Agenda

- Review on March '98 proposals
- Configuration process overview
  - Net Manager selection procedure
  - Net configuration
- Cycle configuration
- Conclusion

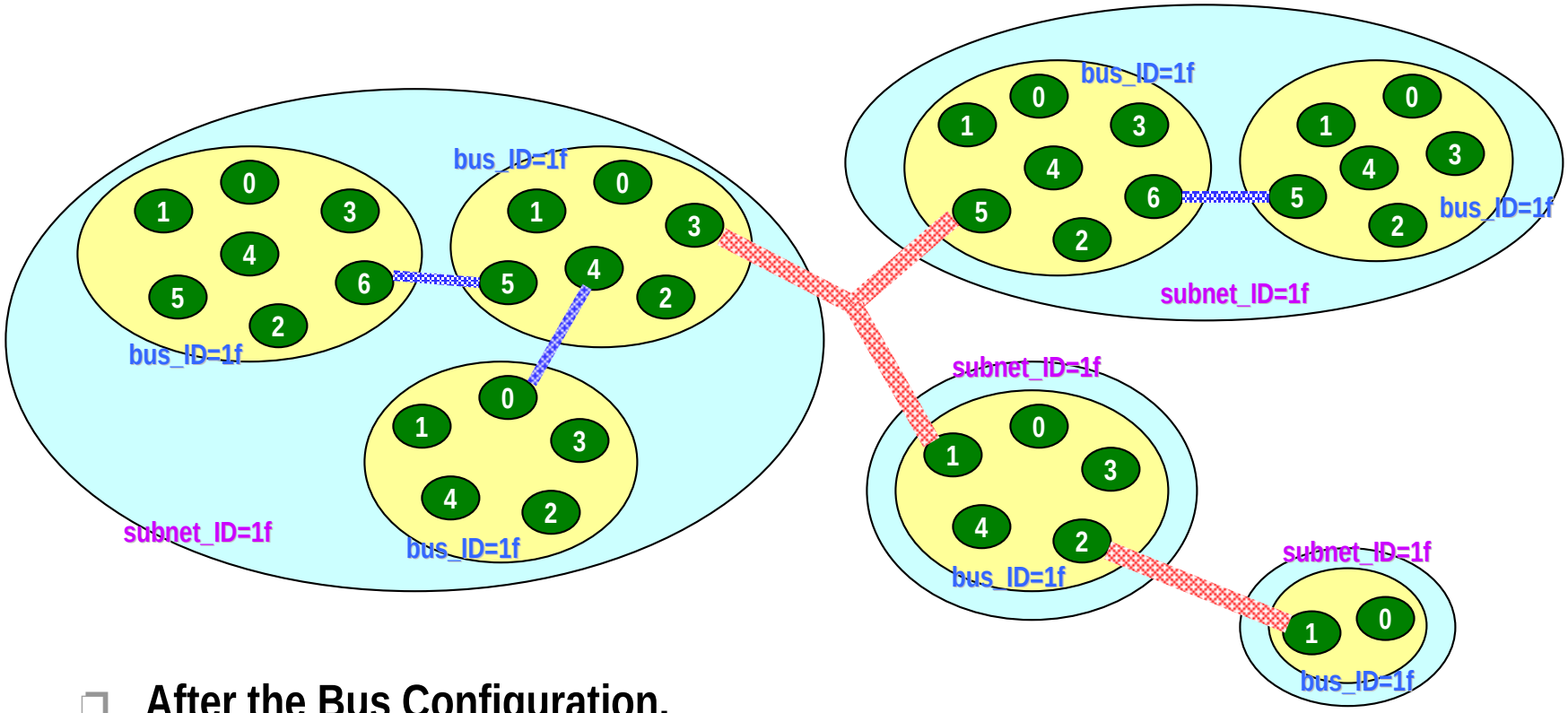
Review on Mar. '98 Proposals

- Introduction of wireless
  - Wireless as bridge inner fabric
- Loose Coupled Bridge
  - Anticipate unexpected disconnection
- Subnet architecture
  - Hierarchical management
  - Localize reconfiguration

Configuration Steps

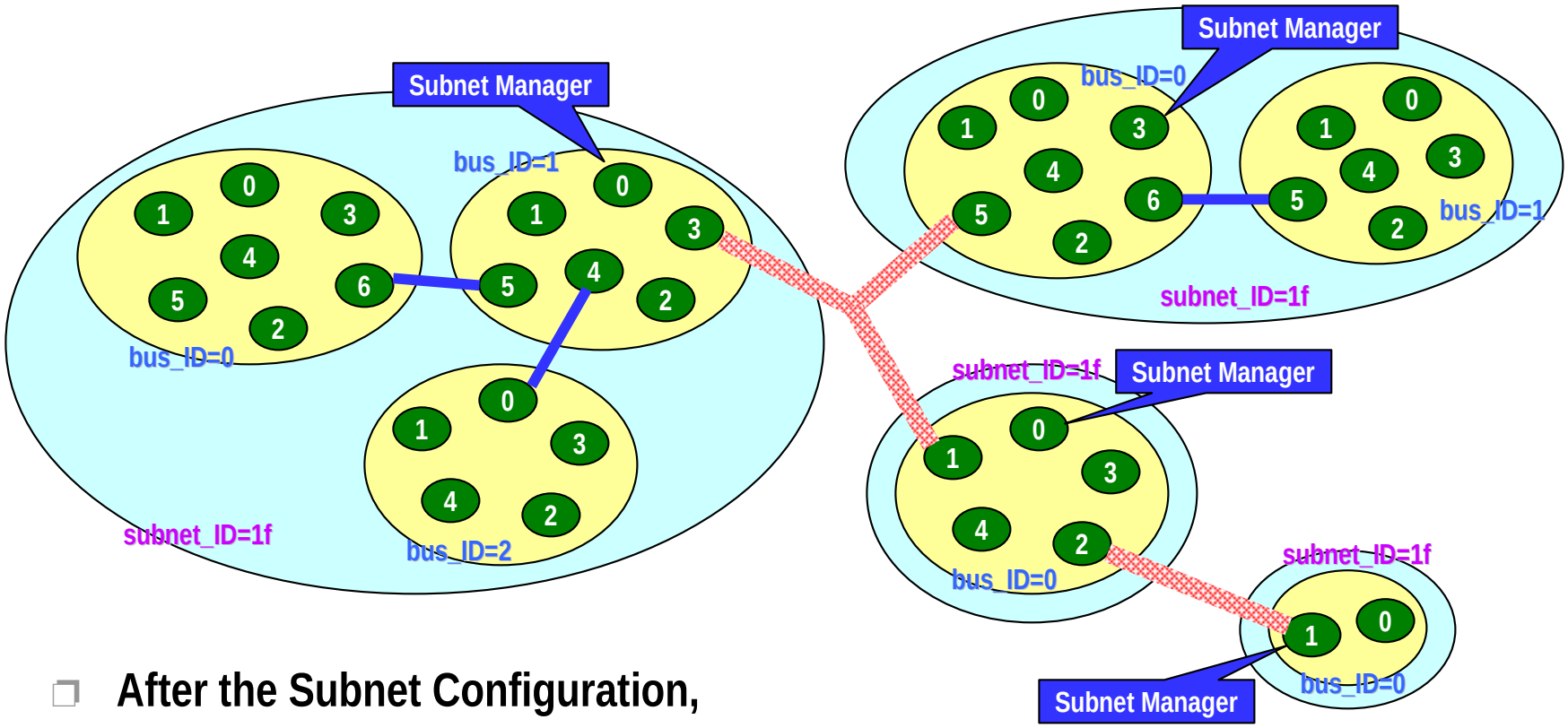
- The Configuration should take the following steps
  - Step-1 : Bus Configuration
    - As it is described in IEEE1394-1995
  - Step-2 : Subnet Configuration inside a Subnet
    - It follows the current Net Configuration procedure and Bridge Manager selection algorithm
      - bus_ID Assignment
      - Route Setting
      - Subnet Manager Selection
  - Step-3 : Net Manager Selection
  - Step-4 : Net Configuration
    - subnet_ID Assignment
    - Route setting between Subnets

Step-1 : Bus Configuration



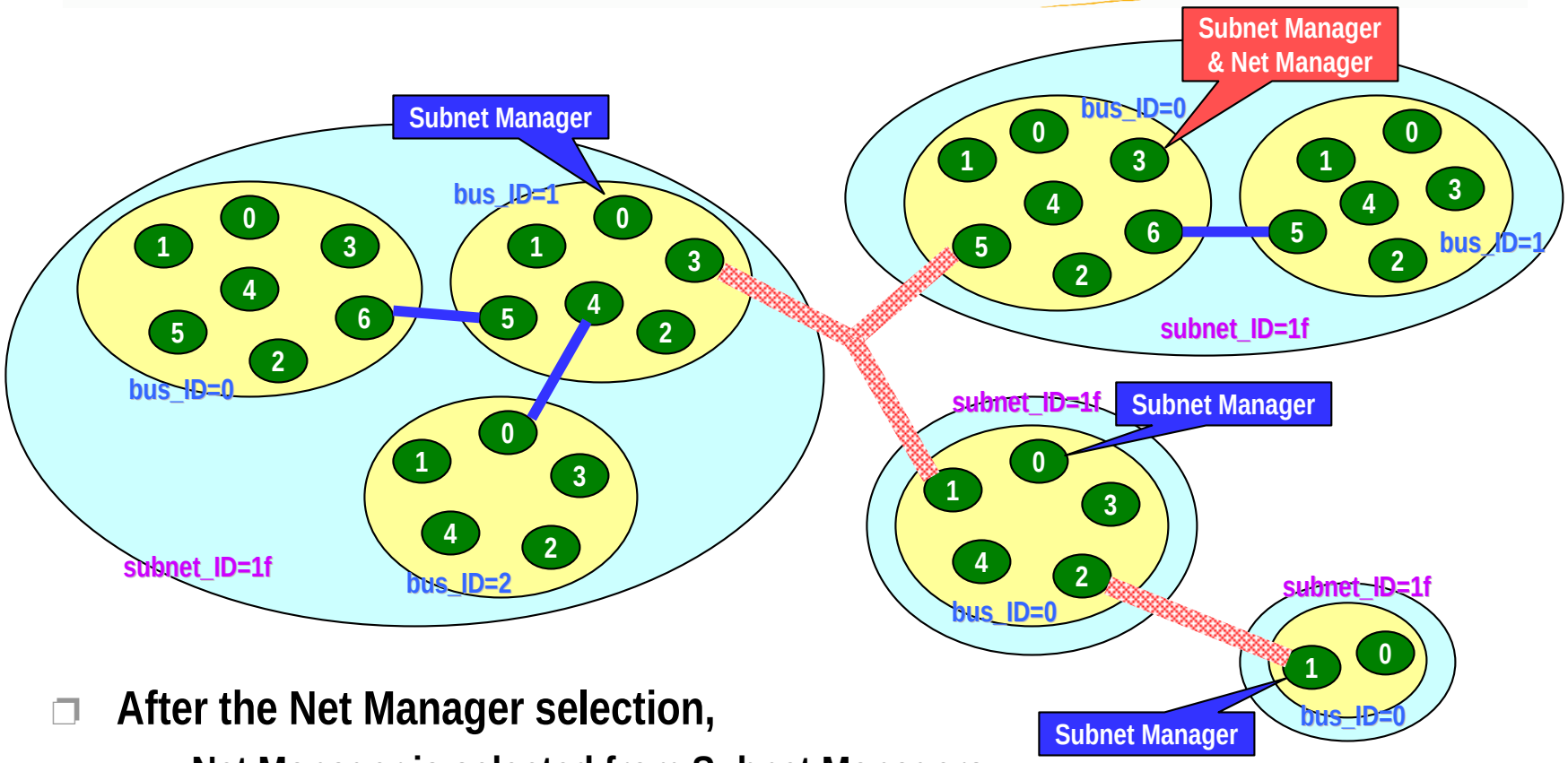
- After the Bus Configuration,
  - Communication between nodes in a Bus is available
  - bus_ID and subnet_ID are not assigned yet

