Ceilometer to Gnocchi

Transitioning to Aggregates

Is Gnocchi a replacement for Ceilometer?

No, it’s a replacement for the Metering storage part of Ceilometer only.

How they differ

- Ceilometer legacy storage captures full-resolution data. Each datapoint has:
    - Timestamp, measurement, IDs, resource metadata, metric metadata, etc...
    - Single datapoint averages to ~1.5KB/point (mongodb) or ~150B/point (SQL)
    - For 1000 VM, capturing 10 metrics/VM, every minute:
        - ~15MB/minute, ~900MB/hour, ~21GB/day, etc...
        - Now try to calculate the average on that data in a timely manner...
- Gnocchi stores aggregated data in a timeserie. Each datapoint has:
    - Timestamp, measurement... that's it... and then it's compressed
        - resource metadata is an explicit subset AND not tied to measurement
    - Single datapoint AT MOST is 9B/point
    - For 1000 VM, capturing 10metrics/VM, every minute:
        - ~90KB/minute, ~5.4MB/hour, ~130MB/day, etc...
        - Average (and any other statistical aggregation) is already computed prior to query
    - Mandatory archive rules means less unwanted data stored

Archive Policies

- Required to define at what resolution you want to capture data
- Gnocchi provides default policies but custom policies accepted
- max sample value every minute, over 1 month

  -
    ```
    gnocchi archive-policy create <name> -d granularity:1m,points:43200 -m max
    ```
- mean sample every sec, over 1 day & mean sample every day, over 1 month

  -
    ```
    gnocchi archive-policy create <name> -d granularity:1s,points:86400 -d granularity:1d,points:30 -m mean
    ```
- default aggregates every month, over 2 years

  -
    ```
    gnocchi archive-policy create <name> -d granularity:1m,points:24
    ```

Querying is a little different…

List resources

A little less information is available regarding resources in Ceilometer view. You also need to know what the ids are to understand what the resource is.

```
$ ceilometer resource-list
+--------------------------------------+-----------+--------------------------------------+------------+
| Resource ID                          | Source    | User ID                              | Project ID |
+--------------------------------------+-----------+--------------------------------------+------------+
| 00060172-76cd-58b1-9280-ff08a8221883 | openstack | 3db5ac20-31e9-5dd0-abe4-c58922811879 | None       |
| 00c35173-8100-5080-a417-0fdec483636b | openstack | d057842c-5931-5552-a392-9fbf45347c24 | None       |
| 00c9b261-c076-5344-82d0-cea604d6693e | openstack | 5352584a-1045-5a90-9c70-1ded49a02a16 | None       |
| 00d6629d-1fab-5297-8c2d-827509d3f845 | openstack | a1b56816-9ddf-595e-9120-455948d2c72e | None       |
| 0135a4aa-9bc2-575d-9b5d-254c3ab8350c | openstack | bf4f474a-23dc-5d8d-bdca-988c89928ce0 | None       |
+--------------------------------------+-----------+--------------------------------------+------------+
```

```
$ gnocchi resource list
+-----------------------------+-----------------------------+-----------------------------+-----------------------------+-----------------------------+-----------------------------+---------
+------------------------------+--------------+
| id                          | type                        | project_id                  | user_id                     | original_resource_id        | started_at                  | ended_at | revision_start
| revision_end |
+-----------------------------+-----------------------------+-----------------------------+-----------------------------+-----------------------------+-----------------------------+---------
+------------------------------+--------------+
| 3dfee229-67f8-5e21-844d-    | instance_disk               | 71bf402adea343609f2192ce998 | fd3eb127863b4177bf1abb38dda | e90974a6-31bf-4e47-8824     | 2016-04-07T17:32:33.008421+ | None     | 2016-04-07T17:32:33.008443
+0 | None         |
| 525a811fc1c7                |                             | fa38e                       | 1f557                       | -ca074cd9b47d-hdd           | 00:00                       |          | 0:00
|              |
| e90974a6-31bf-              | instance                    | 71bf402adea343609f2192ce998 | fd3eb127863b4177bf1abb38dda | e90974a6-31bf-              | 2016-04-07T17:32:25.740862+ | None     | 2016-04-07T17:32:33.245924
+0 | None         |
| 4e47-8824-ca074cd9b47d      |                             | fa38e                       | 1f557                       | 4e47-8824-ca074cd9b47d      | 00:00                       |          | 0:00
|              |
+-----------------------------+-----------------------------+-----------------------------+-----------------------------+-----------------------------+-----------------------------+---------
+------------------------------+--------------+
```

List resources by type

Not really possible in Ceilometer. You need to query on a common metadata attribute.

