Study on Net Manager Selection Algorithm

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Agenda

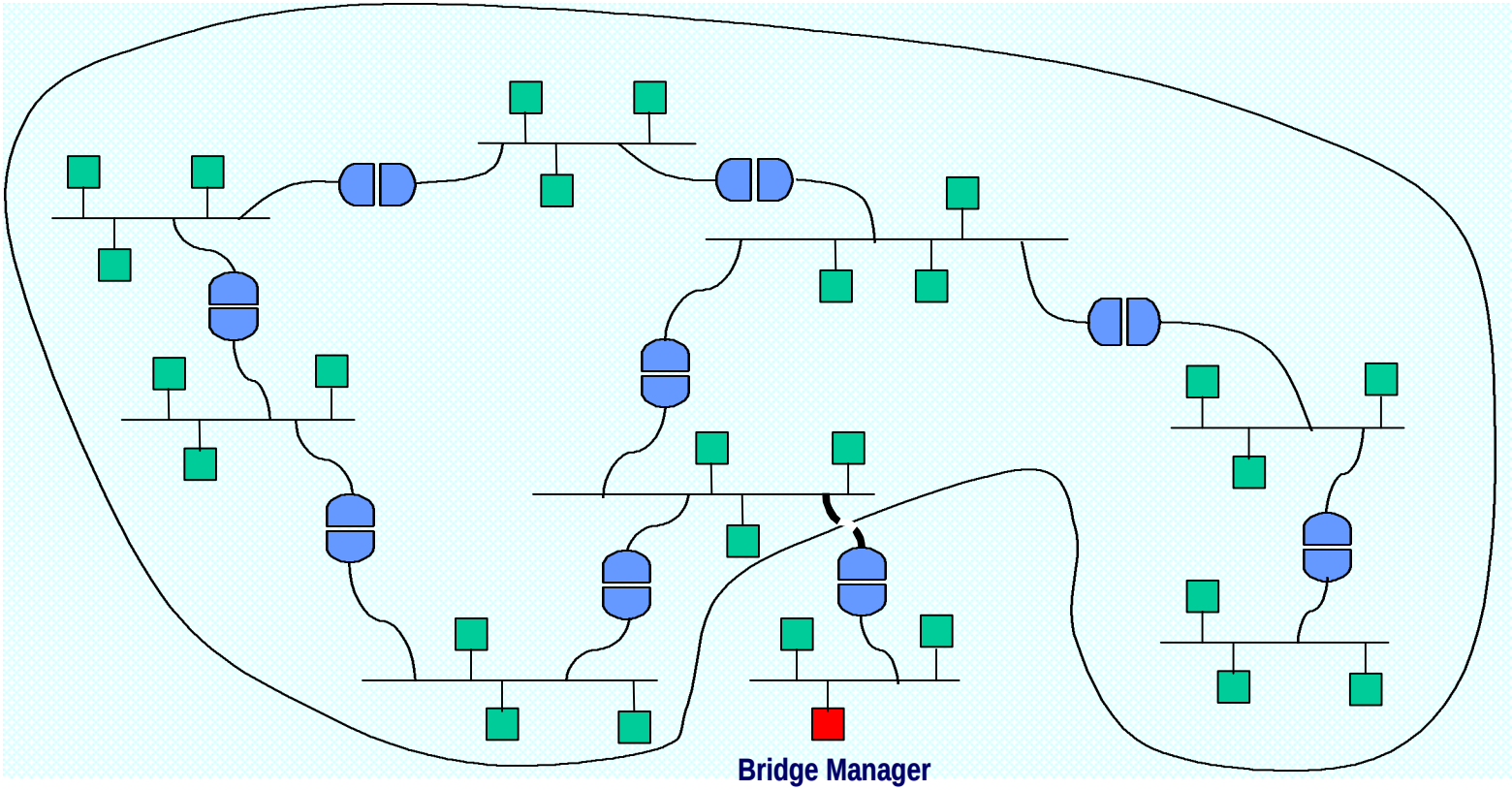
- Review on Subnet Structure
- Net Manager Selection (Revised)
  - Concept and assumption
  - Step by step transition
- Open Issue
- Conclusion

Review on Subnet Structure

- Disadvantages of Single Plane Structure
  - Need to manage up to 1023 buses
    - Configuration (re-routing, manager selection, etc.) could be a significant load when the topology changes
- Advantages of Hierarchical Structure (Subnet)
  - Net manager and subnet managers handle up to 31 subnets and buses respectively in the case of two 5 bits
  - Localize the reconfiguration within a subnet when the topology changes

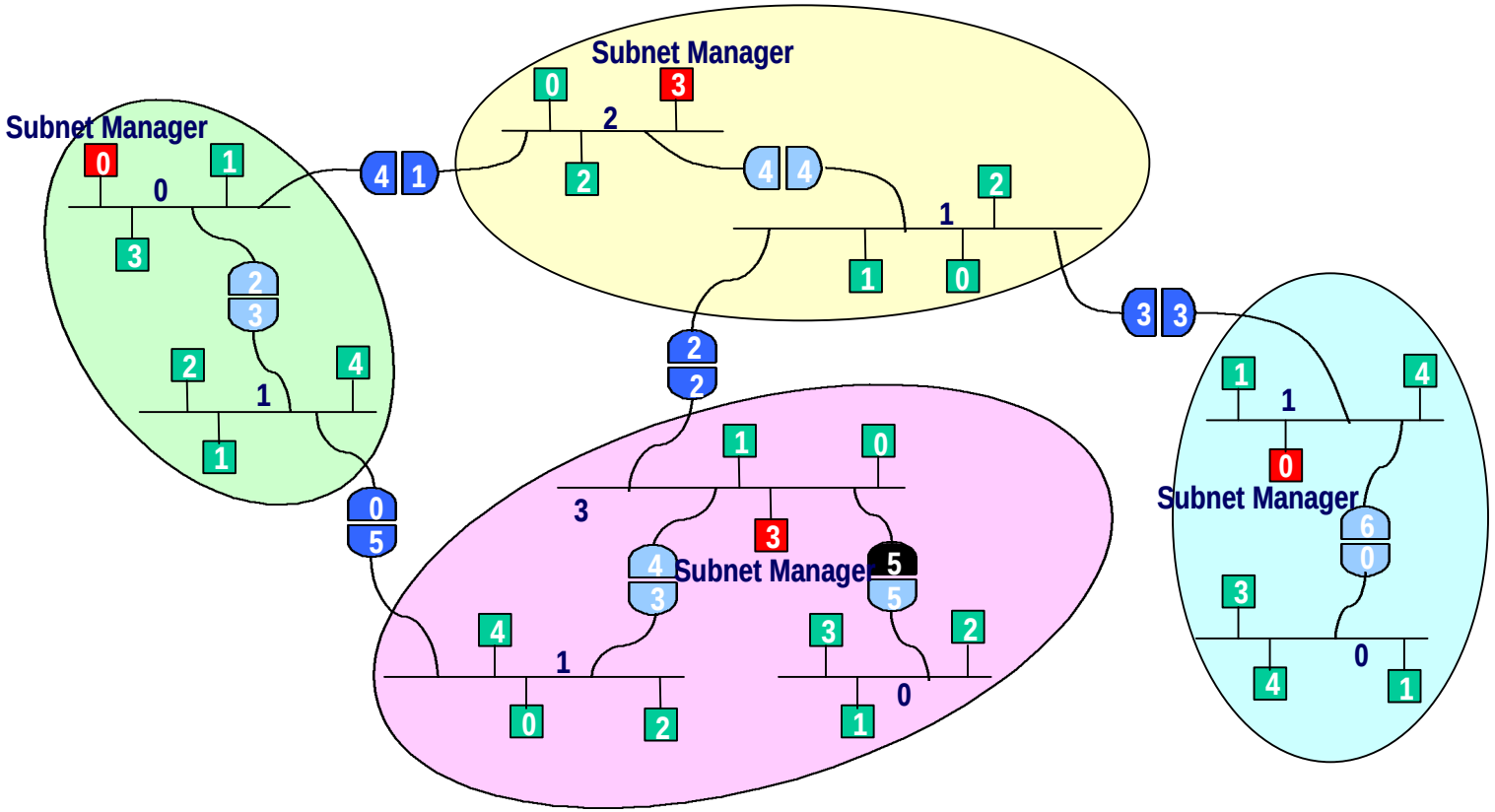
Single Plane Architecture

Reconfiguration could be a heavy load in case a critical path is torn !