Step-2 : Subnet Configuration



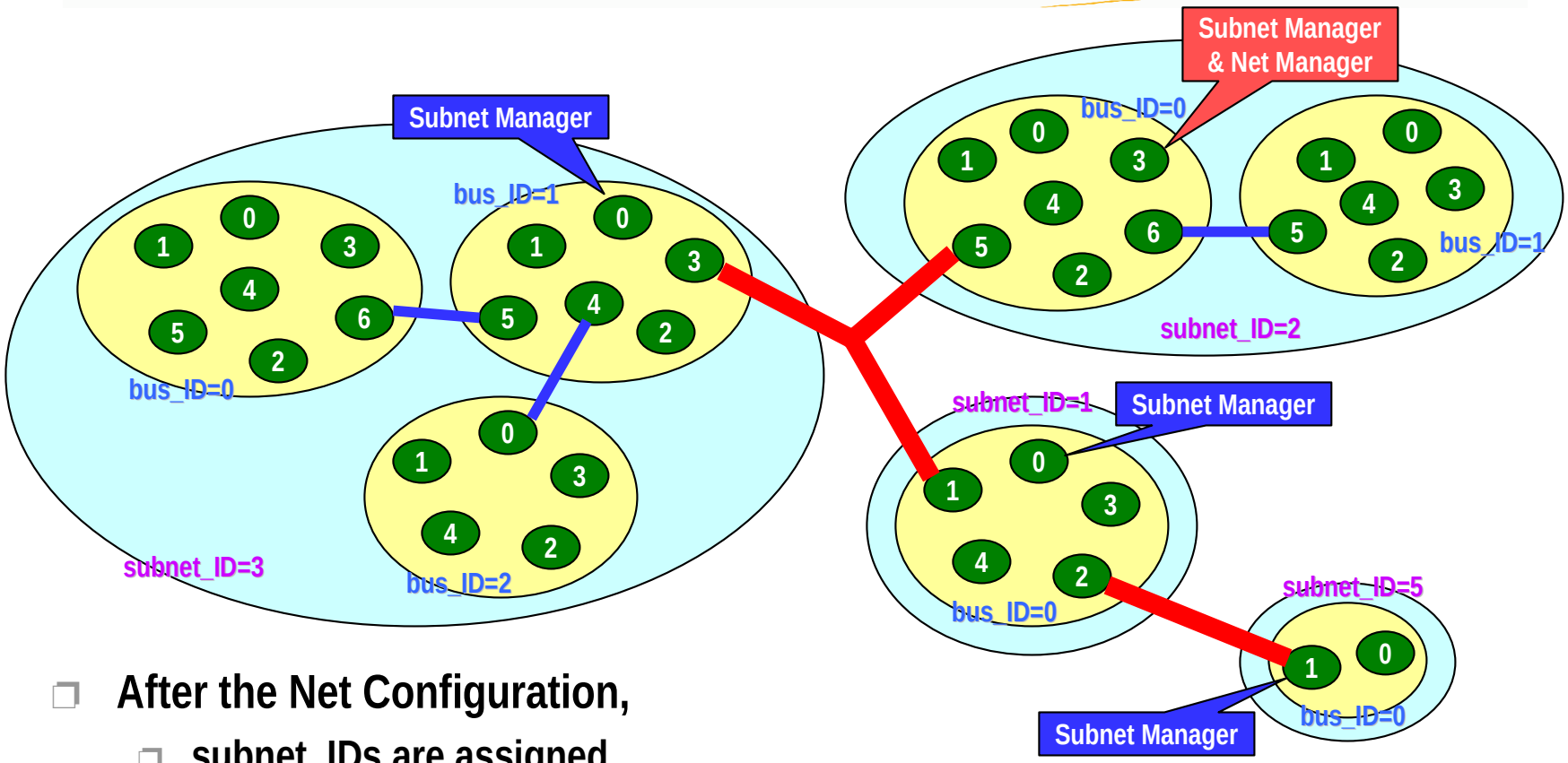
- After the Subnet Configuration,
  - Subnet Manager is selected
  - Communication within a Subnet is available
  - subnet_ID is not assigned yet

Step-3 : Net Manager Selection



- After the Net Manager selection,
  - Net Manager is selected from Subnet Managers
  - subnet_ID is still not assigned yet
  - No communication between subnets yet

Step-4 : Net Configuration



- After the Net Configuration,
  - subnet_IDs are assigned
  - Communication within the Net is available
  - *Cycle Configuration may need after this step*

Net Manager Selection

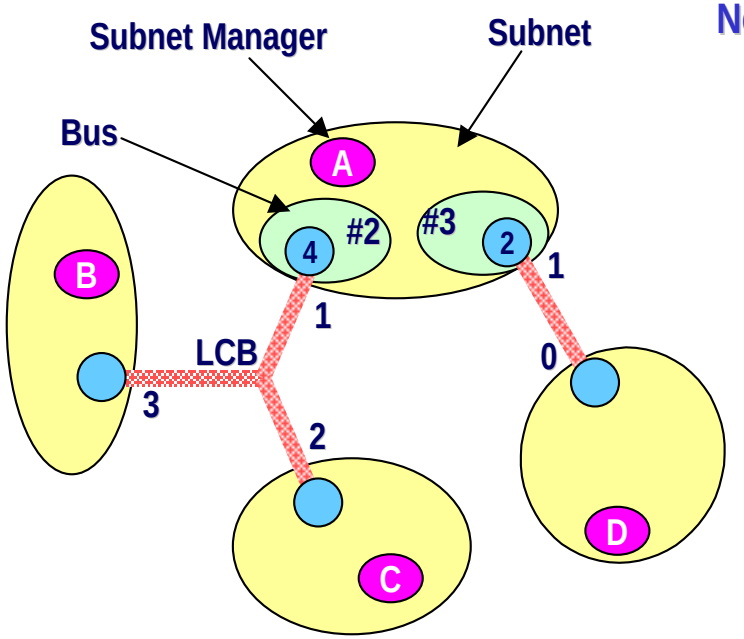
- Idea
  - A Subnet Manager with highest rank becomes the Net Manager
- Procedure
  - Duel with adjacent Subnet Manager
  - Loser receives the winner's rank and EUI and duels with adjacent Subnet Manager again
  - A Subnet Manager which has the original rank and EUI becomes the Net Manager
- Things To be clarified
  - A special function is required for the LCB in order to duel
  - Every Subnet Manager has the ability to be the Net Manager
  - The rank need to be defined

No direct communication has been set up yet !

Net Manager Selection <Preparation>

- Every Subnet Manager has to figure out who are the neighbors and the local LCB portals connected to those neighbors before Net Manager Selection Starts.

Example

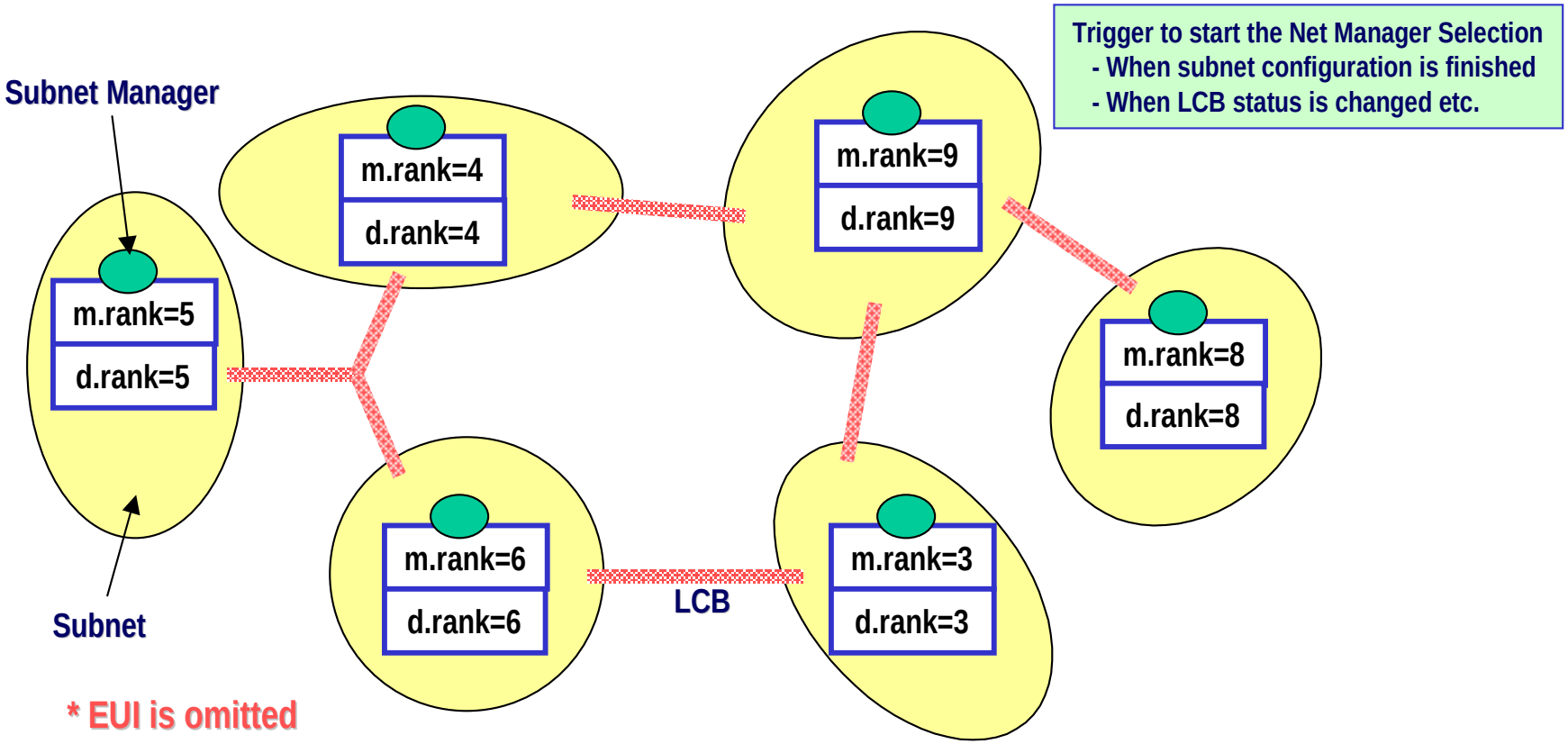


Neighbors Information for Subnet Manager A

#	node_ID of local LCB Portal (subnet_ID, bus_ID, phy_ID)	portal_ID in the neighbors
0	(1f, 2, 4)	3
1	(1f, 2, 4)	2
2	(1f, 3, 2)	0

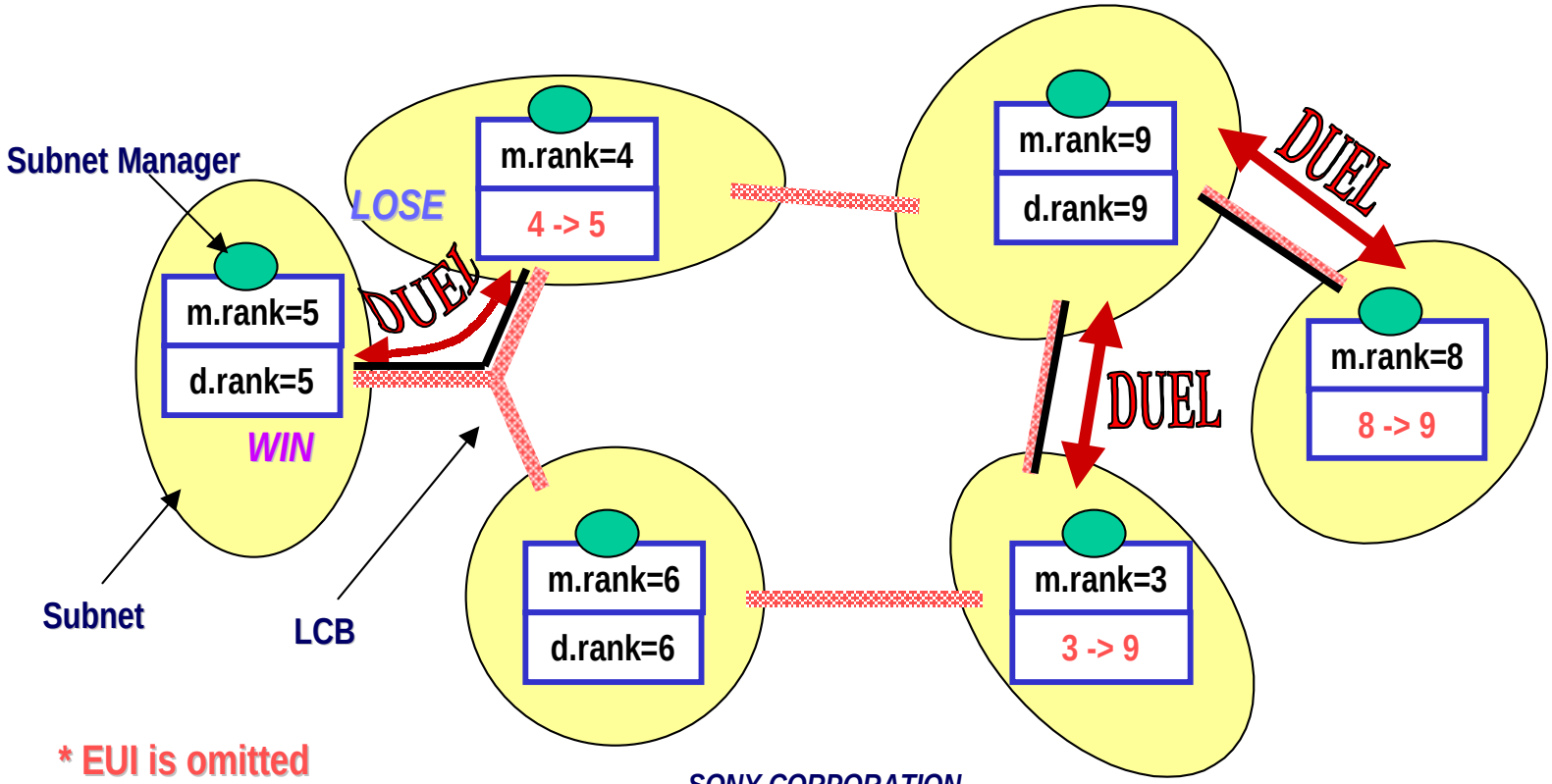
Net Manager Selection <Step-1>

m.rank : Manager rank stored in Config.ROM (Its own capability)
d.rank : Duel rank at CSR to be updated, loaded from m.rank at the beginning



