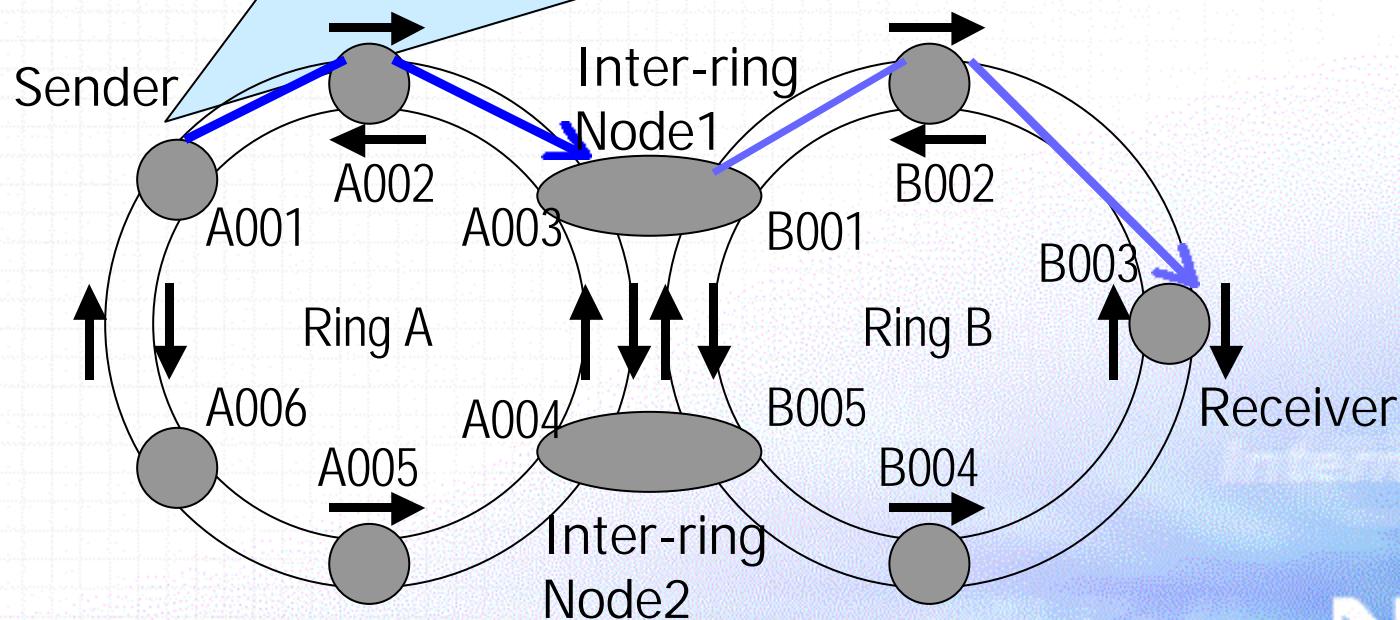
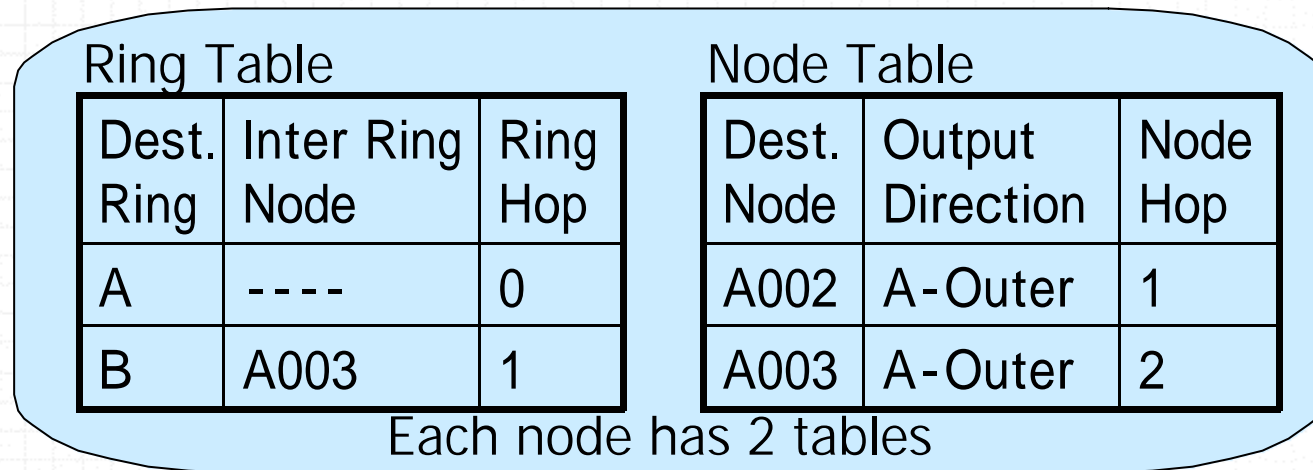
- Spatial Reuse
- Faster Recovery