Hierarchical Architecture

- Node_ID consists of sunbet_ID(5bit), bus_ID(5bit) and phy_ID(6bit)



Today's Contribution

- Bridge Manager or Subnet Manger selection scheme has to be specified anyway
- Subnet Manager selection scheme is supposed to be the same as Bridge Manager selection
- Net Manager selection scheme is the extra portion if we choose Subnet structure

Architecture Choice	Single Plane	Subnet
Need to be specified	Bridge Manager Selection	Subnet Manager Selection
		Net Manager Selection

Net Manager Selection Overview

- Assumption
  - Subnet managers should be selected in advance
  - Classified criteria should be specified for "Rank" table
  - Every subnet manager has the ability to be the Net Manager
  - Trigger of the start of selection should be specified under "Reset Notification" discussion
- Procedure
  - Exploring the Net Manager by "Duel" with Rank table
  - EUI-Duel is placed as tiebreaker if Rank-Duel results in Draw
  - Status Register and some commands are prepared for the selection process

Duel Rules

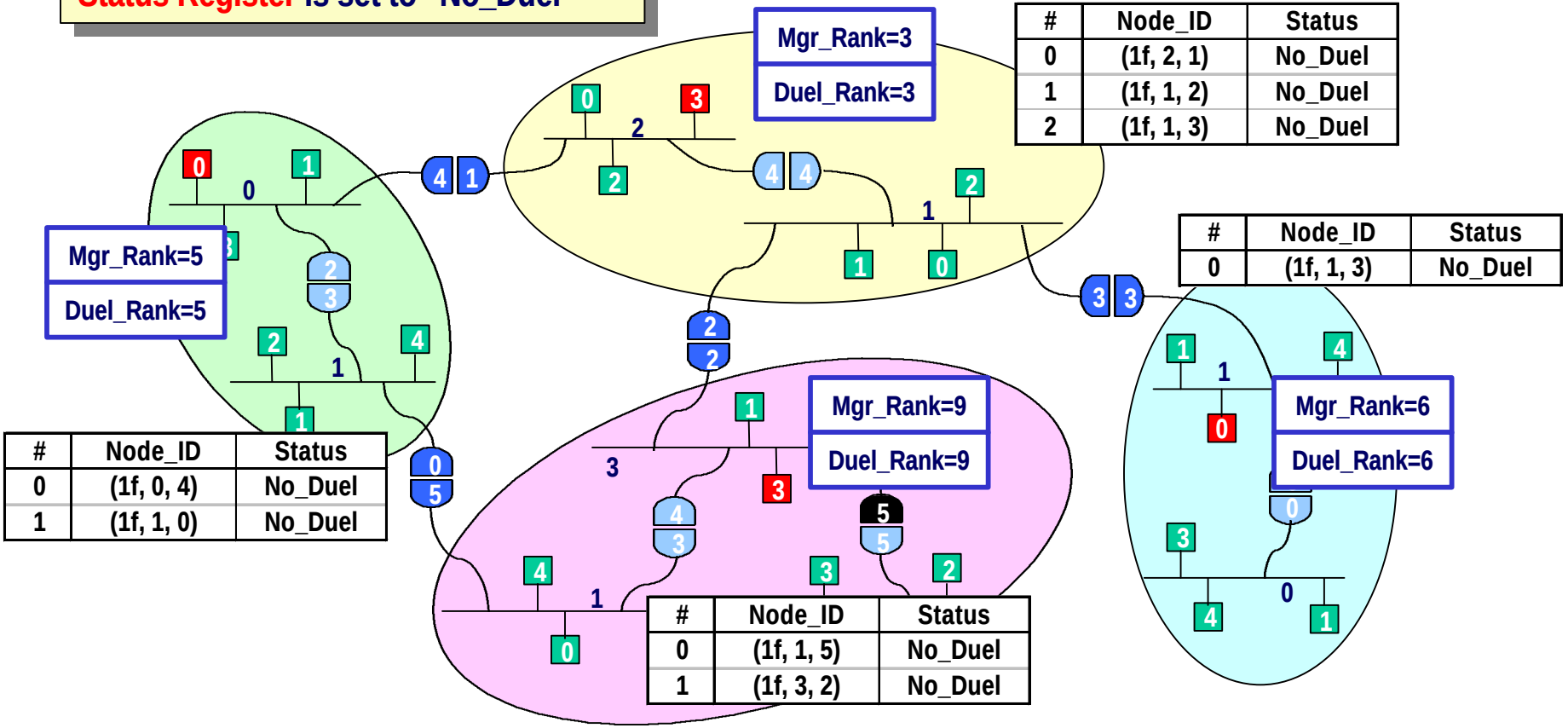
- Duel is based on Rank table
  - The higher rank holder wins the duel
  - The loser's duel_rank is overwritten with the winner's
- In the case of draw, bit-reversed EUI is used for tiebreaker
- If the tiebreaker results in draw, it tells there is a loop

Ready for Duel

Status

No_Duel	Initial status
Wait_Result	Waiting for the duel result status
Child	Loser to be confirmed
Child_Finish	Confirmed loser
Parent	Winner to be confirmed
Parent_Finish	Confirmed winner
Draw_Finish	Tied situation (It happens when a loop exists)

Mgr_Rank is stored in the Config-ROM
Duel_Rank is copied from Mgr_Rank
Status Register is set to "No_Duel"



#	Node_ID	Status
0	(1f, 2, 1)	No_Duel
1	(1f, 1, 2)	No_Duel
2	(1f, 1, 3)	No_Duel

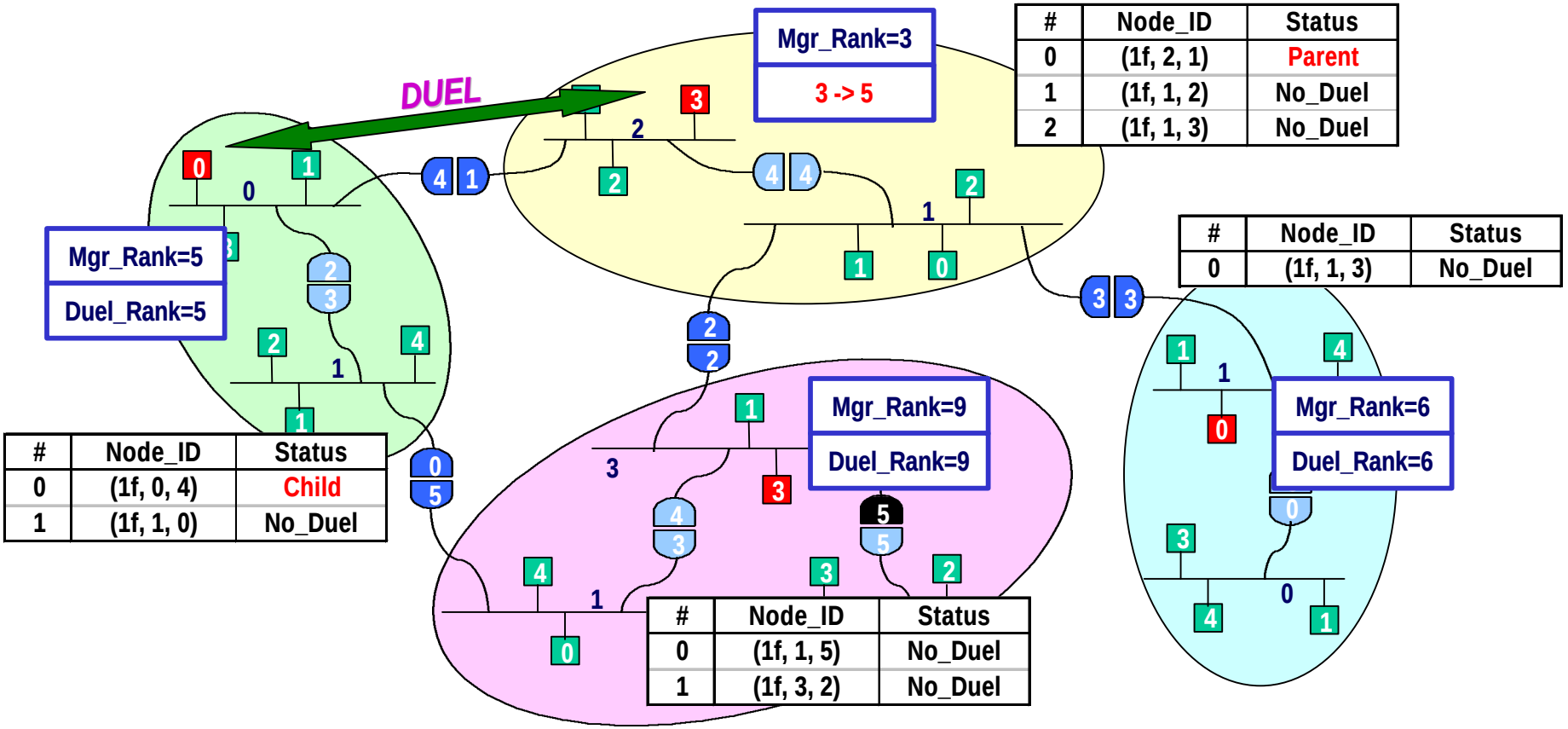
#	Node_ID	Status
0	(1f, 1, 3)	No_Duel

#	Node_ID	Status
0	(1f, 0, 4)	No_Duel
1	(1f, 1, 0)	No_Duel

#	Node_ID	Status
0	(1f, 1, 5)	No_Duel
1	(1f, 3, 2)	No_Duel

Duel in Progress - 1

- Duel is originated by "Duel_Request" command and it is generated by every Subnet Manager independently.
- The result of Duel is notified by "Duel_Result" command.