Net Manager Selection <Step-2>

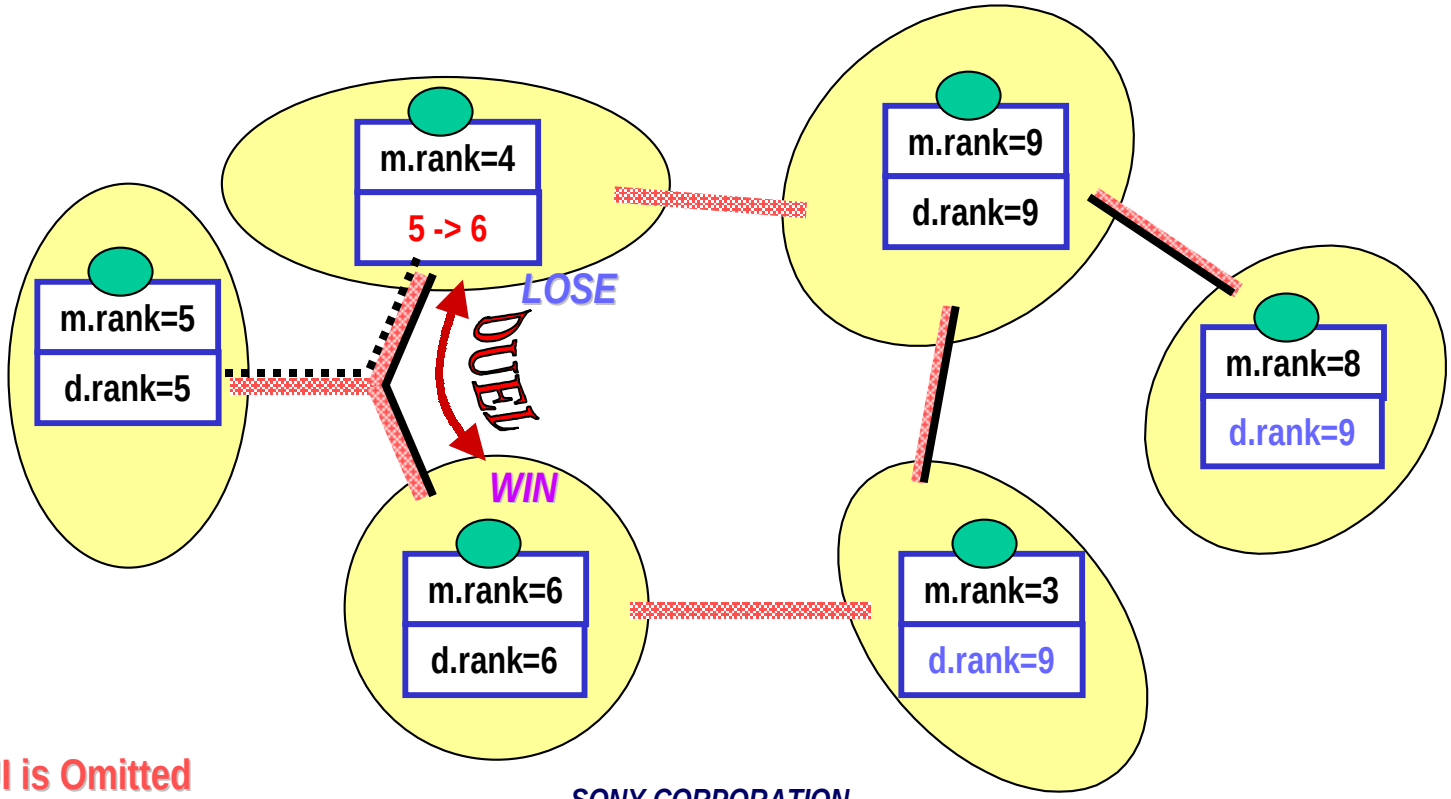
- Compare "d.rank" between subnets and the loser's "d.rank" is overwritten with winner's "d.rank".
- The compared Subnet Manager's IDs are stored in the memory



* EUI is omitted

Net Manager Selection <Step-3>

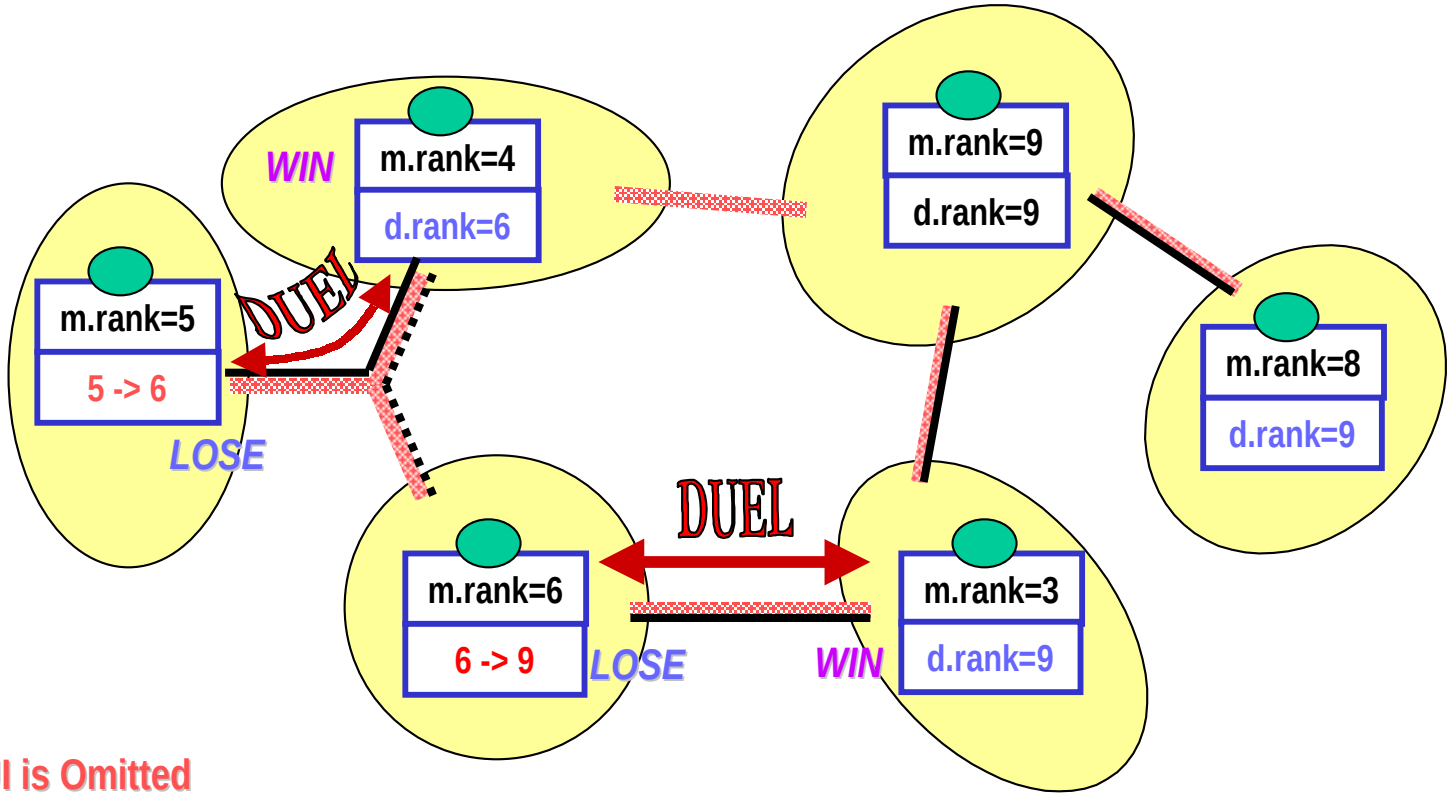
- If the loser again loses the next duel, it is overwritten again and the previous matches are canceled to re-match



* EUI is Omitted

Net Manager Selection <Step-4>

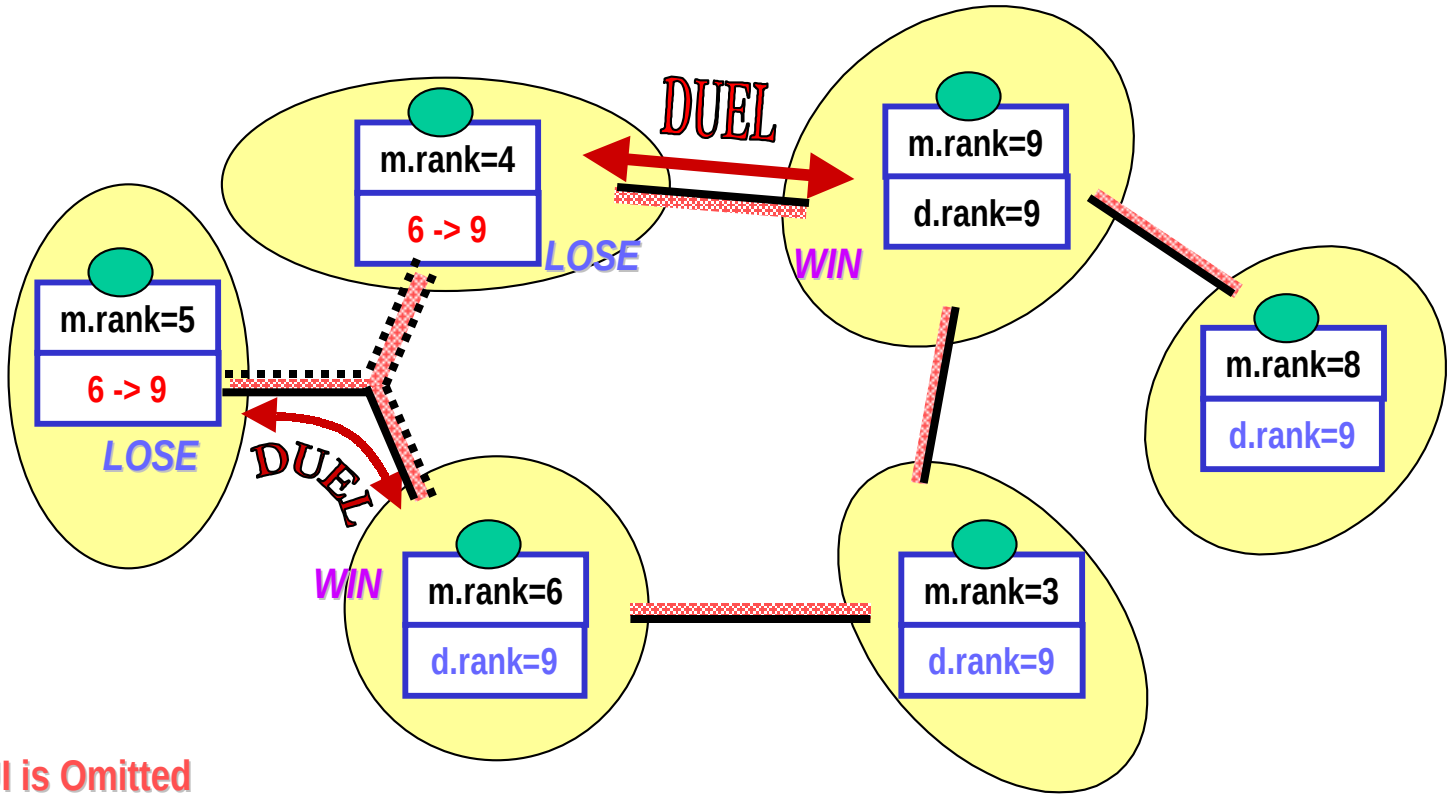
- If the loser again loses the next duel, it is overwritten again and the previous matches are canceled to re-match



* EUI is Omitted

Net Manager Selection <Step-5>

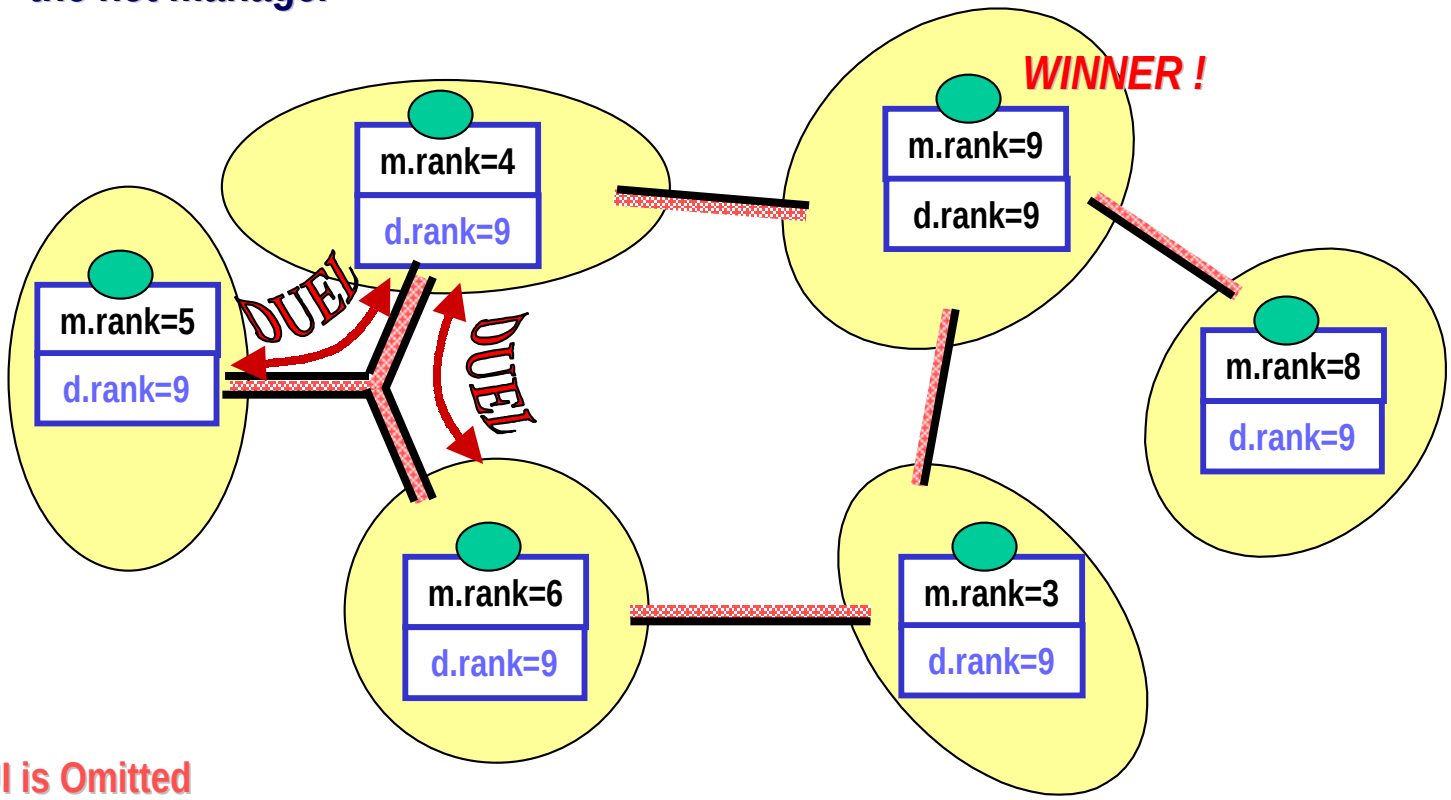
- If the loser again loses the next duel, it is overwritten again and the previous matches are canceled to re-match



