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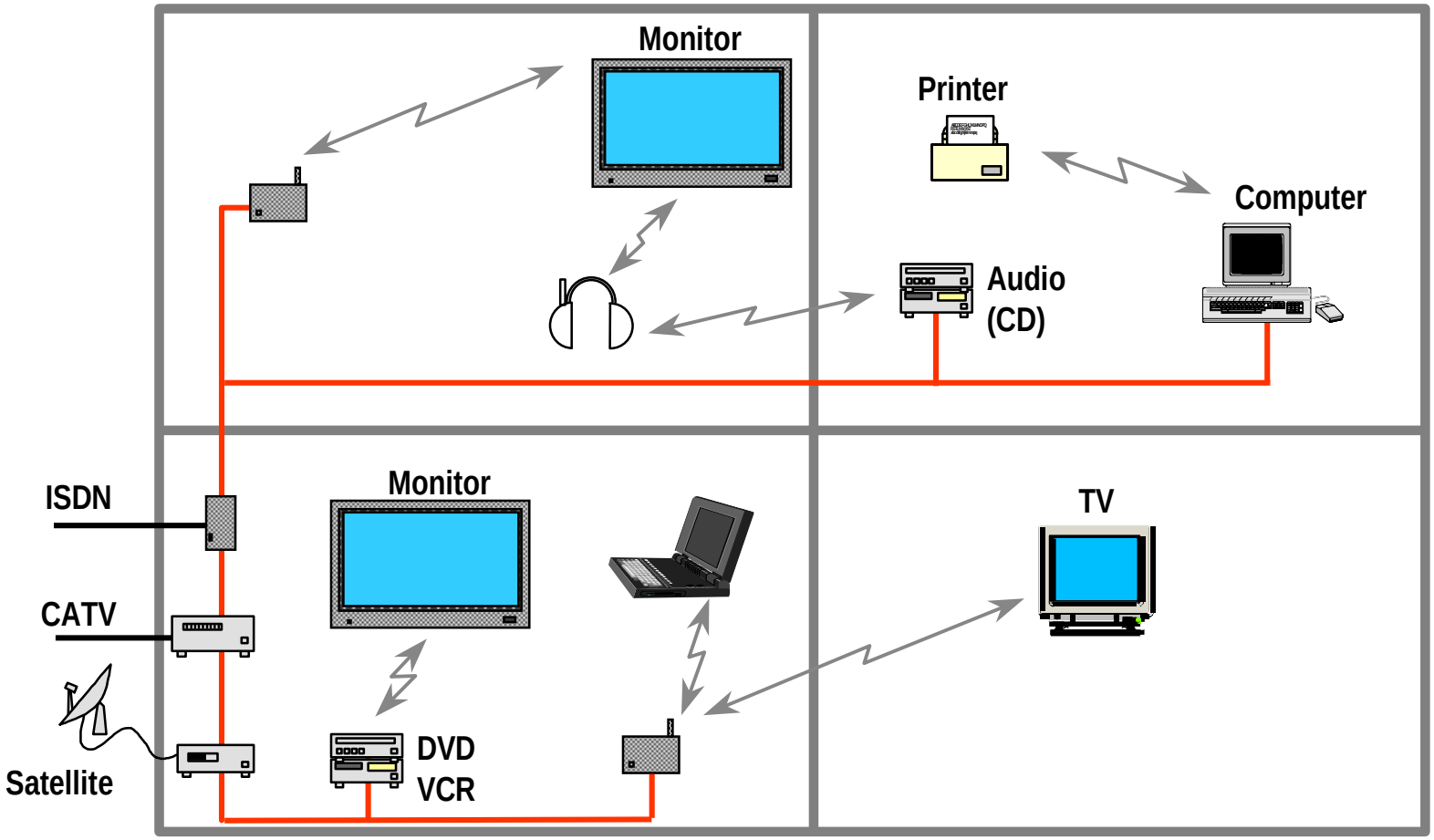
- Opportunity for Wireless in 1394
- Proposals
- Loose Coupled Bridge
  - Subnet Architecture
    - Addressing Scheme
    - Routing Scheme
    - Net Management Scheme
- Conclusion

Wireless - As a New Medium

- Cable (Twisted Pair)
- POF
- Coaxial (?)
- **Wireless**
  - Implement Wireless Without Significant Impact to the Current Specifications
  - Need Clear and Neat Solution

Possibility in P1394.1 With Minimal Modification Without Describing .Wireless. Specification