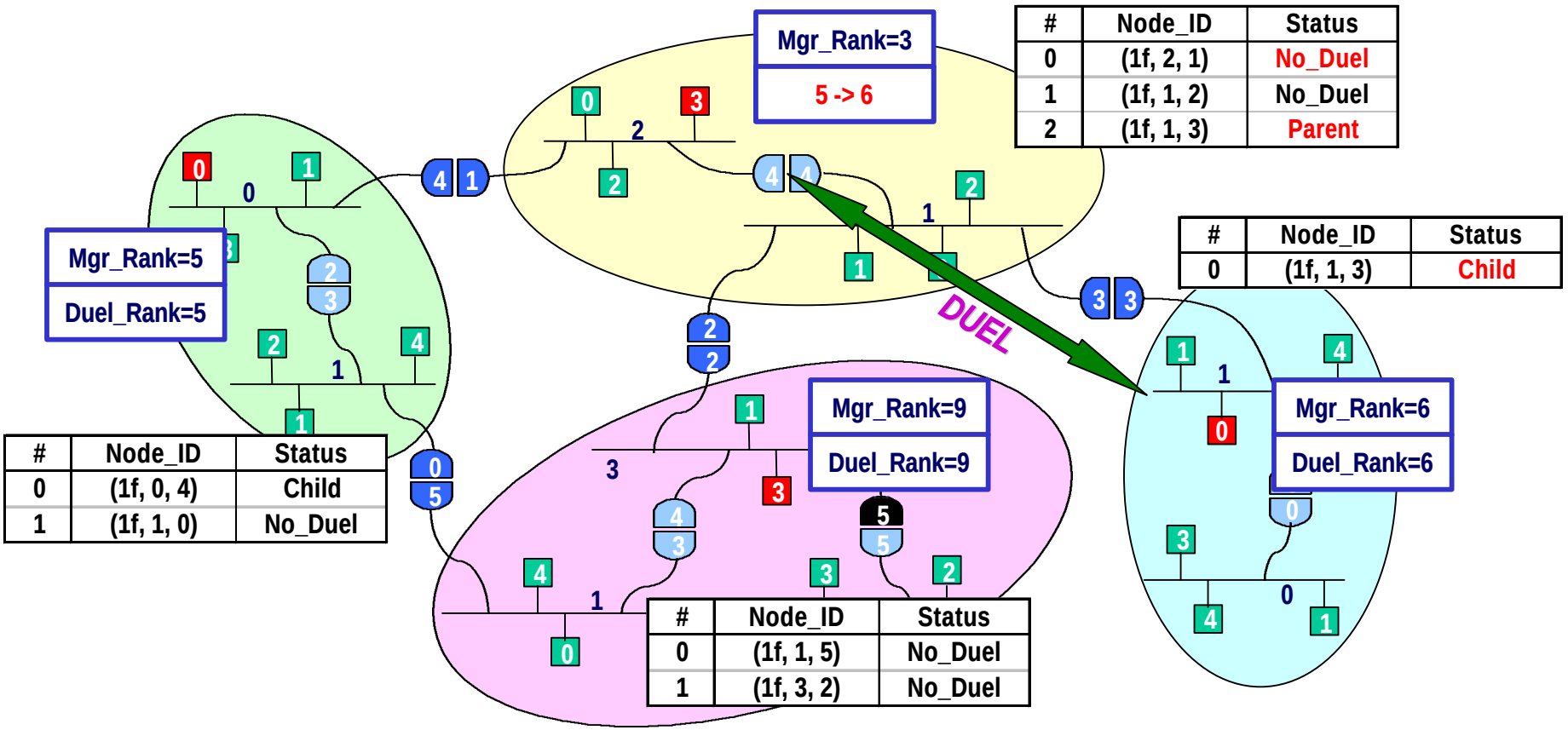
#	Node_ID	Status
0	(1f, 2, 1)	Parent
1	(1f, 1, 2)	No_Duel
2	(1f, 1, 3)	No_Duel

#	Node_ID	Status
0	(1f, 1, 3)	No_Duel

#	Node_ID	Status
0	(1f, 0, 4)	Child
1	(1f, 1, 0)	No_Duel

#	Node_ID	Status
0	(1f, 1, 5)	No_Duel
1	(1f, 3, 2)	No_Duel

Duel in Progress - 2



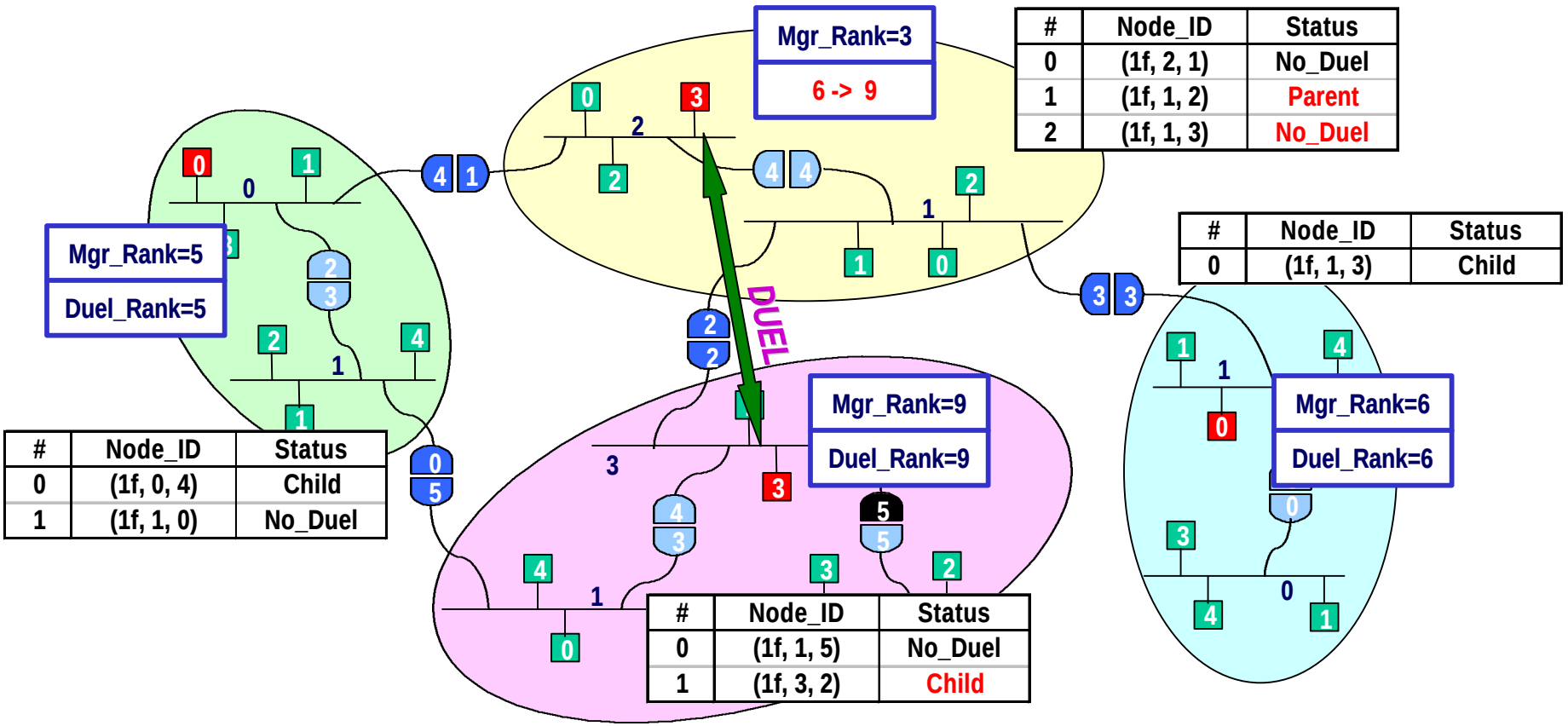
#	Node_ID	Status
0	(1f, 2, 1)	No_Duel
1	(1f, 1, 2)	No_Duel
2	(1f, 1, 3)	Parent

#	Node_ID	Status
0	(1f, 1, 3)	Child

#	Node_ID	Status
0	(1f, 0, 4)	Child
1	(1f, 1, 0)	No_Duel

#	Node_ID	Status
0	(1f, 1, 5)	No_Duel
1	(1f, 3, 2)	No_Duel

Duel in Progress - 3



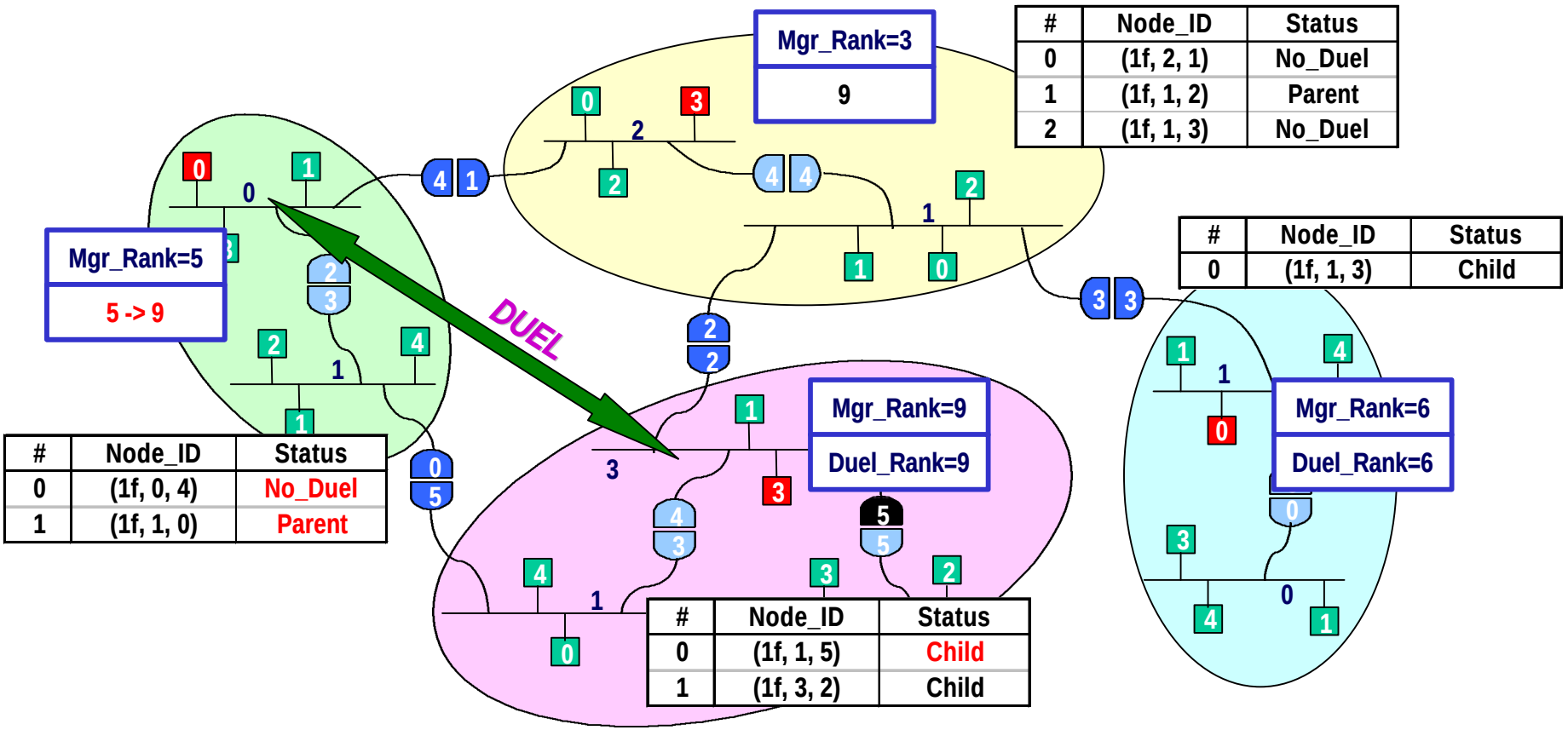
#	Node_ID	Status
0	(1f, 2, 1)	No_Duel
1	(1f, 1, 2)	Parent
2	(1f, 1, 3)	No_Duel