```
$ ceilometer resource-list --query resource_metadata.status=active
+----------------------------------------------+-----------+----------------------------------+----------------------------------+
| Resource ID                                  | Source    | User ID                          | Project ID                       |
+----------------------------------------------+-----------+----------------------------------+----------------------------------+
| 57ed4b6c-2166-46da-9f27-01493d4ffeae         | openstack | None                             | 3b6c31f80b93476eae6d5517164fd5b4 |
| 94a239b3-a4b5-41db-bc21-a23d5f6d965e         | openstack | None                             | 3b6c31f80b93476eae6d5517164fd5b4 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc         | openstack | c1a568c378524edc8028014c13086f57 | 3b6c31f80b93476eae6d5517164fd5b4 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc-hdd     | openstack | c1a568c378524edc8028014c13086f57 | 3b6c31f80b93476eae6d5517164fd5b4 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc-vda     | openstack | c1a568c378524edc8028014c13086f57 | 3b6c31f80b93476eae6d5517164fd5b4 |
| ec272a53-671a-4383-9ead-ebd63dcb0f8a         | openstack | None                             | 3b6c31f80b93476eae6d5517164fd5b4 |
| nova-instance-instance-00000001-fa163ed83b5d | openstack | c1a568c378524edc8028014c13086f57 | 3b6c31f80b93476eae6d5517164fd5b4 |
+----------------------------------------------+-----------+----------------------------------+----------------------------------+
```

```
$ gnocchi resource list --type instance
+--------------------------------+----------+--------------------------------+--------------------------------+--------------------------------+--------------------------------+----------
+----------------------------------+--------------+
| id                             | type     | project_id                     | user_id                        | original_resource_id           | started_at                     | ended_at | revision_start
| revision_end |
+--------------------------------+----------+--------------------------------+--------------------------------+--------------------------------+--------------------------------+----------
+----------------------------------+--------------+
| e90974a6-31bf-                 | instance | 71bf402adea343609f2192ce998fa3 | fd3eb127863b4177bf1abb38dda1f5 | e90974a6-31bf-                 | 2016-04-07T17:32:25.740862+00: | None     | 2016-04-07T17:32:33.245924+00:
00 | None         |
| 4e47-8824-ca074cd9b47d         |          | 8e                             | 57                             | 4e47-8824-ca074cd9b47d         | 00                             |          |
|              |
| 4728c95f-39c6-4120-b93f-       | instance | 71bf402adea343609f2192ce998fa3 | fd3eb127863b4177bf1abb38dda1f5 | 4728c95f-39c6-4120-b93f-       | 2016-04-07T14:41:42.711772+00: | None     | 2016-04-07T20:00:22.622462+00:
00 | None         |
| 5dd2629cd12f                   |          | 8e                             | 57                             | 5dd2629cd12f                   | 00                             |          |
|              |
+--------------------------------+----------+--------------------------------+--------------------------------+--------------------------------+--------------------------------+----------
+----------------------------------+--------------+
```

Show resource

```
$ ceilometer resource-show e996cb04-3d78-484a-ad88-3dc089cdf6cc-hdd
+-------------+--------------------------------------------------------------------------+
| Property    | Value                                                                    |
+-------------+--------------------------------------------------------------------------+
| metadata    | {"instance_host": "ubuntu-devstack", "ramdisk_id": "57ed4b6c-2166-46da-  |
|             | 9f27-01493d4ffeae", "flavor.vcpus": "1", "OS-EXT-AZ.availability_zone":  |
|             | "nova", "instance_id": "e996cb04-3d78-484a-ad88-3dc089cdf6cc",           |
|             | "display_name": "test1", "state": "active", "disk_name": "hdd",          |
|             | "flavor.id": "2", "status": "active", "ephemeral_gb": "0",               |
|             | "flavor.name": "m1.small", "disk_gb": "20", "kernel_id": "94a239b3-a4b5  |
|             | -41db-bc21-a23d5f6d965e", "image.id": "ec272a53-671a-4383-9ead-          |
|             | ebd63dcb0f8a", "flavor.ram": "2048", "host":                             |
|             | "9a057237f15ac6b6a60a31cbea34544eee70d7f50df8f28844e4cf30",              |
|             | "flavor.ephemeral": "0", "image.name": "cirros-0.3.4-x86_64-uec",        |
|             | "image_ref_url": "http://10.0.2.15:8774/4c2fc478e3994ccc8a6f2a62fb1bbd09 |
|             | /images/ec272a53-671a-4383-9ead-ebd63dcb0f8a", "image.links": "[{'href': |
|             | 'http://10.0.2.15:8774/4c2fc478e3994ccc8a6f2a62fb1bbd09/images/ec272a53- |
|             | 671a-4383-9ead-ebd63dcb0f8a', 'rel': 'bookmark'}]", "flavor.disk": "20", |
|             | "root_gb": "20", "name": "instance-00000001", "memory_mb": "2048",       |
|             | "instance_type": "m1.small", "vcpus": "1", "image_ref":                  |
|             | "ec272a53-671a-4383-9ead-ebd63dcb0f8a", "flavor.links": "[{'href':       |
|             | 'http://10.0.2.15:8774/4c2fc478e3994ccc8a6f2a62fb1bbd09/flavors/2',      |
|             | 'rel': 'bookmark'}]"}                                                    |
| project_id  | 3b6c31f80b93476eae6d5517164fd5b4                                         |
| resource_id | e996cb04-3d78-484a-ad88-3dc089cdf6cc-hdd                                 |
| source      | openstack                                                                |
| user_id     | c1a568c378524edc8028014c13086f57                                         |
+-------------+--------------------------------------------------------------------------+
```

