



General Router Management Protocol (GRMP) Version 1

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INTRODUCTION

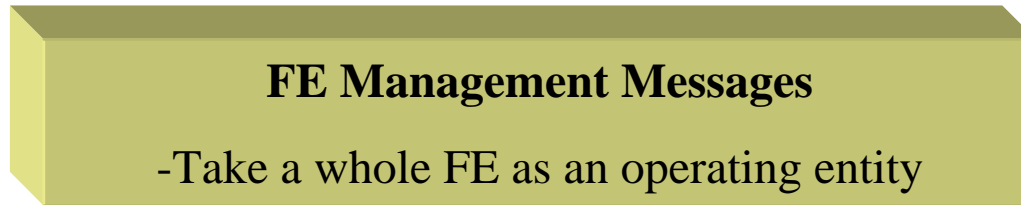
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- Submitted as a proposal for ForCES protocol
 - To meet all ForCES requirements
 - As a base protocol, with FE model as protocol Data Model
 - Developed separately from GSMP, but has been considering its possible compatibility with GSMP



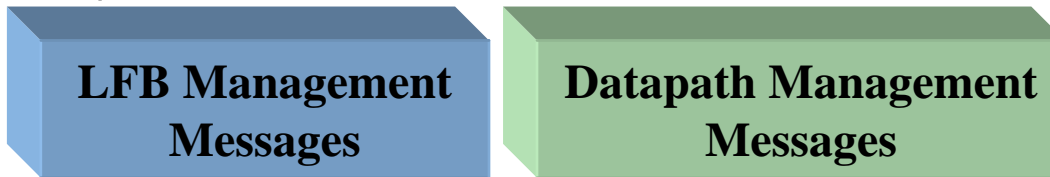
MESSAGES IN GRMP

Organizing Messages

FE Coarse Layer



FE Fine Layer



Protocol Layer and Others



Reliability Consideration

- 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

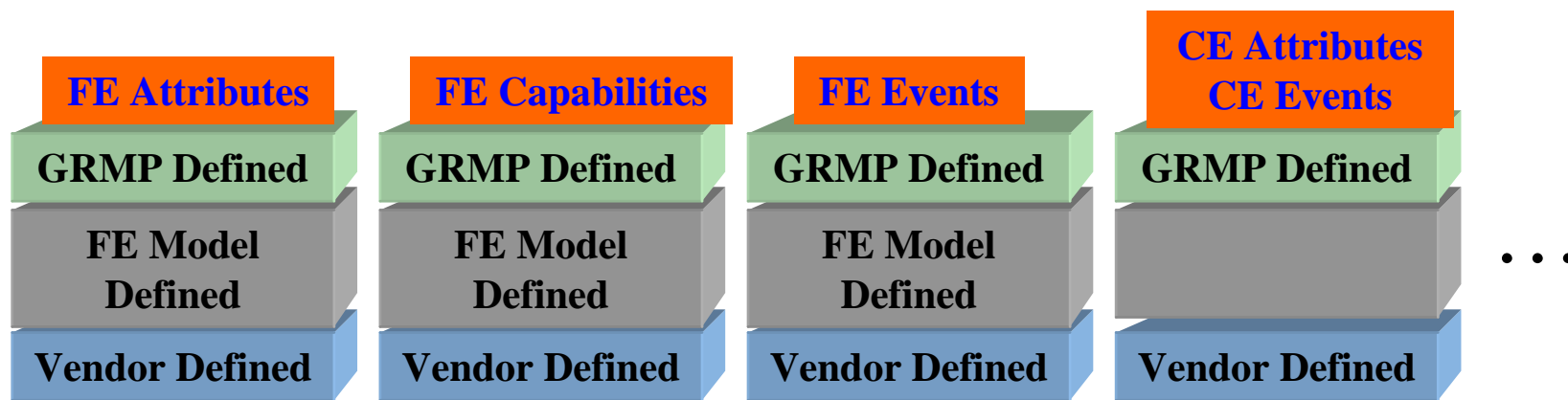
- To prevent man-in-the-middle attack between CE and FE
 - GRMP Recommends IPsec and TLS as security exchange protocol for IP based medium
 - Can be turned off for all-in-one-box case
 - Need more work for other mediums
- To prevent DoS attack
 - DoS protection mechanism
- To prevent FE join or leave 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