* EUI is Omitted

Net Manager Selection <Step-6>

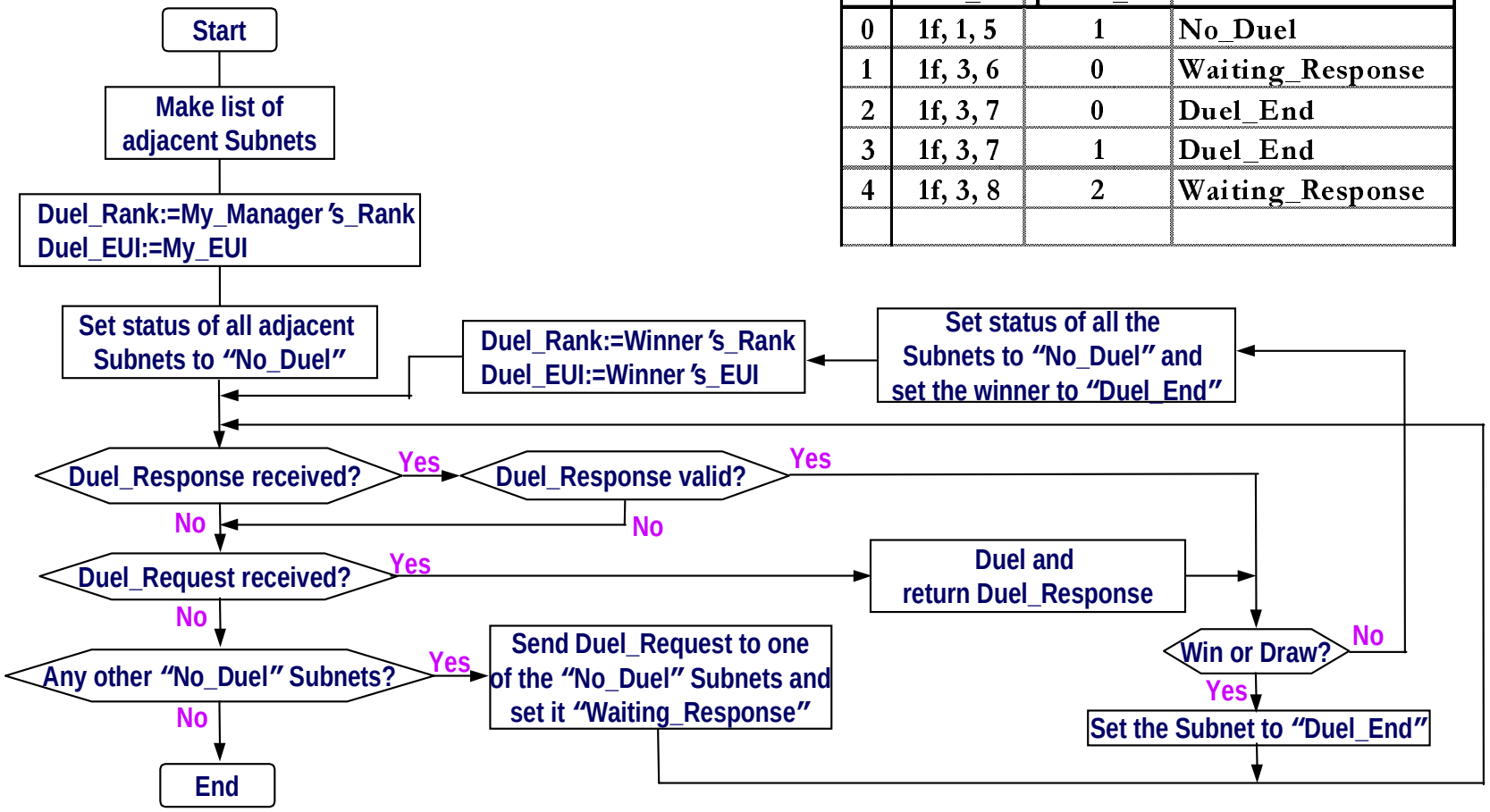
- If the duel is tie, do nothing
- The Subnet whose "d.rank" is the same as "m.rank" is the winner and becomes the net manager



* EUI is Omitted

Net Manager Selection Flow Chart

#	node_ID	portal_ID	Status
0	1f, 1, 5	1	No_Duel
1	1f, 3, 6	0	Waiting_Response
2	1f, 3, 7	0	Duel_End
3	1f, 3, 7	1	Duel_End
4	1f, 3, 8	2	Waiting_Response



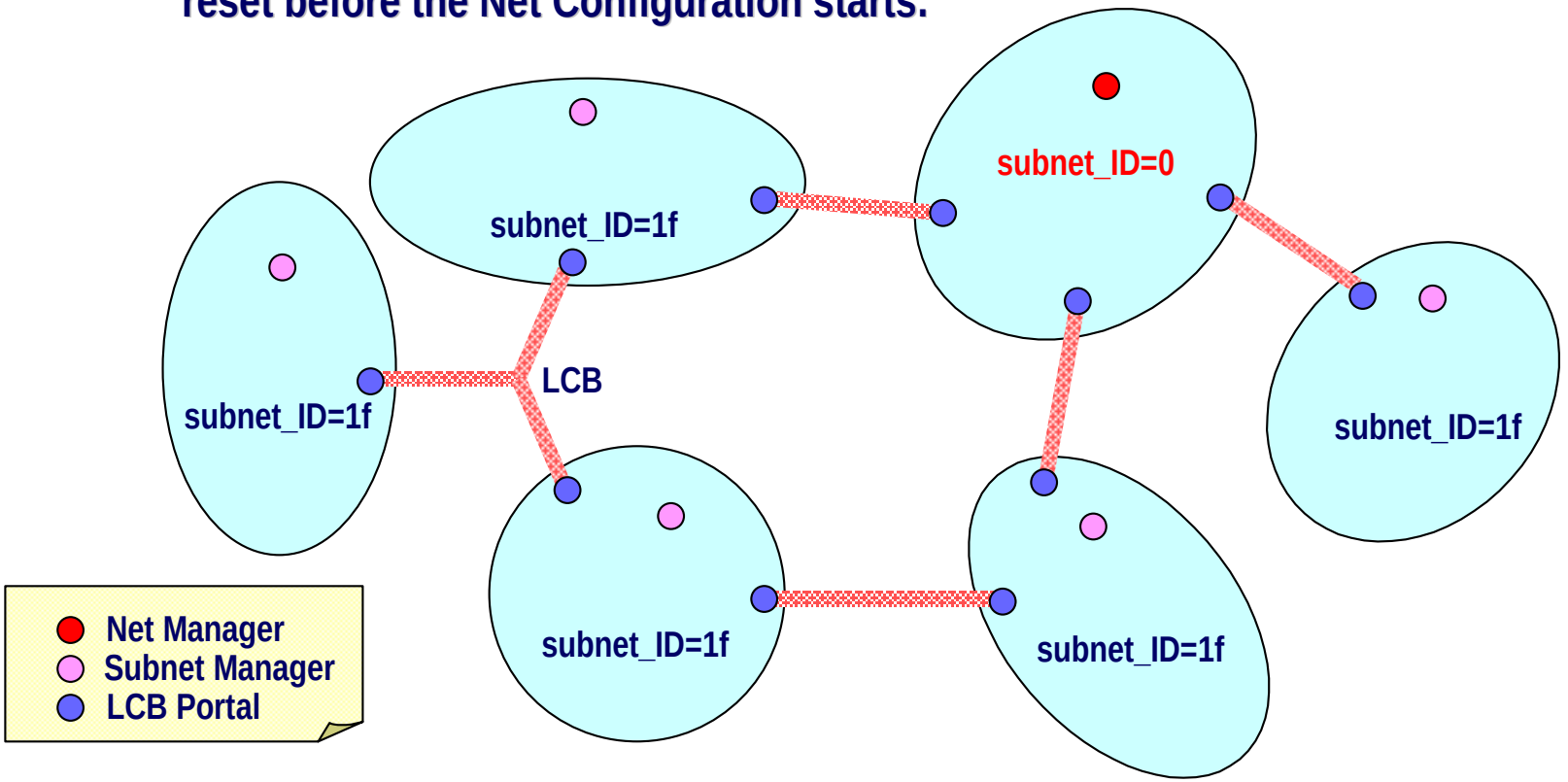
Net Configuration

- Configuration Items
  - subnet_IDs Assignment
  - Portal registers' setting for routing by the Subnet Manager
- Procedure*
  1) Net manager initiates to assign subnet_IDs to adjacent subnets and each subnet propagates to assign it to its adjacent subnets.
  2) A confirmation comes back from a far-end subnet and on its way back, following registers at each TCB and LCB are set :
     - SUBNET_ROUTING Register for TCB
     - IMPORT_ROUTING / EXPORT_ROUTING Register for LCB
  3) Routing Optimization (Further Study)

* This is an example and better procedures can be applicable.

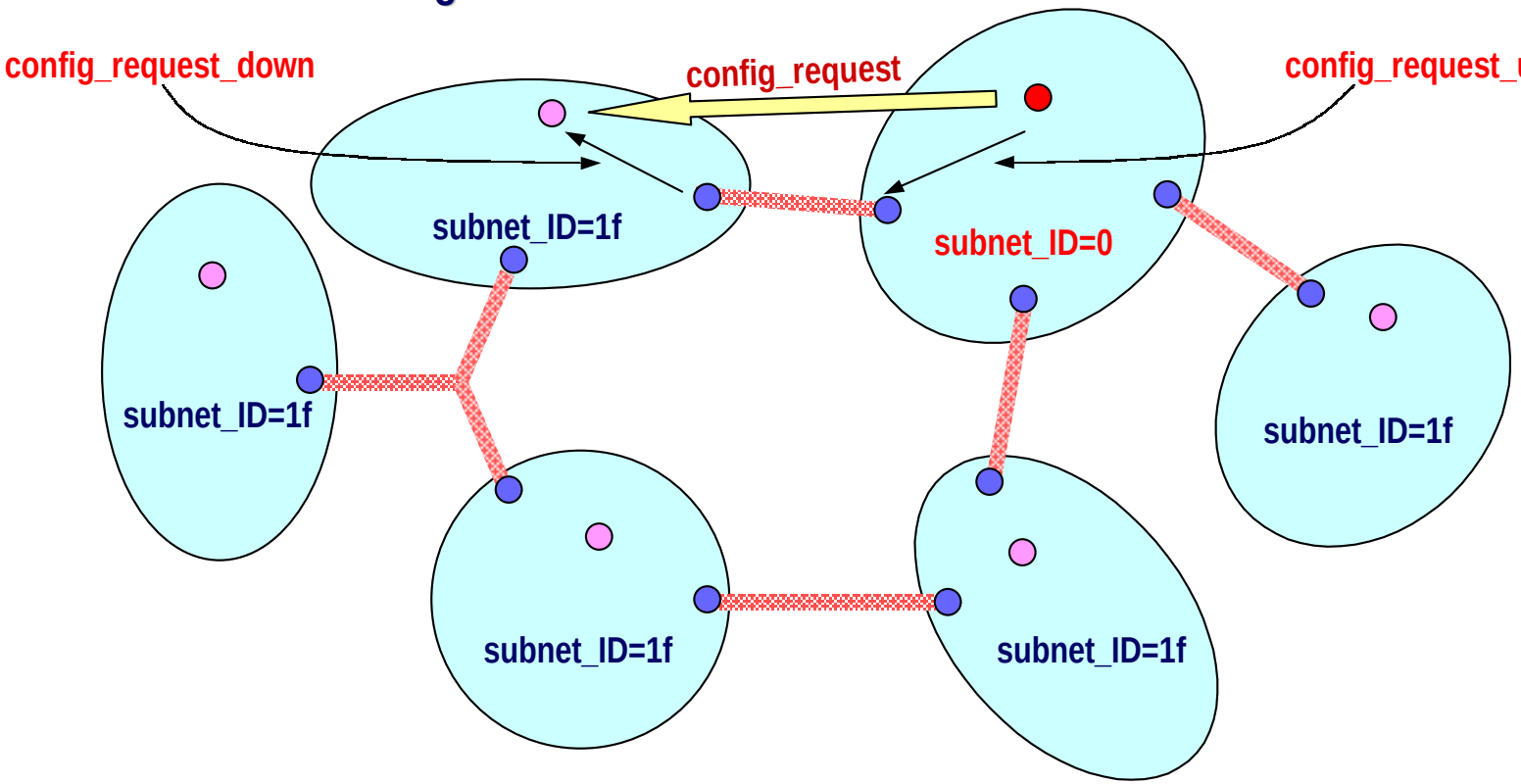
Net Configuration <Start Line>

- Net Manager has been selected and is assigned subnet_ID=0 (Not necessarily 0)
- Rest of the subnet_IDs=1f
- Configuration Status in each Subnet Manager (internal memory) should be reset before the Net Configuration starts.



