Scheduling

Compute uses the `nova-scheduler` service to determine how to dispatch compute and volume requests. For example, the `nova-scheduler` service determines on which host a VM should launch. In the context of filters, the term *host* means a physical node that has a `nova-compute` service running on it. You can configure the scheduler through a variety of options.

Compute is configured with the following default scheduler options in the `/etc/nova/nova.conf` file:

```
scheduler_driver=nova.scheduler.multi.MultiScheduler
scheduler_driver_task_period = 60
scheduler_driver = nova.scheduler.filter_scheduler.FilterScheduler
scheduler_available_filters = nova.scheduler.filters.all_filters
scheduler_default_filters = RetryFilter, AvailabilityZoneFilter, RamFilter, ComputeFilter, ComputeCapabilitiesFilter, ImagePropertiesFilter, ServerGrou
```

By default, the `scheduler_driver` is configured as a filter scheduler, as described in the next section. In the default configuration, this scheduler considers hosts that meet all the following criteria:

- Have not been attempted for scheduling purposes (`RetryFilter`).
- Are in the requested availability zone (`AvailabilityZoneFilter`).
- Have sufficient RAM available (`RamFilter`).
- Can service the request (`ComputeFilter`).
- Satisfy the extra specs associated with the instance type (`ComputeCapabilitiesFilter`).
- Satisfy any architecture, hypervisor type, or virtual machine mode properties specified on the instance's image properties (`ImagePropertiesFilter`).
- Are on a different host than other instances of a group (if requested) (`ServerGroupAntiAffinityFilter`).
- Are in a set of group hosts (if requested) (`ServerGroupAffinityFilter`).

The scheduler caches its list of available hosts; use the `scheduler_driver_task_period` option to specify how often the list is updated.

Note

Do not configure `service_down_time` to be much smaller than `scheduler_driver_task_period`; otherwise, hosts appear to be dead while the host list is being cached.

For information about the volume scheduler, see the Block Storage section of *OpenStack Cloud Administrator Guide*.

The scheduler chooses a new host when an instance is migrated.

When evacuating instances from a host, the scheduler service does not pick the next host. Instances are evacuated to the host explicitly defined by the administrator. For information about instance evacuation, see Evacuate instances section of the *OpenStack Cloud Administrator Guide*.

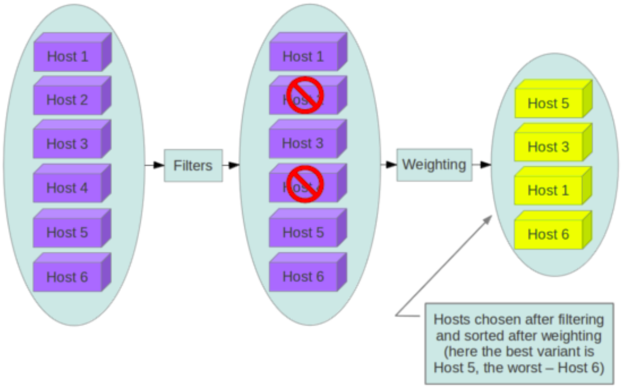
Filter scheduler

The filter scheduler (`nova.scheduler.filter_scheduler.FilterScheduler`) is the default scheduler for scheduling virtual machine instances. It supports filtering and weighting to make informed decisions on where a new instance should be created.

Filters

When the filter scheduler receives a request for a resource, it first applies filters to determine which hosts are eligible for consideration when dispatching a resource. Filters are binary: either a host is accepted by the filter, or it is rejected. Hosts that are accepted by the filter are then processed by a different algorithm to decide which hosts to use for that request, described in the Weights section.