#	Node_ID	Status
0	(1f, 1, 3)	Child

#	Node_ID	Status
0	(1f, 0, 4)	Child
1	(1f, 1, 0)	No_Duel

#	Node_ID	Status
0	(1f, 1, 5)	No_Duel
1	(1f, 3, 2)	Child

Duel in Progress - 4



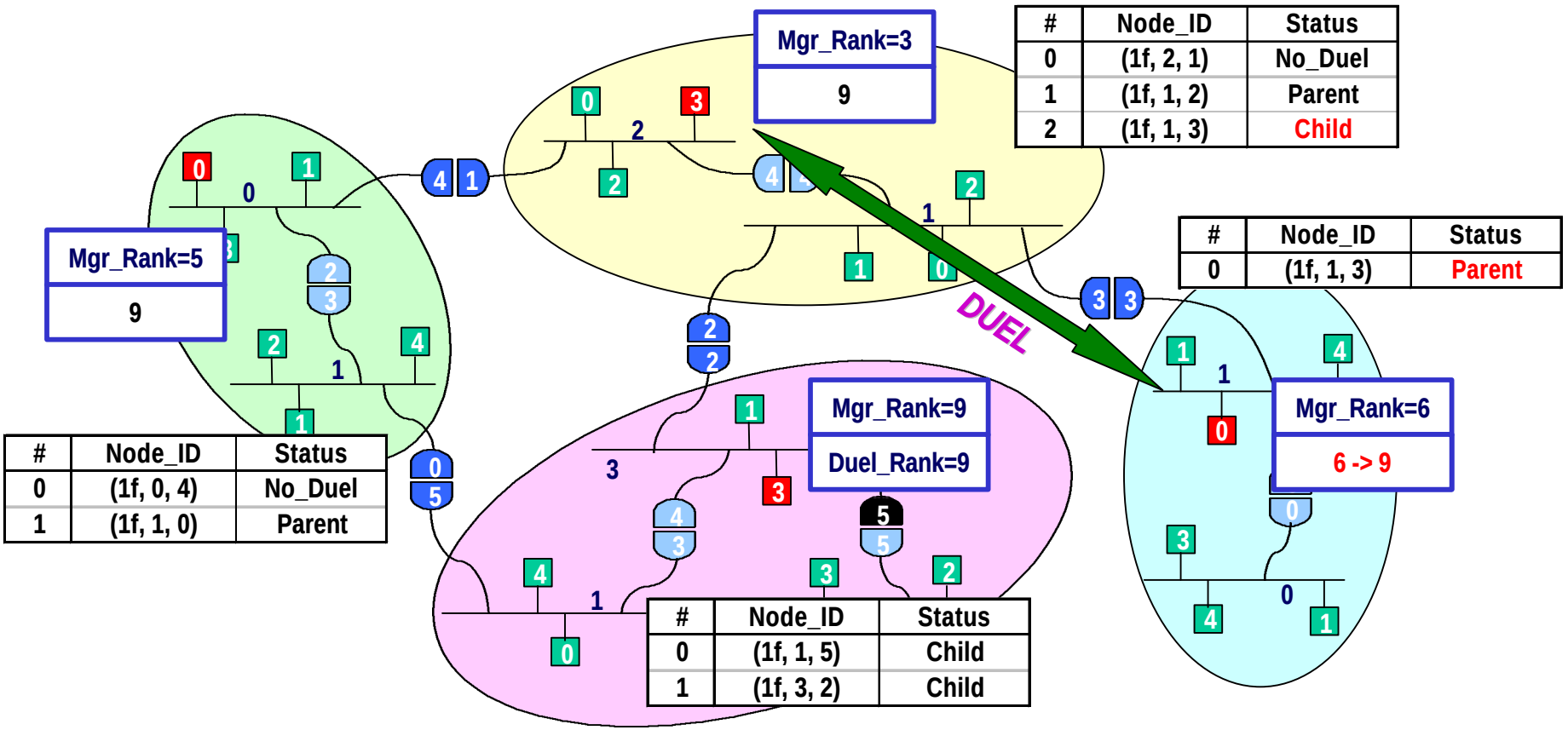
#	Node_ID	Status
0	(1f, 2, 1)	No_Duel
1	(1f, 1, 2)	Parent
2	(1f, 1, 3)	No_Duel

#	Node_ID	Status
0	(1f, 1, 3)	Child

#	Node_ID	Status
0	(1f, 0, 4)	No_Duel
1	(1f, 1, 0)	Parent

#	Node_ID	Status
0	(1f, 1, 5)	Child
1	(1f, 3, 2)	Child

Duel in Progress - 5



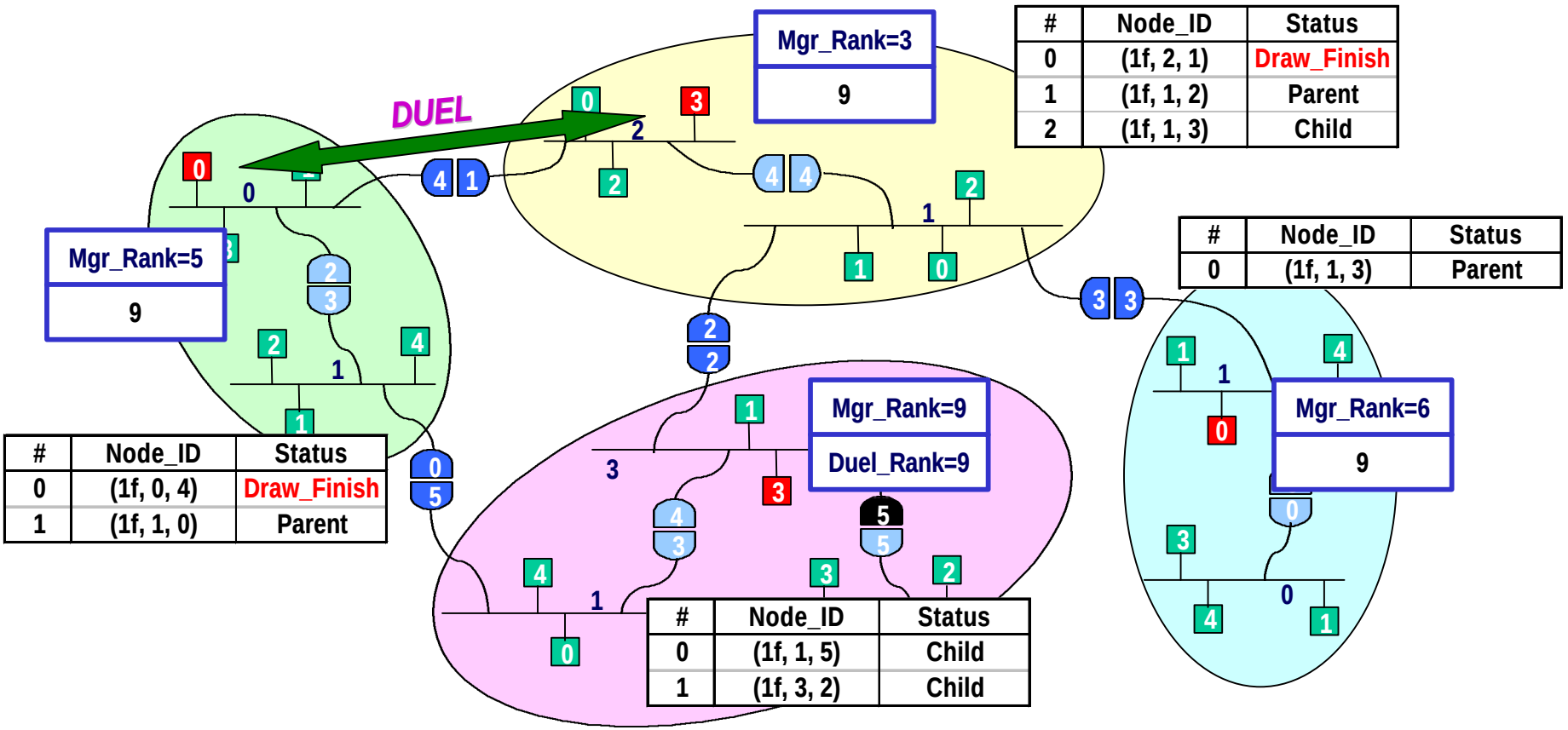
#	Node_ID	Status
0	(1f, 2, 1)	No_Duel
1	(1f, 1, 2)	Parent
2	(1f, 1, 3)	Child