Wireless System Overview

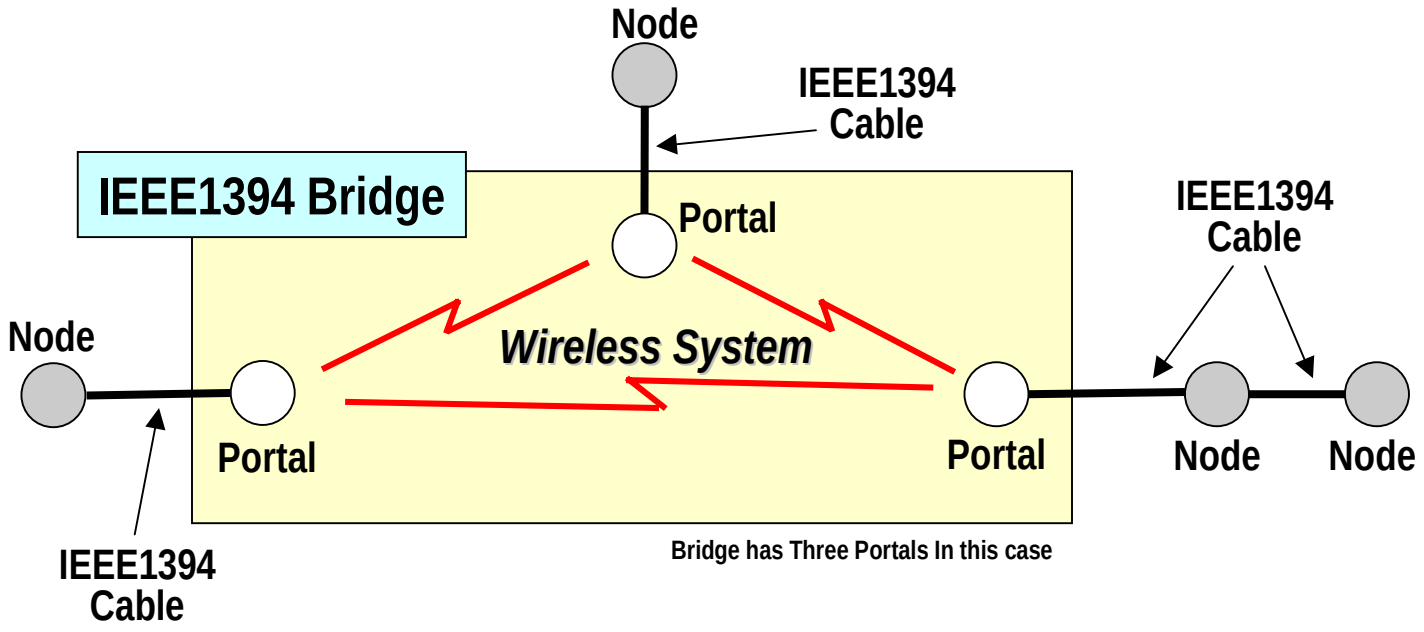


Hurdles for Wireless

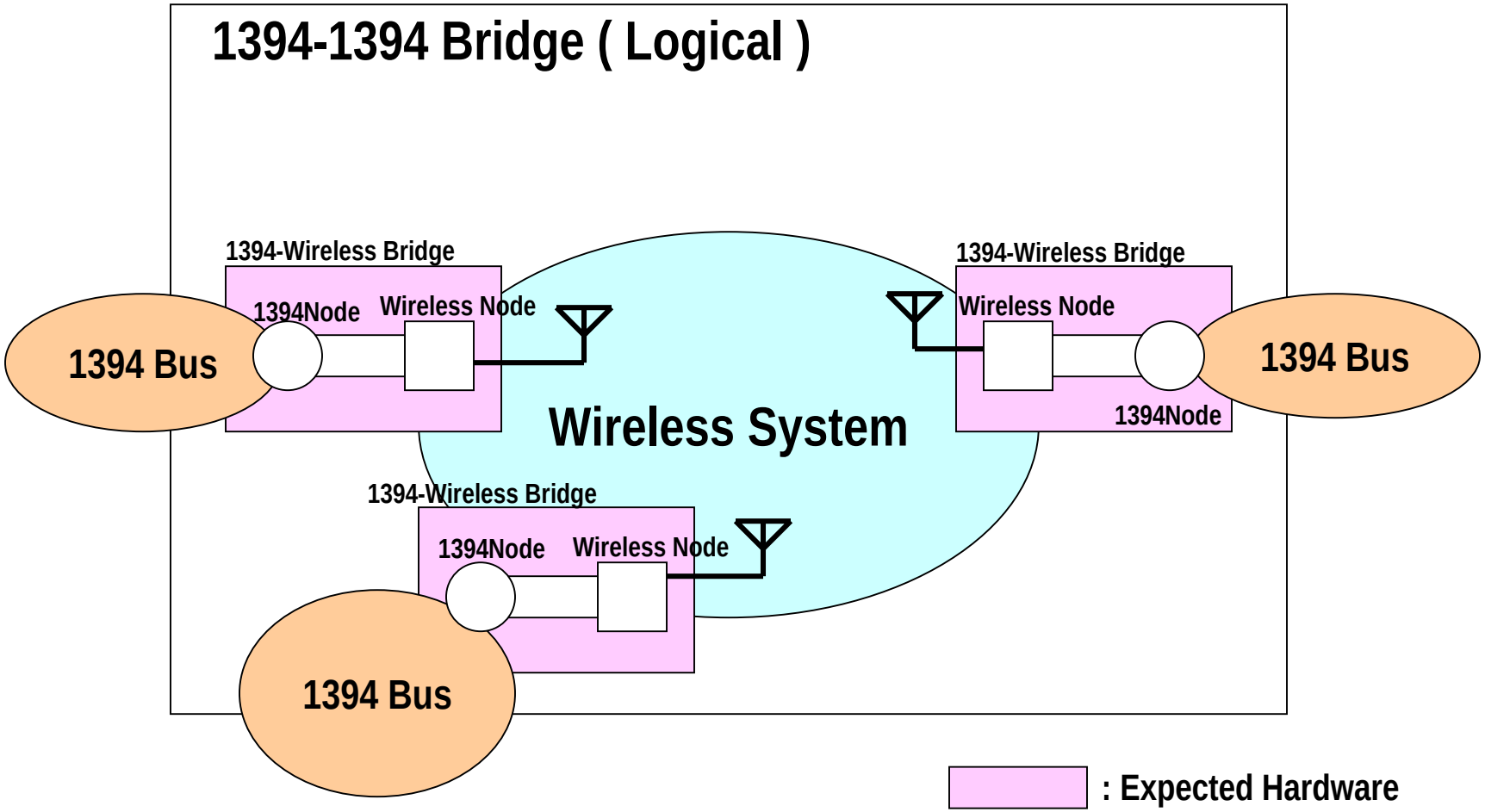
- Unexpected Disconnection
- Transmission Errors
- "Bus" May Not be Achieved
  - All the Nodes May Not be Seen Directly
- Limited Frequency Resources
  - Bandwidth Limitation
  - Efficient Use of Frequencies Required

Implementation Plan

- To Guarantee the Transparency to IEEE1394, Wireless System Need to be Defined as 1394-1394 Bridge
- Wireless Environment is ***Bridge Inner Fabric*** From Cable IEEE1394 Point of View