Figure 2.2. Filtering



The `scheduler_available_filters` configuration option in `nova.conf` provides the Compute service with the list of the filters that are used by the scheduler. The default setting specifies all of the filter that are included with the Compute service:

```
scheduler_available_filters = nova.scheduler.filters.all_filters
```

This configuration option can be specified multiple times. For example, if you implemented your own custom filter in Python called `myfilter.MyFilter` and you wanted to use both the built-in filters and your custom filter, your `nova.conf` file would contain:

```
scheduler_available_filters = nova.scheduler.filters.all_filters
scheduler_available_filters = myfilter.MyFilter
```

The `scheduler_default_filters` configuration option in `nova.conf` defines the list of filters that are applied by the `nova-scheduler` service. The default filters are:

```
scheduler_default_filters = RetryFilter, AvailabilityZoneFilter, RamFilter, ComputeFilter, ComputeCapabilitiesFilter, ImagePropertiesFilter, ServerGrou
```

The following sections describe the available filters.

AggregateCoreFilter

Filters host by CPU core numbers with a per-aggregate `cpu_allocation_ratio` value. If the per-aggregate value is not found, the value falls back to the global setting. If the host is in more than one aggregate and more than one value is found, the minimum value will be used. For information about how to use this filter, see the section called “Host aggregates”. See also the section called “CoreFilter”.

AggregateDiskFilter

Filters host by disk allocation with a per-aggregate `disk_allocation_ratio` value. If the per-aggregate value is not found, the value falls back to the global setting. If the host is in more than one aggregate and more than one value is found, the minimum value will be used. For information about how to use this filter, see the section called “Host aggregates”. See also the section called “DiskFilter”.

AggregateImagePropertiesIsolation

Matches properties defined in an image's metadata against those of aggregates to determine host matches:

- If a host belongs to an aggregate and the aggregate defines one or more metadata that matches an image's properties, that host is a candidate to boot the image's instance.
- If a host does not belong to any aggregate, it can boot instances from all images.

For example, the following aggregate `myWinAgg` has the Windows operating system as metadata (named 'windows'):

```
$ nova aggregate-details MyWinAgg
+----+----------+-------------------+------------+---------------+
| Id | Name     | Availability Zone | Hosts      | Metadata      |
+----+----------+-------------------+------------+---------------+
| 1  | MyWinAgg | None              | 'sf-devel' | 'os=windows'  |
+----+----------+-------------------+------------+---------------+
```

In this example, because the following Win-2012 image has the windows property, it boots on the `sf-devel` host (all other filters being equal):

```
$ glance image-show Win-2012
+------------------+--------------------------------------+
| Property         | Value                                |
+------------------+--------------------------------------+
| Property 'os'    | windows                              |
| checksum         | f8a2eeee2dc65b3d9b6e63678955bd83     |
| container_format | ami                                  |
| created_at       | 2013-11-14T13:24:25                  |
...
```

You can configure the `AggregateImagePropertiesIsolation` filter by using the following options in the `nova.conf` file:

```
# Considers only keys matching the given namespace (string).
aggregate_image_properties_isolation_namespace = <None>

# Separator used between the namespace and keys (string).
aggregate_image_properties_isolation_separator = .
```

AggregateInstanceExtraSpecsFilter

Matches properties defined in extra specs for an instance type against admin-defined properties on a host aggregate. Works with specifications that are scoped with `aggregate_instance_extra_specs`. For backward compatibility, also works with non-scoped specifications; this action is highly discouraged because it conflicts with ComputeCapabilitiesFilter filter when you enable both filters. For information about how to use this filter, see the host aggregates section.

AggregateIoOpsFilter

Filters host by disk allocation with a per-aggregate `max_io_ops_per_host` value. If the per-aggregate value is not found, the value falls back to the global setting. If the host is in more than one aggregate and more than one value is found, the minimum value will be used. For information about how to use this filter, see the section called “Host aggregates”. See also the section called “IoOpsFilter”.

AggregateMultiTenancyIsolation

Isolates tenants to specific host aggregates. If a host is in an aggregate that has the `filter_tenant_id` metadata key, the host creates instances from only that tenant or list of tenants. A host can be in different aggregates. If a host does not belong to an aggregate with the metadata key, the host can create instances from all tenants.

AggregateNumInstancesFilter

Filters host by number of instances with a per-aggregate `max_instances_per_host` value. If the per-aggregate value is not found, the value falls back to the global setting. If the host is in more than one aggregate and thus more than one value is found, the minimum value will be used. For information about how to use this filter, see the section called “Host aggregates”. See also the section called “NumInstancesFilter”.

