

# FPC Status & Update

IETF 99

July 2017

(<https://tools.ietf.org/html/draft-ietf-dmm-fpc-cpdp-07>)

# Status

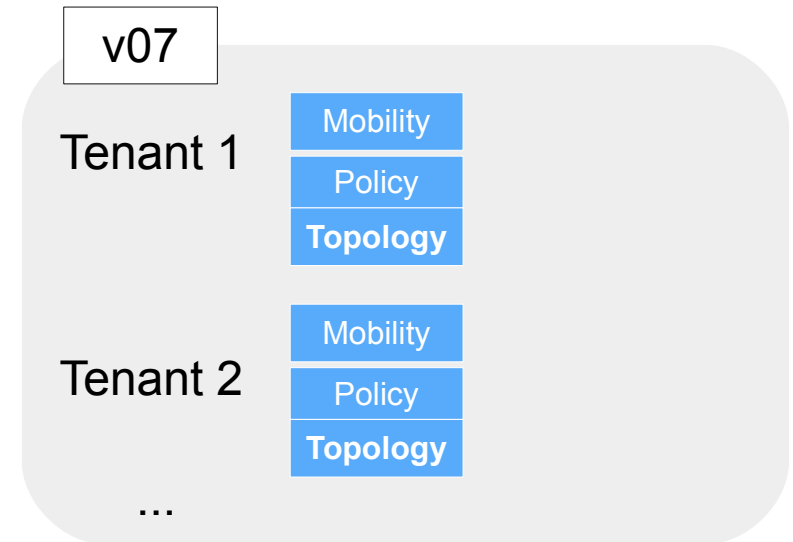
- Still on version 07
- No bugs / issues filed
- No bugs / issues found in implementation
- Activities
  - Weekly meetings since IETF 98
  - 2x week since Early June
  - Internships for FPC development (at an Operator)

# Implementations

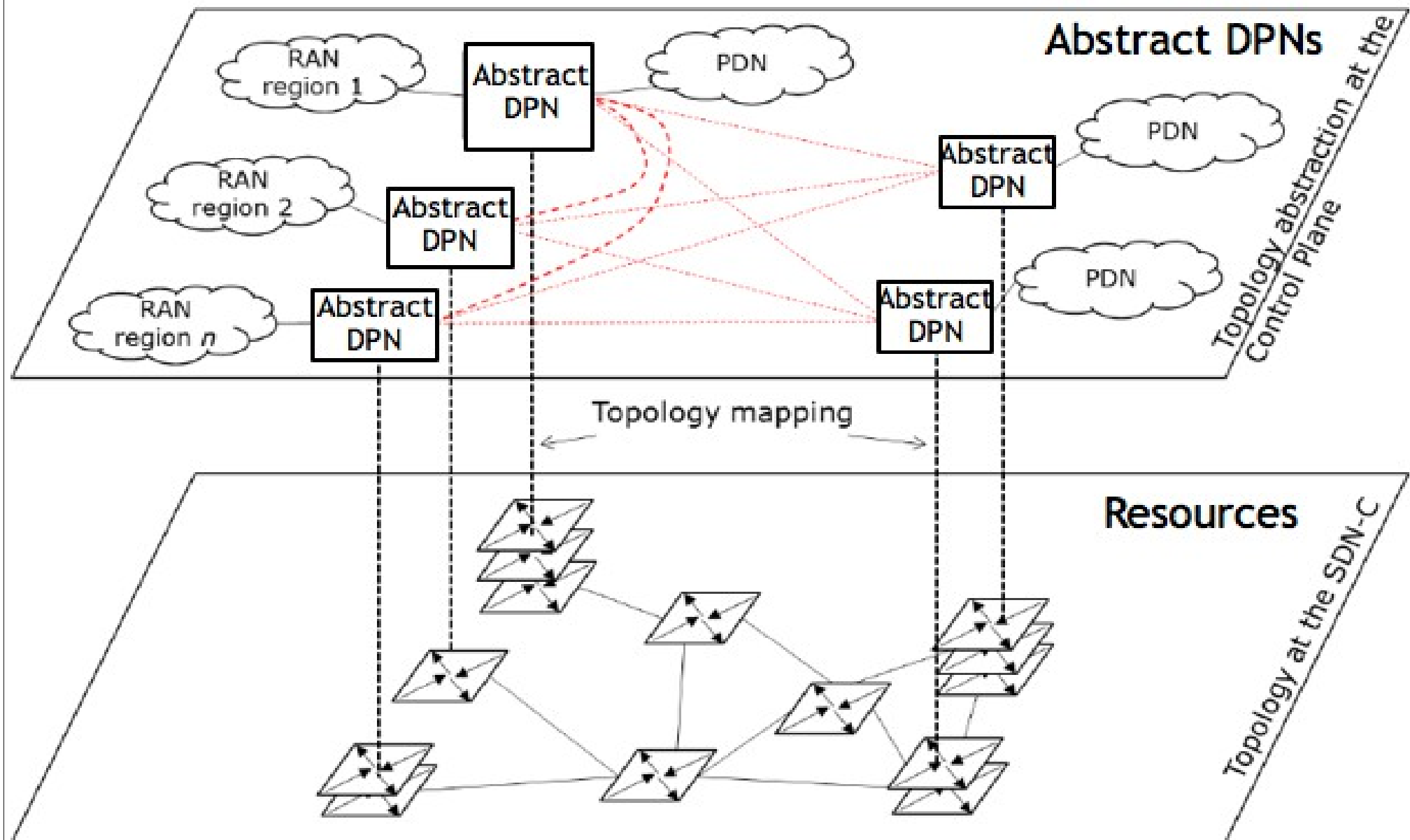
- Opendaylight FPC Agent
  - Version 04 mobility model
  - Multi-DPN Agent
- NEW - ONOS based FPC Agent
  - Version 04 mobility model
  - Uses ONOS Flow store

