Protocol for Forwarding Policy Configuration (FPC) in DMM
draft-ietf-dmm-fpc-cpdp-12

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What is this work about..?

• Enable the separation of a mobility network’s Control-Plane function from its Data-Plane function

• Enable distributed deployment of Control- and Data-Plane functions by abstracted Data-plane model and protocol messages

• Support multi-tenancy on a single real deployed D-plane network and multiple domains within a tenant
From IETF 101

• Determine if Service-Endpoints are eliminated and modify Service-Groups
  • Resolved during IETF 101 and update was sent out to ML
    (https://mailarchive.ietf.org/arch/msg/dmm/nJzgamhzHO0ULFKf4sjgRNEDsDY)

• Review YANG for NMDA compliance – Complete
  • Added language in Appendix
  • Changed configure statements

• More examples
  • Use of Service Groups during DPN selection
  • Policy Creation
  • DPN Policy Installation
  • Monitor lifecycle

• Editing passes
  • Service-Group resides under the Topology-Information-Mode
  • Domain now has a checkpoint and the Topology Information Model checkpoint was removed
Service-Groups

• Information model used to select an DPN interface(s) that will meet the needs for a FPC Client

• Considers
  • Protocol, e.g. pmip
  • Function, e.g. lma
  • Protocol message (sub)set, e.g. gtp-s5, gtp-s8
  • Features (and Settings) that MUST be known in order to successfully connect, e.g. a key feature MUST be turned OFF

• This is an information model – FPC does NOT decide who (Client or Agent) selects or how

| +-[Service-Group] <G-Key>, <Name> (O) <Set> |
| -+[Extensible: FALSE] |
| -+[Role] <U-Key> |
| -+[Protocol] <Set> |
| -+[Feature] <Set> (O) |
| -+[Service-Group-Configuration] <Set> (O) |
| -+[DPN-Key] <Set> |
|   | -+[Referenced-Interface] <Set> |
|   |     | -+[Interface-Key] <L-Key> |
|   |     | -+[Peer-Service-Group-Key] <Set> (O) |
Templates

• Simplify development and maintenance of the needed policies and other objects

• A Template Attribute Notation (Attribute Expression) is provided

Attribute Expression Notation

'[Att-Name:]' Mandatory Attribute is defined, but template does not provide any configured value.

'[Att-Name: Att-Value]' Mandatory Attribute is defined, and has a statically configured value.

'[Att-Name: ~ Att-Value]' Mandatory Attribute is defined, and has a default value.

'[Att-Name]' Non-mandatory Attribute may be included but template does not provide any configured value.

'[Att-Name = Att-Value]' Non-mandatory Attribute may be included and has a statically configured value.

'[Att-Name ~ Att-Value]' Non-mandatory Attribute may be included and has a default value.

+-[Template] <U-Key, Name> (M) <Set>
  |   +-[Attributes] <Set> (M)
  |   +-[Extensible ~ FALSE]
  |   +-[Entity-State ~ Initial]
  |   +-[Version]
Entity Configuration and Domain

Entity Configuration
• References a Template (Entity)
• Provides Attribute Expressions that further define/refine the Template

Domain
• A group of heterogeneous Topology resources typically sharing a common administrative authority.
• Other models, outside of the scope of this specification, provide the details for the Domain.
Policy

• Policy contains Rules (by reference) ordered by Precedence (search order)
  • Has a Configuration

• Rules
  • Contain Descriptors (by Reference) and Direction applied
  • Contains Actions (by Reference) executed by Order
  • Uses Descriptor-Match-Type (AND/OR) to note how the list of Descriptors is logically applied, an AND or OR list
  • Has a Configuration

• Descriptor – Template that describes traffic
• Action – Template that defines action to take on wrt a packet

+-[Policy Information Model]
  |  +-[Extensible:]
  |  |  +-[Policy-Template] <G-Key> (M) <Set>
  |  |  |  |  +-[Policy-Configuration] <Set> (O)
  |  |  |  |  |  +-[Rule-Template-Key] <List> (M)
  |  |  |  |  |  |  |  +-[Precedence] (M)
  |  |  |  |  +-[Rule-Template] <L-Key> (M) <Set>
  |  |  |  |  |  |  |  |  +-[Descriptor-Match-Type] (M)
  |  |  |  |  |  |  |  |  |  +-[Descriptor-Configuration] <Set> (M)
  |  |  |  |  |  |  |  |  |  |  +-[Direction] (O)
  |  |  |  |  |  |  |  |  |  |  |  +-[Action-Configuration] <Set> (M)
  |  |  |  |  |  |  |  |  |  |  |  |  |  +-[Action-Order] (M)
  |  |  |  |  |  |  |  |  |  |  |  |  |  |  +-[Rule-Configuration] (O)
  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  +-[Descriptor-Template] <L-Key> (M) <Set>
  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  +-[Descriptor-Type] (O)
  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  +-[Attribute-Expression] <Set> (M)
  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  +-[Action-Template] <L-Key> (M) <Set>
  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  +-[Action-Type] (O)
  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  +-[Attribute-Expression] <Set> (M)

Usage
Descriptors & Actions are created first, then Rules, then Policies.
Rule Configurations can refine/extend Actions/Descriptors.
Policy Configurations can refine/extend Rules/Actions/Descriptors.
DPNs

- Has interfaces categorized by Role, Protocols and Configurations
- Domain Reference
- Service-Groups it is part of
- DPN-Policy-Configuration
  - Policies installed on the DPN
- DPN-Resource-Mapping-Reference
  - A reference to the underlying implementation, e.g. physical node, software module, etc. that supports this DPN.