#	Node_ID	Status
0	(1f, 1, 3)	Parent

#	Node_ID	Status
0	(1f, 0, 4)	No_Duel
1	(1f, 1, 0)	Parent

#	Node_ID	Status
0	(1f, 1, 5)	Child
1	(1f, 3, 2)	Child

Duel in Progress - 6

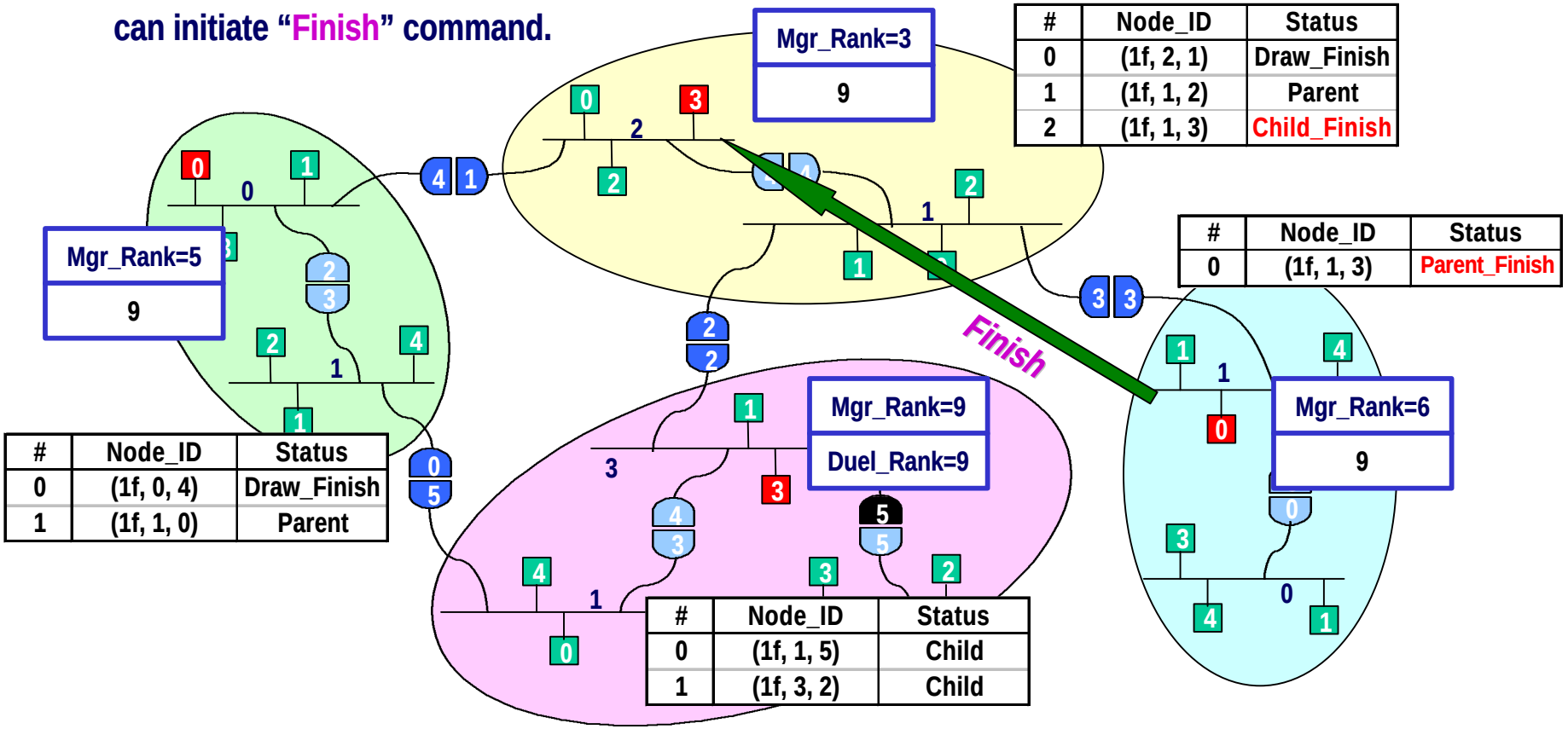


Duel in Progress - 7

Those Subnet Managers whose Status :

- doesn't contain "No_Duel" nor "Child" and
- contains "Parent"

can initiate "Finish" command.



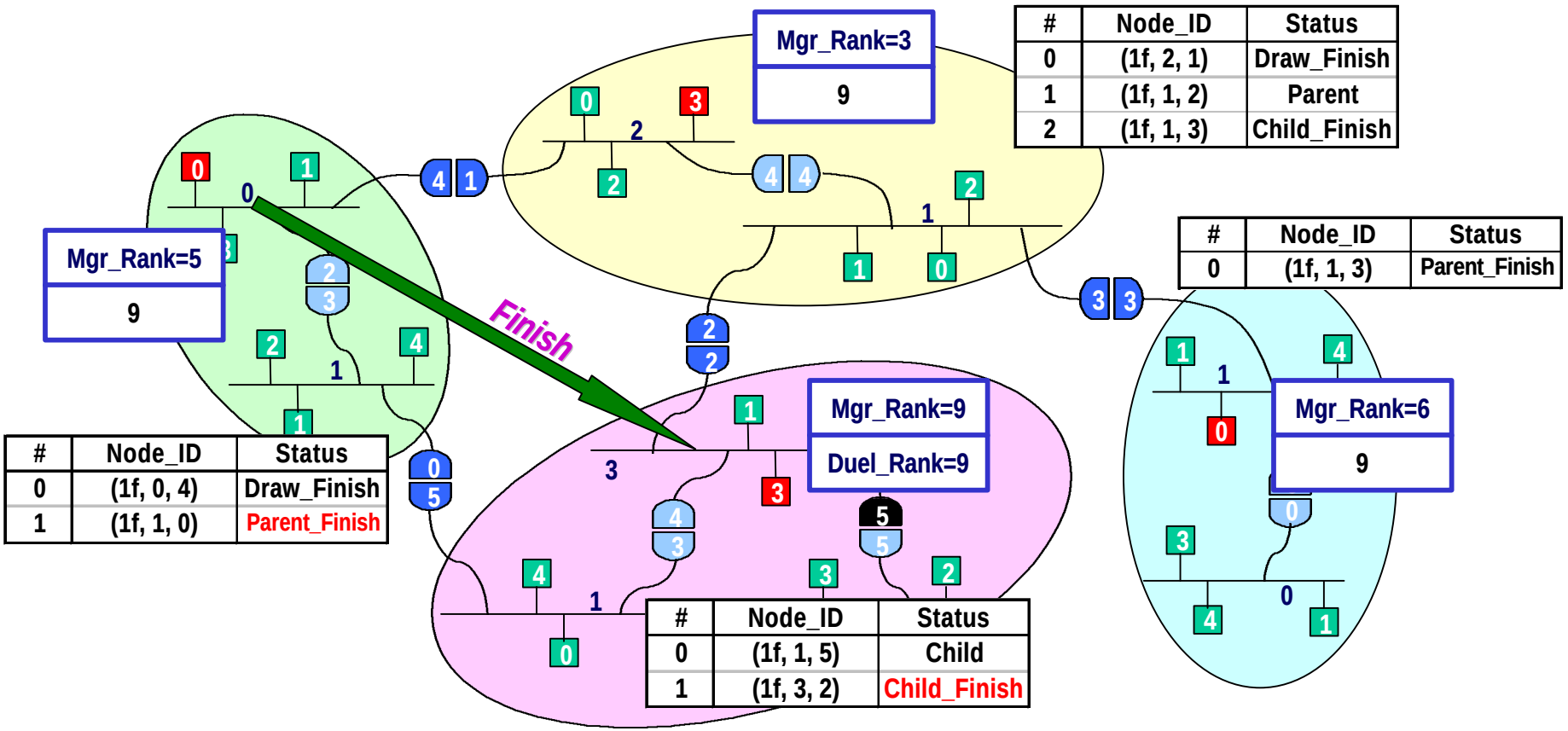
#	Node_ID	Status
0	(1f, 2, 1)	Draw_Finish
1	(1f, 1, 2)	Parent
2	(1f, 1, 3)	Child_Finish