```
[gchung@localhost devstack]$ gnocchi resource show e90974a6-31bf-4e47-8824-ca074cd9b47d
+-----------------------+----------------------------------------------------------------+
| Field                 | Value                                                          |
+-----------------------+----------------------------------------------------------------+
| created_by_project_id | f7481a38d7c543528d5121fab9eb2b99                               |
| created_by_user_id    | 9246f424dcb341478067967f495dc133                               |
| ended_at              | None                                                           |
| id                    | e90974a6-31bf-4e47-8824-ca074cd9b47d                           |
| metrics               | cpu.delta: 20cd1d71-de2f-43d5-90a8-b23ad31a7d04                |
|                       | cpu: 060f69f6-3b9e-46a7-962f-81ae7d0a7716                      |
|                       | cpu_util: 22cd22e7-e48e-4f21-887a-b1c6612b4c98                 |
|                       | disk.allocation: a97527cc-0c68-49b1-b6dd-8a0cbe36a52e          |
|                       | disk.capacity: 6c17fc89-dcb4-4144-a305-a2c436139b2b            |
|                       | disk.ephemeral.size: 115d1ab5-4228-44b0-a273-b9e6eca52171      |
|                       | disk.iops: 9611a114-d37e-42e7-9b0c-0fb5e61d96c8                |
|                       | disk.latency: 6205c66f-2a5d-49c8-85e6-aa7572cfb34a             |
|                       | disk.root.size: c9f9ca31-7e54-4dd7-81ad-129d86951dbc           |
|                       | disk.usage: 4f29ca2e-d58f-40a9-94a7-15084233c1bb               |
|                       | instance: 2932e516-d13c-4378-9ff7-61451b25b516                 |
|                       | memory.resident: ec8ca15b-96df-4c47-a9e9-1c6002ef7216          |
|                       | memory.usage: 29c54126-9b7e-4802-8bf6-540e12e447b8             |
|                       | memory: 71fc307f-ee54-42cb-bcab-8937fa8566e7                   |
|                       | vcpus: 391ee768-8243-446c-9894-53ffbe1892d4                    |
| original_resource_id  | e90974a6-31bf-4e47-8824-ca074cd9b47d                           |
| project_id            | 71bf402adea343609f2192ce998fa38e                               |
| revision_end          | None                                                           |
| revision_start        | 2016-04-07T17:32:33.245924+00:00                               |
| started_at            | 2016-04-07T17:32:25.740862+00:00                               |
| type                  | instance                                                       |
| user_id               | fd3eb127863b4177bf1abb38dda1f557                               |
+-----------------------+----------------------------------------------------------------+
```

Show resource (with metadata)

```
$ ceilometer resource-show e996cb04-3d78-484a-ad88-3dc089cdf6cc-hdd
+-------------+--------------------------------------------------------------------------+
| Property    | Value                                                                    |
+-------------+--------------------------------------------------------------------------+
| metadata    | {"instance_host": "ubuntu-devstack", "ramdisk_id": "57ed4b6c-2166-46da-  |
|             | 9f27-01493d4ffeae", "flavor.vcpus": "1", "OS-EXT-AZ.availability_zone":  |
|             | "nova", "instance_id": "e996cb04-3d78-484a-ad88-3dc089cdf6cc",           |
|             | "display_name": "test1", "state": "active", "disk_name": "hdd",          |
|             | "flavor.id": "2", "status": "active", "ephemeral_gb": "0",               |
|             | "flavor.name": "m1.small", "disk_gb": "20", "kernel_id": "94a239b3-a4b5  |
|             | -41db-bc21-a23d5f6d965e", "image.id": "ec272a53-671a-4383-9ead-          |
|             | ebd63dcb0f8a", "flavor.ram": "2048", "host":                             |
|             | "9a057237f15ac6b6a60a31cbea34544eee70d7f50df8f28844e4cf30",              |
|             | "flavor.ephemeral": "0", "image.name": "cirros-0.3.4-x86_64-uec",        |
|             | "image_ref_url": "http://10.0.2.15:8774/4c2fc478e3994ccc8a6f2a62fb1bbd09 |
|             | /images/ec272a53-671a-4383-9ead-ebd63dcb0f8a", "image.links": "[{'href': |
|             | 'http://10.0.2.15:8774/4c2fc478e3994ccc8a6f2a62fb1bbd09/images/ec272a53- |
|             | 671a-4383-9ead-ebd63dcb0f8a', 'rel': 'bookmark'}]", "flavor.disk": "20", |
|             | "root_gb": "20", "name": "instance-00000001", "memory_mb": "2048",       |
|             | "instance_type": "m1.small", "vcpus": "1", "image_ref":                  |
|             | "ec272a53-671a-4383-9ead-ebd63dcb0f8a", "flavor.links": "[{'href':       |
|             | 'http://10.0.2.15:8774/4c2fc478e3994ccc8a6f2a62fb1bbd09/flavors/2',      |
|             | 'rel': 'bookmark'}]"}                                                    |
| project_id  | 3b6c31f80b93476eae6d5517164fd5b4                                         |
| resource_id | e996cb04-3d78-484a-ad88-3dc089cdf6cc-hdd                                 |
| source      | openstack                                                                |
| user_id     | c1a568c378524edc8028014c13086f57                                         |
+-------------+--------------------------------------------------------------------------+
```