Additional field for ring ID



Implementation Example #1_a

- Example of hierarchical routing



Implementation Example #1_b

- Example of hierarchical routing

How does it work?

Sending:

1. Check Ring Table and find inter-ring node from the destination ring ID.
2. Check Node Table and find direction from the inter-ring node ID.

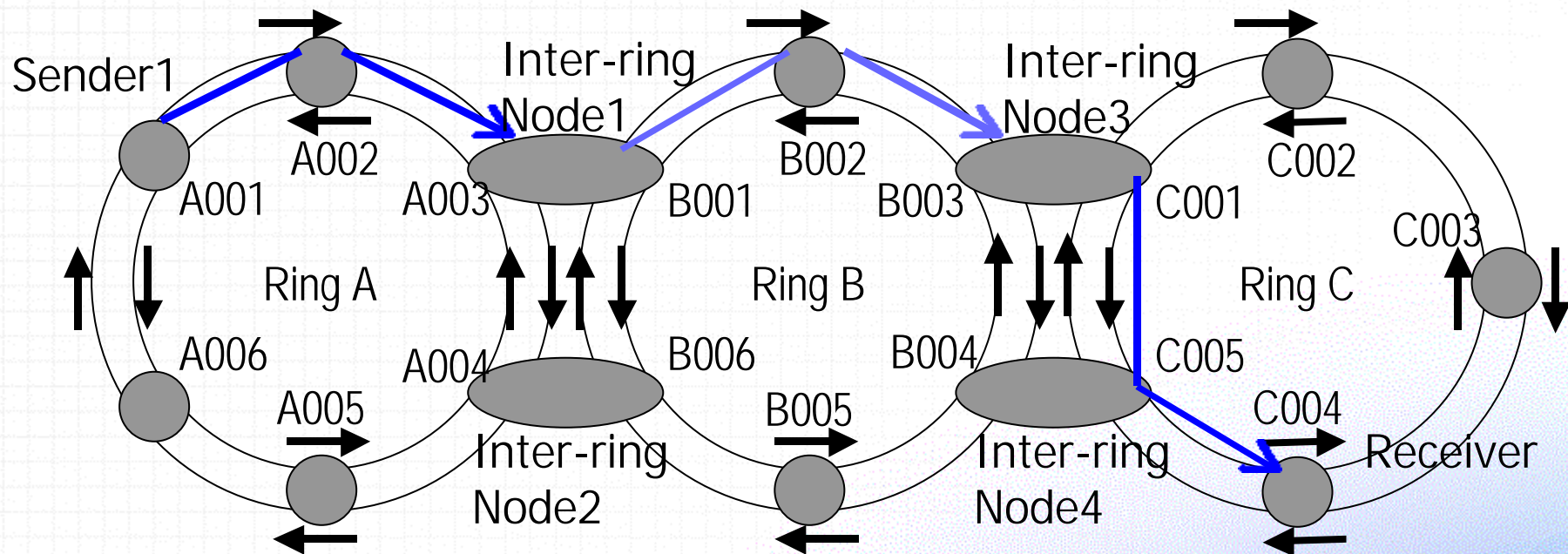
Receiving: Each node receives the data to

- Itself
- The rings behind the node (If it's a inter-ring node.)