AggregateRamFilter

Filters host by RAM allocation of instances with a per-aggregate `ram_allocation_ratio` value. If the per-aggregate value is not found, the value falls back to the global setting. If the host is in more than one aggregate and thus more than one value is found, the minimum value will be used. For information about how to use this filter, see the section called “Host aggregates”. See also the section called “RamFilter”.

AggregateTypeAffinityFilter

Filters host by per-aggregate `instance_type` value. For information about how to use this filter, see the section called “Host aggregates”. See also the section called “TypeAffinityFilter”.

AllHostsFilter

This is a no-op filter. It does not eliminate any of the available hosts.

AvailabilityZoneFilter

Filters hosts by availability zone. You must enable this filter for the scheduler to respect availability zones in requests.

ComputeCapabilitiesFilter

Matches properties defined in extra specs for an instance type against compute capabilities.

If an extra specs key contains a colon (`:`), anything before the colon is treated as a namespace and anything after the colon is treated as the key to be matched. If a namespace is present and is not `capabilities`, the filter ignores the namespace. For backward compatibility, also treats the extra specs key as the key to be matched if no namespace is present; this action is highly discouraged because it conflicts with AggregateInstanceExtraSpecsFilter filter when you enable both filters.

ComputeFilter

Passes all hosts that are operational and enabled.

In general, you should always enable this filter.

CoreFilter

Only schedules instances on hosts if sufficient CPU cores are available. If this filter is not set, the scheduler might over-provision a host based on cores. For example, the virtual cores running on an instance may exceed the physical cores.

You can configure this filter to enable a fixed amount of vCPU overcommitment by using the `cpu_allocation_ratio` configuration option in `nova.conf`. The default setting is:

```
cpu_allocation_ratio = 16.0
```

With this setting, if 8 vCPUs are on a node, the scheduler allows instances up to 128 vCPU to be run on that node.

To disallow vCPU overcommitment set:

```
cpu_allocation_ratio = 1.0
```

> **Note**
>
> The Compute API always returns the actual number of CPU cores available on a compute node regardless of the value of the `cpu_allocation_ratio` configuration key. As a result changes to the `cpu_allocation_ratio` are not reflected via the command line clients or the dashboard. Changes to this configuration key are only taken into account internally in the scheduler.

DifferentHostFilter

Schedules the instance on a different host from a set of instances. To take advantage of this filter, the requester must pass a scheduler hint, using `different_host` as the key and a list of instance UUIDs as the value. This filter is the opposite of the `SameHostFilter`. Using the **nova** command-line tool, use the `--hint` flag. For example:

```
$ nova boot --image cedef40a-ed67-4d10-800e-17455edce175 --flavor 1 \
  --hint different_host=a0cf03a5-d921-4877-bb5c-86d26cf818e1 \
  --hint different_host=8c19174f-4220-44f0-824a-cd1eeef10287 server-1
```

With the API, use the `os:scheduler_hints` key. For example:

```
{
    "server": {
        "name": "server-1",
        "imageRef": "cedef40a-ed67-4d10-800e-17455edce175",
        "flavorRef": "1"
    },
    "os:scheduler_hints": {
        "different_host": [
            "a0cf03a5-d921-4877-bb5c-86d26cf818e1",
            "8c19174f-4220-44f0-824a-cd1eeef10287"
        ]
    }
}
```

DiskFilter

Only schedules instances on hosts if there is sufficient disk space available for root and ephemeral storage.

You can configure this filter to enable a fixed amount of disk overcommitment by using the `disk_allocation_ratio` configuration option in `nova.conf`. The default setting is:

```
disk_allocation_ratio = 1.0
```

Adjusting this value to greater than 1.0 enables scheduling instances while over committing disk resources on the node. This might be desirable if you use an image format that is sparse or copy on write so that each virtual instance does not require a 1:1 allocation of virtual disk to physical storage.

GroupAffinityFilter

> **Note**
>
> This filter is deprecated in favor of ServerGroupAffinityFilter.