```
[gchung@localhost devstack]$ gnocchi resource show e90974a6-31bf-4e47-8824-ca074cd9b47d --type
instance
+-----------------------+--------------------------------------------------------------------------+
| Field                 | Value                                                                    |
+-----------------------+--------------------------------------------------------------------------+
| created_by_project_id | f7481a38d7c543528d5121fab9eb2b99                                         |
| created_by_user_id    | 9246f424dcb341478067967f495dc133                                         |
| display_name          | test3                                                                    |
| ended_at              | None                                                                     |
| flavor_id             | 1                                                                        |
| host                  | 7f218c8350a86a71dbe6d14d57e8f74fa60ac360fee825192a6cf624                 |
| id                    | e90974a6-31bf-4e47-8824-ca074cd9b47d                                     |
| image_ref             | 671375cc-177b-497a-8551-4351af3f856d                                     |
| metrics               | cpu.delta: 20cd1d71-de2f-43d5-90a8-b23ad31a7d04                          |
|                       | cpu: 060f69f6-3b9e-46a7-962f-81ae7d0a7716                                |
|                       | cpu_util: 22cd22e7-e48e-4f21-887a-b1c6612b4c98                           |
|                       | disk.allocation: a97527cc-0c68-49b1-b6dd-8a0cbe36a52e                    |
|                       | disk.capacity: 6c17fc89-dcb4-4144-a305-a2c436139b2b                      |
|                       | disk.ephemeral.size: 115d1ab5-4228-44b0-a273-b9e6eca52171                |
|                       | disk.iops: 9611a114-d37e-42e7-9b0c-0fb5e61d96c8                          |
|                       | disk.latency: 6205c66f-2a5d-49c8-85e6-aa7572cfb34a                       |
|                       | disk.root.size: c9f9ca31-7e54-4dd7-81ad-129d86951dbc                     |
|                       | disk.usage: 4f29ca2e-d58f-40a9-94a7-15084233c1bb                         |
|                       | instance: 2932e516-d13c-4378-9ff7-61451b25b516                           |
|                       | memory.resident: ec8ca15b-96df-4c47-a9e9-1c6002ef7216                    |
|                       | memory.usage: 29c54126-9b7e-4802-8bf6-540e12e447b8                       |
|                       | memory: 71fc307f-ee54-42cb-bcab-8937fa8566e7                             |
|                       | vcpus: 391ee768-8243-446c-9894-53ffbe1892d4                              |
| original_resource_id  | e90974a6-31bf-4e47-8824-ca074cd9b47d                                     |
| project_id            | 71bf402adea343609f2192ce998fa38e                                         |
| revision_end          | None                                                                     |
| revision_start        | 2016-04-07T17:32:33.245924+00:00                                         |
| server_group          | None                                                                     |
| started_at            | 2016-04-07T17:32:25.740862+00:00                                         |
| type                  | instance                                                                 |
| user_id               | fd3eb127863b4177bf1abb38dda1f557                                         |
+-----------------------+--------------------------------------------------------------------------+
```

List metrics

```
$ ceilometer meter-list
 +-----------------------------+------------+-----------+---------------+-----------+--------------+
 | Name                        | Type       | Unit      | Resource ID   | User ID   | Project ID   |
 +-----------------------------+------------+-----------+---------------+-----------+--------------+
 | cpu                         | cumulative | ns        | INSTANCE_ID_1 | USER_ID_A | PROJECT_ID_X |
 | cpu                         | cumulative | ns        | INSTANCE_ID_2 | USER_ID_B | PROJECT_ID_Y |
 | cpu                         | cumulative | ns        | INSTANCE_ID_3 | USER_ID_C | PROJECT_ID_Z |
 | cpu_util                    | gauge      | %         | INSTANCE_ID_1 | USER_ID_A | PROJECT_ID_X |
 | cpu_util                    | gauge      | %         | INSTANCE_ID_3 | USER_ID_C | PROJECT_ID_Z |
 | disk.ephemeral.size         | gauge      | GB        | INSTANCE_ID_1 | USER_ID_A | PROJECT_ID_X |
 | disk.ephemeral.size         | gauge      | GB        | INSTANCE_ID_2 | USER_ID_B | PROJECT_ID_Y |
 | disk.ephemeral.size         | gauge      | GB        | INSTANCE_ID_3 | USER_ID_C | PROJECT_ID_Z |
 | ... [snip]                                                                                        |
 +-----------------------------+------------+-----------+---------------+-----------+-------------
```

```
$ gnocchi metric list
+-------------------------------+---------------------+------------------------------+-------------------------------+
| id                            | archive_policy/name | name                         | resource_id                   |
+-------------------------------+---------------------+------------------------------+-------------------------------+
| 014064e4-e2e0-44ab-957f-      | low                 | storage.objects.size         | b94f3bdf-b43b-46e8-a2db-      |
| 541d139e24d5                  |                     |                              | 2c7170864575                  |
| 0142a30e-0369-4328-b57d-      | low                 | disk.device.usage            | 16cb0f65-1f6f-57f2-a8ef-      |
| e280ad724081                  |                     |                              | 9883bfb6ac04                  |
| 029d9316-2a61-4509-896c-      | low                 | storage.objects.containers   | 17cc73a6-bc7b-4846-87a1-6534e |
| dfb61f63cf32                  |                     |                              | fa98fef                       |
| 02b2c343-e5cb-45b4-9ebe-      | low                 | storage.api.request          | 22d1fec0-7b0f-4191-9f5b-      |
| a4f27396                      |                     |                              | bc44546bcb05                  |
+-------------------------------+---------------------+------------------------------+-------------------------------+
```

Note: a bug is opened to capture unit value in Gnocchi.

Get metric

This does not exist in Ceilometer. Metric, Resource, and measurement data are all one.