#	Node_ID	Status
0	(1f, 1, 3)	Parent_Finish

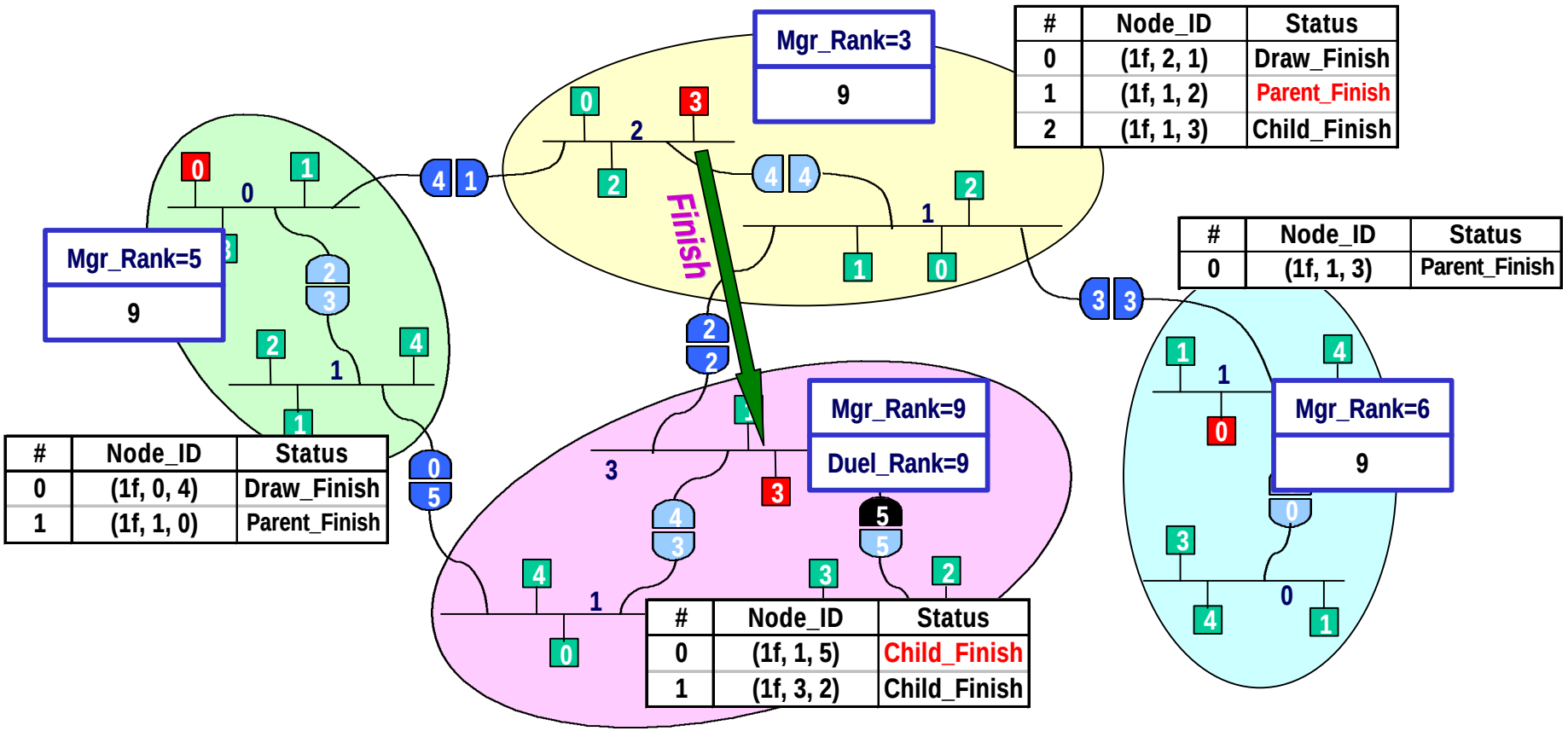
#	Node_ID	Status
0	(1f, 0, 4)	Draw_Finish
1	(1f, 1, 0)	Parent

#	Node_ID	Status
0	(1f, 1, 5)	Child
1	(1f, 3, 2)	Child

Duel in Progress - 8



Duel in Progress - 9



#	Node_ID	Status
0	(1f, 2, 1)	Draw_Finish
1	(1f, 1, 2)	Parent_Finish
2	(1f, 1, 3)	Child_Finish

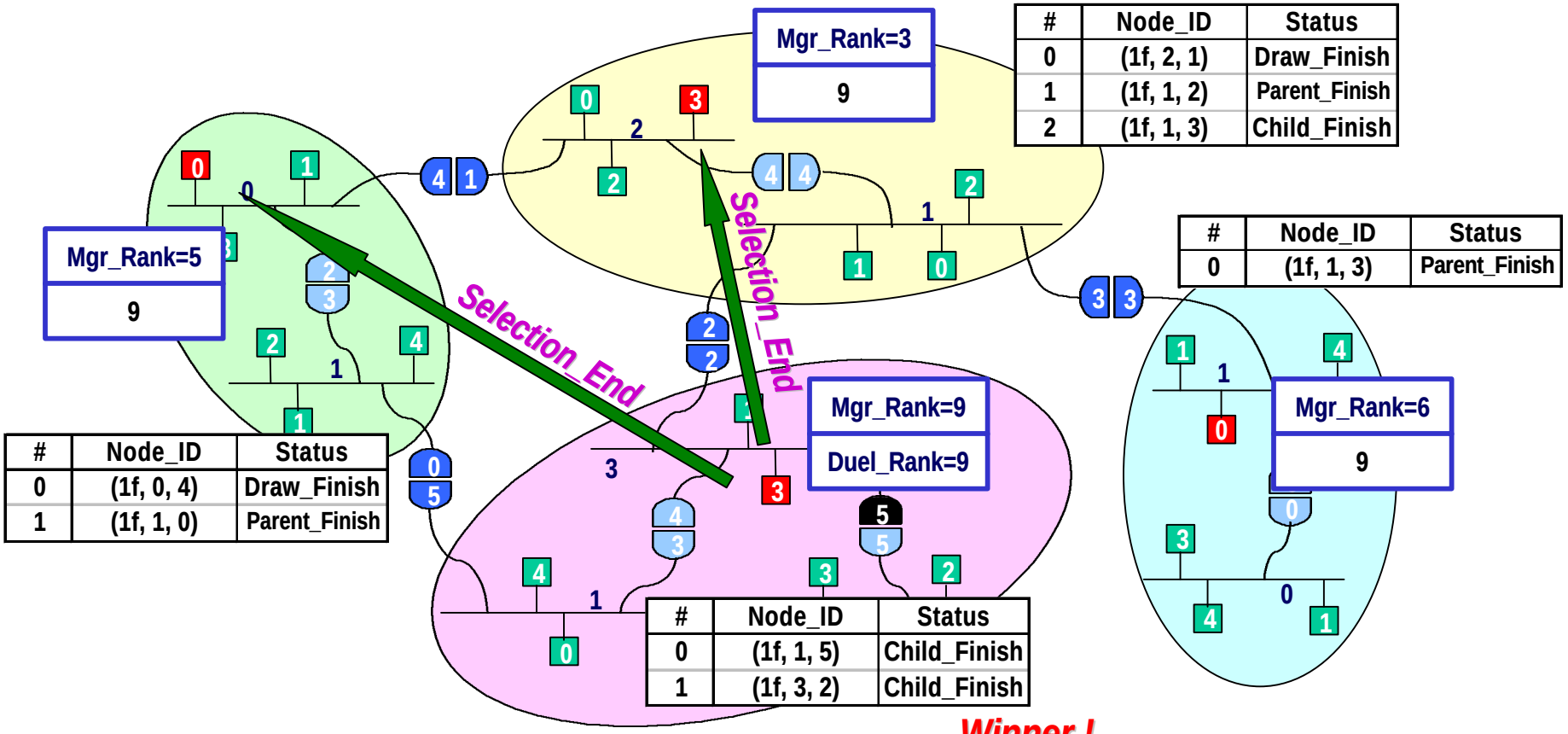
#	Node_ID	Status
0	(1f, 1, 3)	Parent_Finish

#	Node_ID	Status
0	(1f, 0, 4)	Draw_Finish
1	(1f, 1, 0)	Parent_Finish

#	Node_ID	Status
0	(1f, 1, 5)	Child_Finish
1	(1f, 3, 2)	Child_Finish

Duel in Progress - 10

The Subnet Manager whose Status only contains either "Child_Finish" or "Draw_Finish" becomes the Net Manager and the Net Manager initiates "Selection_End" command to all of neighbors.



