# ZeroMQ Message Formats (Controller 🡨🡪 DP)

This document defines the messages shared between DPNs and Controllers. For information on how the **Topic** field values listed in the following tables are generated and shared, refer to the DPNLifecycle-start.docx file.

## Message Type Values

The following table shows the possible values for the **Message Type** field for the requests and responses listed in this document.

|  |  |
| --- | --- |
| **Message Type** | **Value** |
| Create Session | 1 |
| Update / Modify Bearer | 2 |
| Delete Session | 3 |
| DPN Response | 4 |
| DDN | 5 |
| DDN ACK | 6 |
| (Reserved for other session messages) | 7-9 |
| Assign Topic | 10 |
| Assign Conflict | 11 |
| DPN Status Indication | 12 |
| DPN Status ACK | 13 |
| Controller Status Indication | 14 |
| Generate CDR | 15 |
| Generate CDR Acknowledgement | 16 |
| ADC Rule | 17 |
| PCC Rule | 18 |

## Create Session Messages

The following fields appear in order, as shown in each table.

|  |  |  |
| --- | --- | --- |
| Create Session Request (Controller to DP) | | |
| **Field** | **Size in bytes** | **Notes** |
| Topic | 1 | DPN subscribes to this topic |
| Message Type | 1 | Create Value = 1 |
| IMSI | 8 | 64 bit unsigned integer |
| EBI | 1 |  |
| UE IP | 4 | 32 bit unsigned integer |
| S1U SGW GTPU TEID | 4 | 32 bit unsigned integer |
| S1U SGW GTPU IP | 4 | 32 bit unsigned integer |
| Session ID | 8 | 64 bit unsigned integer |
| Controller Topic | 1 | Controller subscribes to this topic |
| Client ID | 4 | 32 bit unsigned integer |
| OP ID | 4 | 32 bit unsigned integer |

|  |  |  |
| --- | --- | --- |
| Create Session Response / ACK (DP to Controller) | | |
| **Field** | **Size in bytes** | **Notes** |
| Topic | 1 | Controller subscribes to this topic |
| Message Type | 1 | DPN Response = 4 |
| Status | 1 | 3GPP 29.274 Table 8.4-1 Cause Values |
| Client ID | 4 | 32 bit unsigned integer |
| OP ID | 4 | 32 bit unsigned integer |

## Modify Bearer Messages

The following fields appear in order, as shown in each table.

|  |  |  |
| --- | --- | --- |
| Modify Bearer Request (Controller to DP) | | |
| **Field** | **Size in bytes** | **Notes** |
| Topic | 1 | DPN subscribes to this topic |
| Message Type | 1 | Update Value = 2 |
| S1U SGW GTPU IP | 4 | 32 bit unsigned integer |
| S1U ENB GTPU TEID | 4 | 32 bit unsigned integer |
| S1U ENB GTPU IP | 4 | 32 bit unsigned integer |
| Session ID | 8 | 64 bit unsigned integer |
| Controller Topic | 1 | Controller Subscribes to this topic |
| Client ID | 4 | 32 bit unsigned integer |
| OP ID | 4 | 32 bit unsigned integer |

|  |  |  |
| --- | --- | --- |
| Modify Bearer Response / ACK (DP to Controller) | | |
| **Field** | **Size in bytes** | **Notes** |
| Topic | 1 | Controller subscribes to this topic |
| Message Type | 1 | DPN Response = 4 |
| Status | 1 | 3GPP 29.274 Table 8.4-1 Cause Values |
| Client ID | 4 | 32 bit unsigned integer |
| OP ID | 4 | 32 bit unsigned integer |

## Delete Session Messages

The following fields appear in order, as shown in each table.