The GroupAffinityFilter ensures that an instance is scheduled on to a host from a set of group hosts. To take advantage of this filter, the requester must pass a scheduler hint, using `group` as the key and an arbitrary name as the value. Using the **nova** command-line tool, use the `--hint` flag. For example:

```
$ nova boot --image IMAGE_ID --flavor 1 --hint group=foo server-1
```

This filter should not be enabled at the same time as GroupAntiAffinityFilter or neither filter will work properly.

GroupAntiAffinityFilter

> **Note**
>
> This filter is deprecated in favor of ServerGroupAntiAffinityFilter.

The GroupAntiAffinityFilter ensures that each instance in a group is on a different host. To take advantage of this filter, the requester must pass a scheduler hint, using `group` as the key and an arbitrary name as the value. Using the **nova** command-line tool, use the `--hint` flag. For example:

```
$ nova boot --image IMAGE_ID --flavor 1 --hint group=foo server-1
```

This filter should not be enabled at the same time as GroupAffinityFilter or neither filter will work properly.

ImagePropertiesFilter

Filters hosts based on properties defined on the instance's image. It passes hosts that can support the specified image properties contained in the instance. Properties include the architecture, hypervisor type, and virtual machine mode. for example, an instance might require a host that runs an ARM-based processor and QEMU as the hypervisor. An image can be decorated with these properties by using:

```
$ glance image-update img-uuid --property architecture=arm --property hypervisor_type=qemu
```

The image properties that the filter checks for are:

- `architecture`: Architecture describes the machine architecture required by the image. Examples are i686, x86_64, arm, and ppc64.
- `hypervisor_type`: Hypervisor type describes the hypervisor required by the image. Examples are xen, qemu, and xenapi. Note that qemu is used for both QEMU and KVM hypervisor types.
- `vm_mode`: Virtual machine mode describes the hypervisor application binary interface (ABI) required by the image. Examples are 'xen' for Xen 3.0 paravirtual ABI, 'hvm' for native ABI, 'uml' for User Mode Linux paravirtual ABI, exe for container virt executable ABI.

IsolatedHostsFilter

Allows the admin to define a special (isolated) set of images and a special (isolated) set of hosts, such that the isolated images can only run on the isolated hosts, and the isolated hosts can only run isolated images. The flag `restrict_isolated_hosts_to_isolated_images` can be used to force isolated hosts to only run isolated images.

The admin must specify the isolated set of images and hosts in the `nova.conf` file using the `isolated_hosts` and `isolated_images` configuration options. For example:

```
isolated_hosts = server1, server2
isolated_images = 342b492c-128f-4a42-8d3a-c5088cf27d13, ebd267a6-ca86-4d6c-9a0e-bd132d6b7d09
```

IoOpsFilter

The IoOpsFilter filters hosts by concurrent I/O operations on it. Hosts with too many concurrent I/O operations will be filtered out. The max_io_ops_per_host option specifies the maximum number of I/O intensive instances allowed to run on a host. A host will be ignored by the scheduler if more than max_io_ops_per_host instances in build, resize, snapshot, migrate, rescue or unshelve task states are running on it.

JsonFilter

The JsonFilter allows a user to construct a custom filter by passing a scheduler hint in JSON format. The following operators are supported:

- =
- <
- >
- in
- <=
- >=
- not
- or
- and

The filter supports the following variables:

- $free_ram_mb
- $free_disk_mb
- $total_usable_ram_mb
- $vcpus_total
- $vcpus_used

Using the **nova** command-line tool, use the --hint flag:

```
$ nova boot --image 827d564a-e636-4fc4-a376-d36f7ebe1747 \
  --flavor 1 --hint query='[">=","$free_ram_mb",1024]' server1
```

With the API, use the os:scheduler_hints key:

```
{
    "server": {
        "name": "server-1",
        "imageRef": "cedef40a-ed67-4d10-800e-17455edce175",
        "flavorRef": "1"
    },
    "os:scheduler_hints": {
        "query": "[&gt;=,$free_ram_mb,1024]"
    }
}
```

MetricsFilter

Filters hosts based on metrics weight_setting. Only hosts with the available metrics are passed so that the metrics weigher will not fail due to these hosts.