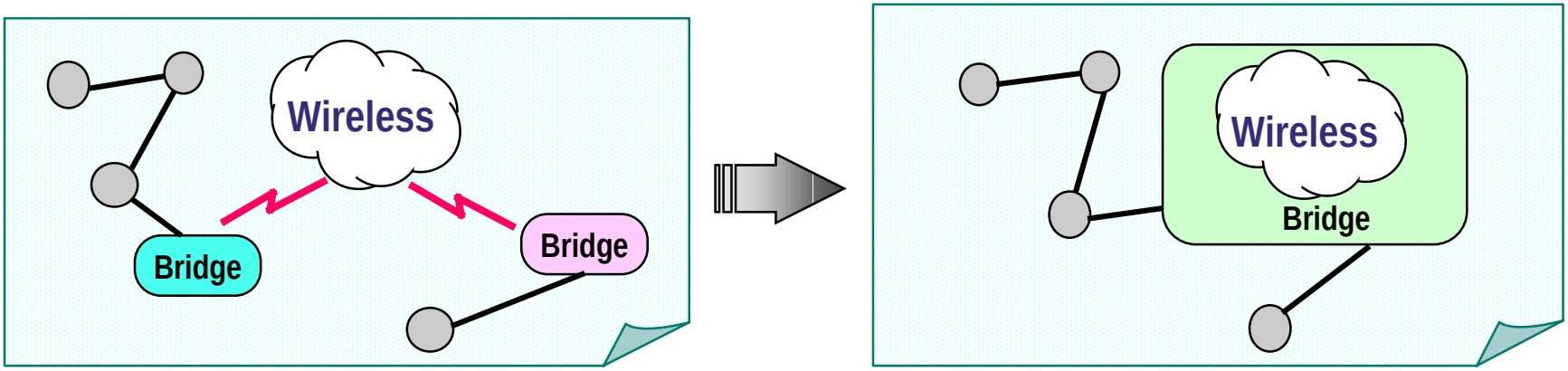


Bridge Architecture



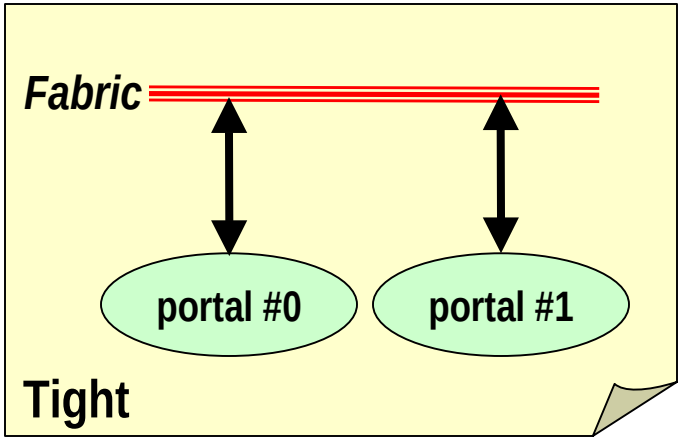
Implementation As Bus v.s. Fabric

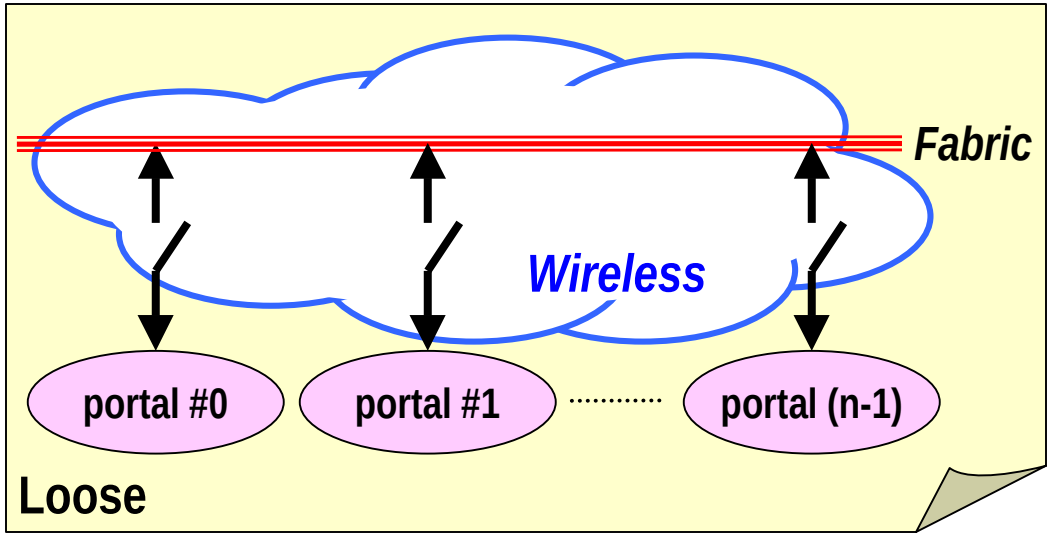
- Bus Causes Discrepancies Such As :
  - Requires A New Environment Other Than Cable or Backplane
  - Does Not Allow .Delay.
  - Bandwidth Acquisition for Isochronous Depends on Wireless Path
- Fabric Requires :
  - To Support Portal Disconnection
  - Multiportal



Proposal-1: Loose Coupled Bridge

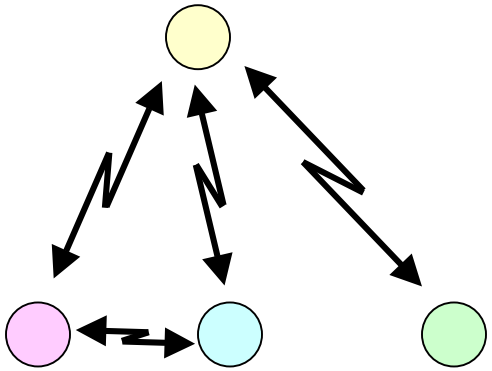
- Define Two Type of Bridges
  - Tight Coupled Bridge : 2-Portal
    - Conventional Bridge Between Buses
  - Loose Coupled Bridge : with Multiportal
    - Supports Disconnected State
    - Covers Even Distributed Bridge (ex. Located in Separate Room)





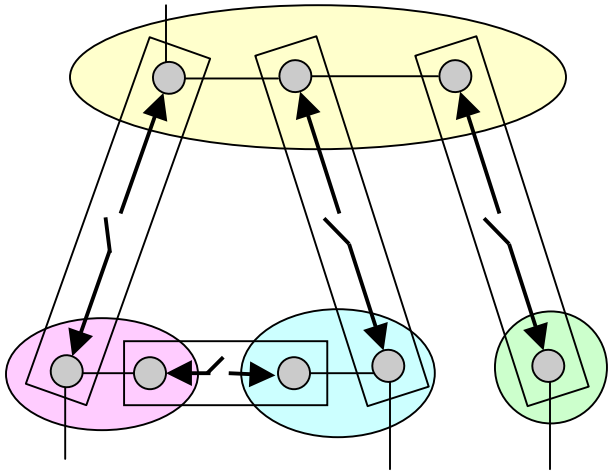
Why Multiportal ?