```
$ gnocchi metric show 4ad754b7-54ed-4a3f-98c2-fe6f529c6836
+------------------------------------+-----------------------------------------------------------------------+
| Field                              | Value                                                                 |
+------------------------------------+-----------------------------------------------------------------------+
| archive_policy/aggregation_methods | std, count, 95pct, min, max, sum, median, mean                        |
| archive_policy/back_window         | 0                                                                     |
| archive_policy/definition          | - points: 12, granularity: 0:05:00, timespan: 1:00:00                 |
|                                    | - points: 24, granularity: 1:00:00, timespan: 1 day, 0:00:00          |
|                                    | - points: 30, granularity: 1 day, 0:00:00, timespan: 30 days, 0:00:00 |
| archive_policy/name                | low                                                                   |
| created_by_project_id              | f7481a38d7c543528d5121fab9eb2b99                                      |
| created_by_user_id                 | 9246f424dcb341478067967f495dc133                                      |
| id                                 | 4ad754b7-54ed-4a3f-98c2-fe6f529c6836                                  |
| name                               | cpu_util                                                              |
| resource/created_by_project_id     | f7481a38d7c543528d5121fab9eb2b99                                      |
| resource/created_by_user_id        | 9246f424dcb341478067967f495dc133                                      |
| resource/ended_at                  | None                                                                  |
| resource/id                        | 4728c95f-39c6-4120-b93f-5dd2629cd12f                                  |
| resource/original_resource_id      | 4728c95f-39c6-4120-b93f-5dd2629cd12f                                  |
| resource/project_id                | 71bf402adea343609f2192ce998fa38e                                      |
| resource/revision_end              | None                                                                  |
| resource/revision_start            | 2016-04-08T16:01:05.000670+00:00                                      |
| resource/started_at                | 2016-04-07T14:41:42.711772+00:00                                      |
| resource/type                      | instance                                                              |
| resource/user_id                   | fd3eb127863b4177bf1abb38dda1f557                                      |
+------------------------------------+-----------------------------------------------------------------------+
```

Or

```
$ gnocchi metric show cpu_util --resource-id 4728c95f-39c6-4120-b93f-5dd2629cd12f
```

Get all measures for everything ever!

```
$ ceilometer sample-list
+--------------------------------------+---------------------------------------------+---------------------------------+------------+----------------+-----------+----------------------------+
| ID                                   | Resource ID                                 | Name                            | Type       | Volume         | Unit      | Timestamp                  |
+--------------------------------------+---------------------------------------------+---------------------------------+------------+----------------+-----------+----------------------------+
| 9e0e0eae-fdb6-11e5-9677-080027774b87 | e996cb04-3d78-484a-ad88-3dc089cdf6cc        | cpu                             | cumulative | 27710000000.0  | ns        | 2016-04-08T18:20:48.189720 |
| 9e15bb5e-fdb6-11e5-a1cb-080027774b87 | e996cb04-3d78-484a-ad88-3dc089cdf6cc        | cpu_util                        | gauge      | 0.249096775094 | %         | 2016-04-08T18:20:48.189720 |
| 9e1bd91c-fdb6-11e5-b694-080027774b87 | e996cb04-3d78-484a-ad88-3dc089cdf6cc        | cpu.delta                       | delta      | 50000000.0     | ns        | 2016-04-08T18:20:48.189720 |
+--------------------------------------+---------------------------------------------+---------------------------------+------------+----------------+-----------+----------------------------+
```

Not possible in Gnocchi, but why would you want to do this anyways?

Get all measures for a resource

