



# General Router Management Protocol (GRMP) Version 1

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# INTRODUCTION

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- Submitted as a proposal for ForCES protocol
  - To meet all ForCES requirements
  - As a base protocol, with FE model as protocol Data Model
  - Developed separately from GSMP, but has been considering its possible compatibility with GSMP

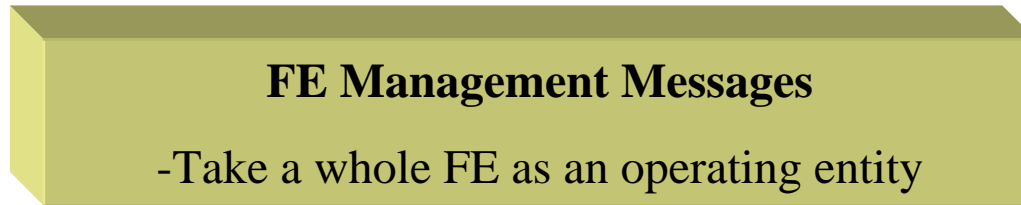


# MESSAGES IN GRMP

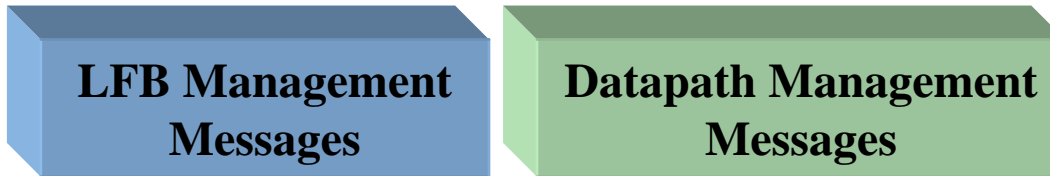
# Organizing Messages

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## FE Coarse Layer



## FE Fine Layer



## Protocol Layer and Others





# Reliability Consideration

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- Built-in Error Control Mechanism
  - Normal Level  
Result, Code + ACK message
    - for error control of message processing as well as transmission to increase protocol reliability.
  - Strengthened Level  
CRC-32 checksum + Normal Level
- Some other means

# Security Consideration

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- To prevent man-in-the-middle attack between CE and FE
  - GRMP Recommends IPsec and TLS as security exchange protocol for IP based medium
  - Can be turned off for all-in-one-box case
  - Need more work for other mediums
- To prevent DoS attack
  - DoS protection mechanism
- To prevent FE join or leave flood
  - In GRMP, CE does not have to explicitly response FE join or leave request messages. The requests can even be ignored by CE if it finds something abnormal.