#	Node_ID	Status
0	(1f, 2, 1)	Draw_Finish
1	(1f, 1, 2)	Parent_Finish
2	(1f, 1, 3)	Child_Finish

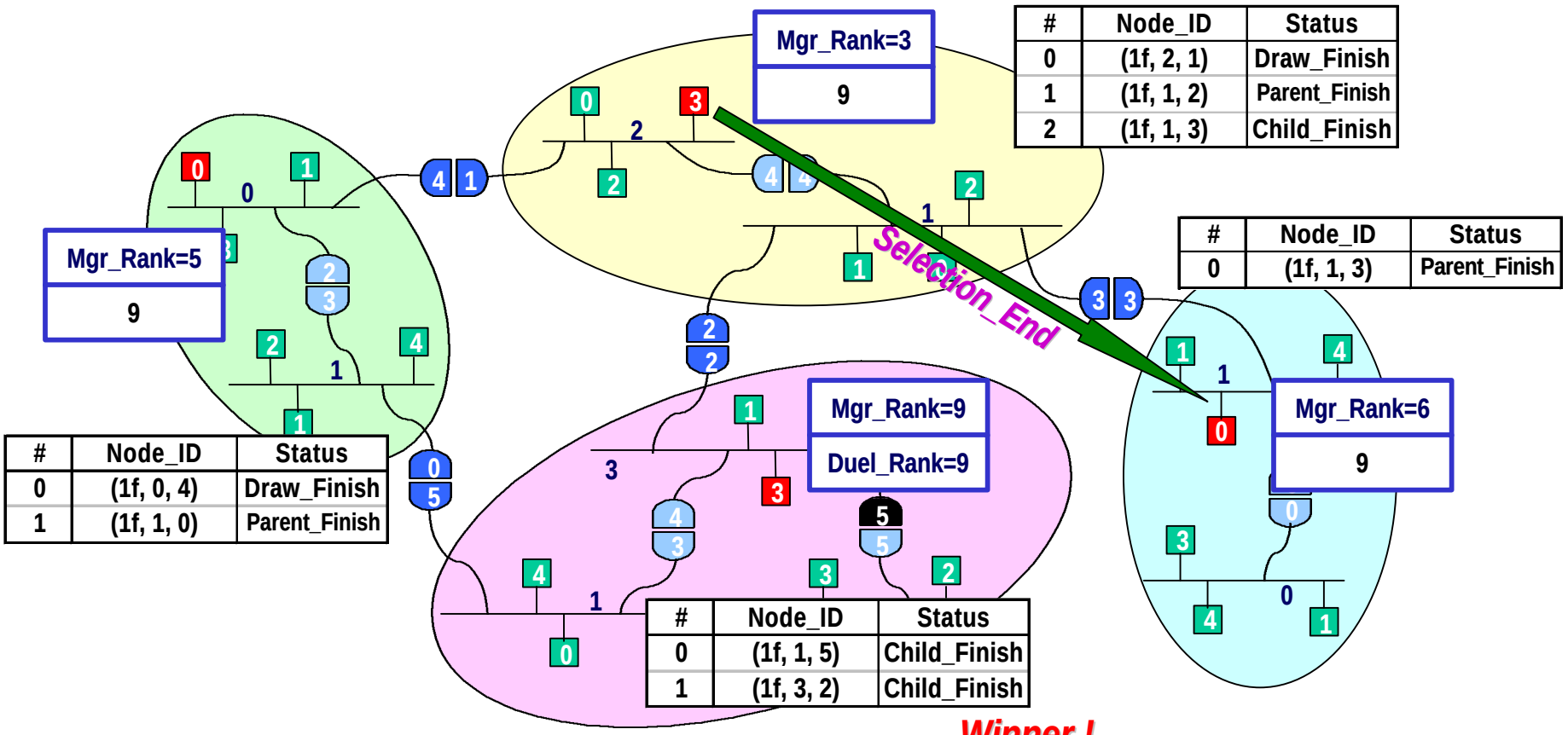
#	Node_ID	Status
0	(1f, 1, 3)	Parent_Finish

#	Node_ID	Status
0	(1f, 0, 4)	Draw_Finish
1	(1f, 1, 0)	Parent_Finish

#	Node_ID	Status
0	(1f, 1, 5)	Child_Finish
1	(1f, 3, 2)	Child_Finish

Duel in Progress - 11

Upon receiving "Selection_End", it propagates "Selection_End" to the subnet manager whose status is "Child_Finish", if any.



#	Node_ID	Status
0	(1f, 2, 1)	Draw_Finish
1	(1f, 1, 2)	Parent_Finish
2	(1f, 1, 3)	Child_Finish

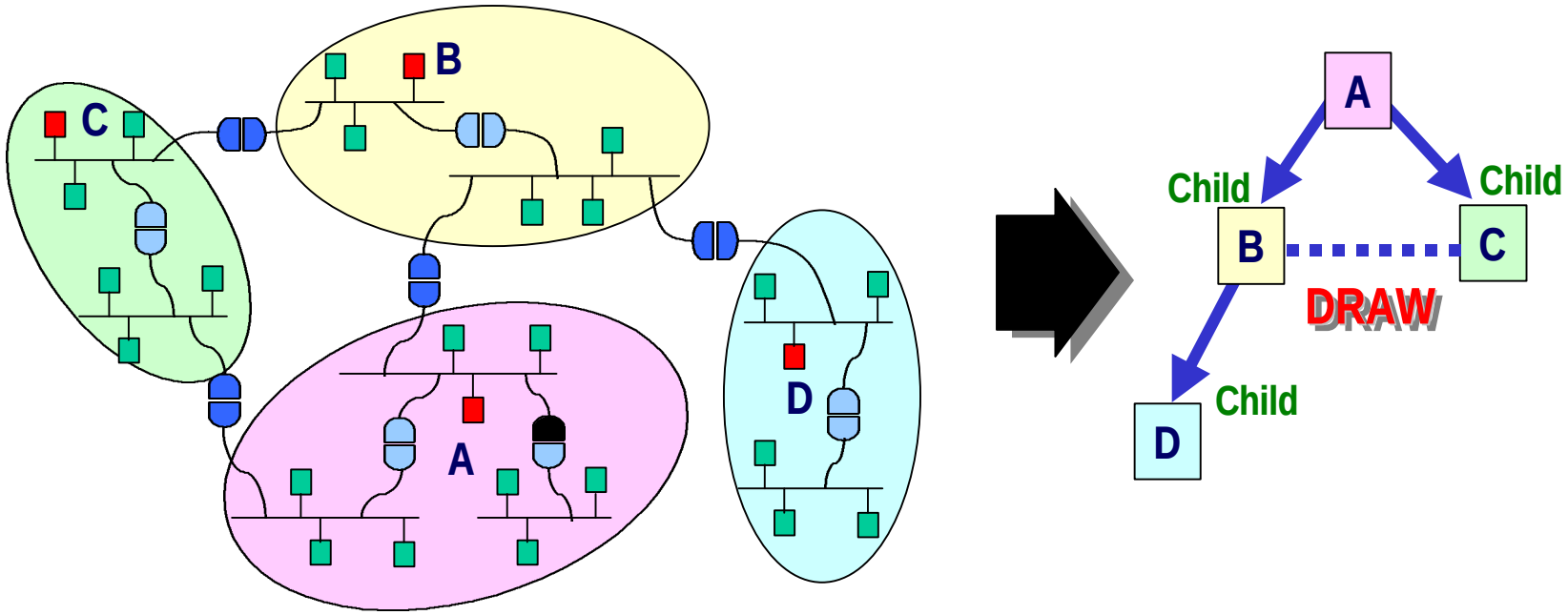
#	Node_ID	Status
0	(1f, 1, 3)	Parent_Finish

#	Node_ID	Status
0	(1f, 0, 4)	Draw_Finish
1	(1f, 1, 0)	Parent_Finish

#	Node_ID	Status
0	(1f, 1, 5)	Child_Finish
1	(1f, 3, 2)	Child_Finish

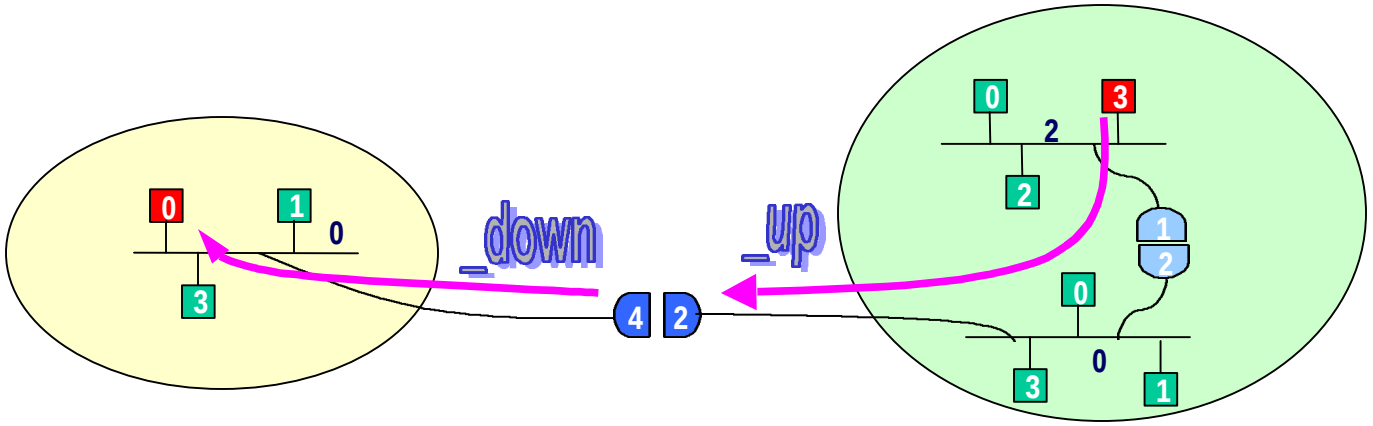
Duel Result

1) The winner A is the Net Manager
2) The net is logically broken down as a tree structure
3) Status information could be used for Net Configuration



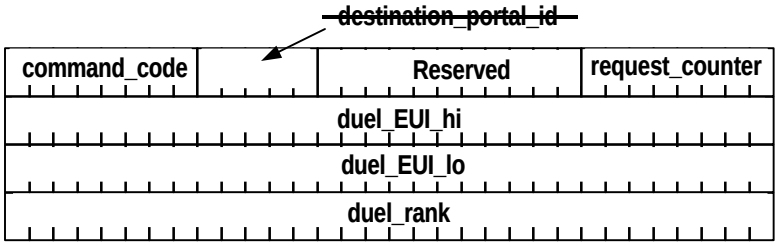
Command and Status Summary

- Commands
  - duel_request_up / _down Duel origination
  - duel_result_up / _down Response with duel result
  - finish_up / _down Finish notification from the winner
  - selection_end_up / _down Finish notification from a loser to the other losers