- 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

- 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

- 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

- 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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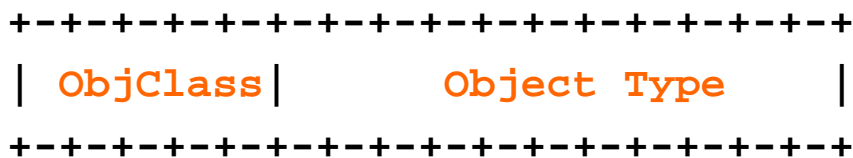
Object Types

- 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

- 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

- 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

- CE attributes
 - To be done
- CE events
 - Currently defines:
 - CE status event (CE up, down or leave, active, inactive, failover)
 - CE heartbeat

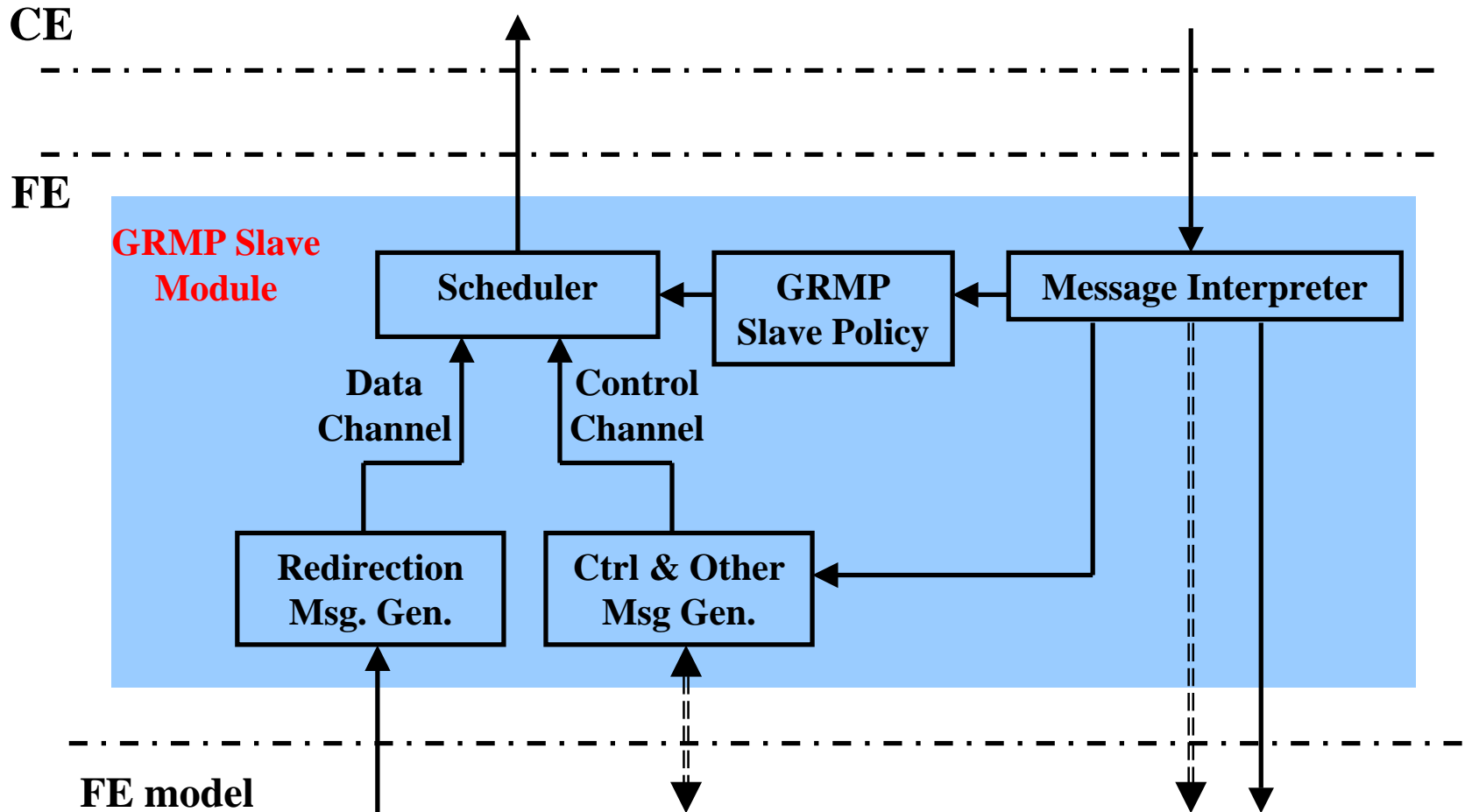
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GRMP Defined FE Attributes

