Affinity and Anti-Affinity Rules on OpenStack

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The following sections describe affinity and anti-affinity policies with examples.

Intra Group Affinity Policy

The VNFs within the same VM group can either be deployed on the same host, or into the same availability zone.

Example for Intra Group Affinity Policy:

```
<vm_group>
    <name>affinity-test-gp</name>
    <placement>
<type>affinity</type>
<enforcement>strict</enforcement>
    </placement>
...
```

The type *zone-host* is used to deploy VNFs in the same host, or into the same availability zone.

Zone or Host Based Placement

The VNFs are within the same VM group and deployed on the same host or the same available zone. The *host* tag is used to deploy VMs on the same host and the *zone* tag is used to deploy VMs in the same available zone. Before deploying, you need to make sure that the host exists in OpenStack. ESC validates the specified host on OpenStack. The *zone-host* tag specifies the type of placement. Hence, if a host or a zone is not specified during a deployment, the deployment fails.

👉

Important   You cannot specify both the host and zone tags to deploy VM on the same host or the same available zone.

Example for host placement:

```
<vm_group>
    <name>zone-host-test-gp1</name>
    <placement>
<type>zone_host</type>
<enforcement>strict</enforcement>
```

```
 <host>my-server</host>
     </placement>
...
```

Example for zone placement:

```
<vm_group>
     <name>zone-host-test-gp2</name>
     <placement>
 <type>zone_host</type>
 <enforcement>strict</enforcement>
        <zone>dt-zone</zone>
     </placement>
...
```

Intra Group Anti-Affinity Policy

The VNFs within the same VM group are explicitly deployed on different hosts. For example, back-up VNFs.

Example for Intra Group anti-affinity Policy:

```
<vm_group>
        <name>anti-affinity-test-gp</name>
        <placement>
            <type>anti_affinity</type>
            <enforcement>strict</enforcement>
        </placement>
...
```

Inter Group Affinity Policy

The VNFs in the same deployment but different VM groups can be explicitly deployed in the same host. For example VNF bundles. Multiple VM groups can follow this policy by adding the vm_group_ref tag and providing the VM group name as the value.

✎

Note You can use one or more vm_group_ref tag, type tag and enforcement tag under the placement tag. The host or zone cannot be specified.

Example for Inter Group Affinity Policy:

```
<deployments>
            <deployment>
            <name>intergroup-affinity-dep</name>
             <policies>
              <placement>
                <target_vm_group_ref>affinity-test-gp1</target_vm_group_ref>
                <type>affinity</type>
                <vm_group_ref>affinity-test-gp2</vm_group_ref>
                <enforcement>strict</enforcement>
              </placement>
         </policies>
…
```

Inter Group Anti-Affinity Policy

The VNFs in the same deployment but different VM Groups can be explicitly deployed in different hosts. For example back-up VNFs or High-availability VNFs. Multiple VM groups can follow this policy by adding the vm_group_ref tag, and providing the VM group name as the value.

Note
You can only use one <target_vm_group_ref> tag, type tag and enforcement tag under the placement tag. The host or zone cannot be specified.You can use multiple <vm_group_ref> tags, however the anti-affinity policy only applies between each <vm_group_ref> and their <target_vm_group_ref>, which means that 2 or more <vm_group_ref> can be deployed on the same host, as long as each of them are deployed on a different host from their <target_vm_group_ref> that is acceptable.

Example for Inter Group anti-affinity Policy:

```
<deployments>
        <deployment>
         <name>intergroup-anti_affinity-dep</name>
          <policies>
           <placement>
               <target_vm_group_ref>affinity-test-gp1</target_vm_group_ref>
               <type>anti_affinity</type>
               <vm_group_ref>affinity-test-gp2</vm_group_ref>
               <enforcement>strict</enforcement>
             </placement>
          </policies>
…
```

In a multiple VIM deployment, the VM groups of a placement policy must belong to the same VIM. That is, the VIM connector must be the same for the VM groups (specified in the vim_id attribute in the locator tag of the VM group). ESC rejects a deployment if the affinity and anti-affinity policies between VM groups are on different VIMs. For more details on deploying VMs on multiple deployments, see "Deploying VNFs onMultiple OpenStack VIMs".

A placement group tag is added under policies. Each <placement_group> contains the following:

* name—name unique per deployment.