Wireless System Example

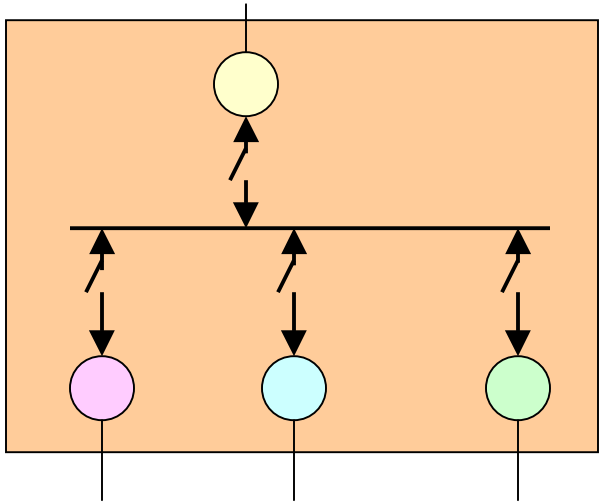


- Multiportal Solution is Simpler
- Reduce the Load of :
  - Isochronous Owner
  - Bridge Manager
- Wireless Routing is Concealed in Multiportal Solution

2-portal Solution

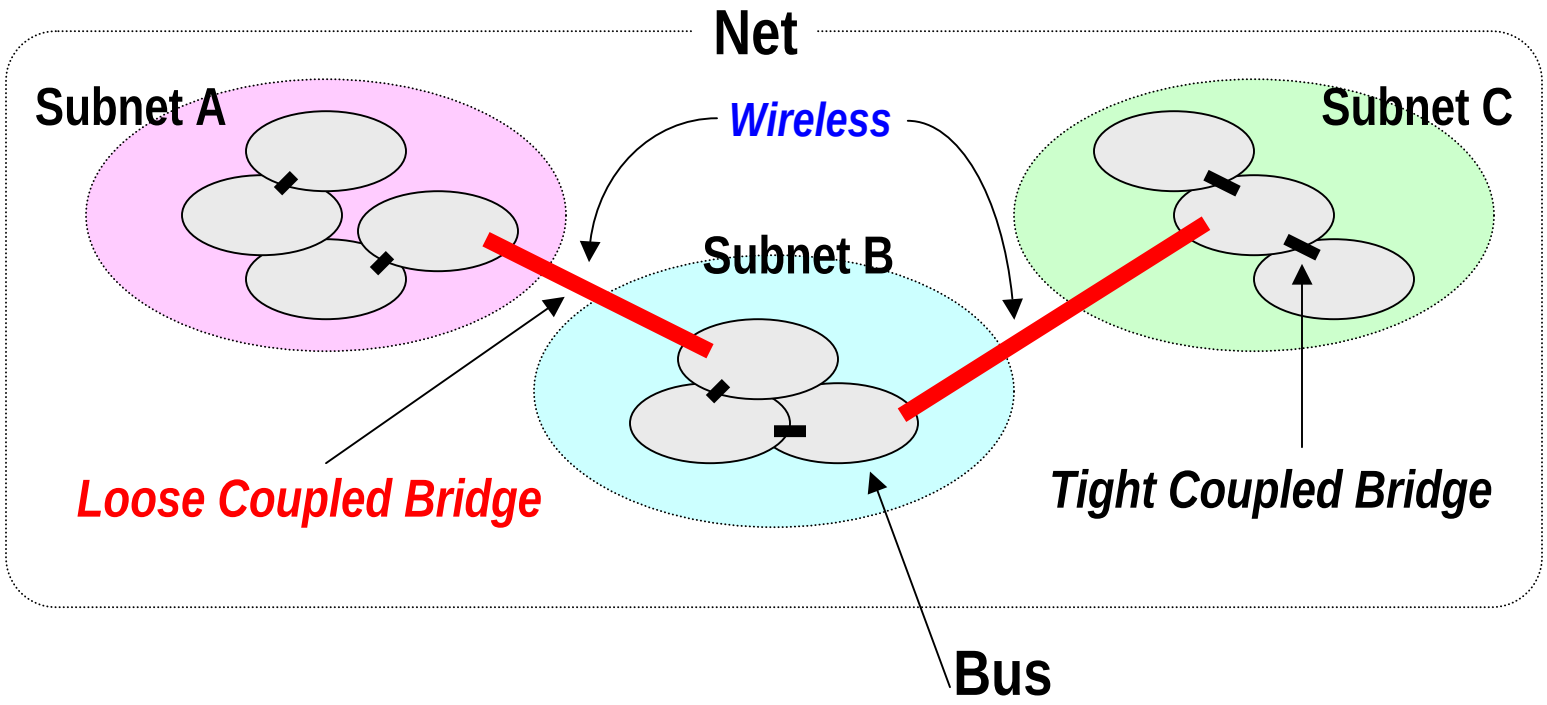


Multiportal Solution



Proposal-2 : Subnet Architecture

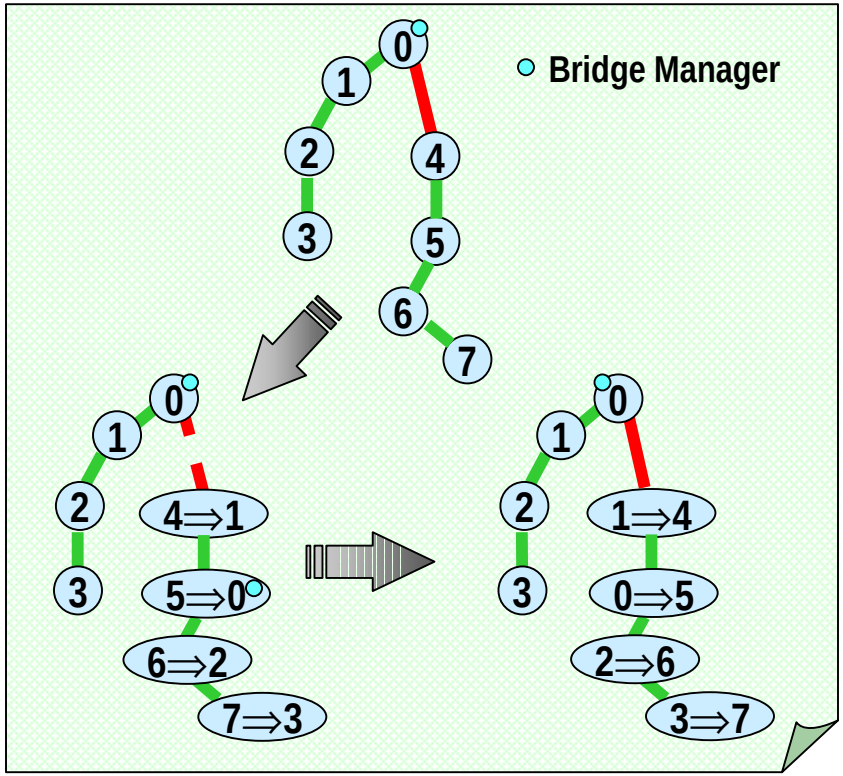
- Hierarchy : Net ⊃ Subnet ⊃ Bus ⊃ Node

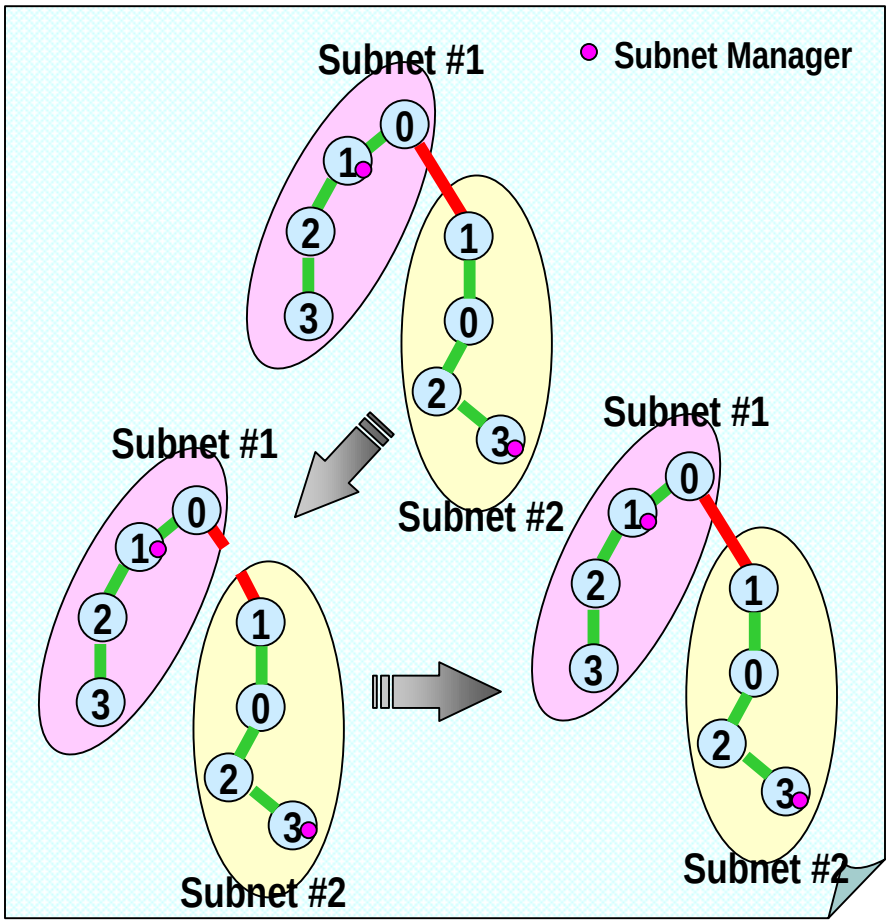


