

Persistence of HPA related information in AAI

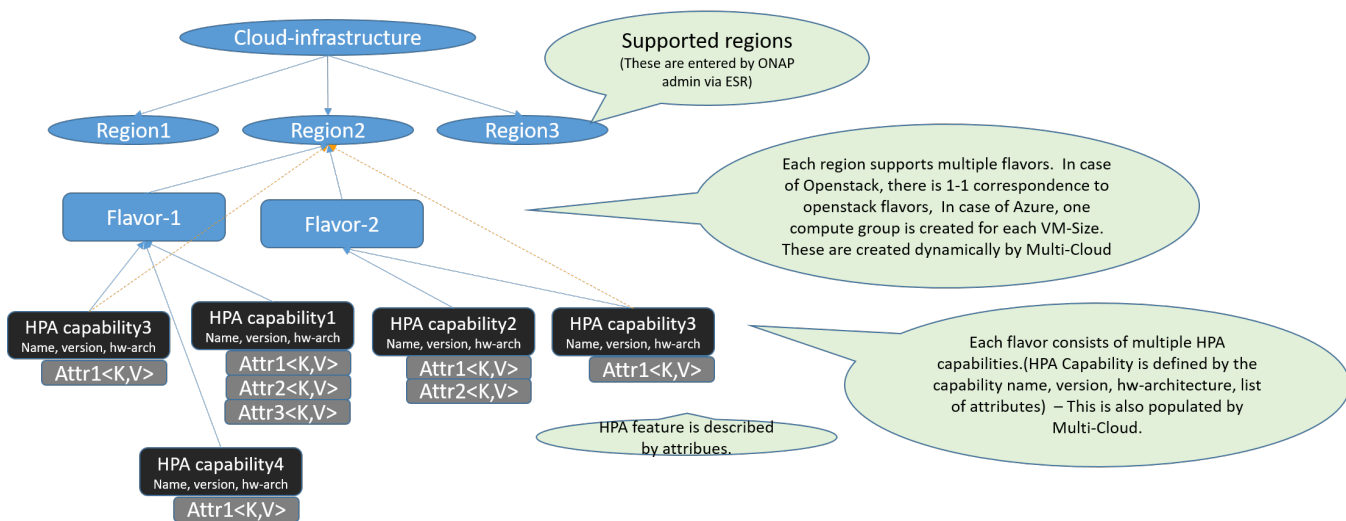
Requirements that are kept in mind are :

- Expose HW capability of various CPU architecture (Intel x86, ARM etc...) in generic fashion.
- Provide flexibility to expose CPU architecture and vendor specific features.
- Support for multiple Clouds such as Openstack clouds, AWS Cloud, Azure Cloud etc...
- No hardcoding of HPA feature names OR attribute names in ONAP (other than Multi-Cloud plugin)
- [HPA Impact on the AAI Project](#)
- Please refer to [HPA Requirement & Capability Specification](#)

Following format is used to represent the HPACapability:

- Data centers typically have flavors (openstack calls them flavors, Azure calls them VM sizes and AWS calls them as Instance types). Each flavor is represented by hardware features. When these are discovered by ONAP, there are few ways to represent them in A&AI DB.
 - Approach 1:
 - flavors as children to the cloud-region (Already existing)
 - Represent HPA capabilities under each flavor (HPA capabilities as children of each flavor)
 - Approach 2:
 - flavors as children to the cloud-region (Already existing). Also, represent HPA capabilities also children to the cloud-regions.
 - Then provide relationship between flavors and capabilities.
 - Approach 3:
 - Approach 1 +
 - Create another tree with capability to region+flavor list.
 - Which approach to follow? Some guidance from A&AI team. Requirement is this:
 - During VNF instantiation, OOF gets hold of hardware requirements and based on that requirements, it needs to find out the best cloud-region and flavor.
 - Would Approach 3 seem possible?
- Each HPACapability is defined as **{HPACapability-id,HPAFeature, Schema Version, hardware-architecture, [List of HPAAttributes] - names and values}**
- HPAFeatureAttribute is <hpaAttributeKey, hpaAttributeValue>
- Refer [Supported HPA Capability Requirements\(DRAFT\)](#) for more specific Capability names and values.

