Bearers, Attachment Circuits, SAPs, & Slicing

draft-boro-opsawg-teas-common-ac
draft-boro-opsawg-teas-attachment-circuit
draft-boro-opsawg-ntw-attachment-circuit

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SDPs & SAPs

"An SDP may be **abstracted as a Service Attachment Point (SAP)** [I-D.ietf-opsawg-sap] for the purpose of generalizing the concept across multiple service types and **representing it in management and configuration systems**."

draft-ietf-teas-ietf-network-slices

Background

- ***Service Attachment Points (SAPs)*** are network reference points where services can be (or are being) delivered to customers
  - SAPs may be provisioned ***prior or during the activation*** of a service instance
  - SAPs may be ***multiservice (e.g., slice, L3VPN) or specific to a single service***
    - E.g., A dedicated service type is defined for network slices (“network-slice”)

- SAPs are connected to a customer device (e.g., unmanaged CEs, ASBRs, Network Functions) via logical constructs called: ***Attachment Circuits***
  - Setting up an AC may require ***L2, IPv4/IPv6 address/prefix assignments, static/dynamic routes, OAM features …***
  - One or more ACs can be bound to the same SAP
  - The same AC can be terminated by one or more peer-SAPs
  - A SAP and a peer-SAP can share one or multiple ACs

- ACs are built over ***bearers***
  - Bearers may be wireless, wired, et.
  - Bearers can be seen as the required underlying connection for the provisioning of an attachment circuit
  - The same bearer can host one or multiple ACs