```
$ ceilometer sample-list --query resource_id=e996cb04-3d78-484a-ad88-3dc089cdf6cc
+--------------------------------------+--------------------------------------+--------------------------+------------+----------------+-----------+----------------------------+
| ID                                   | Resource ID                          | Name                     | Type       | Volume         | Unit      | Timestamp                  |
+--------------------------------------+--------------------------------------+--------------------------+------------+----------------+-----------+----------------------------+
| 9e4fafda-fdb6-11e5-a2a6-080027774b87 | e996cb04-3d78-484a-ad88-3dc089cdf6cc | memory.resident          | gauge      | 337.0          | MB        | 2016-04-08T18:20:48.618527 |
| 9e4a1fe8-fdb6-11e5-a569-080027774b87 | e996cb04-3d78-484a-ad88-3dc089cdf6cc | instance                 | gauge      | 1.0            | instance  | 2016-04-08T18:20:48.561331 |
| 9e48a2d0-fdb6-11e5-ad20-080027774b87 | e996cb04-3d78-484a-ad88-3dc089cdf6cc | disk.read.requests.rate  | gauge      | 0.0            | request/s | 2016-04-08T18:20:48.554010 |
| 9e464be8-fdb6-11e5-9ca4-080027774b87 | e996cb04-3d78-484a-ad88-3dc089cdf6cc | disk.read.requests       | cumulative | 239.0          | request   | 2016-04-08T18:20:48.554010 |
| 9e4125b4-fdb6-11e5-8380-080027774b87 | e996cb04-3d78-484a-ad88-3dc089cdf6cc | disk.read.bytes          | cumulative | 1885514.0      | B         | 2016-04-08T18:20:48.537855 |
| 9e45c88a-fdb6-11e5-9cbc-080027774b87 | e996cb04-3d78-484a-ad88-3dc089cdf6cc | disk.read.bytes.rate     | gauge      | 0.0            | B/s       | 2016-04-08T18:20:48.537855 |
| 9e360404-fdb6-11e5-8a49-080027774b87 | e996cb04-3d78-484a-ad88-3dc089cdf6cc | disk.allocation          | gauge      | 10993664.0     | B         | 2016-04-08T18:20:48.430504 |
| 9e1c4b36-fdb6-11e5-a650-080027774b87 | e996cb04-3d78-484a-ad88-3dc089cdf6cc | disk.write.bytes.rate    | gauge      | 0.0            | B/s       | 2016-04-08T18:20:48.276805 |
| 9e1dc8e4-fdb6-11e5-b908-080027774b87 | e996cb04-3d78-484a-ad88-3dc089cdf6cc | disk.write.bytes         | cumulative | 9482240.0      | B         | 2016-04-08T18:20:48.276805 |
| 9e1987e8-fdb6-11e5-bce2-080027774b87 | e996cb04-3d78-484a-ad88-3dc089cdf6cc | disk.write.requests.rate | gauge      | 0.0            | request/s | 2016-04-08T18:20:48.251773 |
| 9e1859ae-fdb6-11e5-9c12-080027774b87 | e996cb04-3d78-484a-ad88-3dc089cdf6cc | disk.write.requests      | cumulative | 461.0          | request   | 2016-04-08T18:20:48.251773 |
| 9e1428b6-fdb6-11e5-8685-080027774b87 | e996cb04-3d78-484a-ad88-3dc089cdf6cc | disk.usage               | gauge      | 10993664.0     | B         | 2016-04-08T18:20:48.235334 |
| 9e0e035a-fdb6-11e5-8c1d-080027774b87 | e996cb04-3d78-484a-ad88-3dc089cdf6cc | disk.capacity            | gauge      | 21475268608.0  | B         | 2016-04-08T18:20:48.209300 |
| 9e15bb5e-fdb6-11e5-a1cb-080027774b87 | e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util                 | gauge      | 0.249096775094 | %         | 2016-04-08T18:20:48.189720 |
| 9e1bd91c-fdb6-11e5-b694-080027774b87 | e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu.delta                | delta      | 50000000.0     | ns        | 2016-04-08T18:20:48.189720 |
| 9e0e0eae-fdb6-11e5-9677-080027774b87 | e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu                      | cumulative | 27710000000.0  | ns        | 2016-04-08T18:20:48.189720 |
+--------------------------------------+--------------------------------------+--------------------------+------------+----------------+-----------+----------------------------+
```

Not possible in Gnocchi. You may use gnocchi resource show <res_id> to get list of available metrics for a resource.

Get all measures for a resource (for a single metric)

```
$ ceilometer sample-list -m cpu_util --query resource_id=e996cb04-3d78-484a-ad88-3dc089cdf6cc
+--------------------------------------+----------+-------+----------------+------+----------------------------+
| Resource ID                          | Name     | Type  | Volume         | Unit | Timestamp                  |
+--------------------------------------+----------+-------+----------------+------+----------------------------+
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 0.249096775094 | %    | 2016-04-08T18:20:48.189720 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 0.199345747258 | %    | 2016-04-08T18:20:38.238248 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 0.199953300907 | %    | 2016-04-08T18:20:28.117200 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 0.149885592327 | %    | 2016-04-08T18:20:18.172608 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 0.218216145565 | %    | 2016-04-08T18:20:08.112529 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 0.199945654771 | %    | 2016-04-08T18:19:58.157342 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 0.200700605674 | %    | 2016-04-08T18:19:48.154624 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 0.197538824281 | %    | 2016-04-08T18:19:38.189532 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 0.100756439042 | %    | 2016-04-08T18:19:28.064940 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 0.200174432    | %    | 2016-04-08T18:19:18.140016 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 0.300286713754 | %    | 2016-04-08T18:19:08.148730 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 0.298407577802 | %    | 2016-04-08T18:18:58.158278 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 0.204100980593 | %    | 2016-04-08T18:18:48.104914 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 0.294969211605 | %    | 2016-04-08T18:18:38.305843 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 4.31713557452  | %    | 2016-04-08T18:18:28.135290 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 4.78908041774  | %    | 2016-04-08T18:18:18.129833 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 0.845113091294 | %    | 2016-04-08T18:18:08.214674 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 0.807110359781 | %    | 2016-04-08T18:17:58.084231 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 8.33768071797  | %    | 2016-04-08T18:17:48.099023 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 54.9919885879  | %    | 2016-04-08T18:17:38.260424 |
| e996cb04-3d78-484a-ad88-3dc089cdf6cc | cpu_util | gauge | 93.3483477653  | %    | 2016-04-08T18:17:28.309347 |
+--------------------------------------+----------+-------+----------------+------+----------------------------+
```