A&AI Schema Changes



Example: Run time view of A&AI graph instance

[blocked URL](#)

Current AAI Schema

```
<java-type name="CloudRegion">
  <xml-root-element name="cloud-region" />
  <java-attributes>
    <xml-element java-attribute="cloudOwner" name="cloud-owner" required="true" type="java.lang.String" xml-key="true">
```

```

        <xml-properties>
            <xml-property name="description" value="Identifies the vendor and cloud name. First part of
composite key should be formatted as vendor-cloudname" />
        </xml-properties>
    </xml-element>
    <xml-element java-attribute="cloudRegionId" name="cloud-region-id" required="true" type="java.lang.
String" xml-key="true">
        <xml-properties>
            <xml-property name="description" value="Identifier used by the vendor for the region. Second
part of composite key" />
        </xml-properties>
    </xml-element>
    <xml-element java-attribute="cloudType" name="cloud-type" type="java.lang.String">
        <xml-properties>
            <xml-property name="description" value="Type of the cloud (e.g., openstack)" />
        </xml-properties>
    </xml-element>
    <xml-element java-attribute="ownerDefinedType" name="owner-defined-type" type="java.lang.String">
        <xml-properties>
            <xml-property name="description" value="Cloud-owner defined type indicator (e.g., dcp, lcp)" />
        </xml-properties>
    </xml-element>
    <xml-element java-attribute="cloudRegionVersion" name="cloud-region-version" type="java.lang.String">
        <xml-properties>
            <xml-property name="description" value="Software version employed at the site. NOTE - THIS
FIELD IS NOT KEPT UP TO DATE." />
        </xml-properties>
    </xml-element>
    <xml-element java-attribute="identityUrl" name="identity-url" type="java.lang.String">
        <xml-properties>
            <xml-property name="description" value="URL of the keystone identity service" />
        </xml-properties>
    </xml-element>
    <xml-element java-attribute="cloudZone" name="cloud-zone" type="java.lang.String">
        <xml-properties>
            <xml-property name="description" value="Zone where the cloud is homed. NOTE - THIS FIELD IS
NOT CORRECTLY POPULATED." />
        </xml-properties>
    </xml-element>
    <xml-element java-attribute="complexName" name="complex-name" type="java.lang.String">
        <xml-properties>
            <xml-property name="description" value="complex name for cloud-region instance. NOTE - THIS
FIELD IS NOT CORRECTLY POPULATED." />
        </xml-properties>
    </xml-element>
    <xml-element default-value="false" required="true" java-attribute="sriovAutomation" name="sriov-
automation" type="java.lang.Boolean">
        <xml-properties>
            <xml-property name="defaultValue" value="false"/>
            <xml-property name="description" value="Whether the cloud region supports (true) or does not
support (false) SR-IOV automation." />
        </xml-properties>
    </xml-element>
    <xml-element java-attribute="cloudExtraInfo" name="cloud-extra-info" type="java.lang.String">
        <xml-properties>
            <xml-property name="description" value="ESR inputs extra information about the VIM or Cloud
which will be decoded by MultiVIM." />
        </xml-properties>
    </xml-element>
    <xml-element java-attribute="cloudEpaCaps" name="cloud-epa-caps" type="java.lang.String">
        <xml-properties>
            <xml-property name="description" value="MultiVIM will discover and expose EPA capabilities." />
        </xml-properties>
    </xml-element>
    <xml-element java-attribute="resourceVersion" name="resource-version" type="java.lang.String">
        <xml-properties>
            <xml-property name="description" value="Used for optimistic concurrency. Must be empty on
create, valid on update and delete." />
        </xml-properties>
    </xml-element>
    <xml-element java-attribute="volumeGroups" name="volume-groups" type="inventory.aai.onap.org.v11.