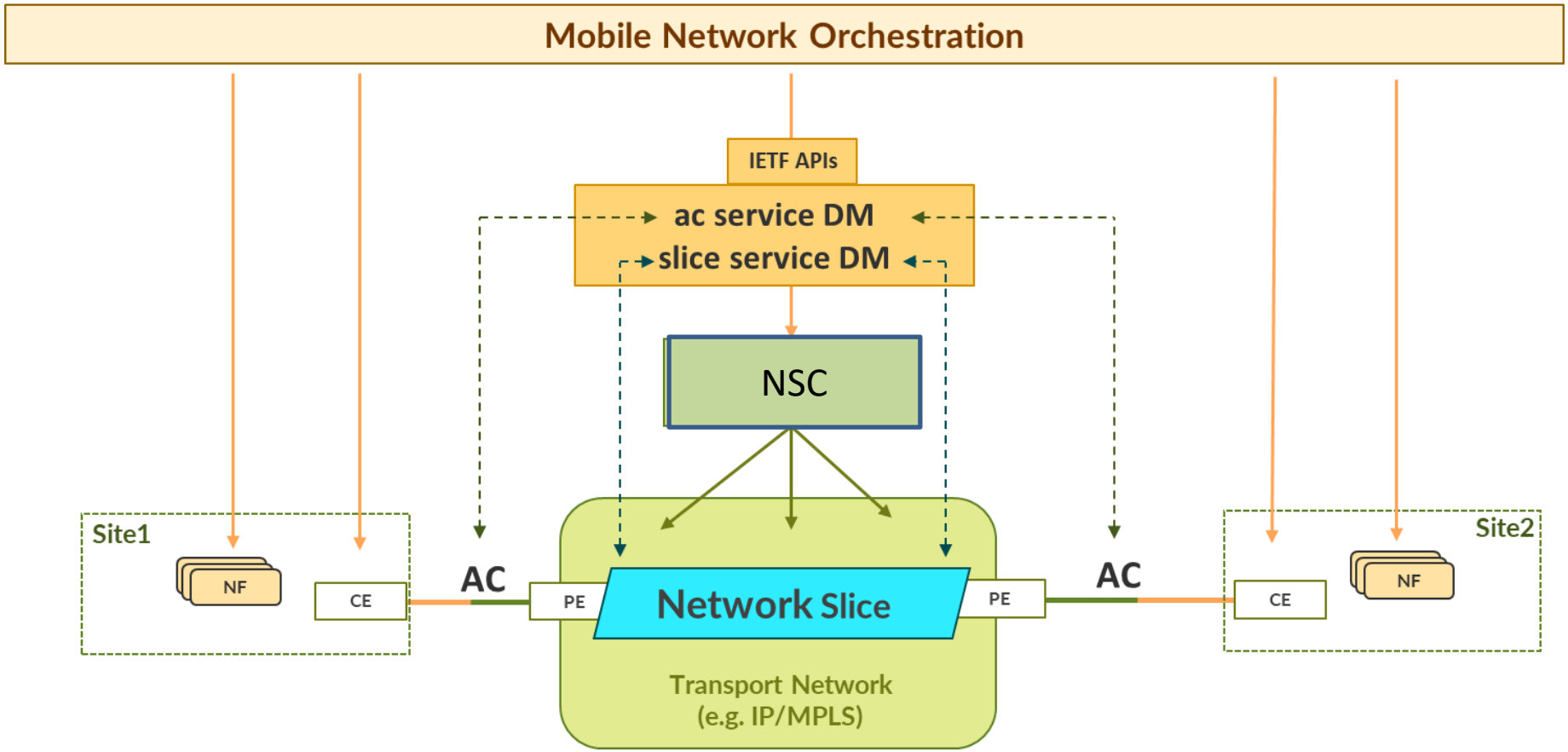
Some Observations

- Recent service models make ***hidden/inaccurate assumptions*** about the AC
  - This limits the applicability of these service models
- Some models ***overload*** some concepts set in the SAP model
  - E.g., peer-sap-id to identify a logical connection
- ***Lack of consistency***: the structure of the AC in some recent models is not aligned with the one used in existing RFCs
  - This deviation makes the mapping with ***network models difficult*** to achieve
  - E.g., L3SM and slicing may be provided over the same AC, but they don't have the same AC structure. Distinct logics to translate a slice service into L3NM will be needed, which is ***suboptimal***
- ***Lack of a standard programmatic interface*** to manage bearers and attachment circuits-as-a-service
- The SAP model ***does not expose the ACs*** that it terminates