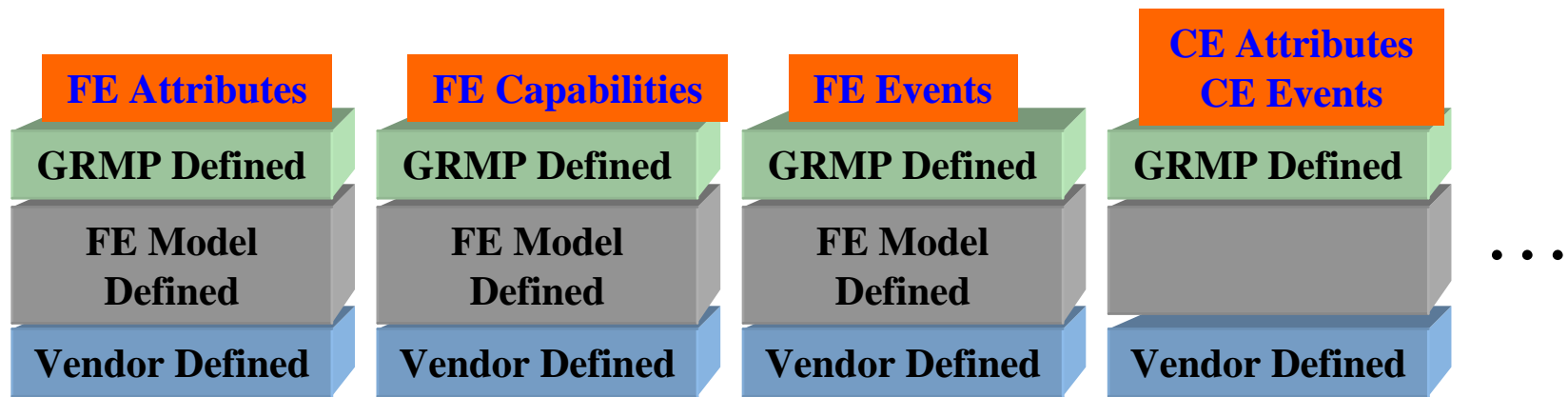




# OBJECTS IN GRMP

# Organizing Objects

Object Class



Object Types

# FE Management

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- FE Join, Leave Request Message
- FE Topology Query and Response Messages
- FE Capability Query and Response Messages
- FE Action Manipulate Message
  - FE Add, Delete, Modify, Join reject, Up, Down, Active, Inactive, etc
- FE Attribute Manipulate, Query and Response Messages
  - FE Attribute add, delete, modify
  - Allow to manipulate several FE attributes in one message
- FE Event Report Message
  - FE state event (up, down, failover, etc), LFB state event , FE heartbeat, FE capability change, FE DoS attack alert, etc.

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# LFB Management

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- LFB Action Manipulate Message
  - LFB Add (with topology), Delete, Modify, Up, Down, Active, Inactive, etc.
- LFB Topology Query and Response Messages
  - Based on PkfIDs topology representation
  - Can query a whole LFB topology, or a single LFB for its topology information
- LFB Attribute Manipulate, Query and Response Message
  - LFB Attribute Add, Delete, modify, etc.

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# Datapath Management

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- Datapath Manipulate Message
- Datapath Query and Response Messages
  - Based on PkfIDs
  - Datapath Add, Delete, Modify, etc.
  - Datapath state query
    - Query all datapaths for their states = Query the whole LFB topology

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# Protocol and Other Managements

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- GRMP ACK Message
- GRMP Packet Redirection Messages
- GRMP Batch Messages
- CE Query Request and Response Message
  - (Request) to query CE attributes
- CE Event Report Message
  - Such as
    - CE state event report (Up, Down, failover, etc)
    - CE heartbeat
- Managed Object (MO) Management Messages
  - Support Network Management Tools like SNMP

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# Object Types

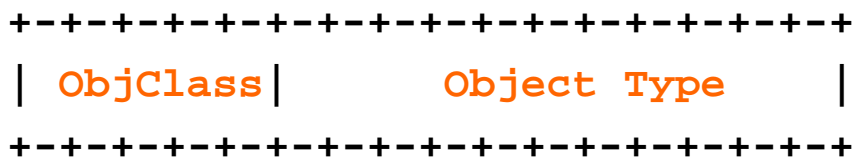
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- FE capabilities
- FE attributes
- FE events
- LFB types
- LFB attributes
- CE attributes
- CE events
- .....

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# Object Class

- To describe who has defined the object
- Use a 5bits prefix to express



With object type, forms a complete object identifier.

## ObjClass Value

0	GRMP defined objects
1 - 15	ForCES FE model defined objects, the number can represent the model version.
16	Vendors defined objects

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# GRMP Defined FE Capabilities

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- FE Supported GRMP Version
- FE Supported object classes (FE model with its version, vendors, etc)
- FE Port Capability
- FE Memory Space

(May change according to FE model work progress)

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# GRMP Defined FE Events

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- FE status event (FE up, down or leave, active, inactive, failover)
- LFB status event (LFB up, down, active, inactive, failover)
- FE heartbeat
- FE port change
- FE memory change
- FE DoS attack alert (with some attacker information)

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# GRMP Defined CE Attributes and Events

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- CE attributes

- To be done

- CE events

Currently defines:

- CE status event (CE up, down or leave, active, inactive, failover)
- CE heartbeat