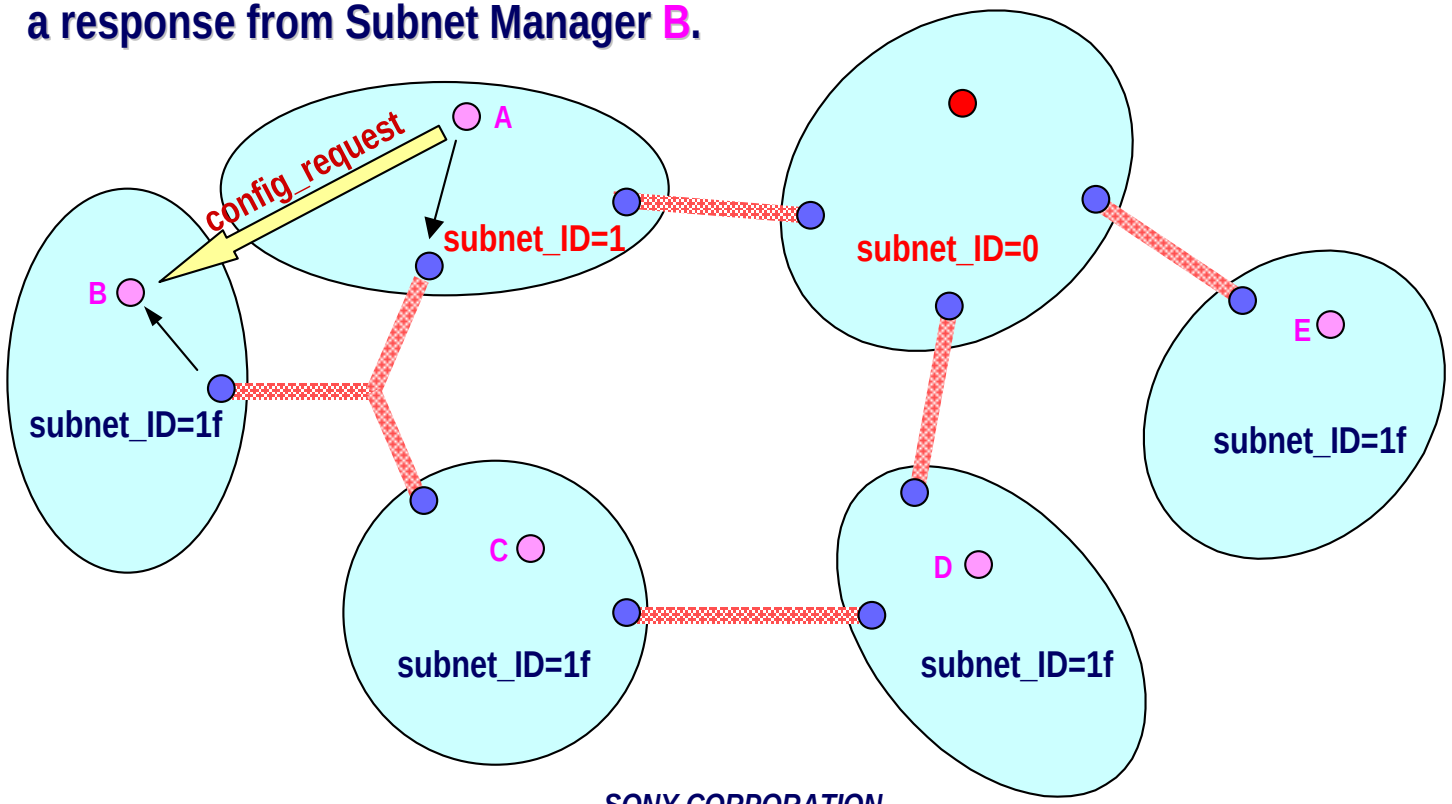
Net Configuration <ID Assignment-1>

- Net Manager requests to configure a neighbor with available IDs (1-30) by config_request which consists of config_request_up and config_request_down.
- Net Manager sets its Configuration Status to "In_Progress" and waits for a response from the Subnet Manager.



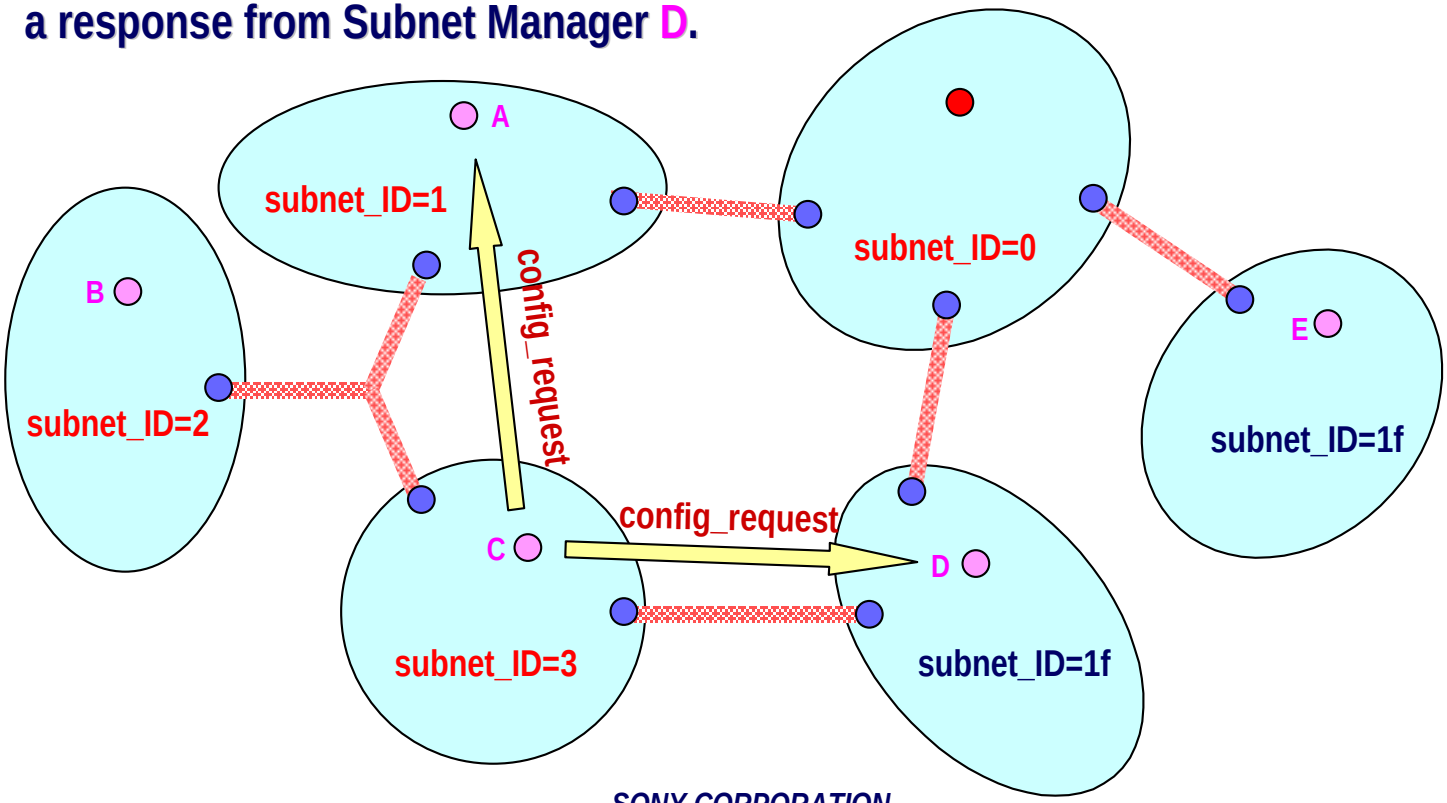
Net Configuration < ID Assignment-2>

- Subnet Manager A assigns its own subnet_ID.
- Subnet Manager A then initiates a config_request with available IDs to one of its neighbor Subnet Managers B, who has not been configured yet.
- Subnet Manager A sets its Configuration Status to "In_Progress" and waits for a response from Subnet Manager B.



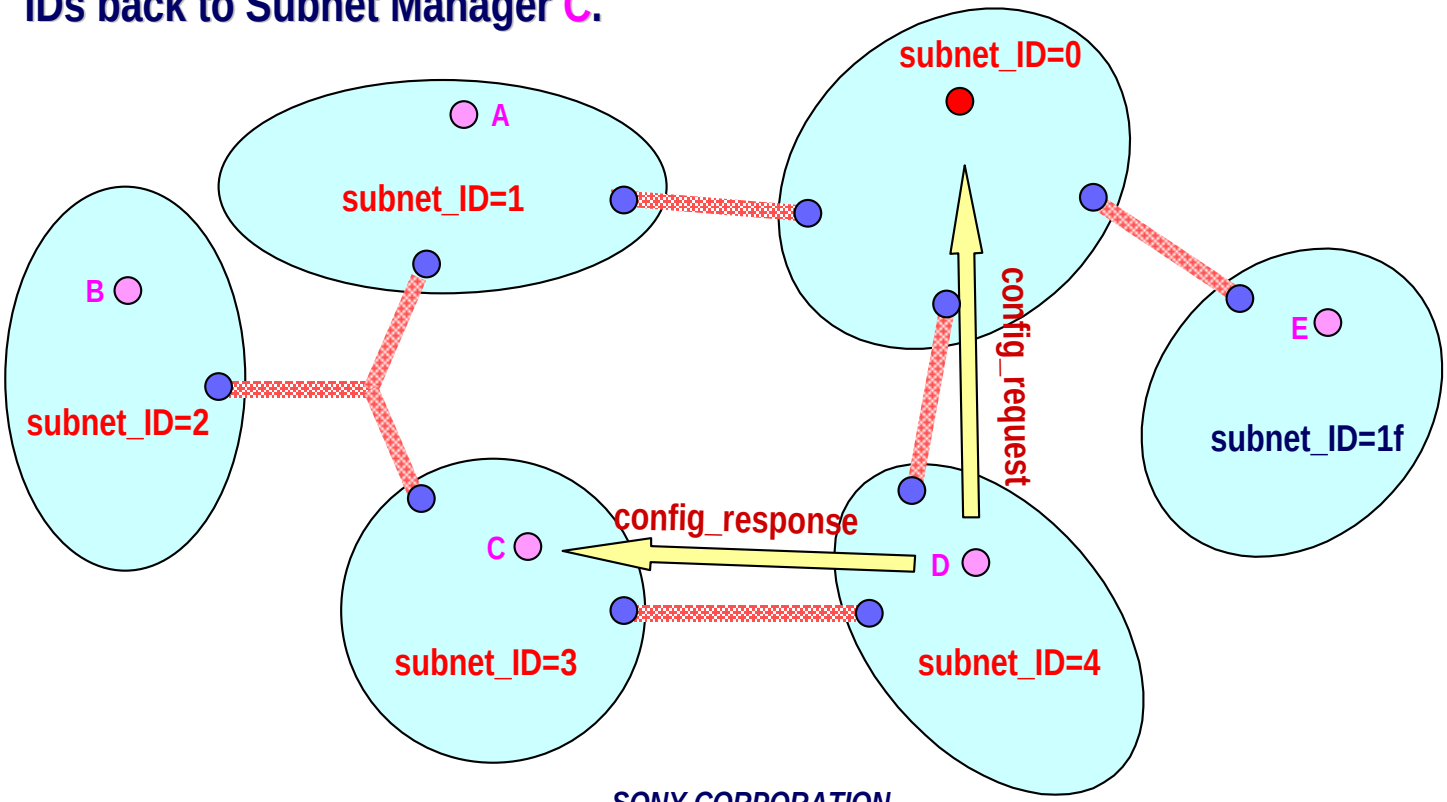
Net Configuration < ID Assignment-3>

- After subnet_ID=3 is assigned, Subnet Manager C tries to configure Subnet #1 but recognizes its Configuration Status is "In_Progress".
- Subnet Manager C sends config_request to Subnet Manager D.
- Subnet Manager C sets its Configuration Status to "In_Progress" and waits for a response from Subnet Manager D.



Net Configuration < ID Assignment-4>

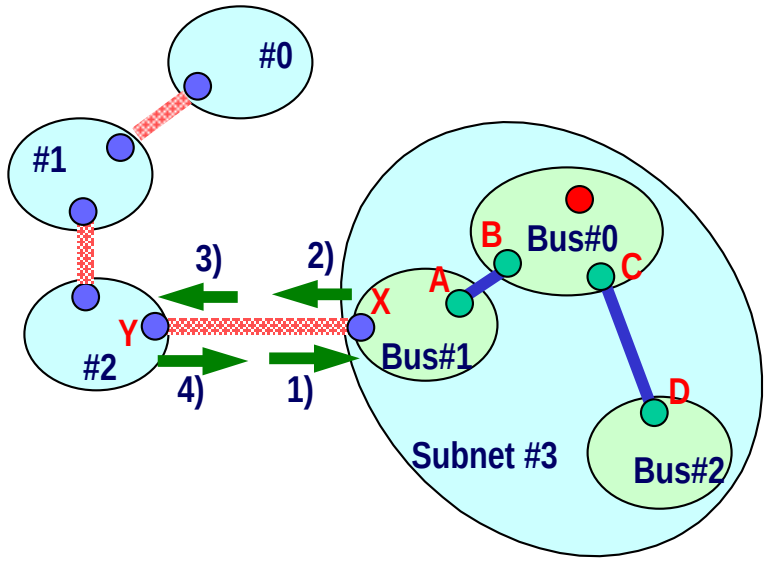
- After subnet_ID=4 is assigned, Subnet Manager D recognizes Configuration Status of Subnet #0 is "In_Progress" in the same manner.
- Subnet Manager D also realizes that no more subnets are left then, sets its Configuration Status to "Completed" and sends config_response with available IDs back to Subnet Manager C.