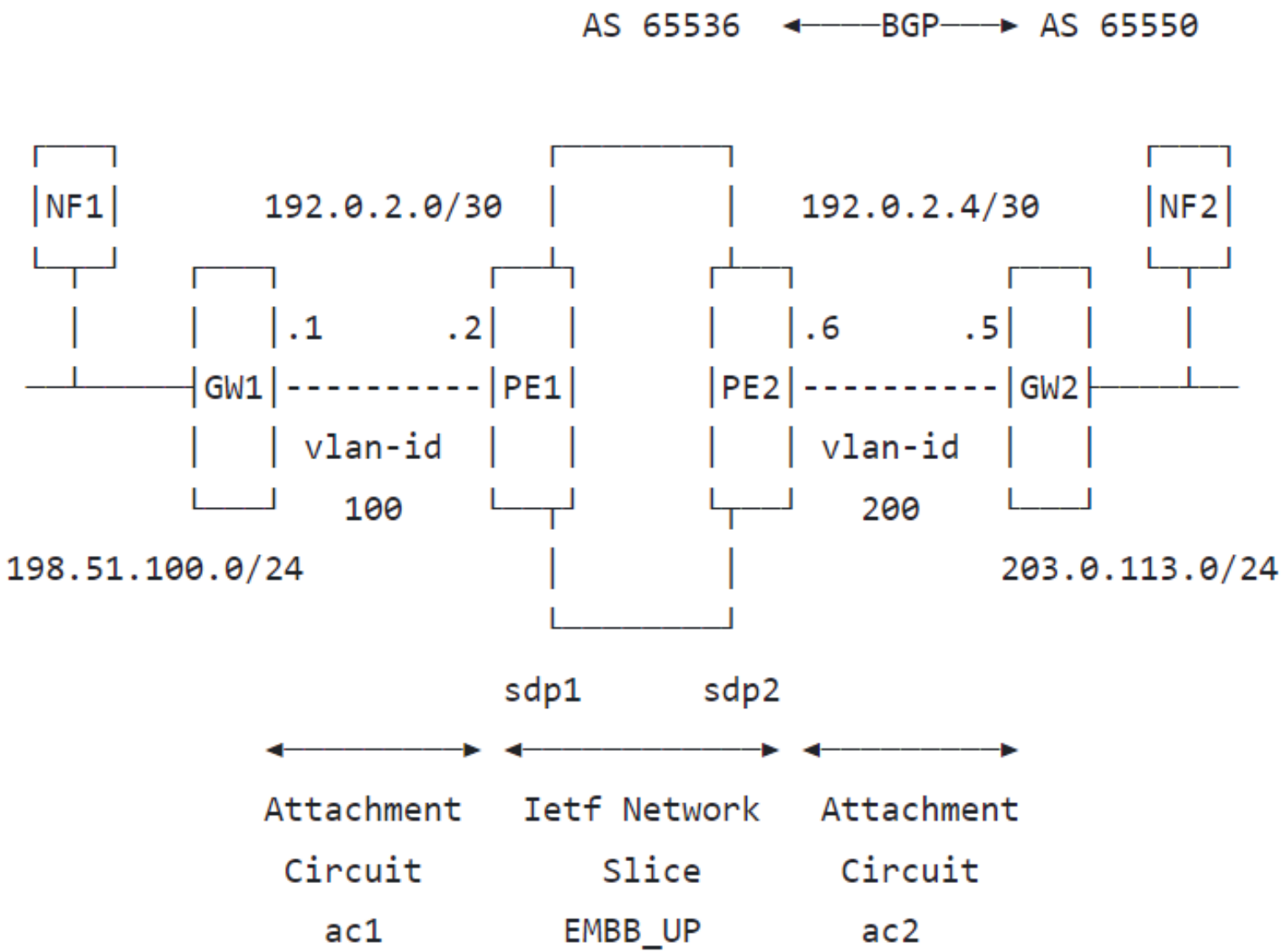
The AC Effort

- An AC library with reusable types, identities, and groupings: ***ac-common***
- A model for managing ACs as a service: ***ac-svc***
  - Does ***not make any assumption about the internal structure*** or even the nature or the services that will be delivered over an AC
  - Accommodates both ***integrated and separate provisioning models***
    - Incudes ***reusable groupings*** for use by other service models
    - Exposes AC ***references*** that can be used in other service placement requests. ***The AC/service glue is achieved using the AC references***.
  - Favor the approach of completely relying upon the AC service model ***instead of duplicating data nodes into specific modules*** of advanced services that are delivered over an AC
- A network model for the AC management: ***ac-ntw***
  - Augments the SAP model with required AC data nodes
  - Network-view of ACs