```

```

VolumeGroups" />
    <xml-element java-attribute="tenants" name="tenants" type="inventory.aai.onap.org.v11.Tenants" />
    <xml-element java-attribute="flavors" name="flavors" type="inventory.aai.onap.org.v11.Flavors" />
    <xml-element java-attribute="groupAssignments" name="group-assignments" type="inventory.aai.onap.org.
v11.GroupAssignments" />
    <xml-element java-attribute="snapshots" name="snapshots" type="inventory.aai.onap.org.v11.Snapshots" />
    <xml-element java-attribute="images" name="images" type="inventory.aai.onap.org.v11.Images" />
    <xml-element java-attribute="dvsSwitches" name="dvs-switches" type="inventory.aai.onap.org.v11.
DvsSwitches" />
    <xml-element java-attribute="oamNetworks" name="oam-networks" type="inventory.aai.onap.org.v11.
OamNetworks" />
    <xml-element java-attribute="availabilityZones" name="availability-zones" type="inventory.aai.onap.org.
v11.AvailabilityZones" />
    <xml-element java-attribute="relationshipList" name="relationship-list" type="inventory.aai.onap.org.
v11.RelationshipList" />
    <xml-element java-attribute="esrSystemInfoList" name="esr-system-info-list" type="inventory.aai.onap.
org.v11.EsrSystemInfoList" />
    <xml-element container-type="java.util.ArrayList" java-attribute="vipIpv4AddressList" name="vip-ipv4-
address-list" type="inventory.aai.onap.org.v11.VipIpv4AddressList" />
    <xml-element container-type="java.util.ArrayList" java-attribute="vipIpv6AddressList" name="vip-ipv6-
address-list" type="inventory.aai.onap.org.v11.VipIpv6AddressList" />
    </java-attributes>
    <xml-properties>
        <xml-property name="description" value="cloud-region designates an installation of a cloud cluster or
region or instantiation." />
        <xml-property name="indexedProps" value="cloud-owner,cloud-region-id,cloud-type,owner-defined-type" />
        <xml-property name="nameProps" value="owner-defined-type" />
        <xml-property name="container" value="cloud-regions" />
        <xml-property name="namespace" value="cloud-infrastructure" />
    </xml-properties>
</java-type>

```

Modified AAI Schema

```

<java-type name="Flavor">
    <xml-root-element name="flavor"/>
    <java-attributes>
        <xml-element java-attribute="flavorId" name="flavor-id" required="true" type="java.lang.String" xml-
key="true">
            <xml-properties>
                <xml-property name="description" value="Flavor id, expected to be unique across cloud-region."/>
            </xml-properties>
        </xml-element>
        <xml-element java-attribute="flavorName" name="flavor-name" required="true" type="java.lang.String">
            <xml-properties>
                <xml-property name="description" value="Flavor name"/>
            </xml-properties>
        </xml-element>
        <xml-element java-attribute="flavorVcpus" name="flavor-vcpus" type="java.lang.Integer">
            <xml-properties>
                <xml-property name="description" value="Number of CPUs"/>
            </xml-properties>
        </xml-element>
        <xml-element java-attribute="flavorRam" name="flavor-ram" type="java.lang.Integer">
            <xml-properties>
                <xml-property name="description" value="Amount of memory"/>
            </xml-properties>
        </xml-element>
        <xml-element java-attribute="flavorDisk" name="flavor-disk" type="java.lang.Integer">
            <xml-properties>
                <xml-property name="description" value="Disk space"/>
            </xml-properties>
        </xml-element>
        <xml-element java-attribute="flavorEphemeral" name="flavor-ephemeral" type="java.lang.Integer">
            <xml-properties>
                <xml-property name="description" value="Amount of ephemeral disk space"/>
            </xml-properties>
        </xml-element>
        <xml-element java-attribute="flavorSwap" name="flavor-swap" type="java.lang.String">