# IETF 98 to IETF 99

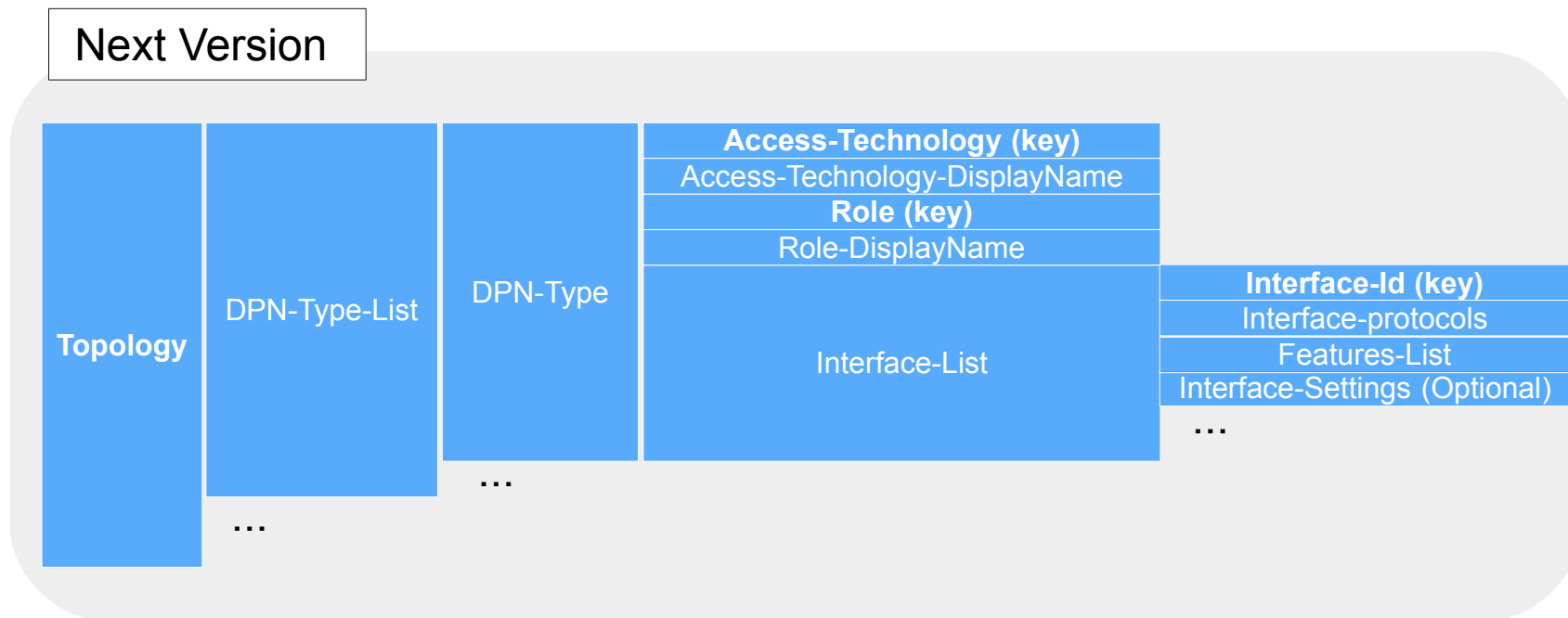
- IETF 98
  - Focused on Mobility / Policy
- Working to IETF 99
  - Focused on Topology
  - Had the most questions and is neglected in implementations
  - Includes concepts such as slicing and discovery support (DDDS – RFC 3958)
  - Biggest questions
    - Can Topology support most widely used Use Cases?
    - How much is out of I-D scope?