NumInstancesFilter

Hosts that have more instances running than specified by the max_instances_per_host option are filtered out when this filter is in place.

PciPassthroughFilter

The filter schedules instances on a host if the host has devices that meet the device requests in the extra_specs attribute for the flavor.

RamFilter

Only schedules instances on hosts that have sufficient RAM available. If this filter is not set, the scheduler may over provision a host based on RAM (for example, the RAM allocated by virtual machine instances may exceed the physical RAM).

You can configure this filter to enable a fixed amount of RAM overcommitment by using the ram_allocation_ratio configuration option in nova.conf. The default setting is:

```
ram_allocation_ratio = 1.5
```

This setting enables 1.5 GB instances to run on any compute node with 1 GB of free RAM.

RetryFilter

Filters out hosts that have already been attempted for scheduling purposes. If the scheduler selects a host to respond to a service request, and the host fails to respond to the request, this filter prevents the scheduler from retrying that host for the service request.

This filter is only useful if the scheduler_max_attempts configuration option is set to a value greater than zero.

SameHostFilter

Schedules the instance on the same host as another instance in a set of instances. To take advantage of this filter, the requester must pass a scheduler hint, using same_host as the key and a list of instance UUIDs as the value. This filter is the opposite of the DifferentHostFilter. Using the **nova** command-line tool, use the --hint flag:

```
$ nova boot --image cedef40a-ed67-4d10-800e-17455edce175 --flavor 1 \
  --hint same_host=a0cf03a5-d921-4877-bb5c-86d26cf818e1 \
  --hint same_host=8c19174f-4220-44f0-824a-cd1eeef10287 server-1
```

With the API, use the os:scheduler_hints key:

```
{
    "server": {
        "name": "server-1",
        "imageRef": "cedef40a-ed67-4d10-800e-17455edce175",
        "flavorRef": "1"
    },
    "os:scheduler_hints": {
        "same_host": [
            "a0cf03a5-d921-4877-bb5c-86d26cf818e1",
            "8c19174f-4220-44f0-824a-cd1eeef10287"
        ]
    }
}
```

ServerGroupAffinityFilter

The ServerGroupAffinityFilter ensures that an instance is scheduled on to a host from a set of group hosts. To take advantage of this filter, the requester must create a server group with an `affinity` policy, and pass a scheduler hint, using `group` as the key and the server group UUID as the value. Using the **nova** command-line tool, use the `--hint` flag. For example:

```
$ nova server-group-create --policy affinity group-1
$ nova boot --image IMAGE_ID --flavor 1 --hint group=SERVER_GROUP_UUID server-1
```

ServerGroupAntiAffinityFilter

The ServerGroupAntiAffinityFilter ensures that each instance in a group is on a different host. To take advantage of this filter, the requester must create a server group with an `anti-affinity` policy, and pass a scheduler hint, using `group` as the key and the server group UUID as the value. Using the **nova** command-line tool, use the `--hint` flag. For example:

```
$ nova server-group-create --policy anti-affinity group-1
$ nova boot --image IMAGE_ID --flavor 1 --hint group=SERVER_GROUP_UUID server-1
```

SimpleCIDRAffinityFilter

Schedules the instance based on host IP subnet range. To take advantage of this filter, the requester must specify a range of valid IP address in CIDR format, by passing two scheduler hints:

`build_near_host_ip`

> The first IP address in the subnet (for example, `192.168.1.1`)

`cidr`

> The CIDR that corresponds to the subnet (for example, `/24`)

Using the **nova** command-line tool, use the `--hint` flag. For example, to specify the IP subnet `192.168.1.1/24`

```
$ nova boot --image cedef40a-ed67-4d10-800e-17455edce175 --flavor 1 \
  --hint build_near_host_ip=192.168.1.1 --hint cidr=/24 server-1
```

With the API, use the `os:scheduler_hints` key:

```
{
    "server": {
        "name": "server-1",
        "imageRef": "cedef40a-ed67-4d10-800e-17455edce175",
        "flavorRef": "1"
    },
    "os:scheduler_hints": {
        "build_near_host_ip": "192.168.1.1",
        "cidr": "24"
    }
}
```

TrustedFilter

Filters hosts based on their trust. Only passes hosts that meet the trust requirements specified in the instance properties.