```

```

        <xml-properties>
            <xml-property name="description" value="amount of swap space allocation"/>
        </xml-properties>
    </xml-element>
    <xml-element java-attribute="flavorIsPublic" name="flavor-is-public" type="java.lang.Boolean">
        <xml-properties>
            <xml-property name="description"
                value="whether flavor is available to all users or private to the tenant it was
created in."/>
        </xml-properties>
    </xml-element>
    <xml-element java-attribute="flavorSelflink" name="flavor-selflink" required="true" type="java.lang.
String">
        <xml-properties>
            <xml-property name="description" value="URL to endpoint where AAI can get more details"/>
        </xml-properties>
    </xml-element>
    <xml-element java-attribute="flavorDisabled" name="flavor-disabled" type="java.lang.Boolean">
        <xml-properties>
            <xml-property name="description" value="Boolean as to whether this flavor is no longer enabled"
/>
    </xml-properties>
</xml-element>
<xml-element java-attribute="hpaCapabilities" name="hpa-capabilities"
    type="inventory.aai.onap.org.v13.HpaCapabilities">
    <xml-properties>
        <xml-property name="description" value="List of HPA Capabilities associated with this flavor"/>
    </xml-properties>
</xml-element>
<xml-element java-attribute="resourceVersion" name="resource-version" type="java.lang.String">
    <xml-properties>
        <xml-property name="description"
            value="Used for optimistic concurrency. Must be empty on create, valid on update
and delete."/>
    </xml-properties>
</xml-element>
<xml-element java-attribute="relationshipList" name="relationship-list"
    type="inventory.aai.onap.org.v13.RelationshipList"/>
</java-attributes>
<xml-properties>
    <xml-property name="description" value="Openstack flavor."/>
    <xml-property name="nameProps" value="flavor-name"/>
    <xml-property name="indexedProps" value="flavor-name,flavor-id"/>
    <xml-property name="dependentOn" value="cloud-region"/>
    <xml-property name="container" value="flavors"/>
</xml-properties>
</java-type>

<java-type name="HpaCapabilities">
    <xml-properties>
        <xml-property name="description" value="Collection of HPA Capabilities"/>
    </xml-properties>
    <xml-root-element name="hpa-capabilities"/>
</java-attributes>
    <xml-element container-type="java.util.ArrayList" java-attribute="hpaCapability" name="hpa-capability"
        type="inventory.aai.onap.org.v13.HpaCapability"/>
</java-attributes>
</java-type>

<java-type name="HpaCapability">
<xml-root-element name="hpa-capability"/>
<java-attributes>
    <xml-element java-attribute="hpaCapabilityId" name="hpa-capability-id" required="true" type="java.lang.
String"
        xml-key="true">
        <xml-properties>
            <xml-property name="description" value="UUID to uniquely identify a HPA capability"/>
        </xml-properties>
    </xml-element>
    <xml-element java-attribute="hpaFeature" name="hpa-feature" required="true" type="java.lang.String">
        <xml-properties>

```

```

        <xml-property name="description" value="Name of the HPACapability"/>
    </xml-properties>
</xml-element>
<xml-element java-attribute="version" name="hpa-version" type="java.lang.String">
    <xml-properties>
        <xml-property name="description" value="HPA schema version"/>
    </xml-properties>
</xml-element>
<xml-element java-attribute="hardwareArchitecture" name="hpa-hw-arch" type="java.lang.String">
    <xml-properties>
        <xml-property name="description" value="Hardware architecture"/>
    </xml-properties>
</xml-element>
<xml-element java-attribute="resourceVersion" name="resource-version" type="java.lang.String">
    <xml-properties>
        <xml-property name="description"
            value="Used for optimistic concurrency. Must be empty on create, valid on update and
delete."/>
    </xml-properties>
</xml-element>
<xml-element java-attribute="relationshipList" name="relationship-list"
    type="inventory.aai.onap.org.v13.RelationshipList"/>
<xml-element container-type="java.util.ArrayList" java-attribute="hpaFeatureAttribute" name="hpa-feature-
attribute"
    type="inventory.aai.onap.org.v13.HpaFeatureAttribute"/>
</java-attributes>
<xml-properties>
    <xml-property name="description" value="Represents a HPA capability"/>
    <xml-property name="nameProps" value="hpa-feature"/>
    <xml-property name="indexedProps" value="hpa-feature,hpa-hw-arch,hpa-capability-id"/>
    <xml-property name="dependentOn" value="flavor"/>
    <xml-property name="container" value="hpa-capabilities"/>
</xml-properties>
</java-type>

<java-type name="HpaFeatureAttribute">
<xml-root-element name="hpa-feature-attribute"/>
<java-attributes>
    <xml-element java-attribute="hpaAttributeKey" name="hpa-attr-key" type="java.lang.String">
        <xml-properties>
            <xml-property name="description" value="name of the specific HPA attribute"/>
        </xml-properties>
    </xml-element>
    <xml-element java-attribute="hpaAttributeValue" name="hpa-attr-value" type="java.lang.String">
        <xml-properties>
            <xml-property name="description"
                value="JSON string specifying the value, unit and type of the specific HPA attribute"
/>
        </xml-properties>
    </xml-element>
    <xml-element java-attribute="resourceVersion" name="resource-version" type="java.lang.String">
        <xml-properties>
            <xml-property name="description"
                value="Used for optimistic concurrency. Must be empty on create, valid on update and
delete."/>
        </xml-properties>
    </xml-element>
    <xml-element java-attribute="relationshipList" name="relationship-list"
        type="inventory.aai.onap.org.v13.RelationshipList"/>
</java-attributes>
<xml-properties>
    <xml-property name="description" value="HPA Capability Feature attributes"/>
    <xml-property name="container" value="hpa-capability"/>
</xml-properties>
</java-type>