Policies MUST be created prior to installing them on a DPN in DPN-Policy-Configuration or DPN Interface (Interface-Configuration).
A DPN-Policy-Configuration or Interface-Configuration can refine/extend Policies/Rules/Actions/Descriptors.
Mobility Context

• Contains parent/child references
• Mobile Node Address(es) and Configuration
• Domain(s) used
• Service-Group(s) used
• DPNs where each has
  • Role used
  • DPN specific policy configuration (Policies)
• Service Data Flow(s)
  • Interface used
  • Configuration (Policies)
  • Direction

Policies MUST be created & installed on the DPN in DPN-Policy-Configuration or DPN Interface (Interface-Configuration).
All Mobility-Context Policy-Configurations (Mobile, DPN, Domain or ServiceDataFlow) can refine/extend Policies/Rules/Actions/Descriptors.
Monitors

• Target describes what is to be monitored
• Deferrable implies responses can be delayed for updates
• Configuration – Attributes determined by the Monitor sub-type (template). Defaults templates are:
  • Periodic (Report)
  • Event-List (Event Trigger)
  • Scheduled (Report)
  • Threshold (Triggered)
Monitor Operations

- Register-Monitors (Create)
- Deregister-Monitors (Delete)
- Probe (Force notification of the current Monitor state)
- All data is returned via NOTIFY
CONFIGURE & CONFIGURE-RESULT-NOTIFICATION

• Follows YANG-PATCH (RFC 8072) style request body & error responses
  • Asks for 1+ ‘edits’ (changes)
  • Edits can have different operations (next slide)

• In a response the Agent can have subsequent edits - those edits required to make the request work
  • Allows Client to only have to fill in part of the information and Agent can add other detail, e.g. Tunnel ID, IP Address, etc.

Simple request – All work completed quickly
- Notify-Follows: FALSE
- Immediate Response
  (maybe some data)

Complex request – All work cannot be completed quickly.
Send back priority data and rest later.
- Notify-Follows: TRUE
- CONFIGURE-RESULT-NOTIFICATION
  (result & rest of data)

Client

CONFIGURE

Agent

Immediate Response

Client

CONFIGURE

Agent

Notify-Follows: TRUE

Immediate Response

Client

CONFIGURE

Agent

Notify-Follows: FALSE

Immediate Response

Client

CONFIGURE

Agent

Notify-Follows: FALSE

Immediate Response

Client

CONFIGURE

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Notify-Follows: FALSE

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Agent

Notify-Follows: FALSE

Immediate Response

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CONFIGURE

Agent

Notify-Follows: FALSE

Immediate Response

Client

CONFIGURE

Agent

Notify-Follows: FALSE

Immediate Response

Client
# Operations

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>create</td>
<td>Creates a new data resource or Entity. If the resource exists an error is returned.</td>
</tr>
<tr>
<td>delete</td>
<td>Deletes a resource. If it does not exist an error is returned.</td>
</tr>
<tr>
<td>insert</td>
<td>Inserts data in a list or user ordered list.</td>
</tr>
<tr>
<td>merge</td>
<td>Merges the edit value with the target data resource; the resource is created if it does not exist.</td>
</tr>
<tr>
<td>move</td>
<td>Moves the target data resource.</td>
</tr>
<tr>
<td>replace</td>
<td>Replace the target data resource with the edit value.</td>
</tr>
<tr>
<td>remove</td>
<td>Removes a data resource if it already exists.</td>
</tr>
<tr>
<td>clone</td>
<td>Clones a data resource and places the copy at the new location. If the resource does not exist an error is returned.</td>
</tr>
</tbody>
</table>

FPC information model is a tree & contains lists so operations are designed to take advantage of this.

Clone it NOT a YANG-PATCH operation
Next Step

• Ask for expert review & feedback
Appendix
Service Group

|--rw service-group* [service-group-key role-key]
  |--rw service-group-key   fpc:fpc-identity
  |--rw service-group-name?  string
  |--rw role-key            identityref
  |--rw role-name?          string
  |--rw protocol*           identityref
  |--rw feature*            identityref
  |--rw service-group-configuration* [index]
    |--rw index              uint16
    |--rw (policy-configuration-value)?
    |    | ...                 |
    |--rw dpn* [dpn-key]
      |--rw dpn-key           fpc:fpc-identity
      |--rw referenced-interface* [interface-key]
        |--rw interface-key   fpc:fpc-identity
        |--rw peer-service-group-key* fpc:fpc-identity