TypeAffinityFilter

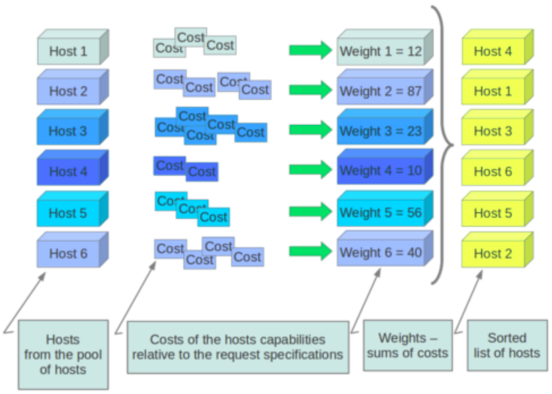
Dynamically limits hosts to one instance type. An instance can only be launched on a host, if no instance with different instances types are running on it, or if the host has no running instances at all.

Weights

When resourcing instances, the filter scheduler filters and weights each host in the list of acceptable hosts. Each time the scheduler selects a host, it virtually consumes resources on it, and subsequent selections are adjusted accordingly. This process is useful when the customer asks for the same large amount of instances, because weight is computed for each requested instance.

All weights are normalized before being summed up; the host with the largest weight is given the highest priority.

Figure 2.3. Weighting hosts



If cells are used, cells are weighted by the scheduler in the same manner as hosts.

Hosts and cells are weighted based on the following options in the `/etc/nova/nova.conf` file:

Table 2.9. Host weighting options

Section	Option	Description
[DEFAULT]	`ram_weight_multiplier`	By default, the scheduler spreads instances across all hosts evenly. Set the `ram_weight_multiplier` option to a negative number if you prefer stacking instead of spreading. Use a floating-point value.
[DEFAULT]	`scheduler_host_subset_size`	New instances are scheduled on a host that is chosen randomly from a subset of the N best hosts. This property defines the subset size from which a host is chosen. A value of 1 chooses the first host returned by the weighting functions. This value must be at least 1. A value less than 1 is ignored, and 1 is used instead. Use an integer value.
[DEFAULT]	`scheduler_weight_classes`	Defaults to `nova.scheduler.weights.all_weighers`, which selects the RamWeigher. Hosts are then weighted and sorted with the largest weight winning.
[metrics]	`weight_multiplier`	Multiplier for weighting metrics. Use a floating-point value.
[metrics]	`weight_setting`	Determines how metrics are weighted. Use a comma-separated list of metricName=ratio. For example: "name1=1.0, name2=-1.0" results in: `name1.value * 1.0 + name2.value * -1.0`
[metrics]	`required`	Specifies how to treat unavailable metrics: • True—Raises an exception. To avoid the raised exception, you should use the scheduler filter `MetricFilter` to filter out hosts with unavailable metrics. • False—Treated as a negative factor in the weighting process (uses the `weight_of_unavailable` option).
[metrics]	`weight_of_unavailable`	If required is set to False, and any one of the metrics set by `weight_setting` is unavailable, the `weight_of_unavailable` value is returned to the scheduler.

For example:

```
[DEFAULT]
scheduler_host_subset_size = 1
scheduler_weight_classes = nova.scheduler.weights.all_weighers
ram_weight_multiplier = 1.0
[metrics]
weight_multiplier = 1.0
weight_setting = name1=1.0, name2=-1.0
required = false
weight_of_unavailable = -10000.0
```

Table 2.10. Cell weighting options

Section	Option	Description
[cells]	`mute_weight_multiplier`	Multiplier to weight mute children (hosts which have not sent capacity or capacity updates for some time). Use a negative, floating-point value.
[cells]	`mute_weight_value`	Weight value assigned to mute children. Use a positive, floating-point value with a maximum of '1.0'.
[cells]	`offset_weight_multiplier`	Multiplier to weight cells, so you can specify a preferred cell. Use a floating point value.
[cells]	`ram_weight_multiplier`	By default, the scheduler spreads instances across all cells evenly. Set the `ram_weight_multiplier` option to a negative number if you prefer stacking instead of spreading. Use a floating-point value.
[cells]	`scheduler_weight_classes`	Defaults to `nova.cells.weights.all_weighers`, which maps to all cell weighters included with Compute. Cells are then weighted and sorted with the largest weight winning.