Applicability to Network Slicing

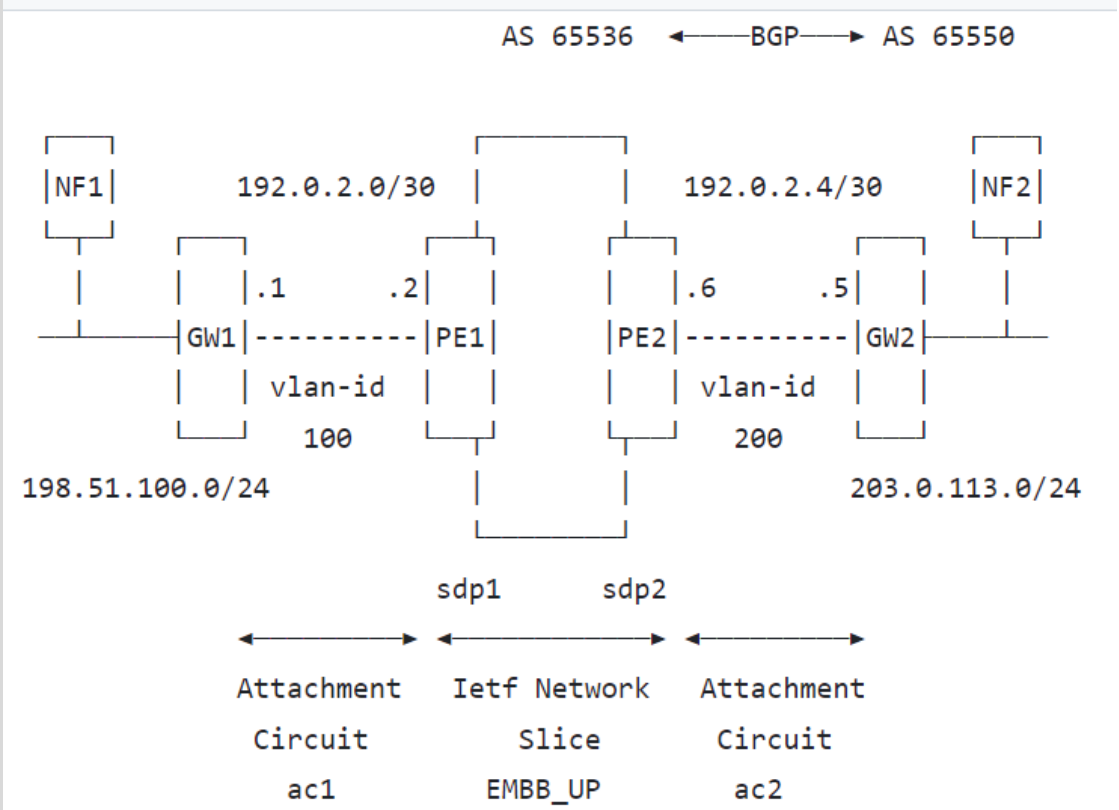


A Sample Slicing Example



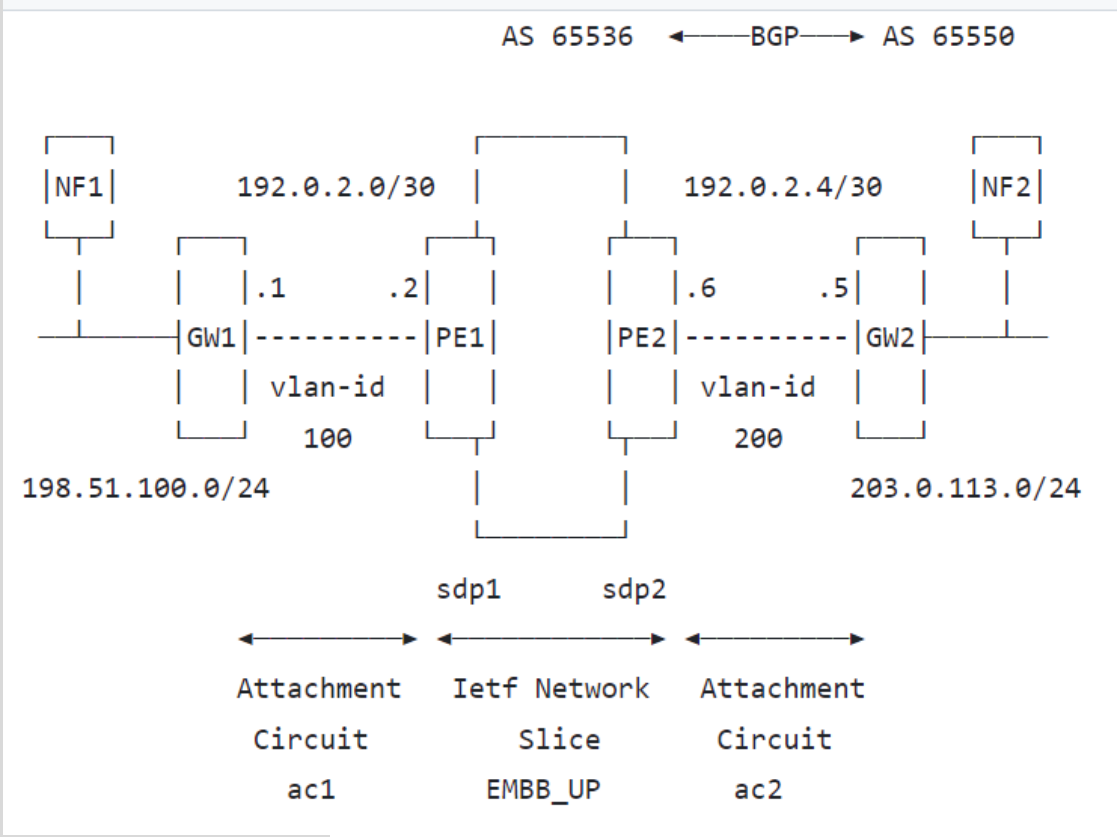
g Example


```
{
 "ietf-ac-svc:attachment-circuits": {
  "ac": [
   {
    "name": "ac1",
    "description": "Connection to site1 on vlan 100",
    "requested-start": "2023-12-12T05:00:00.00Z",
    "l2-connection": {
     "encapsulation": {
      "type": "ietf-vpn-common:dot1q",
      "dot1q": {
       "tag-type": "ietf-vpn-common:c-vlan",
       "cvlan-id": 100
      }
     },
     "bearer-reference": "bearerX@site1"
    },
    "ip-connection": {
     "ipv4": {
      "local-address": "192.0.2.2",
      "prefix-length": 30,
      "address": [
       {
        "address-id": "1",
        "customer-address": "192.0.2.1"
       }]}
    },
    "routing-protocols": {
     "routing-protocol": [
      {
       "id": "1",
       "type": "ietf-vpn-common:static-routing",
       "static": {
        "cascaded-lan-prefixes": {
         "ipv4-lan-prefixes": [
          {
           "lan": "198.51.100.0/24",
           "next-hop": "192.0.2.1",
           "lan-tag": "primary_UP_slice"
          }]}}}]}}]}}
```