Advantages of Subnet Architecture

- Localize the Net Configuration with Loose Coupled Bridge Between Subnets

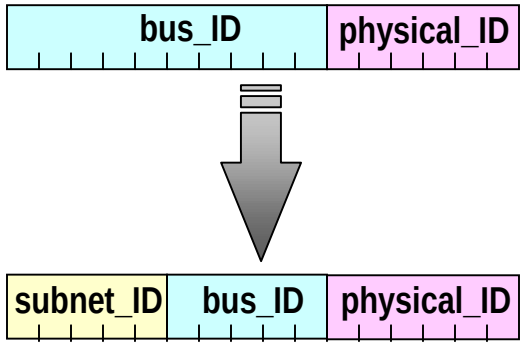
Example : Net Topology Transition

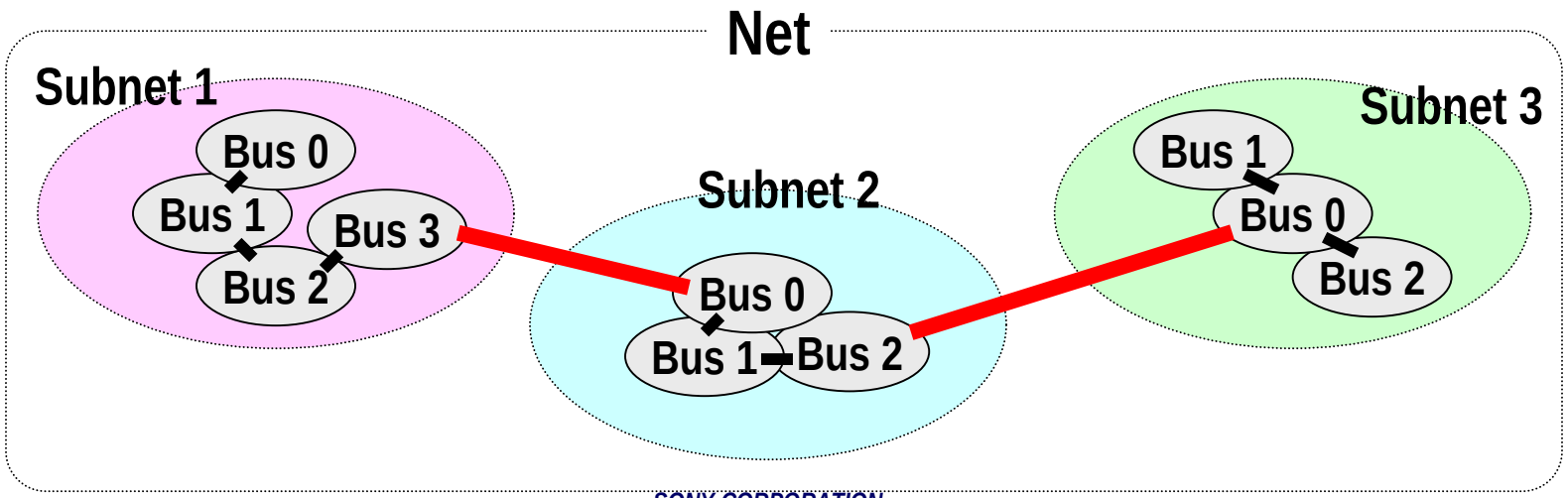




Addressing Scheme

- subnet_ID : 5bit
  - Max 31 Subnets in a Net (0 - 30)
  - Reserve Subnet_ID=31 for Broadcast
- bus_ID : 5bit
  - Max 31 Buses in a Subnet (0 - 30)
  - Reserve bus_ID=31 for Broadcast
- physical_ID : 6 bit