* type—affinity or anti_affinity

* enforcement—strict

* vm_group—the content of each vm_group must be a vm group name listed under the same deployment.

The placement group tag is placed within the placement policy. The placement policy describes the relationship between the target vm group and the vm group members. The placement_group policy describes mutual relationship among all vm group members. The placement group policy is not applicable for target vm group.

The datamodel is as follows:

```
<policies>
 <placement_group>
  <name>placement-affinity-1</name>
  <type>affinity</type>
  <enforcement>strict</enforcement>
  <vm_group>t1g1</vm_group>
  <vm_group>t1g2</vm_group>
```

```
 <vm_group>t1g7</vm_group>
</placement_group>
<placement_group>
 <name>placement-affinity-2</name>
 <type>affinity</type>
 <enforcement>strict</enforcement>
 <vm_group>t1g3</vm_group>
 <vm_group>t1g4</vm_group>
</placement_group>
<placement_group>
 <name>placement-affinity-3</name>
 <type>affinity</type>
 <enforcement>strict</enforcement>
 <vm_group>t1g5</vm_group>
 <vm_group>t1g6</vm_group>
</placement_group>
<placement_group>
 <name>placement-anti-affinity-1</name>
 <type>anti_affinity</type>
 <enforcement>strict</enforcement>
 <vm_group>t1g1</vm_group>
 <vm_group>t1g3</vm_group>
 <vm_group>t1g5</vm_group>
</placement_group>
</policies>
```

Note In the new placement group tag under policies, the <target_vm_group_ref> and <vm_group_ref> are replaced with <vm_group>. The ref based affinity and antiaffinity tags are deprecated.

The placement group policy is applicable for inter group affinity and anti-affinity policies only.

You cannot use both placement and placement group tags together in the inter group affinity and anti-affinity policies.

The placement group name tag must be unique for each placement group policy.

Limitations

Single VM can only be used on one server group for Affinity and Anti-Affinity policies.

Inter Deployment Anti-Affinity Policy

Inter Deployment anti-affinity rules define relationships between different deployments with respect to the host placement. Anti-affinity between deployments is defined such that any VM from one deployment is not co-located on the same host as any other VM from the other deployment.

Note Inter Deployment anti-affinity is supported on OpenStack only. Inter Deployment anti-affinity does not work with host-placement (affinity or anti-affinity) as the latter takes precedence over inter deployment anti-affinity rules.

In the ESC datamodel, inter deployment anti-affinity is defined using anti-affinity groups. All member deployments of an anti-affinity group have an anti-affinity relationship between them. For example, in an

anti-affinity group called default-anti with 3 deployments dep-1, dep-2 and dep-3, dep-1 is anti-affinity to dep-2 and dep-3 deployments, dep-2 is anti-affinity to dep-1 and dep-3 deployments, dep-3 is anti-affinity dep-1 and dep-2. A deployment specifies its membership in an anti-affinity group by referencing to all group names it pertains to as shown below.

```
<deployment>
<name>VPC-dep</name>
 <deployment_groups>
  <anti_affinity_group>VPC-ANTI-AFFINITY</anti_affinity_group>
  <anti_affinity_group>VPNAAS-ANTI-AFFINITY</anti_affinity_group>
 </deployment_groups>
….
</deployment>
```

In the above example, VPC-dep is in 2 anti-affinity groups; any other deployment that references one of these 2 groups will have an anti-affinity relationship with VPC-dep.

Inter-deployment Placement Groups

Anti-affinity group is an example of placement group. Anti-affinity group has the following properties in ESC:

- The placement group need not be created or deleted.

- Placement groups can be referenced for the first time by one deployment as well as multiple deployments in parallel.

- Placement rules are applicable during any deployment phase of a service including:

    - Initial deployment

    - Scale Out

    - VM group update addition

    - VM group minimum scaling update (increasing minimum scaling to add VMs)

    - Recovery

A multiple VIM deployment, supports Inter-deployment anti-affinity. However, ESC rejects a deployment

- If the inter-deployment anti-affinity policy is defined between a multiple VIM deployment (with locators within VM groups) and a default VIM deployment (without locators).

- If all the deployments of an inter-deployment anti-affinity group are not deployed on the same VIM (with same vim_id). For more details on a multiple VIM deployment, see Deploying VNFs on Multiple OpenStack VIMs.