# Topo slide (DPN abstraction)



# Topology Changes (next draft) – DPN Type (1/2)



## DPN-Type

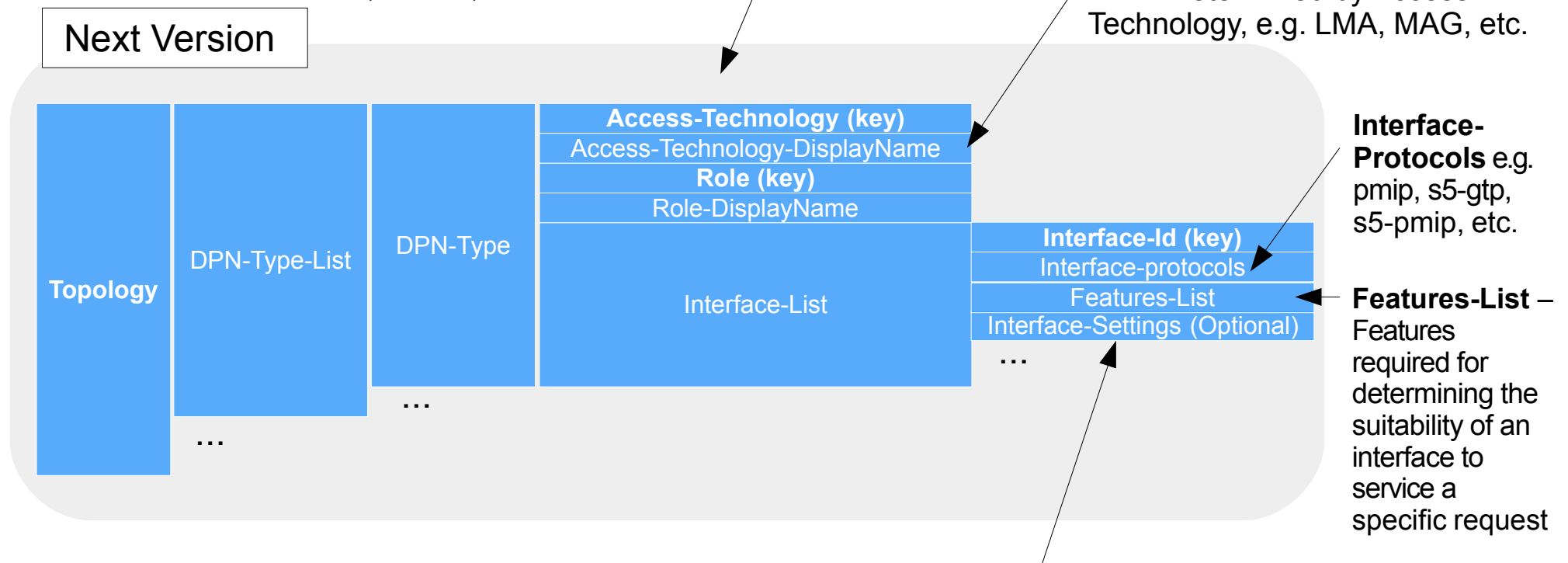
- Describes the types of reference points supported by a DPN or DPN-Group
- Used in determining 'if' a DPN / DPN-Group can service a request

Goal - provide sufficient information that ensures a proper interface can be selected to service a request

# Topology Changes (next draft) – DPN Type (2/2)

**Access-Technology** – the technology used in the access network from where the signaling originates, e.g. 3GPP, WiMAX, 802.x, etc.