|  |  |  |
| --- | --- | --- |
| Delete Session Request (Controller to DP) | | |
| **Field** | **Size in bytes** | **Notes** |
| Topic | 1 | DPN subscribes to this topic |
| Message Type | 1 | Delete Value = 3 |
| Session ID | 8 | 64 bit unsigned integer |
| Controller Topic | 1 | Controller subscribes to this topic |
| Client ID | 4 | 32 bit unsigned integer |
| OP ID | 4 | 32 bit unsigned integer |

|  |  |  |
| --- | --- | --- |
| Delete Session Response / ACK (DP to Controller) | | |
| **Field** | **Size in bytes** | **Notes** |
| Topic | 1 | Controller subscribes to this topic |
| Message Type | 1 | DPN Response = 4 |
| Status | 1 | 3GPP 29.274 Table 8.4-1 Cause Values |
| Client ID | 4 | 32 bit unsigned integer |
| OP ID | 4 | 32 bit unsigned integer |

## Downlink Data Notification Messages

The following fields appear in order, as shown in each table.

|  |  |  |
| --- | --- | --- |
| Downlink Data Notification (DP to Controller) | | |
| **Field** | **Size in bytes** | **Notes** |
| Topic | 1 | Controller subscribes to this topic |
| Message Type | 1 | DDN = 5 |
| Session ID | 8 | 64 bit unsigned integer |
| Client ID | 4 | 32 bit unsigned integer |
| OP ID | 4 | 32 bit unsigned integer |
| Node Id Length | 1 | Length of node id string = len1. Set value to 0 if Node Id is unavailable. |
| Node Id | len1 |  |
| Network Id Length | 1 | Length of network id string = len2. Set value to 0 if Network Id is unavailable. |
| Network Id | len2 |  |

|  |  |  |
| --- | --- | --- |
| Downlink Data Notification Acknowledgement (Controller to DP) | | |
| **Field** | **Size in bytes** | **Notes** |
| Topic | 1 | DPN subscribes to this topic |
| Message Type | 1 | DDN ACK = 6 |
| DL Buffering Duration | 1 | Placeholder for future implementation - not to be implemented for this release & any value will be ignored. See 29.274 clause 8.87 for encoding |
| DL Buffering Suggested Count | 2 | Placeholder for future implementation - not to be implemented for this release & any value will be ignored. 16 bit unsigned integer. |
| Controller Topic | 1 | Controller subscribes to this topic |
| Client ID | 4 | 32 bit unsigned integer |
| OP ID | 4 | 32 bit unsigned integer |

**Note**: DL low priority traffic throttling and data notification delay (as described by 29.274 table 7.2.11.2-1) to be handled by the Control Plane unless objection is made.

## Assign Topic

The following fields appear in order.

|  |  |  |
| --- | --- | --- |
| Assign Topic (Broadcast to all) | | |
| **Field** | **Size in bytes** | **Notes** |
| Topic | 1 | BROADCAST\_ALL Topic = 1 |
| Message Type | 1 | Assign Topic = 10 |
| Topic Generated | 1 | This is the topic the node intends to use |
| Source | 4 | 32 bit unsigned integer |
| Node Id Length | 1 | Length of node id string = len1. Set value to 0 if Node Id is unavailable. |
| Node Id | len1 |  |
| Network Id Length | 1 | Length of network id string = len2. Set value to 0 if Network Id is unavailable. |
| Network Id | len2 |  |

## Assign Conflict

The following fields appear in order.

|  |  |  |
| --- | --- | --- |
| Assign Conflict (Broadcast to all) | | |
| **Field** | **Size in bytes** | **Notes** |
| Topic | 1 | BROADCAST\_ALL Topic = 1 |
| Message Type | 1 | Assign Conflict = 11 |
| Topic Generated | 1 | This is the topic the node intends to use |
| Source | 4 | 32 bit unsigned integer |
| Node Id Length | 1 | Length of node id string = len1. Set value to 0 if Node Id is unavailable. |
| Node Id | len1 |  |
| Network Id Length | 1 | Length of network id string = len2. Set value to 0 if Network Id is unavailable. |
| Network Id | len2 |  |