```
$ gnocchi measures show cpu_util --resource-id e90974a6-31bf-4e47-8824-ca074cd9b47d
+---------------------------+-------------+----------------+
| timestamp                 | granularity |          value |
+---------------------------+-------------+----------------+
| 2016-04-07T00:00:00+00:00 |     86400.0 |  0.30323927544 |
| 2016-04-07T17:00:00+00:00 |      3600.0 |   1.2855184725 |
| 2016-04-07T18:00:00+00:00 |      3600.0 | 0.188613527791 |
| 2016-04-07T19:00:00+00:00 |      3600.0 | 0.188871232024 |
| 2016-04-07T20:00:00+00:00 |      3600.0 | 0.188876901916 |
| 2016-04-07T21:00:00+00:00 |      3600.0 | 0.189646641908 |
| 2016-04-07T20:55:00+00:00 |       300.0 | 0.186680764393 |
| 2016-04-07T21:00:00+00:00 |       300.0 | 0.196676137415 |
| 2016-04-07T21:05:00+00:00 |       300.0 | 0.186475467919 |
| 2016-04-07T21:10:00+00:00 |       300.0 | 0.190019839676 |
| 2016-04-07T21:15:00+00:00 |       300.0 | 0.186565358466 |
| 2016-04-07T21:20:00+00:00 |       300.0 | 0.183166934543 |
| 2016-04-07T21:25:00+00:00 |       300.0 | 0.179994544916 |
| 2016-04-07T21:30:00+00:00 |       300.0 | 0.186649908928 |
| 2016-04-07T21:35:00+00:00 |       300.0 | 0.193315212093 |
| 2016-04-07T21:40:00+00:00 |       300.0 | 0.193272093903 |
| 2016-04-07T21:45:00+00:00 |       300.0 | 0.196677374077 |
| 2016-04-07T21:50:00+00:00 |       300.0 | 0.193300189049 |
+---------------------------+-------------+----------------+


OR


gnocchi measures show 22cd22e7-e48e-4f21-887a-b1c6612b4c98
```

Get a single measure

```
$ ceilometer sample-show 9e15bb5e-fdb6-11e5-a1cb-080027774b87
+-------------+---------------------------------------------------------------------------+
| Property    | Value                                                                     |
+-------------+---------------------------------------------------------------------------+
| id          | 9e15bb5e-fdb6-11e5-a1cb-080027774b87                                      |
| metadata    | {"instance_host": "ubuntu-devstack", "ramdisk_id": "57ed4b6c-2166-46da-   |
|             | 9f27-01493d4ffeae", "flavor.vcpus": "1", "OS-EXT-AZ.availability_zone":   |
|             | "nova", "instance_id": "e996cb04-3d78-484a-ad88-3dc089cdf6cc",            |
|             | "display_name": "test1", "state": "active", "flavor.id": "2", "status":   |
|             | "active", "ephemeral_gb": "0", "flavor.name": "m1.small", "disk_gb":      |
|             | "20", "kernel_id": "94a239b3-a4b5-41db-bc21-a23d5f6d965e", "image.id":    |
|             | "ec272a53-671a-4383-9ead-ebd63dcb0f8a", "flavor.ram": "2048", "host":     |
|             | "9a057237f15ac6b6a60a31cbea34544eee70d7f50df8f28844e4cf30",               |
|             | "flavor.ephemeral": "0", "image.name": "cirros-0.3.4-x86_64-uec",         |
|             | "image_ref_url": "http://10.0.2.15:8774/4c2fc478e3994ccc8a6f2a62fb1bbd09  |
|             | /images/ec272a53-671a-4383-9ead-ebd63dcb0f8a", "image.links": "[{'href':  |
|             | 'http://10.0.2.15:8774/4c2fc478e3994ccc8a6f2a62fb1bbd09/images/ec272a53-  |
|             | 671a-4383-9ead-ebd63dcb0f8a', 'rel': 'bookmark'}]", "cpu_number": "1",    |
|             | "flavor.disk": "20", "root_gb": "20", "name": "instance-00000001",        |
|             | "memory_mb": "2048", "instance_type": "m1.small", "vcpus": "1",           |
|             | "image_ref": "ec272a53-671a-4383-9ead-ebd63dcb0f8a", "flavor.links":      |
|             | "[{'href':                                                                |
|             | 'http://10.0.2.15:8774/4c2fc478e3994ccc8a6f2a62fb1bbd09/flavors/2',       |
|             | 'rel': 'bookmark'}]"}                                                     |
| meter       | cpu_util                                                                  |
| project_id  | 3b6c31f80b93476eae6d5517164fd5b4                                          |
| recorded_at | 2016-04-08T18:20:50.849159                                                |
| resource_id | e996cb04-3d78-484a-ad88-3dc089cdf6cc                                      |
| source      | openstack                                                                 |
| timestamp   | 2016-04-08T18:20:48.189720                                                |
| type        | gauge                                                                     |
| unit        | %                                                                         |
| user_id     | c1a568c378524edc8028014c13086f57                                          |
| volume      | 0.249096775094                                                            |
+-------------+---------------------------------------------------------------------------+
```

Not exactly possible with Gnocchi. Everything is aggregated.

You can create a policy that aggregates at a higher frequency than your sample frequency if you want all datapoints

ie. if cpu_util polling at 60s, set policy granularity to 60s (or less)

Statistics, where things get useful…

Get metric statistics across all resources across all time

