Three topics are reserved for communication:

* Topic 1 is reserved to broadcast to ALL elements attached to the ZMQ device. (BROADCAST\_ALL)
* Topic 2 will be reserved for SDN Controller broadcast, i.e. a message to be sent to ALL SDN Controllers (BROADCAST\_CONTROLLERS).
* Topic 3 will be reserved for DPN broadcast, i.e. a message to be sent to ALL DPNs (BROADCAST\_DPNS).

**DPN Initialization**

For ZMQ,

1. DPN is configured with ZMQ information.
   1. This includes a hostname or
   2. A domain name were the dpn-zmq:<proto> service record resides
   3. If pre-configured for eDecore/Decore then it MUST add the decore specific services per TS 29.303.
   4. A node-reference (String).
2. DPN attaches to the ZMQ Device.
3. Upon attach the DPN attempts to acquire a Topic ID via a   
   ASSIGN\_ID message. It sends out on the BROADCAST\_ALL a selected ID topic (at least a random number) and the node-reference.
   1. If no response is received within 10 seconds the device MAY use the ID.
   2. If an ASSIGN\_CONFLICT message is received, it will contain the Topic ID and node-reference regarding the conflict.
      1. If the Topic ID matches the device MAY generate a new topic and try again.
      2. If the message indicates the conflict includes the node-reference the DPN MUST stop the process and fail (fatal) as node-reference conflicts are not allowed.
4. Once attached a “Hello” is sent via the ‘To Controllers’ Topic (topic 1). This topic is well known (statically assigned by the protocol). This “Hello” should include the following:
   1. Capabilities of the DPN
   2. DPN Topic ID
   3. Resources Allocated which include but are not limited to
      1. Prefixes/Subnet(s), if configured, on interfaces
      2. CPU, memory, I/O including network and compute, etc.
5. The SDN Controller then analyzes the message body (if anything) to determine capabilities. We are looking at gtpv1 as a key for this.
6. The SDN Controller determines IF it will use the DPN.
   1. If Yes,
      1. The SDN Controller sends a direct message to SUSBSCRIBE to general events, e.g. In/Out of Service, Service Errors, Shutdown, Overload, Restart and DDN. This message include the ZMQ topic ID of the Controller.
      2. The SDN Controller determines if a new DPN may be available based upon the Hello advertisement. A DPN is virtual. Thus, in some cases the availability of the DPN does not necessarily result in a new advertisement over the Northbound interface.
         1. In the event that a new advertisement is required the SDN Controller advertises the DPN ***node-reference*** in the model to FPC Clients ***that have indicated they will assign DPNs***. This is a static reference that can be used for DPN ID binding. If possible and **obvious**, the DPN-Type(s), aka Roles, should be provided.

When a Client attempts to bind a DPN it must provide the node-reference, DPN-Types desired and an optional DPN-Id unique to the tenant. When the DPN-Id is not provided it will be assigned by the Agent.

TOPIC Messages

BROADCAST\_ALL –

* ASSIGN\_ID
* ASSIGN\_CONFLICT

BROADCAST\_CONTROLLERS

* HELLO
* OVERLOAD\_START
* OVERLOAD\_STOP
* GOODBYE
* MATERIAL\_CHANGE (see below but to be treated like a HELLO with different capabilities)
* RESTART
* OUT\_OF\_SERVICE

BROADCAST\_DPNS

* HELLO
* GOODBYE

Point to Point messages

* CLOSE
* General DPN messages

**Material Change of DPN**

A material Change of the DPN is defined by one of the following events:

* Capabilities Change
* Resource Allocation Configuration
* Overload (Start / Stop)
* In/Out of Service
* Out of Service Request
* Shutdown

**Topic Format**

The topic should be a 2 byte string ranging from “00” to “99”. The topic should be the first two bytes of any message sent over ZeroMQ.