## DPN Status Indication

The following table shows the possible values for the **DPN Status** field in the DPN Status Indication message.

|  |  |
| --- | --- |
| **DPN Status** | **Value** |
| HELLO | 1 |
| GOODBYE | 2 |
| OVERLOAD\_START | 3 |
| OVERLOAD\_STOP | 4 |
| MATERIAL\_CHANGE | 5 |
| RESTART | 6 |
| OUT\_OF\_SERVICE | 7 |

The following fields appear in order.

|  |  |  |
| --- | --- | --- |
| DPN Status Indication (Broadcast to Controllers) | | |
| **Field** | **Size in bytes** | **Notes** |
| Topic | 1 | BROADCAST\_CONTROLLERS Topic = 2 |
| Message Type | 1 | DPN Status Indication = 12 |
| DPN Topic | 1 | DPN Subscribes to this topic |
| DPN Status | 1 | Value from DPN Status table |
| Source | 4 | 32 bit unsigned integer |
| Node Id Length | 1 | Length of node id string = len1. Set value to 0 if Node Id is unavailable. |
| Node Id | len1 |  |
| Network Id Length | 1 | Length of network id string = len2. Set value to 0 if Network Id is unavailable. |
| Network Id | len2 |  |

**Note**: In this message, if the **DPN Status** is HELLO or MATERIAL\_CHANGE, you must append additional fields to the **DPN Status Indication** message. Append the following fields in the order shown. For more about the DPN capability information, refer to the DPNLifecycle-start.docx file.

|  |  |  |
| --- | --- | --- |
| Additional DPN Status Indication fields, if HELLO or MATERIAL\_CHANGE | | |
| **Field** | **Size in bytes** | **Notes** |
| TBD |  |  |
| TBD |  |  |
| TBD |  |  |
| TBD |  |  |
| TBD |  |  |
| TBD |  |  |

## DPN Status ACK

**Note**: The Controller sends this message only after it receives a DPN Status Indication message with the **DPN Status** field set to HELLO or MATERIAL\_CHANGE.

The following fields appear in order.

|  |  |  |
| --- | --- | --- |
| DPN Status ACK (Controller to DP) | | |
| **Field** | **Size in bytes** | **Notes** |
| Topic | 1 | DPN Subscribes to this topic |
| Message Type | 1 | DPN Status ACK = 13 |
| Controller Topic | 1 | Controller subscribes to this topic |
| Source | 4 | 32 bit unsigned integer |
| Node Id Length | 1 | Length of node id string = len1. Set value to 0 if Node Id is unavailable. |
| Node Id | len1 |  |
| Network Id Length | 1 | Length of network id string = len2. Set value to 0 if Network Id is unavailable. |
| Network Id | len2 |  |

## Controller Status Indication

The following table shows the possible values for the **Controller Status** field in the Controller Status Indication message.

|  |  |
| --- | --- |
| **Controller Status** | **Value** |
| HELLO | 1 |
| GOODBYE | 2 |

The following fields appear in order.

|  |  |  |
| --- | --- | --- |
| Controller Status Indication (Controller to DP) | | |
| **Field** | **Size in bytes** | **Notes** |
| Topic | 1 | BROADCAST\_DPNS = 3 |
| Message Type | 1 | Controller Status Indication = 14 |
| Controller Topic | 1 | Controller subscribes to this topic |
| Controller Status | 1 | Value from Controller Status table |
| Source | 4 | 32 bit unsigned integer |
| Node Id Length | 1 | Length of node id string = len1. Set value to 0 if Node Id is unavailable. |
| Node Id | len1 |  |
| Network Id Length | 1 | Length of network id string = len2. Set value to 0 if Network Id is unavailable. |
| Network Id | len2 |  |

**Note**: If a DPN receives a HELLO from a Controller, that DPN must respond to the Controller with a DPN Status Indication message that has **DPN Status** set to HELLO.