Net Configuration <Routing Register>

At the same time when Subnet Manager sends config_response back to the Subnet Manager who has sent config_request, the Subnet Manager :

- lets all of TCB portals in the subnet set the bits in SUBNET_ROUTING register
- also lets the LCB portal in the subnet set the bits in EXPORT_ROUTING register and IMPORT_ROUTING register



TCB portal "A" & "C" in subnet #3 :

Bit	0	1	2	3	4	5	.....	30	31
BUS_ROUTING	x	x	x	x	x	x	.....	x	1
SUBNET_ROUTING	0	0	0	0	0	0	.....	0	1

*BUS_ROUTING register has already been set at Subnet Configuration

TCB portal "B" & "D" in subnet #3 :

Bit	0	1	2	3	4	5	.....	30	31
BUS_ROUTING	x	x	x	x	x	x	.....	x	1
SUBNET_ROUTING	1	1	1	0	1	1	.....	1	1

LCB portal "X"

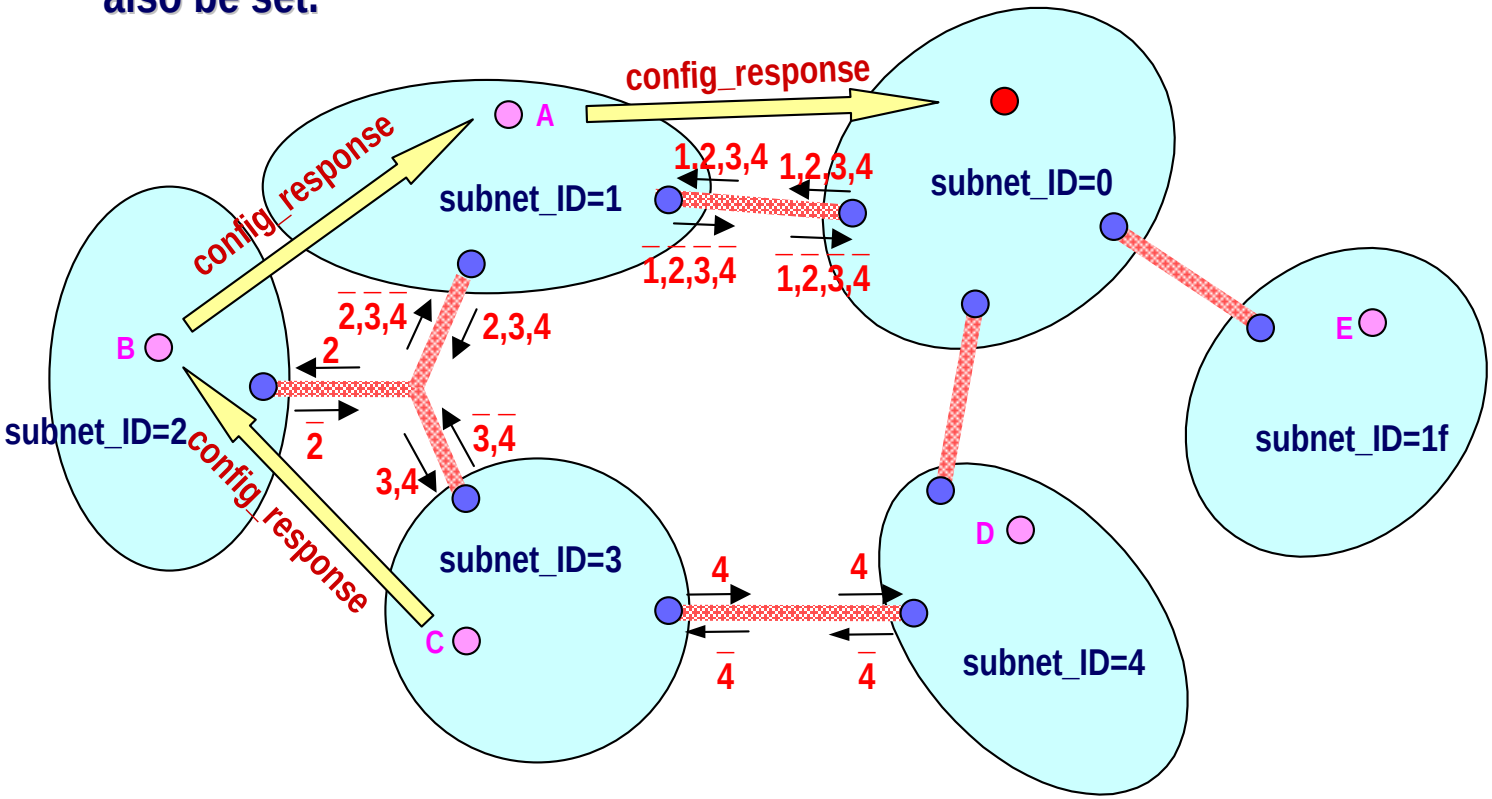
	Bit	0	1	2	3	4	5	.....	30	31
1)	EXPORT_ROUTING	0	0	0	1	0	0	.....	0	1
2)	IMPORT_ROUTING	1	1	1	0	1	1	.....	1	1

LCB portal "Y"

	Bit	0	1	2	3	4	5	.....	30	31
3)	EXPORT_ROUTING	1	1	1	0	1	1	.....	1	1
4)	IMPORT_ROUTING	0	0	0	1	0	0	.....	0	1

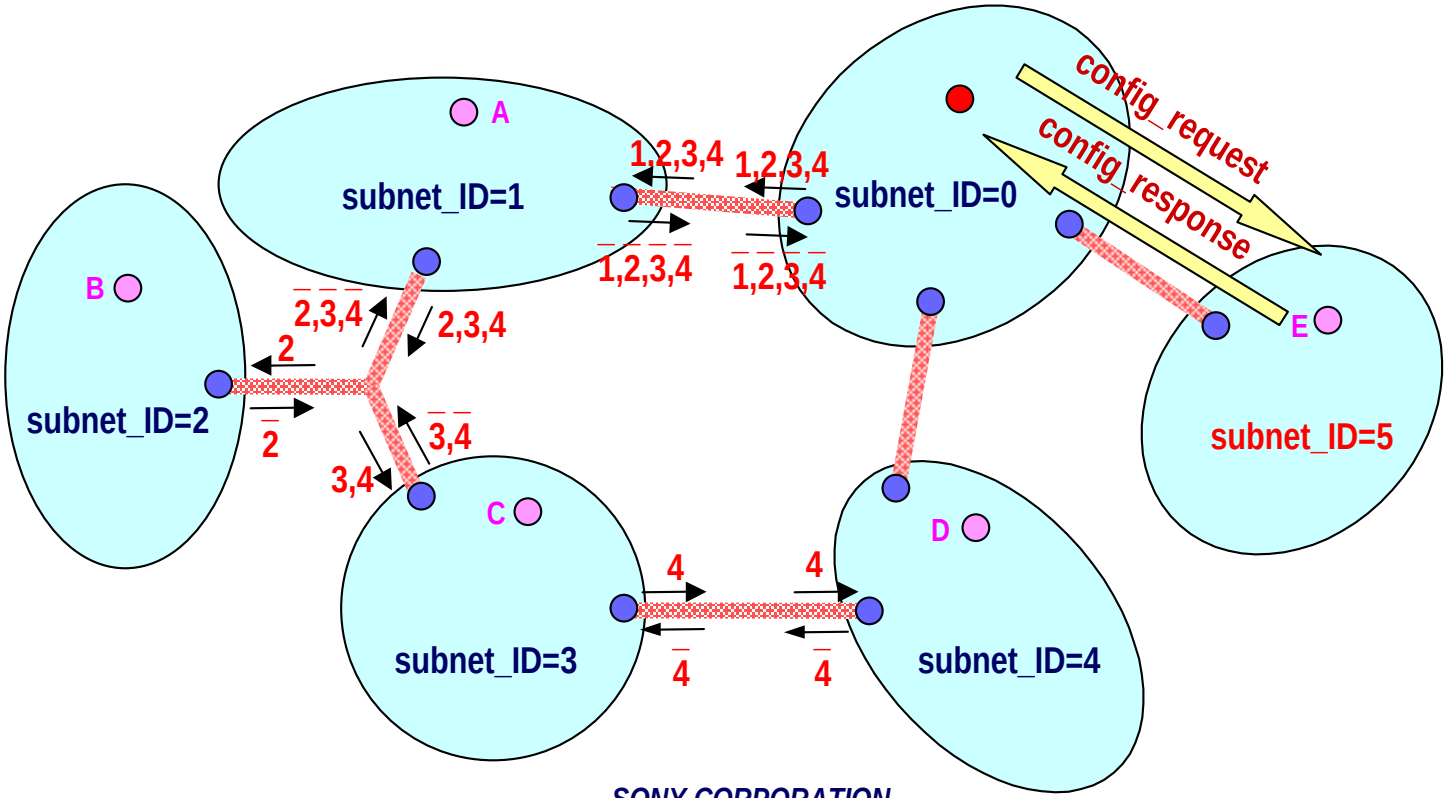
Net Configuration < Routing-1 >

- IMPORT_ / EXPORT_ROUTING Register of each LCB portal will be set in the order of Subnet #4 - #3 - #2 - #1.
- All the SUBNET_ROUTING Registers of TCB portals in every Subnet will also be set.



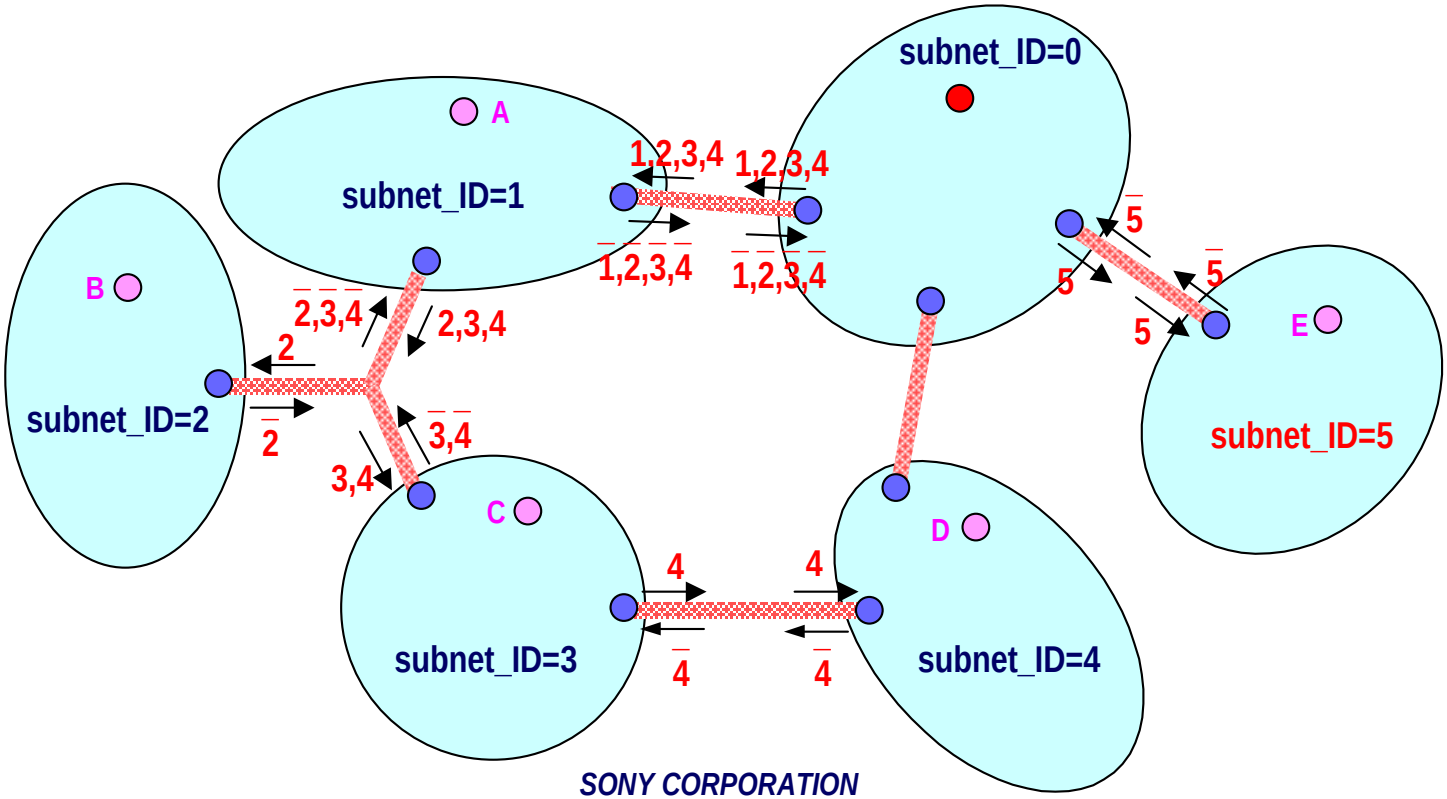
Net Configuration <ID Assignment-5>

- Since the Configuration Status of Subnet #4 is "Completed", Net Manager sends config_request to Subnet Manager E.
- Subnet Manager E assigns subnet_ID=5 and sets Configuration Status to "Completed" then, sends config_response back to the Net Manager.