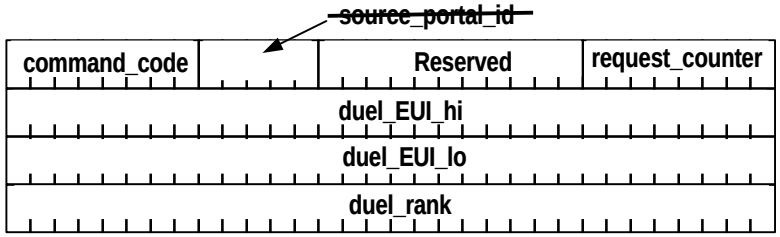


Command List - 1

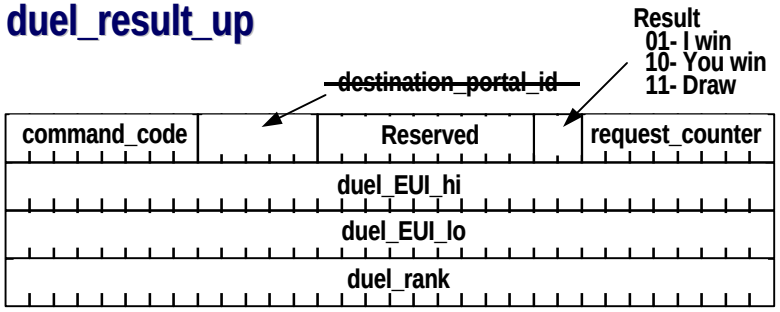
duel_request_up



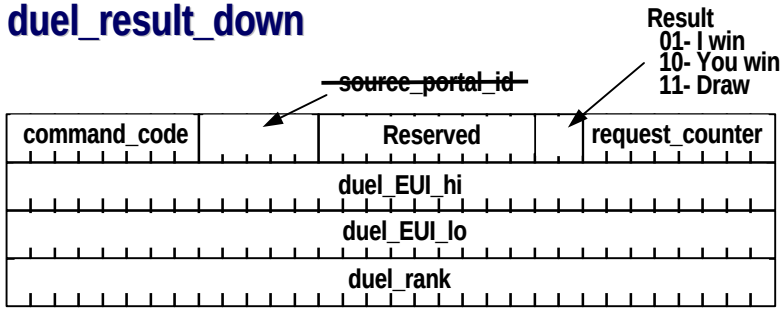
duel_request_down



duel_result_up

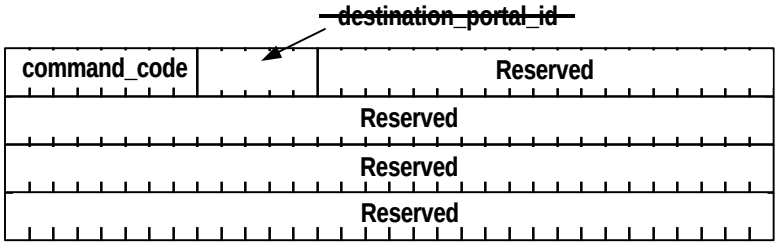


duel_result_down

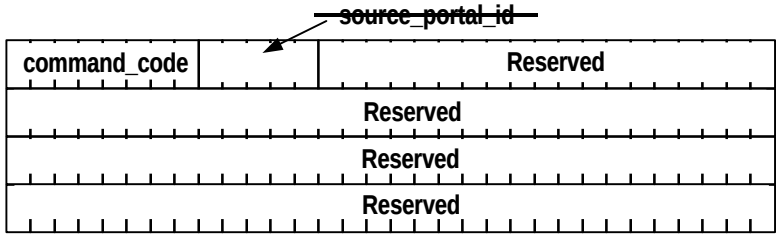


Command List - 2

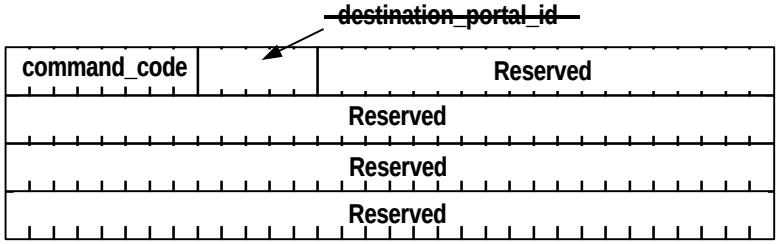
finish_up



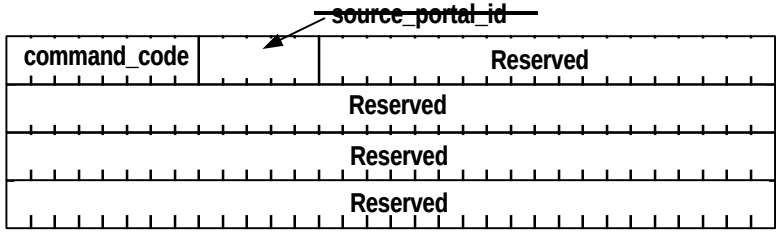
finish_down



selection_end_up



selection_end_down

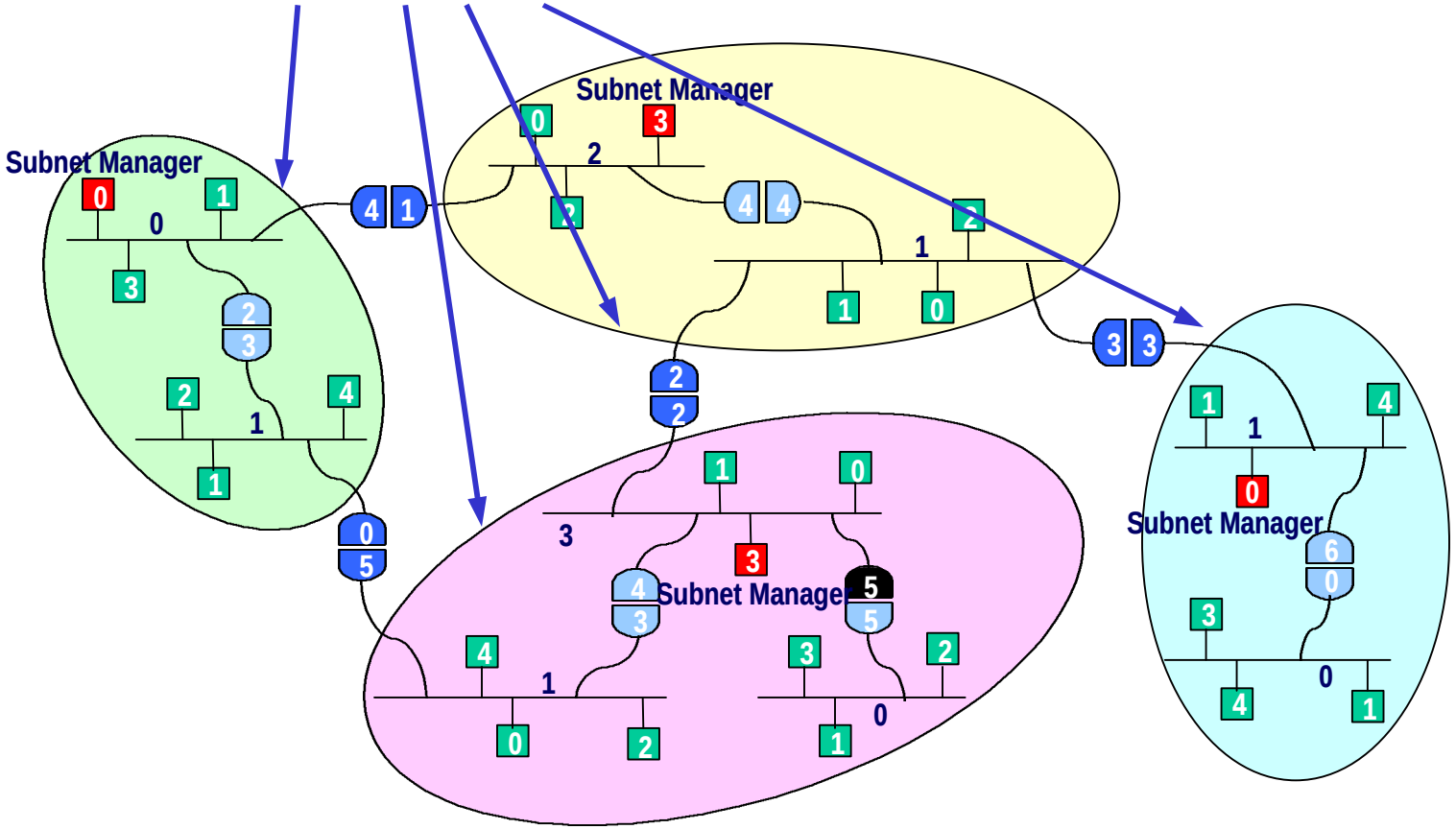


Open Issue

- What makes the boundary between subnets?
  - “Loose Coupled Bridge” for wireless was implicit boundary but ...
  - The boundary should exist before the Subnet Manager selection starts
- Ideas
  - Boundary between subnets should be specified either :
    - Two different products: 1) Inter-Bus Bridge or 2) Inter-Subnet Bridge
      - Users has to decide which one has to be fit for the use
    - Putting dip-switch with user configurable
      - Sounds against “Plug and Play”, however, such a large network needs some level of user configuration anyway
    - Automatic configuration to build subnets
      - Very difficult !

Subnet Architecture

Who specifies those boundaries ?



Conclusion

- Introduced the advantages of subnet structure
  - Simplicity in terms of its hardware and software structure
- Specified detail algorithm of Net Manager Selection
- Further Study
  - Subnet Manager Selection Scheme
  - Trigger of the start of the selection
  - Subnet boundary issue