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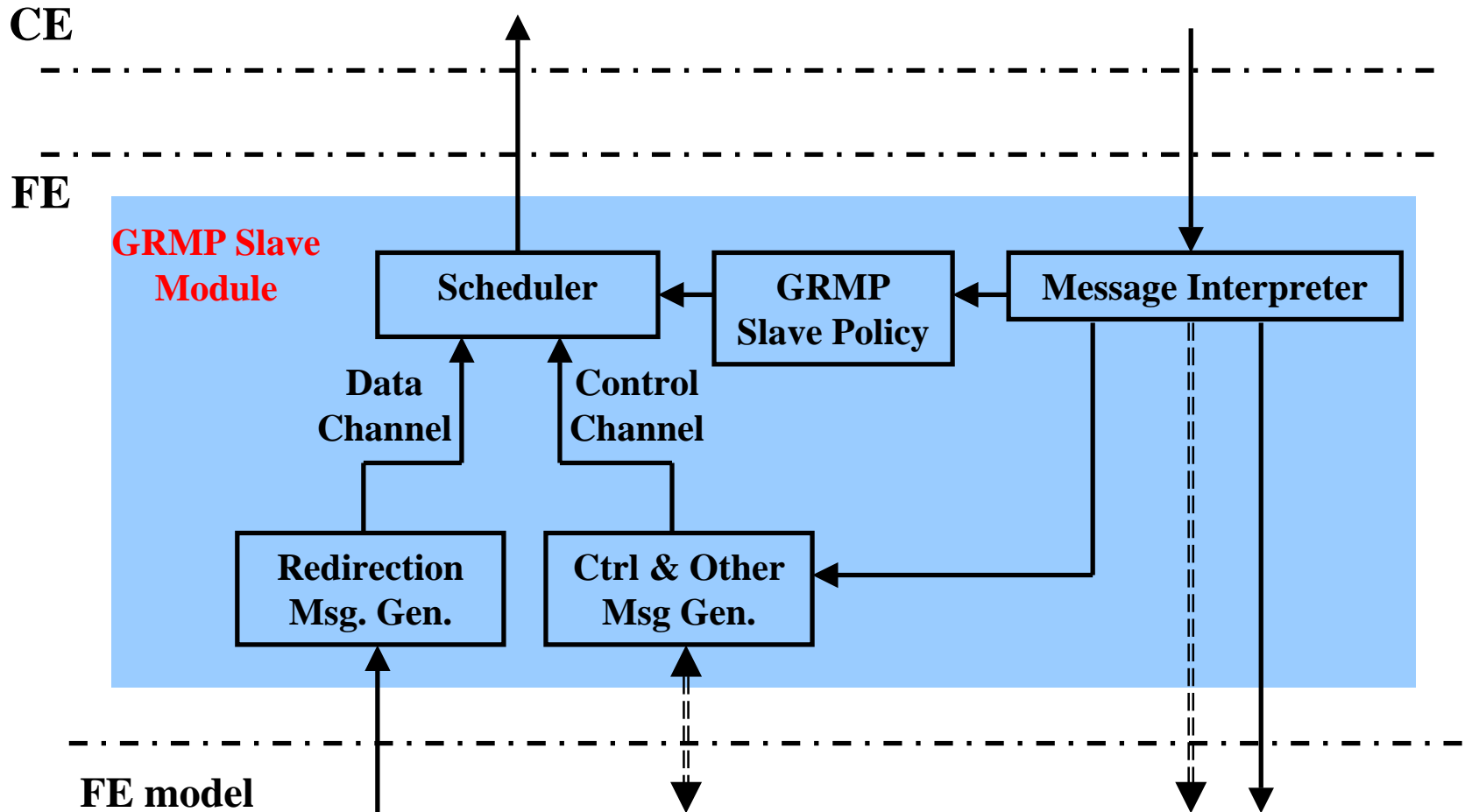
# GRMP Defined FE Attributes

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- DoS protection policy
- DoS attack alert policy
- CE failover or leave policy
- FE failover and rejoin policy
- FE heartbeat policy
- GRMP protocol version assignment
- Register for FE event report
- Current Transaction Identifies