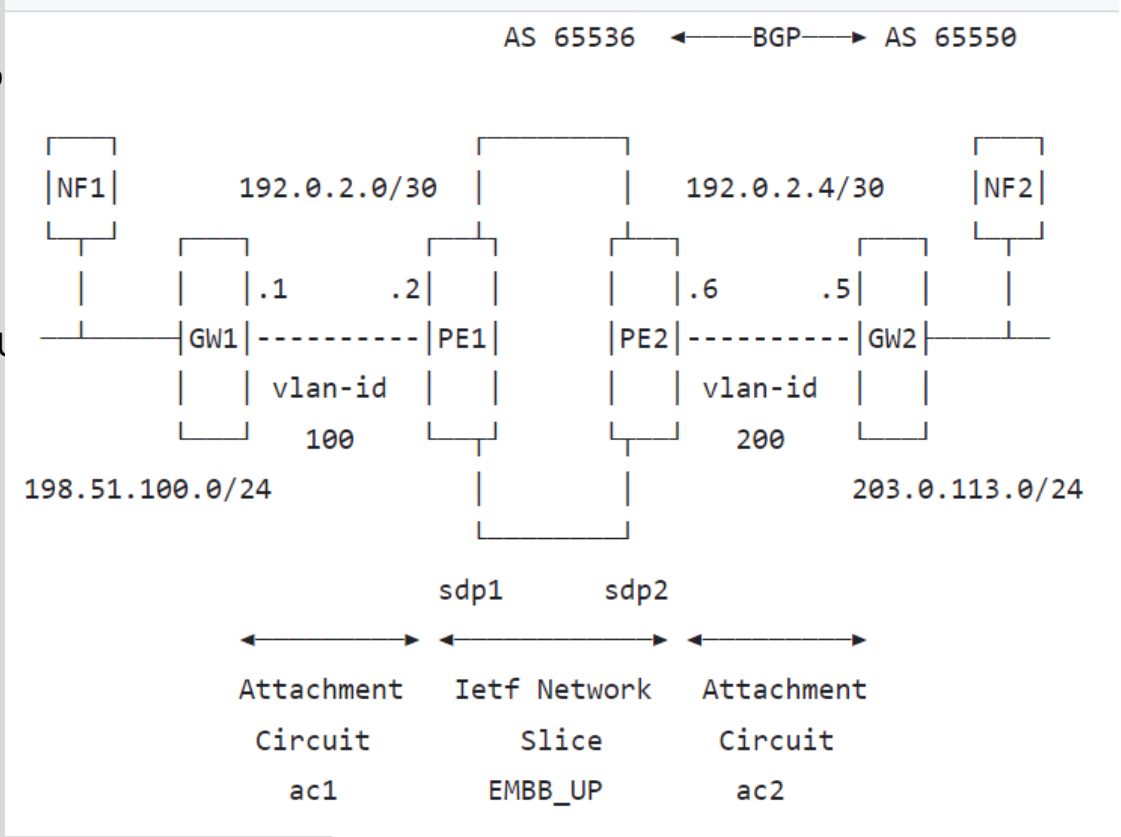
g Example

```
... {
    "name": "ac2",
    "description": "Connection to site2 on vlan 200",
    "requested-start": "2023-12-12T05:00:00.00Z",
    "l2-connection": {
     "encapsulation": {
      "type": "ietf-vpn-common:dot1q",
      "dot1q": {
       "tag-type": "ietf-vpn-common:c-vlan",
       "cvlan-id": 200
      }
     },
     "bearer-reference": "bearerY@site2"
    },
    "ip-connection": {
     "ipv4": {
      "local-address": "192.0.2.6",
      "prefix-length": 30,
      "address": [
       {
        "address-id": "1",
        "customer-address": "192.0.2.5"
       }
      ]
     }
    },
    "routing-protocols": {
     "routing-protocol": [
      {
       "id": "1",
       "type": "ietf-vpn-common:bgp-routing",
       "bgp": {
        "neighbor": [
         {
          "id": "1",
          "peer-as": 65550
         }]}}}}}}
}
```



Bind Slice Services to ACs

```
{
 "ietf-network-slice-service:network-slice-services": {
  "slo-sle-templates": {
   "slo-sle-template": [
    {
     "id": "low-latency-template",
     "template-description": "Lowest latencey fo
    } ]
  },
  "slice-service": [
   {
    "service-id": "Slice URLLC_UP",
    "service-description": "Dedicate TN Slice for U
    "slo-sle-template": "low-latency-template",
    "status": {},
    "sdps": {
     "sdp": [
      {
       "sdp-id": "sdp1",
       "ac-svc-name": ["ac1"]
      },
      {
       "sdp-id": "sdp2",
       "ac-svc-name": ["ac2"]
      }]}}]}
}
```



Summary

- NSSI to focus on network ***slice service specifics***
- AC-related matters to be ***factorized*** among multiple services; including NSS
  - AC-as-a-Service Model
- Binding a network slice service to a list of ACs is done by means of AC references
  - ***New features added to the AC models will be available to the service models***
  - No need to update the service models themselves

Appendix

Methodology

- ***Adhere*** as much as possible to the automation framework set in RFC 8969
  - Ease mappings between service/network models
  - Ease the mapping between network and device models
- ***Leverage*** L3SM (RFC 8299), VPN Common (RFC 9181), L3NM (RFC9182), L2NM (RFC9192), and SAP (draft-ietf-opsawg-sap)
- ***Adjust*** the structure as appropriate to accommodate cloud-specific deployments