Routing Scheme

- .Bit Mapped Register. Instead of .Routing Bound Register.
  - Splitting into Two 5 bit Assignment Enables Sequential Mapping
    - Routing Bound Need to Consider the Topology
    - No Need to Reassign the IDs When the Topology is Changed

⇒ No Interruption When the Topology is Changed

Tight Coupled Bridge Routing Table

Bit (bus/subnet_ID)	0	1	2	3	4	●●●	31
Bus Routing	0	0	1	1	0	●●●	1
Subnet Routing	0	1	1	0	0	●●●	1

Import : 1
Ignore : 0

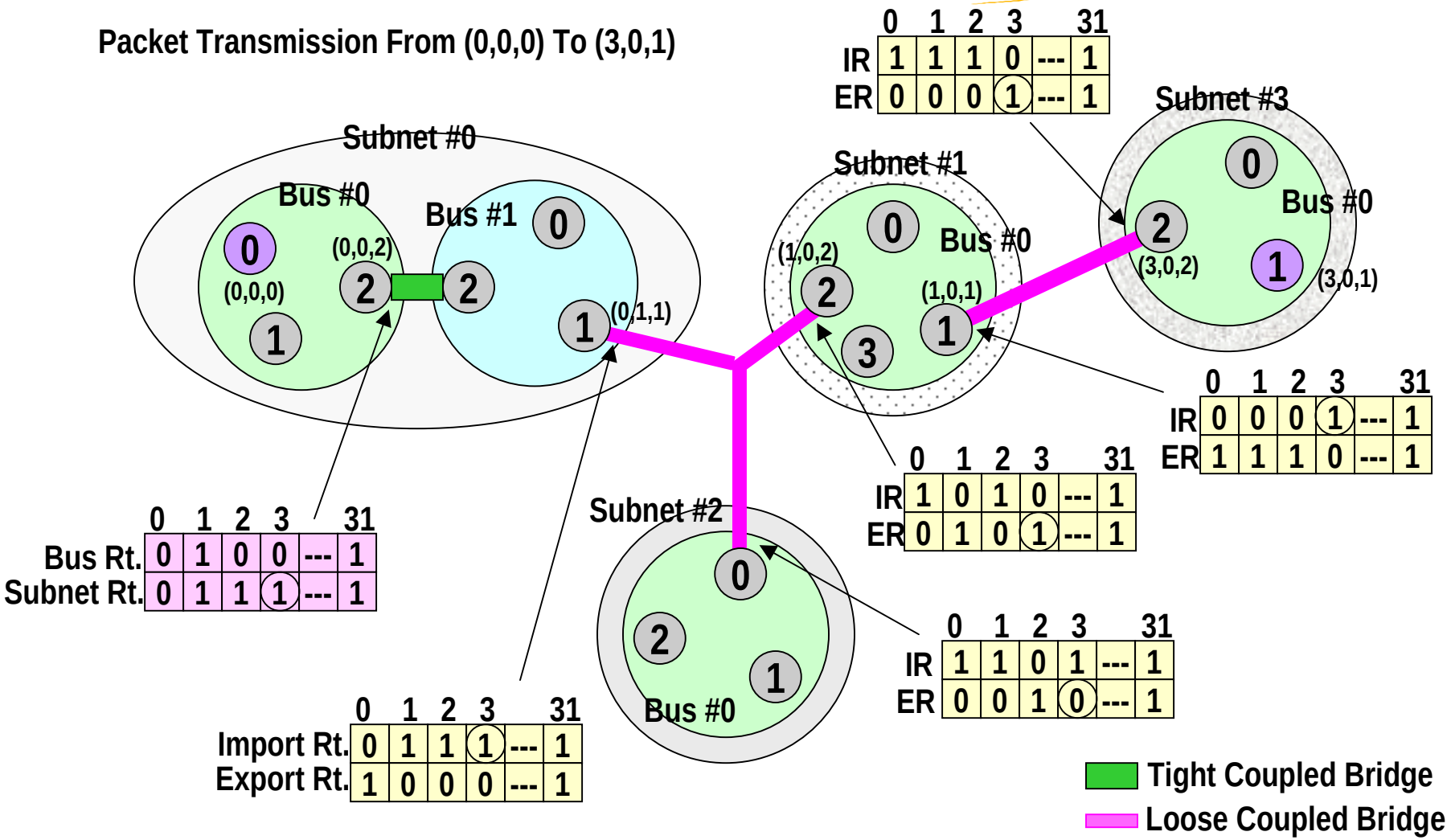
Loose Coupled Bridge Routing Table

Bit (subnet_ID)	0	1	2	3	4	●●●	31
Import Routing	0	0	1	1	0	●●●	1
Export Routing	0	1	1	0	0	●●●	1

Accept : 1
Ignore : 0

Routing Example

Packet Transmission From (0,0,0) To (3,0,1)