```

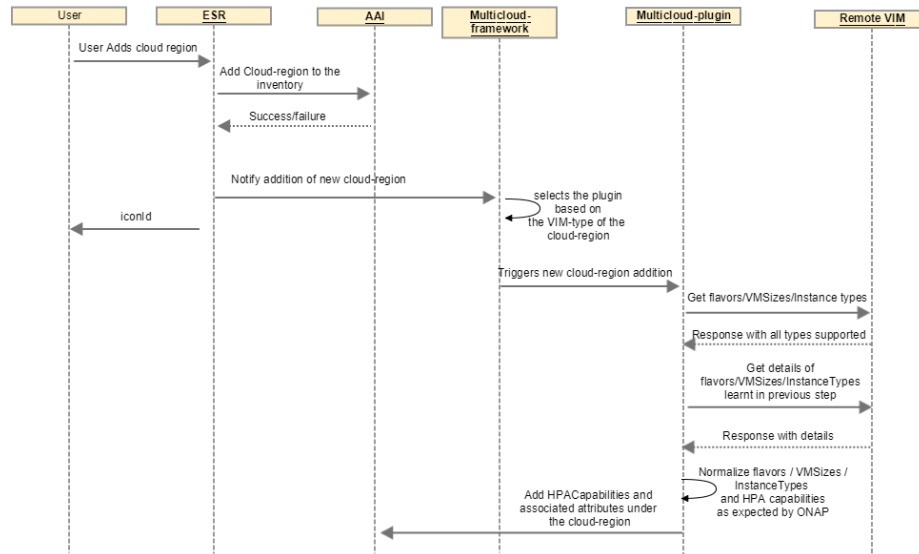
Edge Relations

```
{
  "from": "flavor",
  "to": "cloud-region",
  "label": "org.onap.relationships.inventory.BelongsTo",
  "direction": "OUT",
  "multiplicity": "MANY2ONE",
  "contains-other-v": "!${direction}",
  "delete-other-v": "NONE",
  "SVC-INFRA": "NONE",
  "prevent-delete": "!${direction}",
  "default": "true",
  "description":""
},
{
  "from": "hpa-capability",
  "to": "flavor",
  "label": "org.onap.relationships.inventory.BelongsTo",
  "direction": "OUT",
  "multiplicity": "MANY2ONE",
  "contains-other-v": "!${direction}",
  "delete-other-v": "NONE",
  "SVC-INFRA": "NONE",
  "prevent-delete": "!${direction}",
  "default": "true",
  "description":""
},
{
  "from": "hpa-capability",
  "to": "cloud-region",
  "label": "org.onap.relationships.inventory.AssociatedWith",
  "direction": "OUT",
  "multiplicity": "MANY2ONE",
  "contains-other-v": "NONE",
  "delete-other-v": "NONE",
  "SVC-INFRA": "NONE",
  "prevent-delete": "!${direction}",
  "default": "true",
  "description":""
},
}
```