For **GRMP Slave Module**  
Management

# Model of GRMP Slave Module



# DoS Protection Policy

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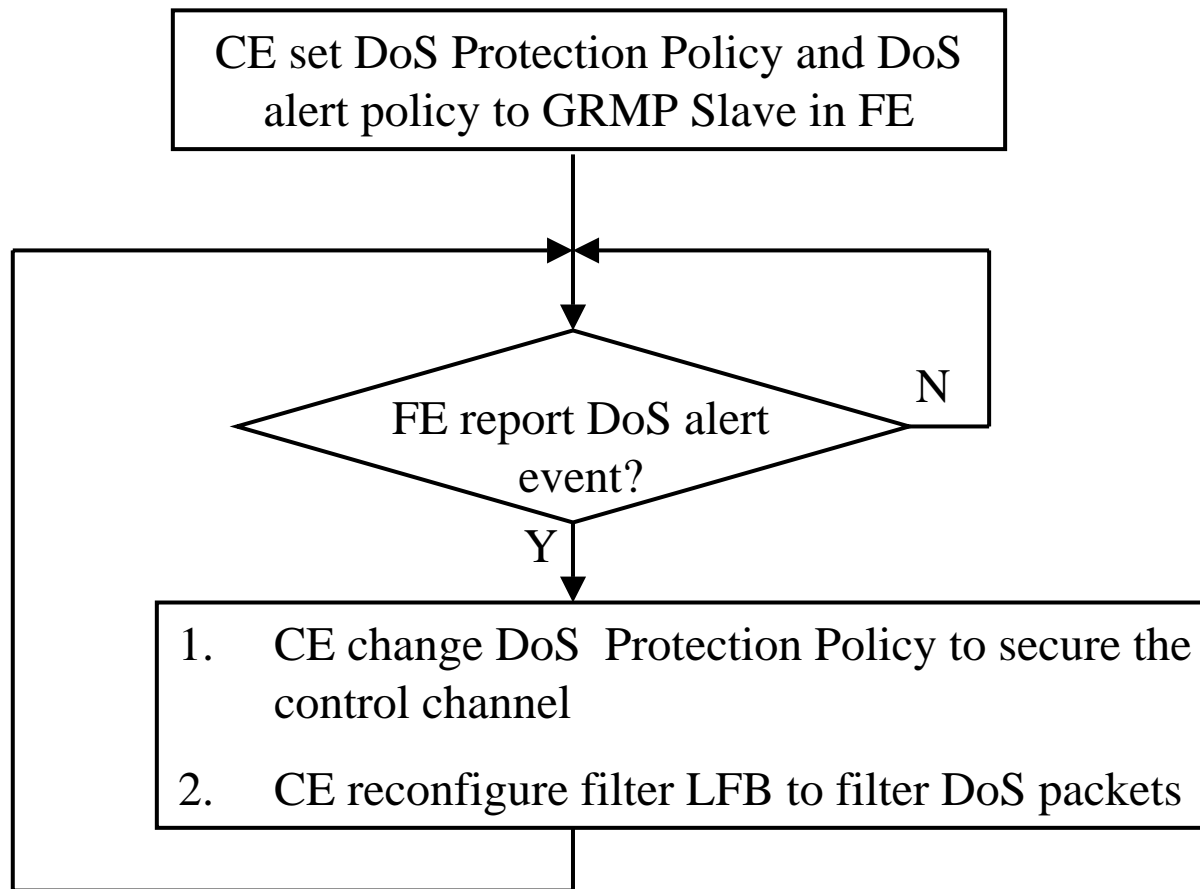
- To setup some scheduling discipline for Data channel and Control channel to control traffic of the channels so as to perform DoS protection.
- Currently defines scheduling disciplines based on:
  - Priority
  - Bandwidths

# DoS Attack Alert Policy

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- To monitor the scheduler to get traffic information so as to capture possible DoS attack.
- Currently define:
  - No attack alert
  - Monitoring Data channel state. If it has been overloaded for a preset time period, DoS attack is considered.

# GRMP Scheme for DoS Protection





# CE Failover or Leave Policy

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- Tell FE what to do when CE fails or leaves
- Currently defines policies like:
  - FE graceful restart for a period then go down if CE has not restarted or a new CE has not been found.
  - FE go down immediately.
  - FE go inactive for a period then go down if CE has not restarted or a new CE has not been found.
  - Policies for FE to find a new work CE:
    - Just wait for old CE to restart
    - Search a new CE among the associated CE list.

# FE Failover and Rejoin Policy

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- Tell FE how to act and how the CE will act in case the FE fails and has an intention to restart (rejoin the NE).
  - Just restart the FE from scratch.
  - Ask the FE to recall as many as possible information when it restarts.

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