Net Configuration < Routing-2>

- Upon receiving config_response from Subnet Manager E, the Net Manager recognizes no more subnets to be configured.
- Net Manager then sets the Configuration Status to "Completed" and it means the completion of the Net Configuration.
- *Optimized routing need to be placed after this. (Details are further study)*



Clock Synchronization

- Concerns

  When the Net topology is changed,

  1) Cycle propagation path will be changed

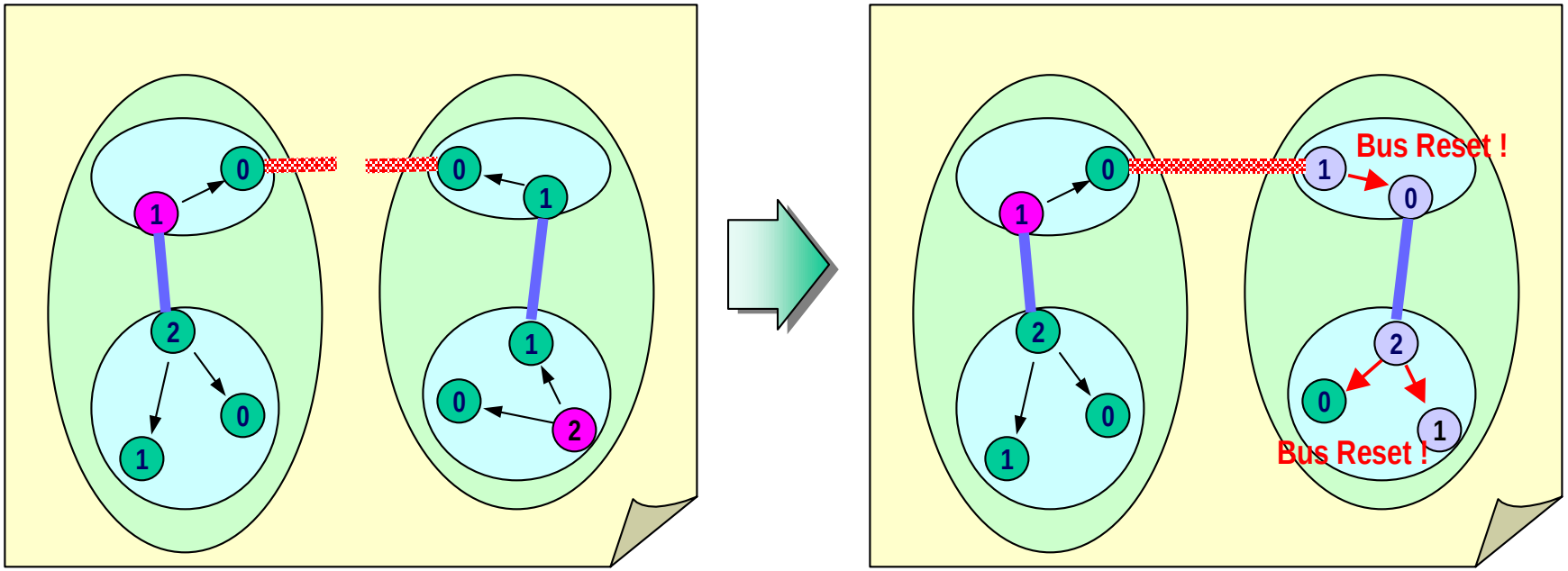
  2) Cycle discontinuation (glitch) will occur

- Solutions

  1) Adjust from LCB portal by sending a command so that the location of the Subnet Cycle Master is not changed

  2) Keep the offset of CYCLE_TIME to a constant value and replace to a new Time Stamp using the offset

Cycle Master Location - 1



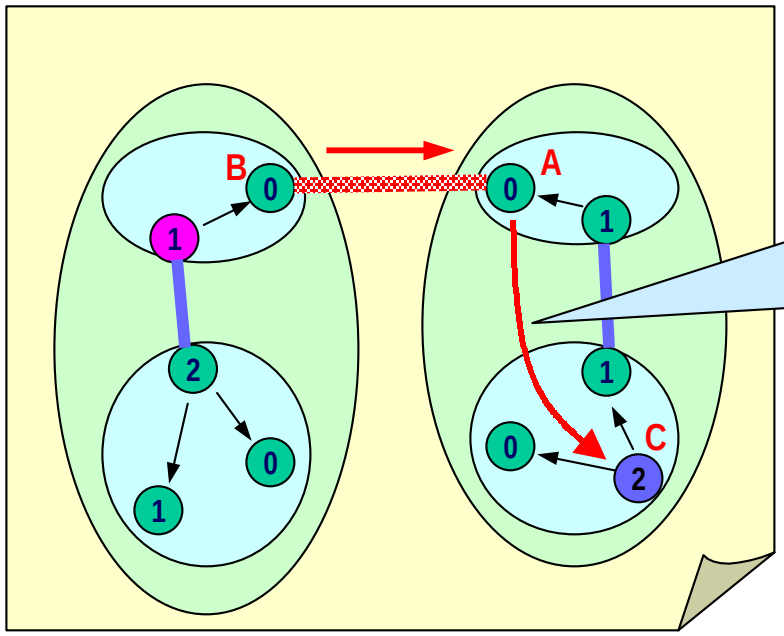
Net Cycle Master

Clock Propagation Path

Net Cycle Master

Need to be re-numbered as Cycle Master must be root which has to have maximum phy_ID

Cycle Master Location - 2



- Adjustment command is sent to the Subnet Cycle Master C.
  (It need to be adjustable)
- Portal A reports the cycle offset between A and B to the Subnet Cycle Master C.

No need to change the topology including clock flow direction

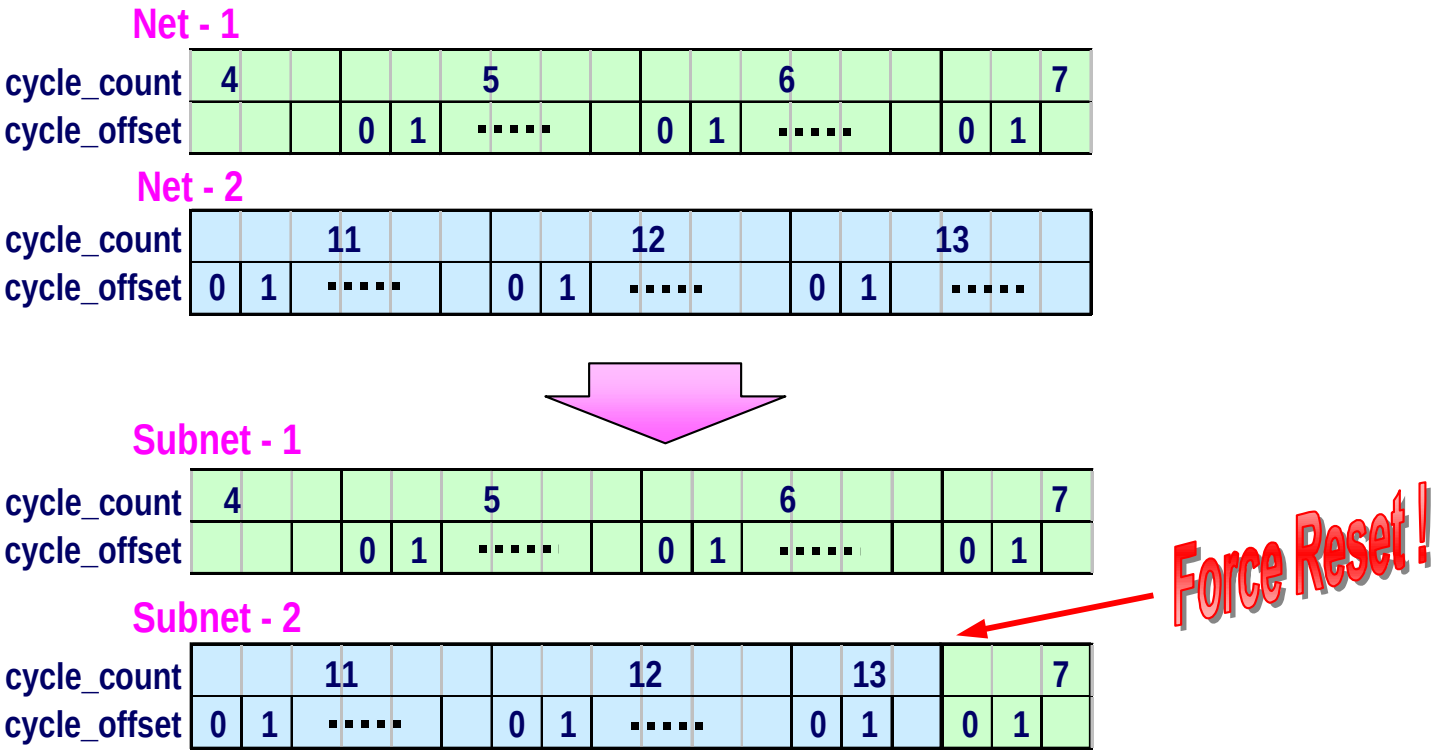
Important for Loose Coupled Bridge

Net Cycle Master

Subnet Cycle Master

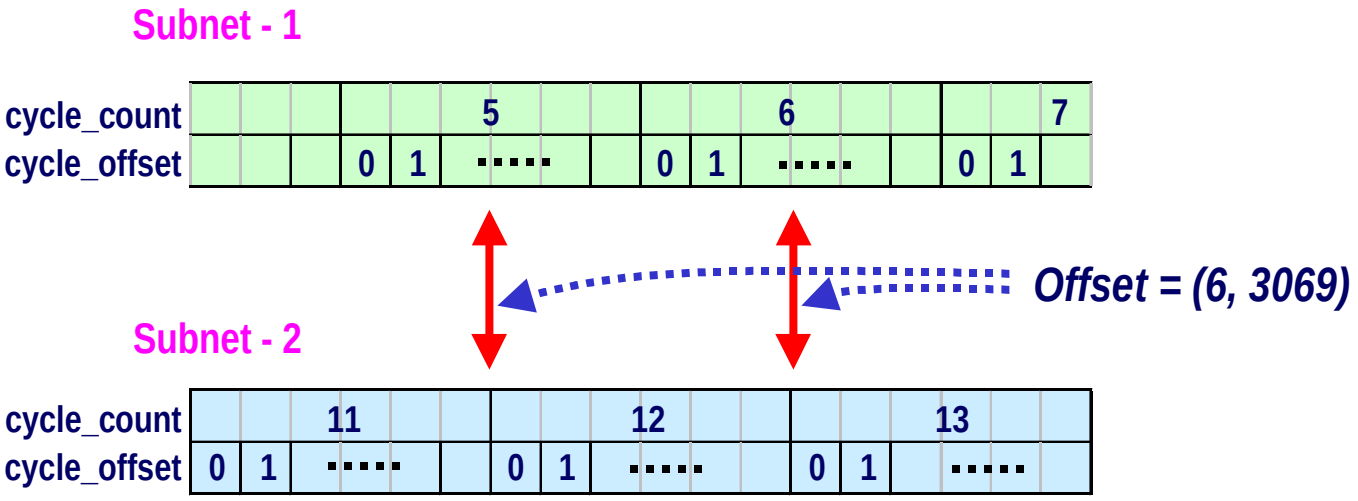
Cycle Time Offset - 1

- When 2 Nets are merged, CYCLE_TIME should be reset in the slave subnet or spend time to lock the phase.

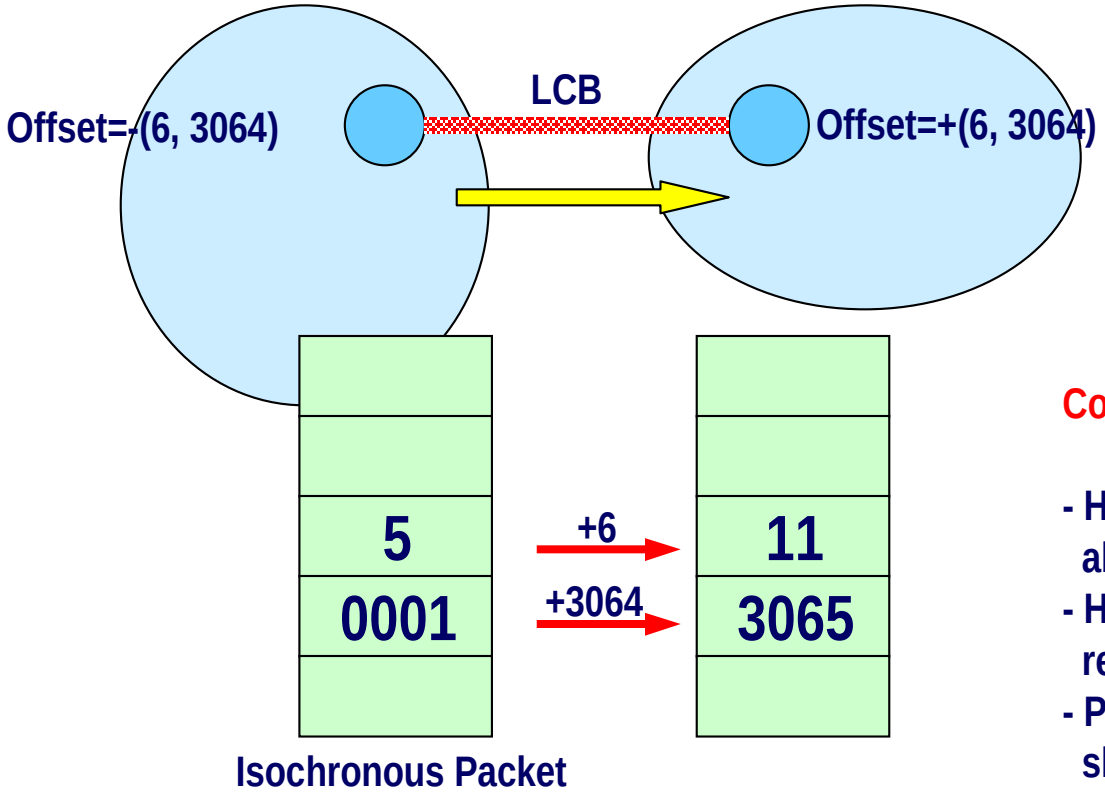


Cycle Time Offset - 2

- The offset of CYCLE_TIME register should be maintained as constant.
- The offset value should be held in Loose Coupled Bridge.



