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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 or specific to a single service*

- SAPs are connected to customer devices (e.g., CEs, ASBRs, Network Functions, etc.) via logical constructs called: **Attachment Circuits**
  - 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., pee-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
A Proposal

• Specify an AC library with reusable types, identities, and groupings: \textit{ac-common}

• Specify a model for managing ACs as a service: \textit{ac-svc}
  \begin{itemize}
  \item Does \textit{not make any assumption about the internal structure} or even the nature or the services that will be delivered over an AC
  \item Accommodates both \textit{integrated and separate provisioning models}
    \begin{itemize}
    \item Includes \textit{reusable groupings} for use by other service models
    \item Exposes AC/bearer \textit{references} that can be used in other service placement requests
    \end{itemize}
  \item Favor the approach of completely relying upon the AC service model \textit{instead of duplicating data nodes into specific modules} of advanced services that are delivered over an AC
  \end{itemize}

• Specify a network model for the AC management: \textit{ac-ntw}
  \begin{itemize}
  \item Augments the SAP model with required AC data nodes
  \item Network-view of ACs
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
Sample Usage: O-RAN
Sample Usage: Cloud

```
{
  "ietf-ac-svc:attachment-circuits": {
    "ac": [
      {
        "name": "ac-BXT-DC-customer-VPC-foo",
        "description": "Connection to Cloud Provider",
        "requested-start": "2023-12-12T05:00:00.00Z",
        "12-connection": {
          "bearer-reference": "1243-56789"
        },
        "ip-connection": {
          "ipv4": {
            "local-address": "192.0.2.1",
            "prefix-length": 24,
            "address": [
              {
                "address-id": "1",
                "customer-address": "192.0.2.2"
              }
            ]
          }
        },
        "routing-protocols": {
          "routing-protocol": {
            "id": "1",
            "type": "ietf-vpn-common:bgp-routing",
            "bgp": {
              "neighbor": [
                {
                  "id": "1",
                  "peer-as": 65536,
                  "authentication": {
                    "keying-material": {
                      "md5-keychain": "nyxNER_c5sdn608fPQl3331d"
                    }
                  }
                }
              ]
            }
          }
        }
      }
    ]
  }
}
```
Work Status

Attachment Circuits Data Models

In Progress
This is actively being worked on
- Review bearer Section
- Review the examples (appendix)
- Review Sections 1-3
- Review Section 3 (Use Cases)
- Review Introduction
- Add text to explain the rationale for the naming
- Where to put the reusable groupings

More Dig Is Needed
- attachment-circuit-model #47
- Change | ----rw bearer-reference? from string to list
- attachment-circuit-model #51
- bundling ACs (from Richard)
- attachment-circuit-model #17
- discuss the case of multiple CE reachable over a same AC
- attachment-circuit-model #49
- Bearer: add LAG parameters
- attachment-circuit-model #46
- discuss VRRP
- attachment-circuit-model #3
- add more details about bearers
- attachment-circuit-model #6
- deal with multiple local subnets (local-address)

Candidate Features
- attachment-circuit-model #67
- Use case for MPLS as an AC
- network-attachment-circuits #7
- Bearer: add provider parameters
- network-attachment-circuits #5
- Bearer: add model physical information of the connectivity
- network-attachment-circuits #4
- Bearer: missing customer port in "customer point" section
- network-attachment-circuits #3
- should we add a constraint on bearer to identify the SP POP to which the bearer is attached?
- network-attachment-circuits #1
- Attach (in/out) BGP policies

Done
This has been completed
- attachment-circuit-model #62
- Have a read-only leaf-list in the bearer-svc to report the ACes on the same bearer
- attachment-circuit-model #65
- Discuss examples A.6 and A.7 are arguable.
- attachment-circuit-model #23
- Clarify the relation with composed VPN
- attachment-circuit-model #18
- One CE Multiple Bearers (Comment from Bo)
- network-attachment-circuits #2
- Sampler Request An AC over An Existing Bearer
- attachment-circuit-model #42
- Add "comment" leaf to include free-text instructions (from Moti)
- attachment-circuit-model #55
-
Next Steps

• Request WG Adoption
  – Used/referred to by other SDOs (O-RAN, for example)

• Commit to report and seek reviews from other WGs, such as teas for the specific slice service
  – Sync how to glue slice-services to attachment circuits/bearers