	0	1	2	3		31
Bus Rt.	0	1	0	0	---	1
Subnet Rt.	0	1	1	1	---	1

	0	1	2	3		31
Import Rt.	0	1	1	1	---	1
Export Rt.	1	0	0	0	---	1

	0	1	2	3		31
IR	1	1	1	0	---	1
ER	0	0	0	1	---	1

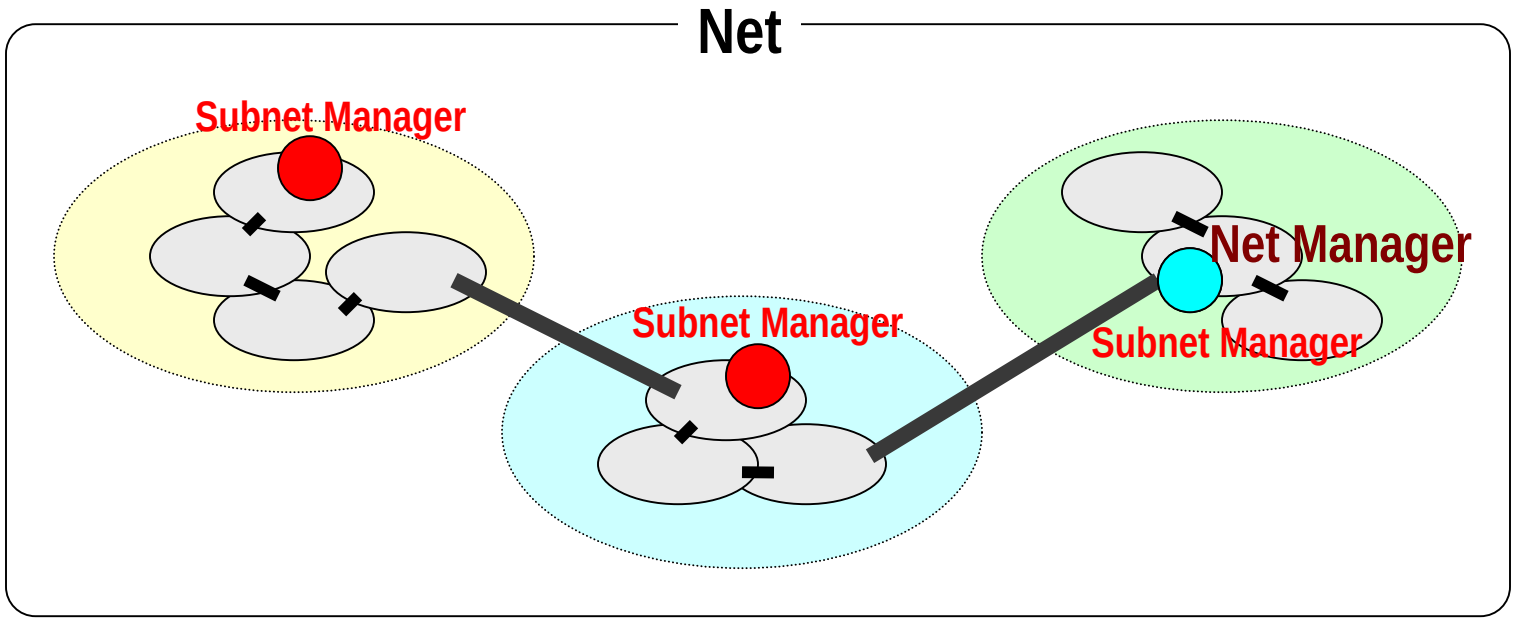
	0	1	2	3		31
IR	1	0	1	0	---	1
ER	0	1	0	1	---	1

	0	1	2	3		31
IR	0	0	0	1	---	1
ER	1	1	1	0	---	1

	0	1	2	3		31
IR	1	1	0	1	---	1
ER	0	0	1	0	---	1

Net Management

- Subnet Manager in Every Subnet
- Net Manager in the Net



Subnet / Net Manager's Tasks

- Subnet Manager's Tasks
  - bus_ID Assignment
  - Routing Configuration in the Subnet
  - Subnet Cycle Master Selection (*To Be Proposed)*
  - Cycle Transfer Configuration in the Subnet (*To Be Proposed)*
- Net Manager' Tasks
  - subnet_ID Assignment
  - Inter-Subnet Routing Configuration
  - Net Cycle Master Selection (*To Be Proposed)*
  - Cycle Transfer Configuration in the Net (*To Be Proposed)*

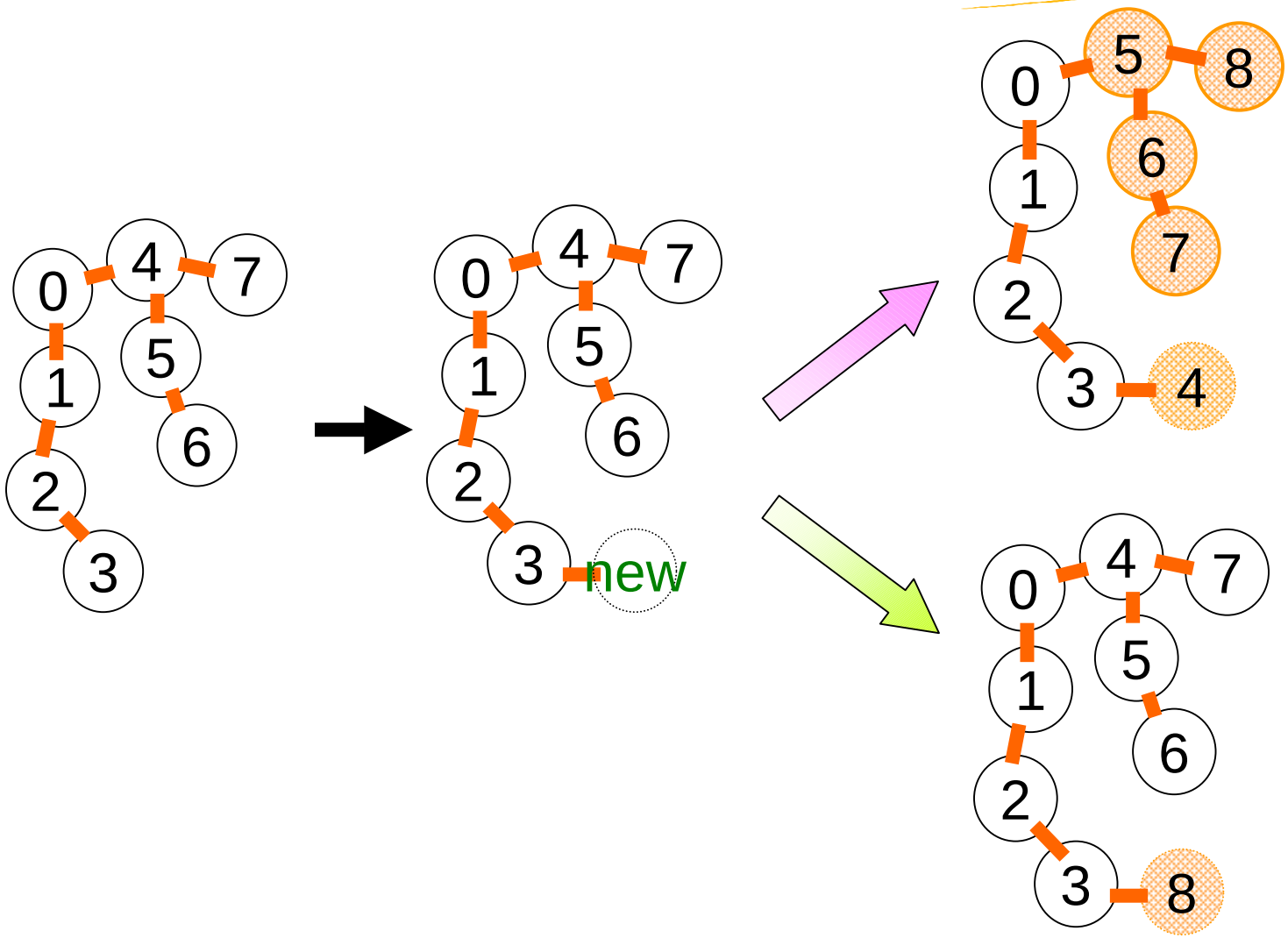
- Maximum Number of Nodes Need to be Handled Became 1/32