**Role** – The actual function of the DPN. Determined by Access-Technology, e.g. LMA, MAG, etc.



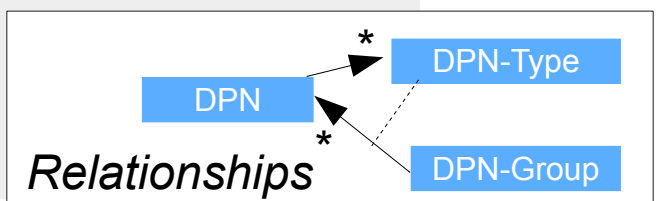
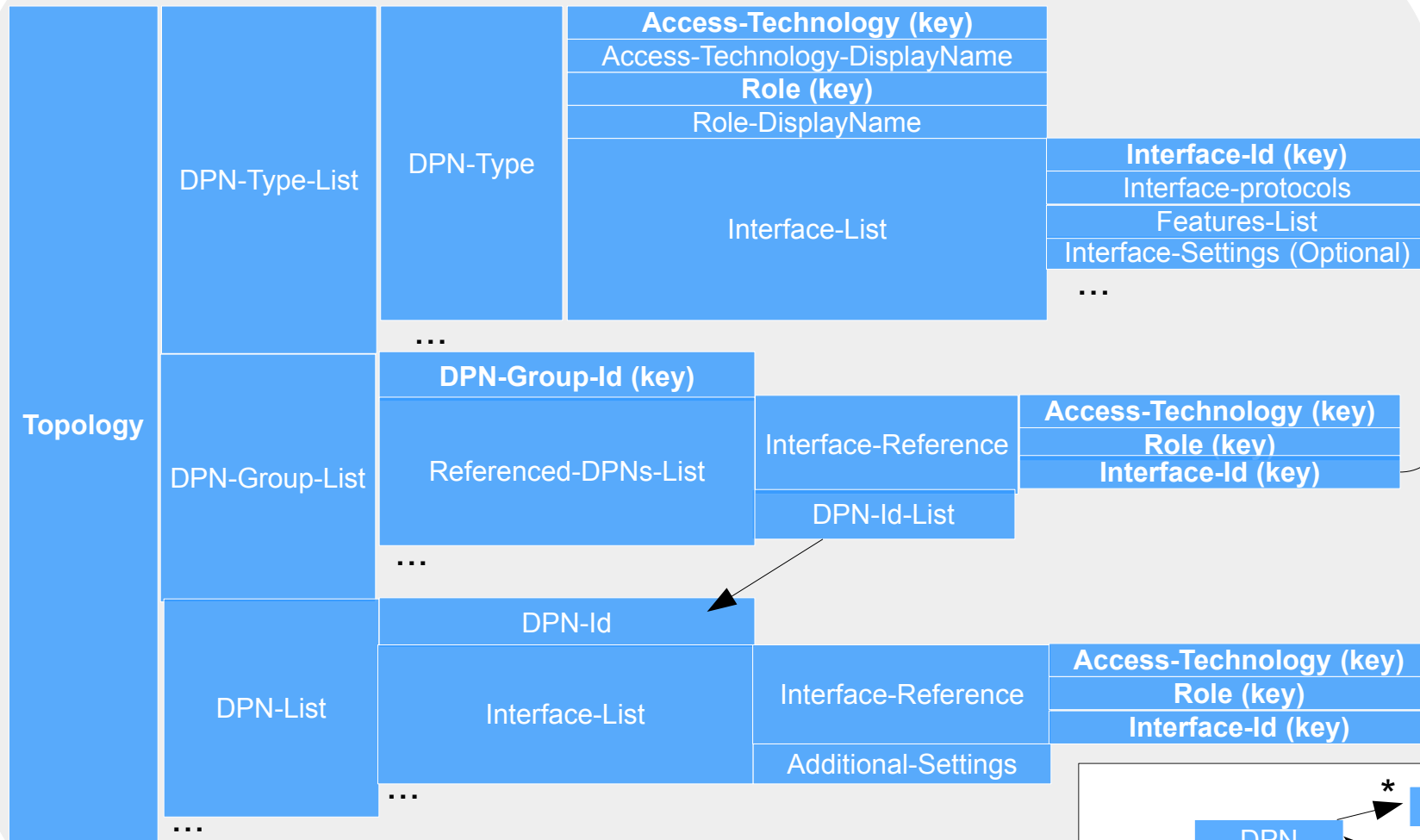
**Interface-Reference** – comprised of the (compound) keys to an Interface-List entry:

- Access-Technology
- Role
- Interface-Id

**Interface-Settings** - Settings that MUST be known when determining the suitability of an interface to service a specific request