For example:

```
[cells]
scheduler_weight_classes = nova.cells.weights.all_weighers
mute_weight_multiplier = -10.0
mute_weight_value = 1000.0
ram_weight_multiplier = 1.0
offset_weight_multiplier = 1.0
```

Chance scheduler

As an administrator, you work with the filter scheduler. However, the Compute service also uses the Chance Scheduler, `nova.scheduler.chance.ChanceScheduler`, which randomly selects from lists of filtered hosts.

Host aggregates

Host aggregates are a mechanism to further partition an availability zone; while availability zones are visible to users, host aggregates are only visible to administrators. Host Aggregates provide a mechanism to allow administrators to assign key-value pairs to groups of machines. Each node can have multiple aggregates, each aggregate can have multiple key-value pairs, and the same key-value pair can be assigned to multiple aggregates. This information can be used in the scheduler to enable advanced scheduling, to set up hypervisor resource pools or to define logical groups for migration.

Command-line interface

The **nova** command-line tool supports the following aggregate-related commands.

nova aggregate-list

Print a list of all aggregates.

nova aggregate-create *<name>* *<availability-zone>*

Create a new aggregate named *<name>* in availability zone *<availability-zone>*. Returns the ID of the newly created aggregate. Hosts can be made available to multiple availability zones, but administrators should be careful when adding the host to a different host aggregate within the same availability zone and pay attention when using the **aggregate-set-metadata** and **aggregate-update** commands to avoid user confusion when they boot instances in different availability zones. An error occurs if you cannot add a particular host to an aggregate zone for which it is not intended.

nova aggregate-delete *<id>*

Delete an aggregate with id *<id>*.

nova aggregate-details *<id>*

Show details of the aggregate with id *<id>*.

nova aggregate-add-host *<id>* *<host>*

Add host with name *<host>* to aggregate with id *<id>*.

nova aggregate-remove-host *<id>* *<host>*

Remove the host with name *<host>* from the aggregate with id *<id>*.

nova aggregate-set-metadata *<id>* *<key=value>* [*<key=value>* ...]

Add or update metadata (key-value pairs) associated with the aggregate with id *<id>*.

nova aggregate-update *<id>* *<name>* [*<availability_zone>*]

Update the name and availability zone (optional) for the aggregate.

nova host-list

List all hosts by service.

nova host-update --maintenance [enable | disable]

Put/resume host into/from maintenance.

Note

Only administrators can access these commands. If you try to use these commands and the user name and tenant that you use to access the Compute service do not have the `admin` role or the appropriate privileges, these errors occur:

```
ERROR: Policy doesn't allow compute_extension:aggregates to be performed. (HTTP 403) (Request-ID: req-299fbff6-6729-4cef-93b2-e7e1f96b4864)
```

```
ERROR: Policy doesn't allow compute_extension:hosts to be performed. (HTTP 403) (Request-ID: req-ef2400f6-6776-4ea3-b6f1-7704085c27d1)
```

Configure scheduler to support host aggregates

One common use case for host aggregates is when you want to support scheduling instances to a subset of compute hosts because they have a specific capability. For example, you may want to allow users to request compute hosts that have SSD drives if they need access to faster disk I/O, or access to compute hosts that have GPU cards to take advantage of GPU-accelerated code.