Conclusion

- Loose Coupled Bridge
- Subnet Architecture
  - Addressing Scheme
  - Routing Scheme
  - Net Management Scheme

APPENDIX

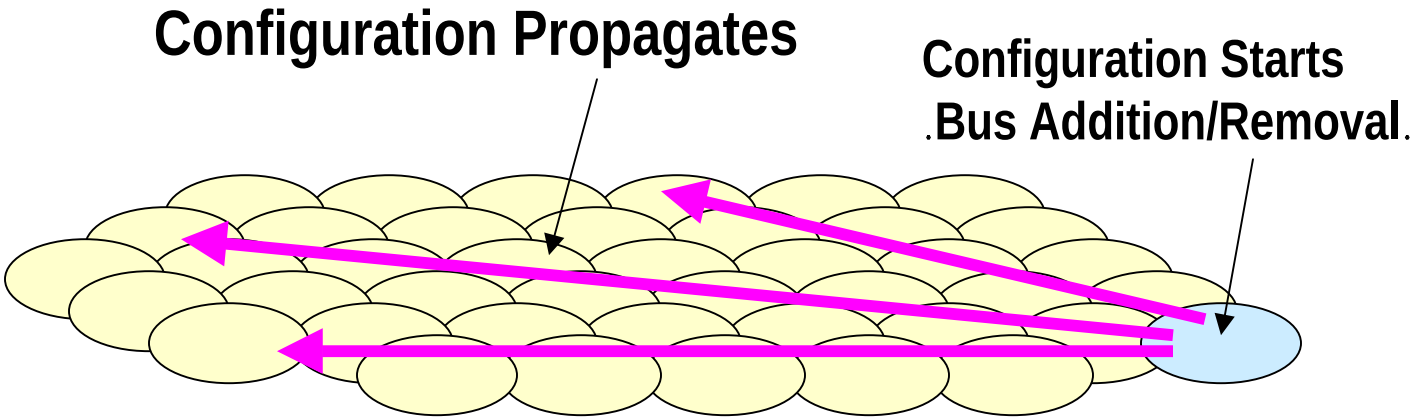
bus_ID Assignment in a Subnet



APPENDIX

Net Configuration Impact

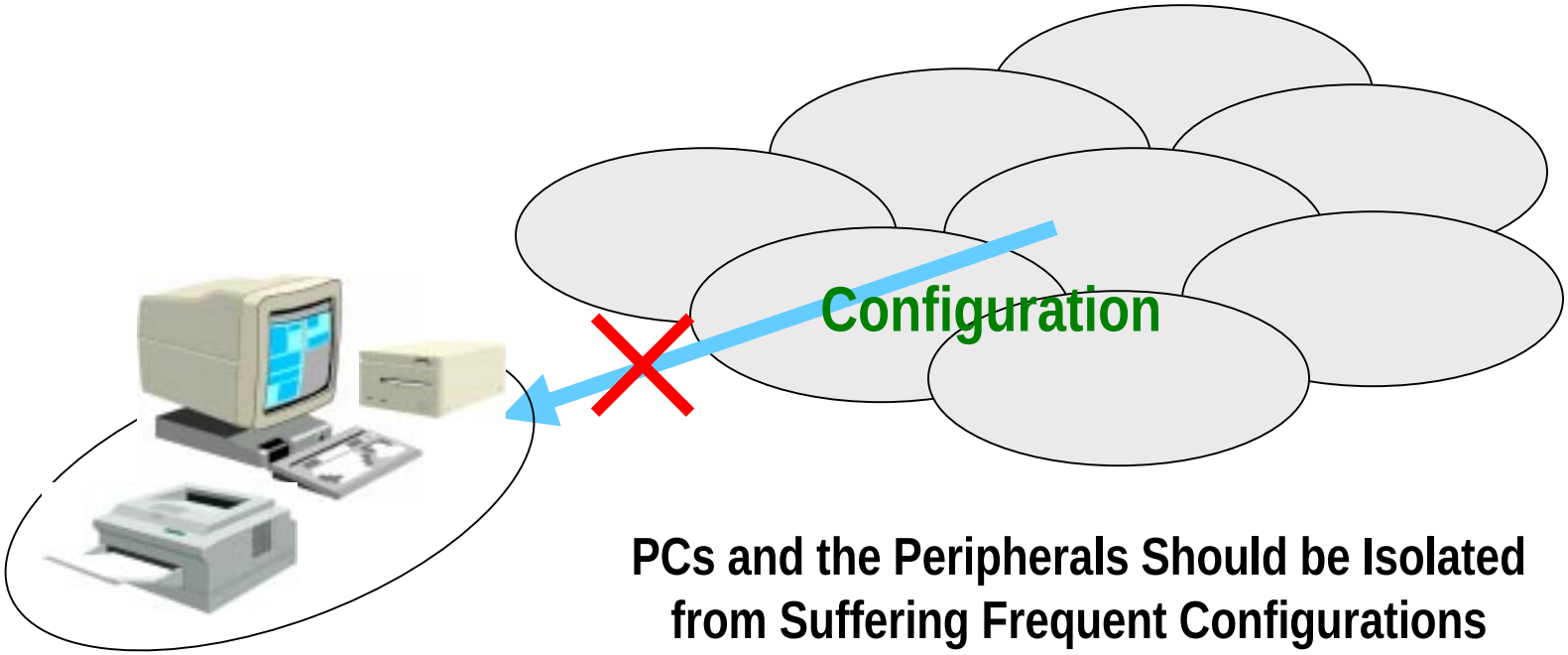
- In a Large Net with Many Buses, Re-configuration May Occur Frequently
- Transactions are Interrupted or Some Troubles may happen



APPENDIX

Net Configuration Impact - cont'd

- Net Configuration May Causes a System Trouble
- Some Systems May Need to be Isolated



PCs and the Peripherals Should be Isolated from Suffering Frequent Configurations