# Combined View (with Pointers)

Next Version





# Topology Changes (next draft) – DPN & DPN Groups

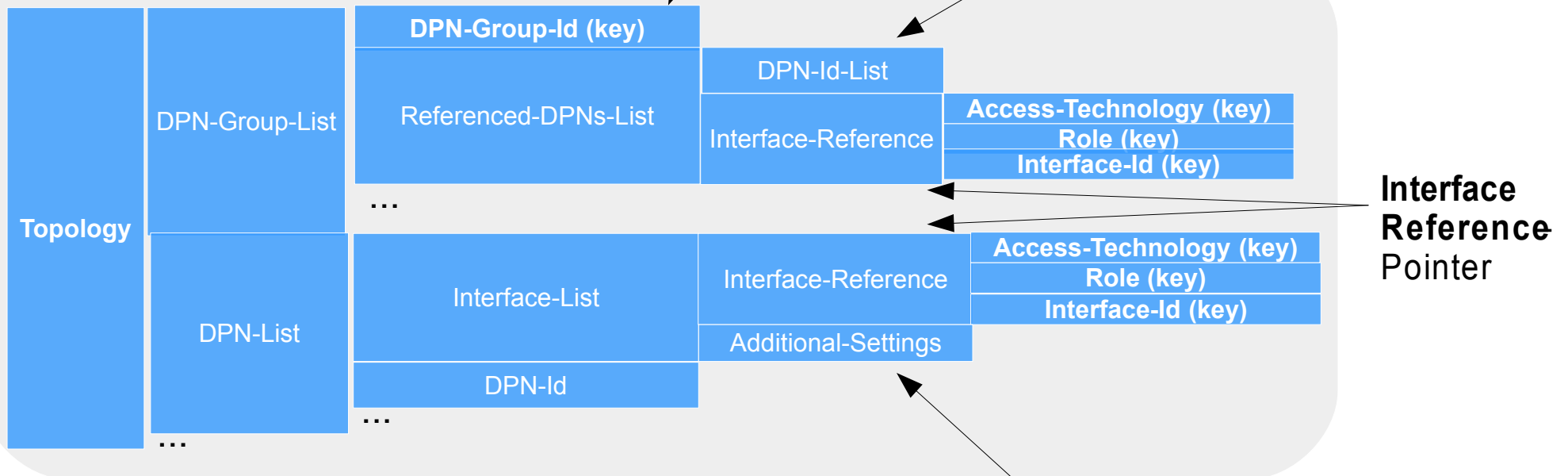
**DPN-Group** – A collection of DPN interfaces that serves a specific purpose prescribed by administrators. It typically serves some function, e.g. inbound roaming services, regionalization, etc.

**DPN-List** – Main structure used to hold the DPNs.

**Referenced-DPNs-List**: list (mix) of interfaces to provide the functions in the DPN-Group

**DPN-Id-List**: DPNs that support the Interface

Next Version



**Additional-Settings** – Settings (in addition to those specified in the referenced interface). The settings will apply to the interface but do not affect the selection of the interface.

# Topology Usage

- DPN-Type is central to **selecting an interface** to service a request
- DPN-Group and DPN-List are used to **select which DPNs** are candidates.

A FPC Client or Agent may use this information, i.e. it is required information but not necessarily needed to be transmitted over an FPC protocol

- So then why do we care?
  - The protocol does care about the DPN-Type information elements but not the data structure it is held in when a Context is created.
  - DPN-Groups and DPN-Peers (still under discussion) are not required to be transmitted between a Client and Agent.
- Our #1 use case for selection, RFC 3598, and many derivatives including 3GPP (TS 29.303) do care about this.
  - *In other words, if we don't support it in the information model it is useless at the system level.*

# Topology Work in Progress / Open Items

- DPN-Peers
  - Prior relationships between DPNs that may be used to further narrow DPN selection or speed up Context creation
- Multi-tenancy – It is in the information model and we currently avoid needing to send tenant information over the wire in the ODL implementation by
  - This has been present in FPC for many versions
  - Having a Client only process a single tenant's request per Client Id. As a result of this a FPC Client may 'bind' (a message that is out of scope of FPC) to the Agent with many Identifiers.
  - We think this will not change but it is by no means finalized
- Slicing
  - It has been added to the model but we will need more analysis on how recent changes to Topology affect it, if at all.

# Internship Work

- Work on two neglected aspects of the Opendaylight FPC Agent
  - Pre-provisioning of Policy – When a tenant is assigned to a DPN sending down base and most frequently used policies to ensure efficient Context creation
    - Looks straight forward but needed to build many reverse pointers in the system for impact analysis when a Policy changed
      - May be limited in its utility
      - Maybe we need better notification models in the Controllers when everything does not live under a tree? (not an IETF issue)
  - Composite DPNs – An *abstract* DPN composed of other DPNs. The Agent uses them to provide features such as N+K redundancy
    - The information model modifications to support this were trivial.
    - 2 RPC calls added to Topology to support adding/removing DPNs from the composite
    - Code is too complex to place into or describe in the FPC spec for just “1+1” composite DPN strategy.
      - Recommend that it is out of scope of this specification
      - Not sure IETF should ever standardize these behaviors