## Generate CDR

The controller sends this message to the DPN to flush a UE’s CDR into a file.

The following table shows the possible values for the **CDR Type** field in the Generate CDR message.

|  |  |
| --- | --- |
| **CDR Type** | **Value** |
| Bearer | 0 |
| ADC | 1 |
| Flow | 2 |
| Rating Group | 3 |
| All | 4 |

The following table shows the possible values for the **Action field** in the Generate CDR message.

|  |  |
| --- | --- |
| **Action** | **Value** |
| Append to existing file | 0 |
| Write to new file and clear old files | 1 |

The following fields appear in order.

|  |  |  |
| --- | --- | --- |
| Generate CDR (Controller to DP) | | |
| **Field** | **Size in bytes** | **Notes** |
| Topic | 1 | DPN subscribes to this topic |
| Message Type | 1 | Generate CDR = 15 |
| Session ID | 8 | 64 bit unsigned integer |
| CDR Type | 1 | Value from CDR Type table |
| Action | 1 | Value from Action table |
| Controller Topic | 1 | Controller subscribes to this topic |
| Client ID | 4 | 32 bit unsigned integer |
| OP ID | 4 | 32 bit unsigned integer |

|  |  |  |
| --- | --- | --- |
| Generate CDR Acknowledgement (DP to Controller) | | |
| **Field** | **Size in bytes** | **Notes** |
| Controller Topic | 1 | Controller subscribes to this topic |
| Message Type | 1 | Generate CDR ACK = 16 |
| Status | 1 | 0 = Success; 1 = Failure |
| Client ID | 4 | 32 bit unsigned integer |
| OP ID | 4 | 32 bit unsigned integer |

## ADC Rules

The controller sends this message to the DPN for each ADC rule after the DPN Status ACK is sent (for a DPN Status Indication with DPN Status value HELLO).

The following table shows the possible values for the **Selector Type Field** in the ADC Rules message.

|  |  |
| --- | --- |
| **Selector Type** | **Value** |
| Domain Name | 0 |
| Domain IP Address | 1 |
| Domain IP Prefix | 2 |
| None | 3 |

The following fields appear in order. The fields in blue are only included based on the condition in the parentheses.

|  |  |  |
| --- | --- | --- |
| ADC Rules (Controller to DP) | | |
| **Field** | **Size in bytes** | **Notes** |
| Topic | 1 | DPN subscribes to this topic |
| Message Type | 1 | ADC rules = 17 |
| Selector Type | 1 | Value from Selector Type table |
| Domain Name Length (included if selector type = 0) | 1 | Length of Domain Name string = len1. |
| Domain Name (included if selector type = 0) | len1 |  |
| IP Address (included if selector type = 1 or 2) | 4 | 32 bit unsigned integer |
| IP Prefix (included if selector type = 2) | 2 | 16 bit unsigned integer |
| Drop | 1 | 1 if DROP, 0 otherwise. |
| Rating Group | 4 | 32 bit unsigned integer |
| Service ID | 4 | 32 bit unsigned integer |
| Sponsor ID Length | 1 | Length of Sponsor ID string = len3. |
| Sponsor ID | len3 |  |
| Controller Topic | 1 | Controller Subscribes to this |

## PCC Table

Controller will send following message to DPN for each PCC rule.