- 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



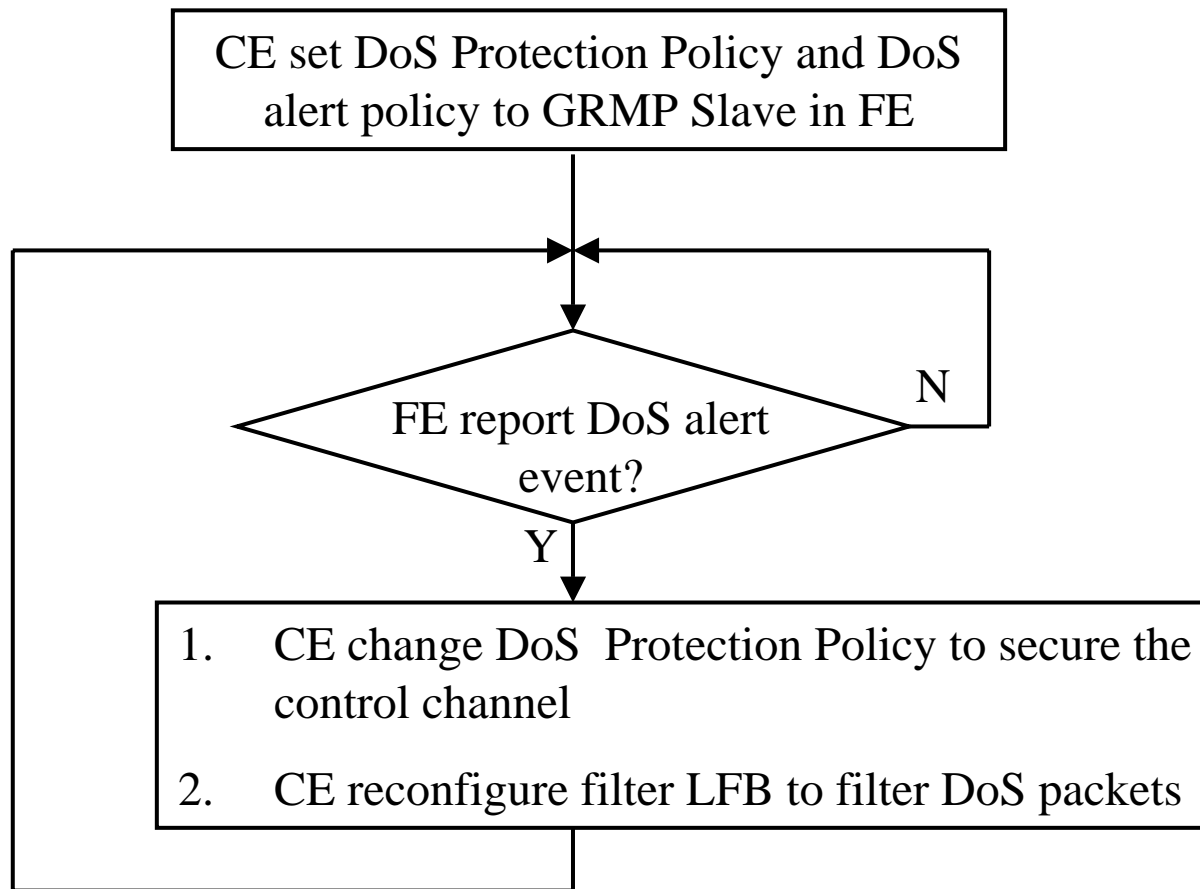
DoS Protection Policy

- 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

- 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

- 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

- 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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