Sequence Diagrams

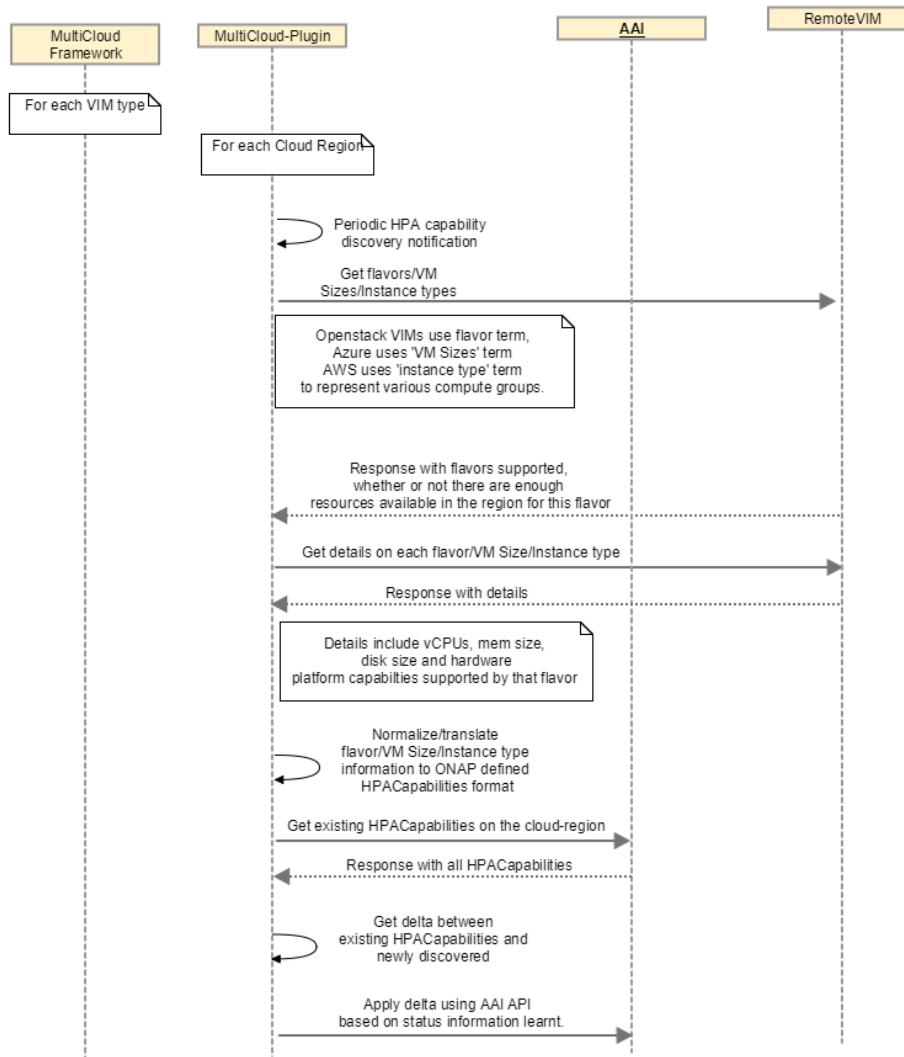
Discovery of HPA-flavors when cloud-region is added

Cloud-RegionInitdiscovery



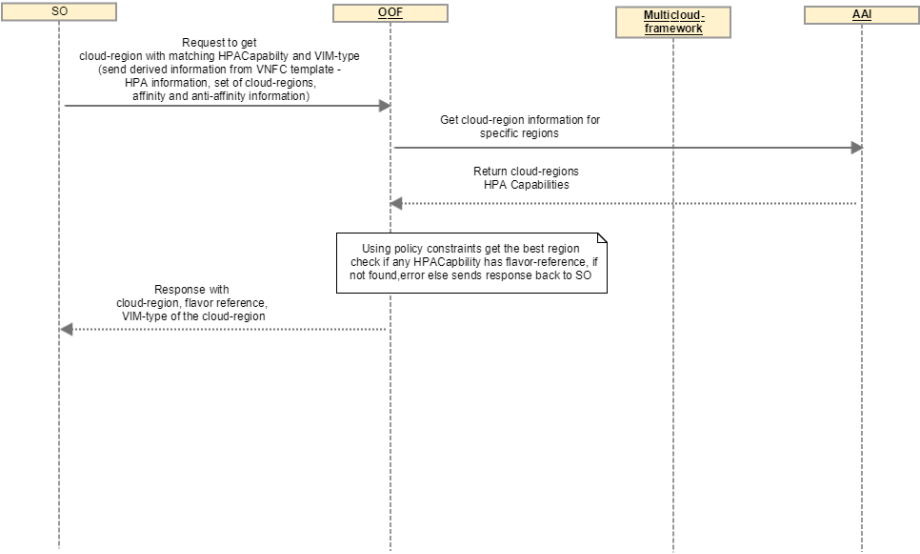
Periodic Discovery of HPACapabilities

Periodic discovery of HPACapabilities



VNFC Instantiation

VNFCinstantiation



TBD

Following table provides HPA features and attributes. Also, it describes matching constraints for each HPA feature. These constraints are applied while finding the best cloud-region for placing VNFC.

Attributes are represented as:

TBD...

<HPA feature name			
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AAI APIs for HPA :

TBD