# Open Items (In order of appearance)

- Topology
- Review of Policy
- Update of Mobility (based on Topology/Policy updates)

# Going Forward – Aspirational Goals

- Why 'aspirational'? The spec is much bigger than others
  - Topology, Mobility and Policy in the same spec
  - System level use cases are verified, e.g. support for RFC 3958 based systems
- IETF 99 – Finish Topology
- Prior to IETF 100 – Finish Policy, modify Mobility based upon impacts & New Spec
- @ IETF 100 - ??? (Reviewers are key here)

# FPC Status & Update

IETF 99

July 2017

(<https://tools.ietf.org/html/draft-ietf-dmm-fpc-cpdp-07>)

# Status

- Still on version 07
- No bugs / issues filed
- No bugs / issues found in implementation
- Activities
  - Weekly meetings since IETF 98
  - 2x week since Early June
  - Internships for FPC development (at an Operator)

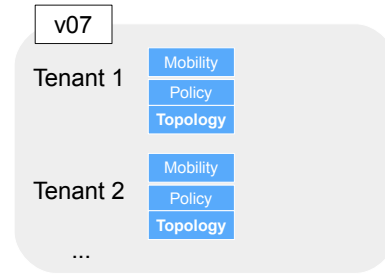


# Implementations

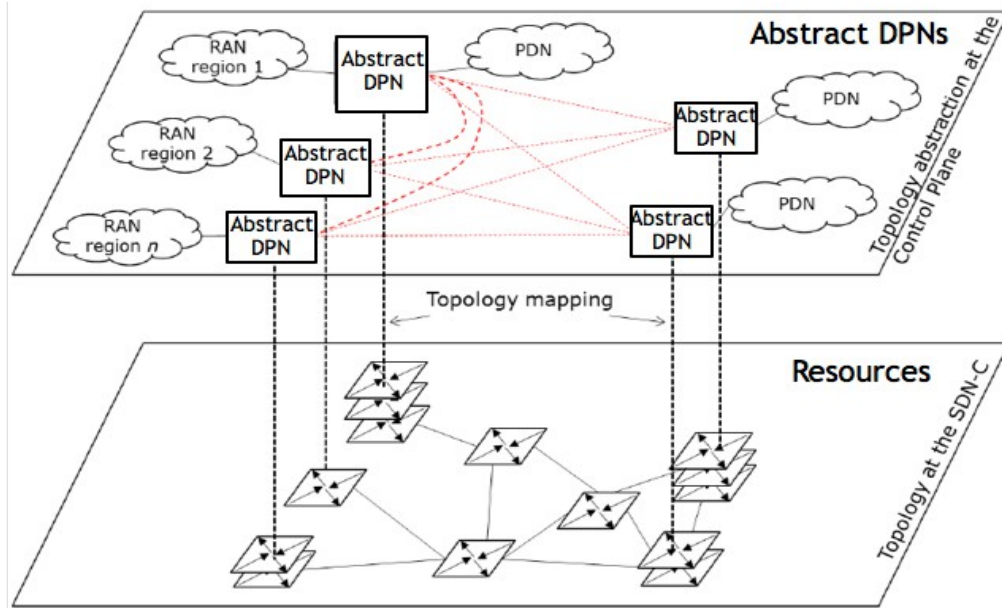
- Opendaylight FPC Agent
  - Version 04 mobility model
  - Multi-DPN Agent
- NEW - ONOS based FPC Agent
  - Version 04 mobility model
  - Uses ONOS Flow store

# IETF 98 to IETF 99

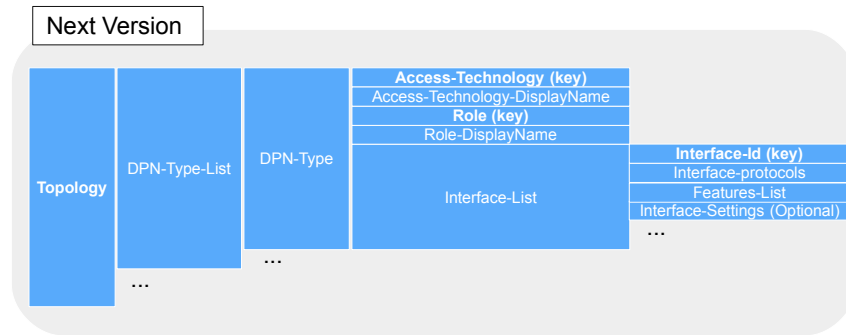
- IETF 98
  - Focused on Mobility / Policy
- Working to IETF 99
  - Focused on Topology
    - Had the most questions and is neglected in implementations
    - Includes concepts such as slicing and discovery support (DDDS – RFC 3958)
    - Biggest questions
      - Can Topology support most widely used Use Cases?
      - How much is out of I-D scope?