To configure the scheduler to support host aggregates, the `scheduler_default_filters` configuration option must contain the `AggregateInstanceExtraSpecsFilter` in addition to the other filters used by the scheduler. Add the following line to `/etc/nova/nova.conf` on the host that runs the `nova-scheduler` service to enable host aggregates filtering, as well as the other filters that are typically enabled:

```
scheduler_default_filters=AggregateInstanceExtraSpecsFilter,RetryFilter,AvailabilityZoneFilter,RamFilter,ComputeFilter,ComputeCapabilitiesFilter,ImageP
```

Example: Specify compute hosts with SSDs

This example configures the Compute service to enable users to request nodes that have solid-state drives (SSDs). You create a `fast-io` host aggregate in the `nova` availability zone and you add the `ssd=true` key-value pair to the aggregate. Then, you add the `node1`, and `node2` compute nodes to it.

```
$ nova aggregate-create fast-io nova
+----+---------+-------------------+-------+----------+
| Id | Name    | Availability Zone | Hosts | Metadata |
+----+---------+-------------------+-------+----------+
| 1  | fast-io | nova              |       |          |
+----+---------+-------------------+-------+----------+

$ nova aggregate-set-metadata 1 ssd=true
+----+---------+-------------------+-------+-------------------+
| Id | Name    | Availability Zone | Hosts | Metadata          |
+----+---------+-------------------+-------+-------------------+
| 1  | fast-io | nova              | []    | {u'ssd': u'true'} |
+----+---------+-------------------+-------+-------------------+
$ nova aggregate-add-host 1 node1
+----+---------+-------------------+-----------+-------------------+
| Id | Name    | Availability Zone | Hosts      | Metadata          |
+----+---------+-------------------+------------+-------------------+
| 1  | fast-io | nova              | [u'node1'] | {u'ssd': u'true'} |
+----+---------+-------------------+------------+-------------------+

$ nova aggregate-add-host 1 node2
+----+---------+-------------------+---------------------+-------------------+
| Id | Name    | Availability Zone | Hosts                | Metadata          |
+----+---------+-------------------+----------------------+-------------------+
| 1  | fast-io | nova              | [u'node1', u'node2'] | {u'ssd': u'true'} |
+----+---------+-------------------+----------------------+-------------------+
```

Use the **nova flavor-create** command to create the *ssd.large* flavor called with an ID of 6, 8 GB of RAM, 80 GB root disk, and four vCPUs.

```
$ nova flavor-create ssd.large 6 8192 80 4
+----+-----------+-----------+------+-----------+------+-------+-------------+-----------+-------------+
| ID | Name      | Memory_MB | Disk | Ephemeral | Swap | VCPUs | RXTX_Factor | Is_Public | extra_specs |
+----+-----------+-----------+------+-----------+------+-------+-------------+-----------+-------------+
| 6  | ssd.large | 8192      | 80   | 0         |      | 4     | 1           | True      | {}          |
+----+-----------+-----------+------+-----------+------+-------+-------------+-----------+-------------+
```

Once the flavor is created, specify one or more key-value pairs that match the key-value pairs on the host aggregates. In this case, that is the *ssd=true* key-value pair. Setting a key-value pair on a flavor is done using the **nova flavor-key** command.

```
$ nova flavor-key ssd.large set  ssd=true
```

Once it is set, you should see the `extra_specs` property of the `ssd.large` flavor populated with a key of `ssd` and a corresponding value of `true`.

```
$ nova flavor-show ssd.large
+----------------------------+-------------------+
| Property                   | Value             |
+----------------------------+-------------------+
| OS-FLV-DISABLED:disabled   | False             |
| OS-FLV-EXT-DATA:ephemeral  | 0                 |
| disk                       | 80                |
| extra_specs                | {u'ssd': u'true'} |
| id                         | 6                 |
| name                       | ssd.large         |
| os-flavor-access:is_public | True              |
| ram                        | 8192              |
| rxtx_factor                | 1.0               |
| swap                       |                   |
| vcpus                      | 4                 |
+----------------------------+-------------------+
```

Now, when a user requests an instance with the `ssd.large` flavor, the scheduler only considers hosts with the `ssd=true` key-value pair. In this example, these are `node1` and `node2`.

XenServer hypervisor pools to support live migration

When using the XenAPI-based hypervisor, the Compute service uses host aggregates to manage XenServer Resource pools, which are used in supporting live migration.

Configuration reference

To customize the Compute scheduler, use the configuration option settings documented in Table 2.51, “Description of scheduler configuration options”.

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