Time Restamping in the LCB

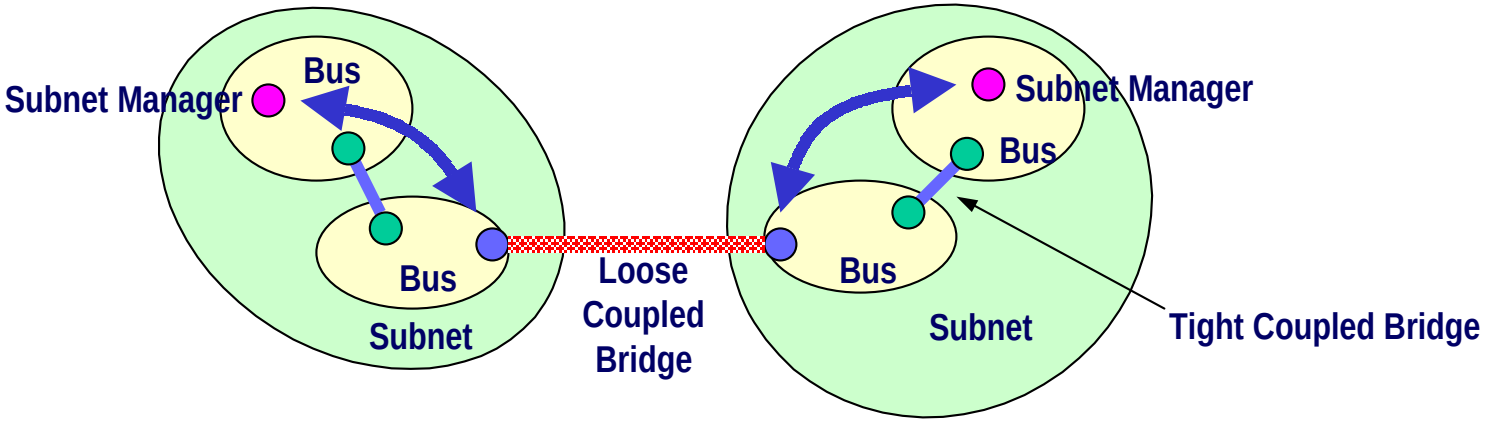


Concerns

- How much jitter should be absorbed in the LCB?
- How frequently should LCB report the offset?
- PLL 's time-constant in the slave side should be determined.
- Initial lock-in-time should be studied.

Command Based Method

- Access between a Loose Coupled Bridge Portal and a Subnet Manager
  - Write to and Read from the Register
  - A Command consists of 4 Quadlet

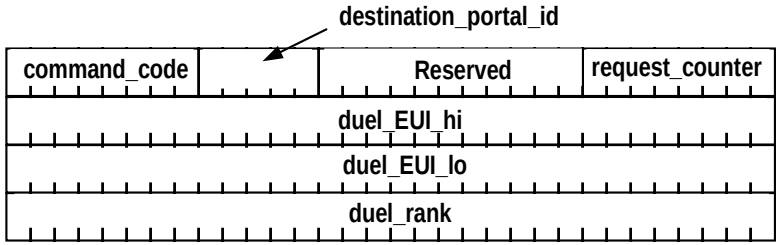


Command Summary

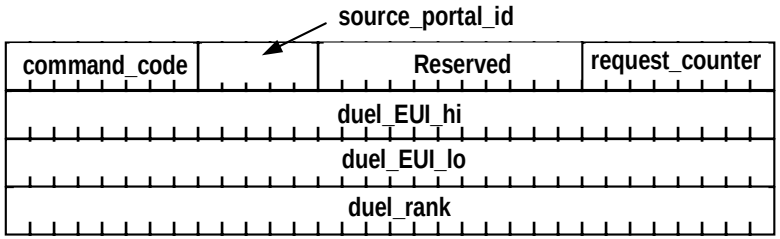
- Subnet Manager <-------> Subnet Manager
  - duel_request_up / _down — For Net Manager selection
  - duel_response_up / _down
  - config_request_up / _down — For subnet_ID assignment and routing
  - config_response_up / _down
- Net Manager <-------> Subnet Manager
  - TBD (for Route Optimization purpose)
- Subnet Manager <--------> LCB Portal
  - remote_portal_write_request — For far-end portal configuration
  - remote_portal_write_response
  - remote_portal_read_request
  - remote_portal_read_response
  - iso_resouce_request (TBD) — Bandwidth reservation for Isochronous
  - iso_resouce_response (TBD)

Command List - 1

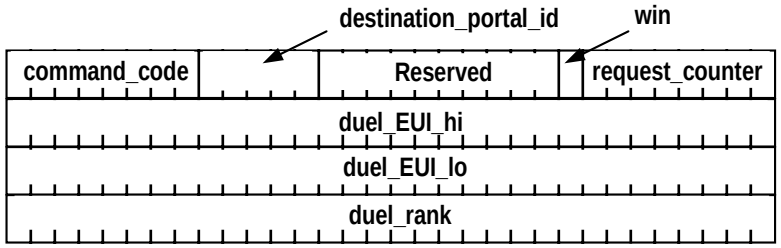
duel_request_up



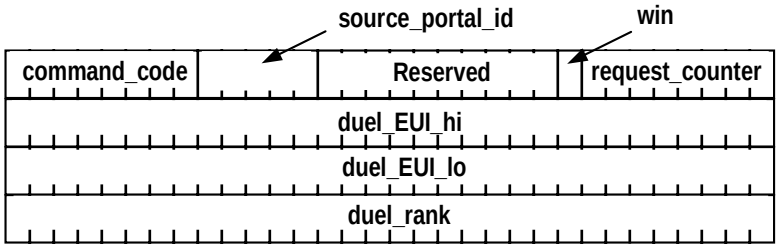
duel_request_down



duel_response_up

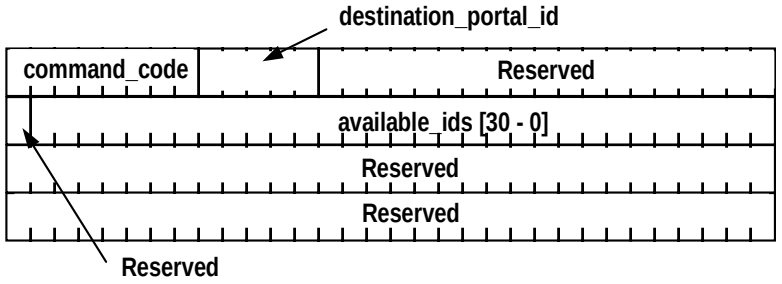


duel_response_down

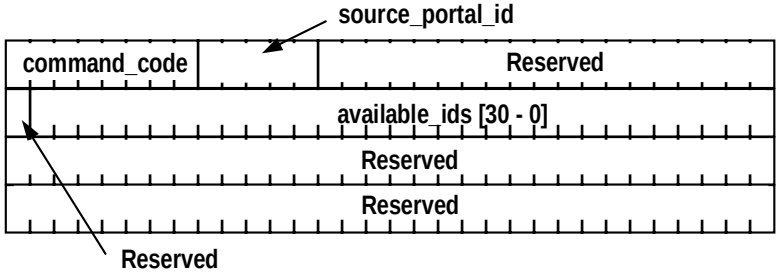


Command List - 2

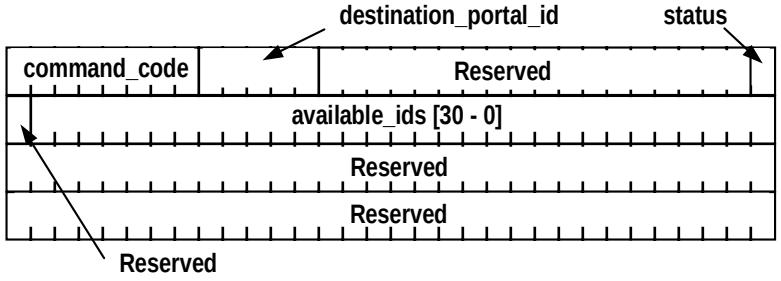
config_request_up



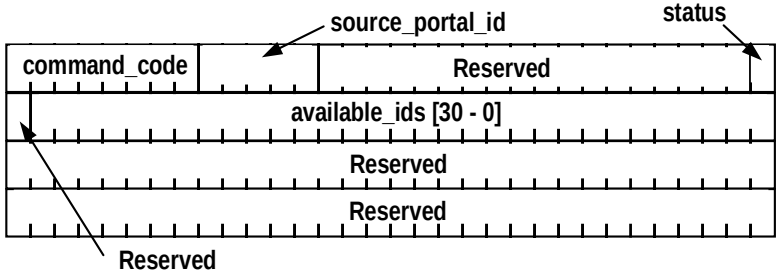
config_request_down



config_response_up

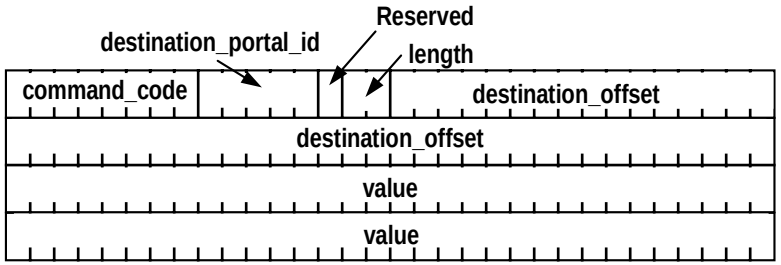


config_response_down

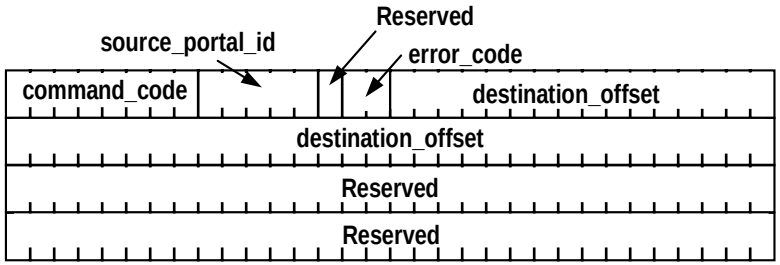


Command List - 3

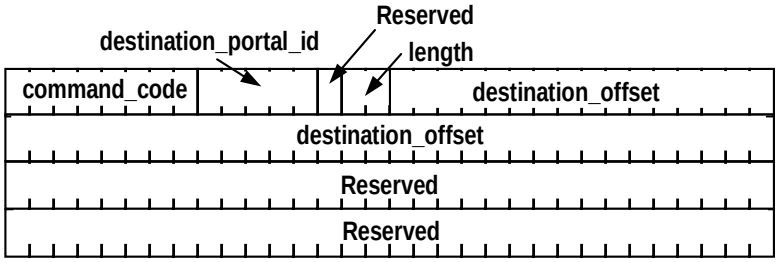
remote_portal_write_request



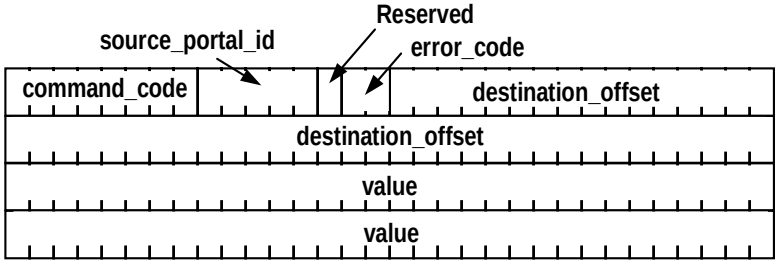
remote_portal_write_response



remote_portal_read_request



remote_portal_read_response



Loose Coupled Bridge Portal Facility

Config. ROM

LCB entry with LCB capability

CSRs

own_portal_ID	5 bits	Own portal ID [0 - 30]
online_portal_ID	31 bits	Bit mapped portals connected to the other subnet(s)
online	1 bit	online=1 / offline=0
subnet_owner_EUI	64 bits	Subnet manager writes its own EUI
subnet_owner_ID	16 bits	Subnet manager writes its own ID
net_owner_EUI	64 bits	Net manager writes its own EUI
net_owner_ID	16 bits	Net manager writes its own ID
command_register	32 bits x 4	Command from/to LCB, command for communication between subnets
import_routing	32 bits	For asynchronous routing (from Phy to Fabric)
export_routing	32 bits	For asynchronous routing (from Fabric to Phy)

Tight Coupled Bridge Portal Facility

Config. ROM

TCB entry with TCB capability

CSRs

subnet_owner_EUI	64 bits	Subnet manager writes its own EUI
subnet_owner_ID	16 bits	Subnet manager writes its own ID
bus_routing	32 bits	For asynchronous routing (from Phy to Fabric)
subnet_routing	32 bits	For asynchronous routing (from Fabric to Phy)

Net / Subnet Manager Facility

Config. ROM

Net / Subnet Manager entry with its manager capability

CSRs

net_owner_EUI	64 bits	Net manager writes its own EUI
net_owner_ID	16 bits	Net manager writes its own ID
command_register	32 bits x 4	Command from/to LCB, command for communication between subnets