## Topo slide (DPN abstraction)



# Topology Changes (next draft) – DPN Type (1/2)



## DPN-Type

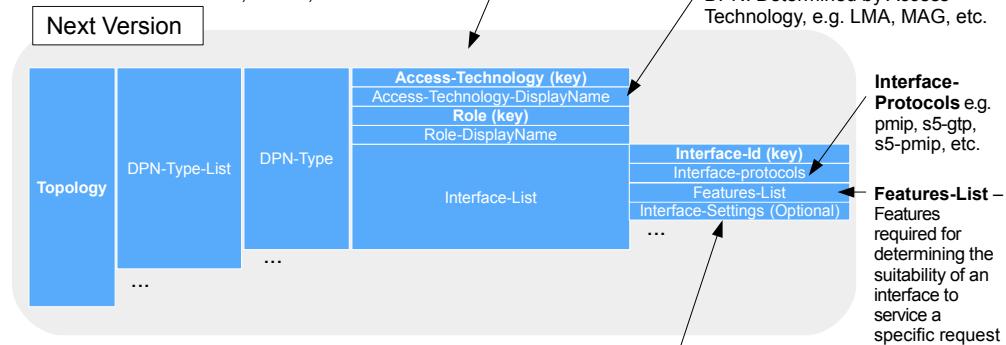
- Describes the types of reference points supported by a DPN or DPN-Group
- Used in determining 'if' a DPN / DPN-Group can service a request

Goal - provide sufficient information that ensures a proper interface can be selected to service a request

# Topology Changes (next draft) – DPN Type (2/2)

**Access-Technology** – the technology used in the access network from where the signaling originates, e.g. 3GPP WiMAX, 802.x, etc.

**Role** – The actual function of the DPN. Determined by Access-Technology, e.g. LMA, MAG, etc.



**Interface-Protocols** e.g. pmip, s5-gtp, s5-pmip, etc.

**Features-List** – Features required for determining the suitability of an interface to service a specific request

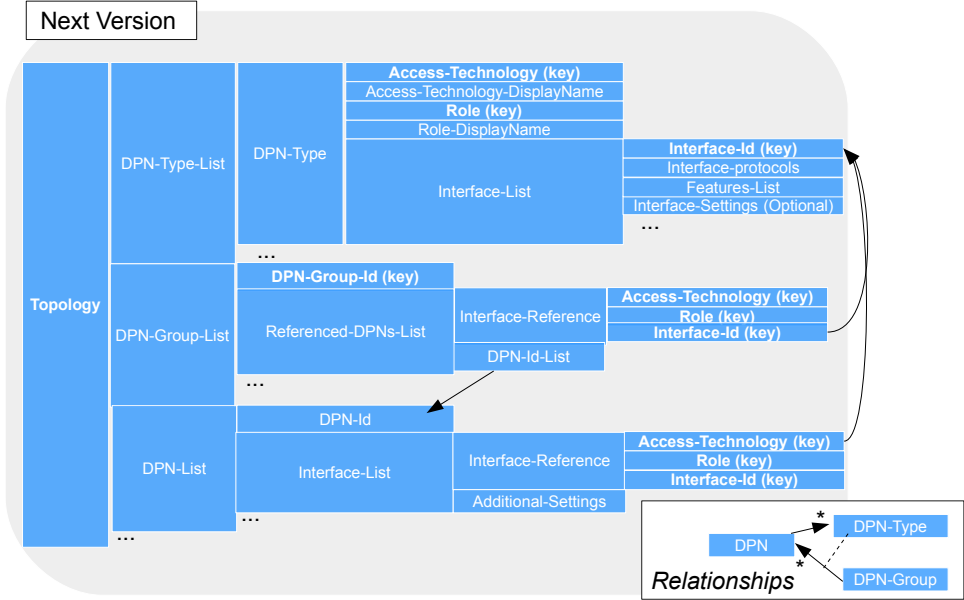
**Interface-Reference** – comprised of the (compound) keys to an Interface-List entry:

- Access-Technology
- Role
- Interface-Id

**Interface-Settings** - Settings that MUST be known when determining the suitability of an interface to service a specific request