|  |  |  |
| --- | --- | --- |
| PCC Rules (Controller to DP) | | |
| **Field** | **Size in bytes** | **Notes** |
| Topic | 1 | DPN subscribes to this topic |
| Message Type | 1 | PCC rule = 18 |
| Metering method | 1 | FWD=0(Default)  SRTCM\_COLOR\_BLIND=1  SRTCM\_COLOR\_AWARE=2  TRTCM\_COLOR\_BLIND=3  TRTCM\_COLOR\_AWARE=4 |
| Charging mode | 1 | Online =0(default) / offline=1 charging |
| Rating group | 2 | Charging key |
| Rule status | 1 | Integer : Default 0 |
| Gate status | 1 | Integer : 1-OPEN(default), 0-CLOSE |
| Monitoring key | 4 | Integer : Default 0 |
| Precedence | 4 | Rule precedence |
| Level of report | 1 | Integer : Default 0 |
| Mute status | 1 | Integer : 1-ON, 0-OFF(Default) |
| Redirect info | 1 | Integer : Default 0 |
| Rule name length | 1 | Length of PCC rule name = len1 |
| Rule name | len1 | String: Name of the rule |
| Sponsor ID length | 1 | Length of sponsor id name = len2 |
| Sponsor ID name | len2 | String : Name of the sponsor |

## Meter Table

Controller will send following message to DPN for each meter table entries.

|  |  |  |
| --- | --- | --- |
| Meter table (Controller to DP) | | |
| **Field** | **Size in bytes** | **Notes** |
| Topic | 1 | DPN subscribes to this topic |
| Message Type | 1 | Meter rule = 19 |
| Meter profile index | 2 | Integer |
| CIR | 8 | Committed information rate |
| CBS | 8 | Committed burst size |
| EBS | 8 | Excess burst size |
| Metering method | 2 | FWD=0(Default)  SRTCM\_COLOR\_BLIND=1  SRTCM\_COLOR\_AWARE=2  TRTCM\_COLOR\_BLIND=3  TRTCM\_COLOR\_AWARE=4 |

## SDF Table

Controller will send following message to DPN for each SDF table entries.

Following table shows possible values for **rule type field**.

|  |  |
| --- | --- |
| **Selector Type** | **Value** |
| Rule string | 0 |
| Five tuple | 1 |

|  |  |  |
| --- | --- | --- |
| SDF table (Controller to DP) | | |
| **Field** | **Size in bytes** | **Notes** |
| Topic | 1 | DPN subscribes to this topic |
| Message Type | 1 | SDF rule = 20 |
| PCC rule ID | 4 | Rule ID – Unsigned integer |
| Precedence | 4 | Unsigned integer |
| Rule type | 0 |  |
| Rule string len  (included if rule type = 0) | 1 | Length of the rule string = len1(Unsigned integer) |
| Rule string  (included if rule type = 0) | Len1 | Actual rule: string |
| IP type  (included if rule type = 1) | 1 | IPV4 = 0(Default)  IPV6 = 1 |
| IPv4 five tuple structure  (included if rule type == 1 and IP type == 0) | IPv4 five tuple structure size | Refer table below for **IPv4 five tuple** |
| IPv6 five tuple structure  (included if rule type == 1 and IP type == 1) | IPv6 five tuple structure size | Refer table below for **IPv6 five tuple** |

Following **IPv4 five tuple structure** will be used in above table

If Rule type == 1 and IP type == **0**

|  |  |  |
| --- | --- | --- |
| **Field** | **Size in bytes** | **Notes** |
| Source IP address | 4 |  |
| Destination IP address | 4 |  |
| Source mask | 4 |  |
| Destination mask | 4 |  |
| Source port range start | 2 |  |
| Source port range end | 2 |  |
| Destination port range start | 2 |  |
| Destination port range end | 2 |  |
| Protocol range start | 2 |  |
| Protocol range end | 2 |  |

Following **IPv6 five tuple structure** will be used in above table

If Rule type == 1 and IP type == **1**

|  |  |  |
| --- | --- | --- |
| **Field** | **Size in bytes** | **Notes** |
| Source IP address | 16 | IPv6 address string |
| Destination IP address | 16 | IPv6 address string |
| Source mask | 4 |  |
| Destination mask | 4 |  |
| Source port range start | 2 |  |
| Source port range end | 2 |  |
| Destination port range start | 2 |  |
| Destination port range end | 2 |  |
| Protocol range start | 2 |  |
| Protocol range end | 2 |  |