Implementation Example #1_c

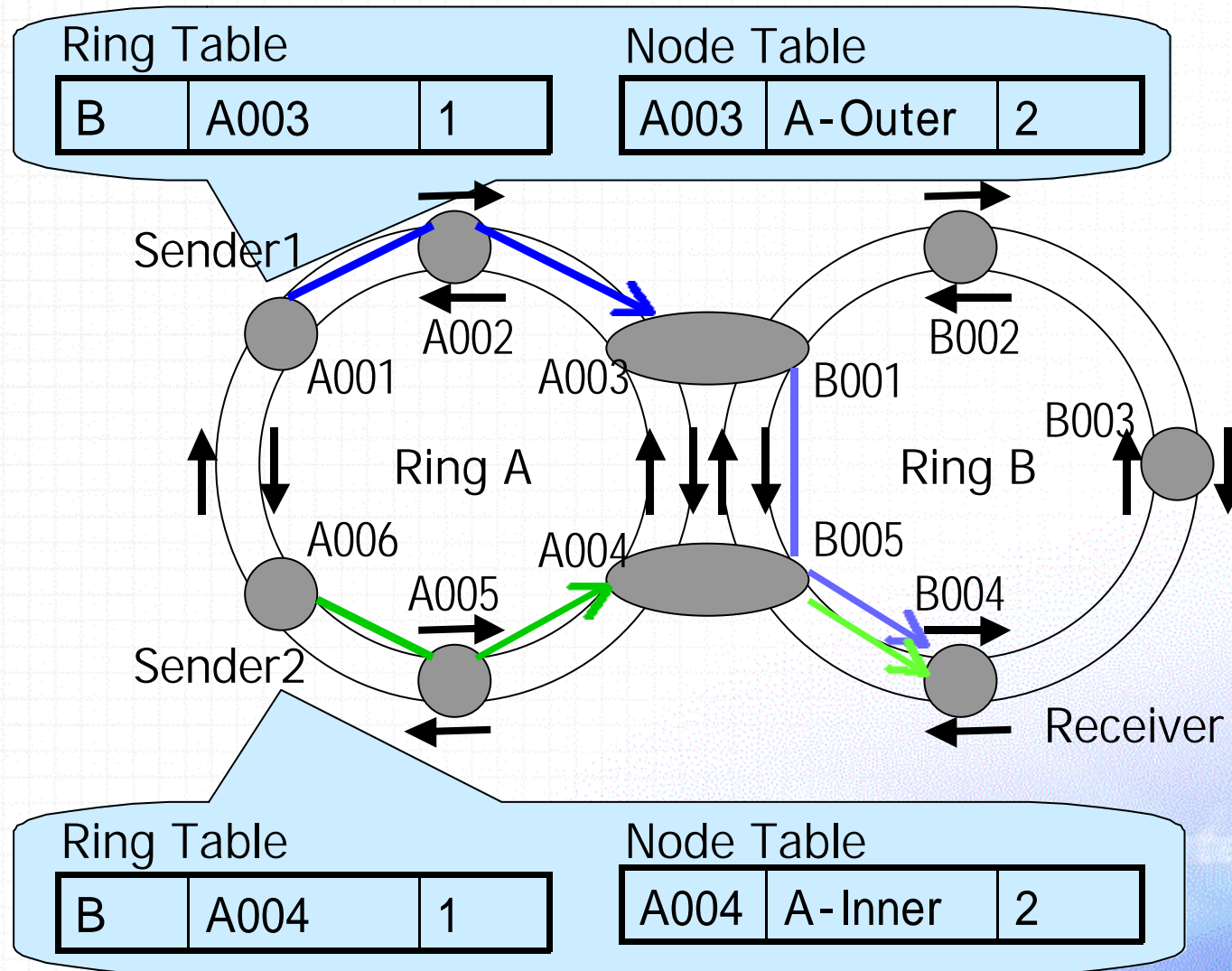
- Example of hierarchical routing

Hierarchical routing scales to 3 or more rings



Implementation Example #2_a

- Example of spatial reuse



Implementation Example #2_b

- Example of spatial reuse

Why can this method provide spatial reuse?

Because each node can select the nearest inter-ring node by itself.

The nearest inter-ring node to Ring B for Sender1 is A003, and the nearest inter-ring node to Ring B for Sender2 is A004. So the sender1 and sender2 choose different inter-ring nodes. It helps to provide the spatial reuse.

Benefit

- Provide Load Balancing
- Faster Recovery

Conclusion

- **Need to discuss more about these multi-ring routing issues.**
 - Accept this as a WG work item.
- Possible solution
 - We propose to use hierarchical addressing.
 - The hierarchical addressing can support spatial reuse.