# Combined View (with Pointers)

Next Version



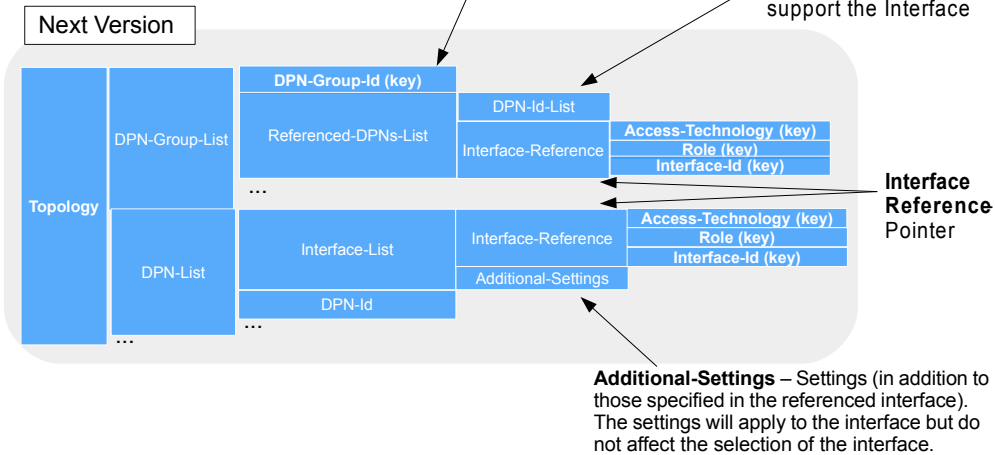
# Topology Changes (next draft) – DPN & DPN Groups

**DPN-Group** – A collection of DPN interfaces that serves a specific purpose prescribed by administrators. It typically serves some function, e.g. inbound roaming services, regionalization, etc.

**DPN-List** – Main structure used to hold the DPNs.

**Referenced-DPNs-List**: list (mix) of interfaces to provide the functions in the DPN-Group

**DPN-Id-List**: DPNs that support the Interface



# Topology Usage

- DPN-Type is central to **selecting an interface** to service a request
- DPN-Group and DPN-List are used to **select which DPNs** are candidates.

A FPC Client or Agent may use this information, i.e. it is required information but not necessarily needed to be transmitted over an FPC protocol

- So then why do we care?
  - The protocol does care about the DPN-Type information elements but not the data structure it is held in when a Context is created.
  - DPN-Groups and DPN-Peers (still under discussion) are not required to be transmitted between a Client and Agent.
- Our #1 use case for selection, RFC 3598, and many derivatives including 3GPP (TS 29.303) do care about this.
  - *In other words, if we don't support it in the information model it is useless at the system level.*



# Topology Work in Progress / Open Items

- DPN-Peers
  - Prior relationships between DPNs that may be used to further narrow DPN selection or speed up Context creation
- Multi-tenancy – It is in the information model and we currently avoid needing to send tenant information over the wire in the ODL implementation by
  - This has been present in FPC for many versions
  - Having a Client only process a single tenant's request per Client Id. As a result of this a FPC Client may 'bind' (a message that is out of scope of FPC) to the Agent with many Identifiers.
  - We think this will not change but it is by no means finalized
- Slicing
  - It has been added to the model but we will need more analysis on how recent changes to Topology affect it, if at all.

# Internship Work

- Work on two neglected aspects of the Opendaylight FPC Agent
  - Pre-provisioning of Policy – When a tenant is assigned to a DPN sending down base and most frequently used policies to ensure efficient Context creation
    - Looks straight forward but needed to build many reverse pointers in the system for impact analysis when a Policy changed
      - May be limited in its utility
      - Maybe we need better notification models in the Controllers when everything does not live under a tree? (not an IETF issue)
  - Composite DPNs – An *abstract* DPN composed of other DPNs. The Agent uses them to provide features such as N+K redundancy
    - The information model modifications to support this were trivial.
    - 2 RPC calls added to Topology to support adding/removing DPNs from the composite
    - Code is too complex to place into or describe in the FPC spec for just “1+1” composite DPN strategy.
      - Recommend that it is out of scope of this specification
      - Not sure IETF should ever standardize these behaviors

## Open Items (In order of appearance)

- Topology
- Review of Policy
- Update of Mobility (based on Topology/Policy updates)

## Going Forward – Aspirational Goals

- Why 'aspirational'? The spec is much bigger than others
  - Topology, Mobility and Policy in the same spec
  - System level use cases are verified, e.g. support for RFC 3958 based systems
- IETF 99 – Finish Topology
- Prior to IETF 100 – Finish Policy, modify Mobility based upon impacts & New Spec
- @ IETF 100 - ??? (Reviewers are key here)