```
$ ceilometer statistics --meter cpu_util
+--------+----------------------------+----------------------------+---------------+----------------+---------------+---------------+-------+------------+----------------------------+----------------------------+
| Period | Period Start               | Period End                 | Max           | Min            | Avg           | Sum           | Count | Duration   | Duration Start             | Duration End               |
+--------+----------------------------+----------------------------+---------------+----------------+---------------+---------------+-------+------------+----------------------------+----------------------------+
| 0      | 2016-04-08T18:17:28.309347 | 2016-04-08T18:20:48.189720 | 93.3483477653 | 0.100756439042 | 8.11665878644 | 170.449834515 | 21    | 199.880373 | 2016-04-08T18:17:28.309347 | 2016-04-08T18:20:48.189720 |
+--------+----------------------------+----------------------------+---------------+----------------+---------------+---------------+-------+------------+----------------------------+----------------------------+
```

You need to list each metric or resource_id explicitly. You’ll want to look at largest granularity

```
$ gnocchi measures aggregation -m 22cd22e7-e48e-4f21-887a-b1c6612b4c98 -m e996cb04-3d78-484a-ad88-3dc089cdf6cc --aggregation max
+---------------------------+-------------+----------------+
| timestamp                 | granularity |          value |
+---------------------------+-------------+----------------+
| 2016-04-07T00:00:00+00:00 |     86400.0 |  0.30323927544 |
| 2016-04-07T17:00:00+00:00 |      3600.0 |   1.2855184725 |
| 2016-04-07T18:00:00+00:00 |      3600.0 | 0.188613527791 |
| 2016-04-07T19:00:00+00:00 |      3600.0 | 0.188871232024 |
| 2016-04-07T20:00:00+00:00 |      3600.0 | 0.188876901916 |
| 2016-04-07T21:00:00+00:00 |      3600.0 | 0.189646641908 |
| 2016-04-07T21:10:00+00:00 |       300.0 | 0.190019839676 |
| 2016-04-07T21:15:00+00:00 |       300.0 | 0.186565358466 |
| 2016-04-07T21:20:00+00:00 |       300.0 | 0.183166934543 |
| 2016-04-07T21:25:00+00:00 |       300.0 | 0.179994544916 |
| 2016-04-07T21:30:00+00:00 |       300.0 | 0.186649908928 |
| 2016-04-07T21:35:00+00:00 |       300.0 | 0.193315212093 |
| 2016-04-07T21:40:00+00:00 |       300.0 | 0.193272093903 |
| 2016-04-07T21:45:00+00:00 |       300.0 | 0.196677374077 |
| 2016-04-07T21:50:00+00:00 |       300.0 | 0.193300189049 |
+---------------------------+-------------+----------------+
```

Get metric statistics … aggregated to periods

```
$ ceilometer statistics --meter cpu_util --period 300
+--------+----------------------------+----------------------------+---------------+----------------+---------------+---------------+-------+------------+----------------------------+----------------------------+
| Period | Period Start               | Period End                 | Max           | Min            | Avg           | Sum           | Count | Duration   | Duration Start             | Duration End               |
+--------+----------------------------+----------------------------+---------------+----------------+---------------+---------------+-------+------------+----------------------------+----------------------------+
| 300    | 2016-04-08T18:17:28.309347 | 2016-04-08T18:22:28.309347 | 93.3483477653 | 0.100756439042 | 8.11665878644 | 170.449834515 | 21    | 199.880373 | 2016-04-08T18:17:28.309347 | 2016-04-08T18:20:48.189720 |
+--------+----------------------------+----------------------------+---------------+----------------+---------------+---------------+-------+------------+----------------------------+----------------------------+
```

That's convenient, Gnocchi already does that.

```
$ gnocchi measures aggregation -m 22cd22e7-e48e-4f21-887a-b1c6612b4c98 -m e996cb04-3d78-484a-ad88-3dc089cdf6cc --aggregation median
+---------------------------+-------------+----------------+
| timestamp                 | granularity |          value |
+---------------------------+-------------+----------------+
| 2016-04-07T00:00:00+00:00 |     86400.0 |  0.30323927544 |
| 2016-04-07T17:00:00+00:00 |      3600.0 |   1.2855184725 |
| 2016-04-07T18:00:00+00:00 |      3600.0 | 0.188613527791 |
| 2016-04-07T19:00:00+00:00 |      3600.0 | 0.188871232024 |
| 2016-04-07T20:00:00+00:00 |      3600.0 | 0.188876901916 |
| 2016-04-07T21:00:00+00:00 |      3600.0 | 0.189646641908 |
| 2016-04-07T20:55:00+00:00 |       300.0 | 0.186680764393 |
| 2016-04-07T21:00:00+00:00 |       300.0 | 0.196676137415 |
| 2016-04-07T21:05:00+00:00 |       300.0 | 0.186475467919 |
| 2016-04-07T21:10:00+00:00 |       300.0 | 0.190019839676 |
| 2016-04-07T21:15:00+00:00 |       300.0 | 0.186565358466 |
| 2016-04-07T21:20:00+00:00 |       300.0 | 0.183166934543 |
| 2016-04-07T21:25:00+00:00 |       300.0 | 0.179994544916 |
| 2016-04-07T21:30:00+00:00 |       300.0 | 0.186649908928 |
| 2016-04-07T21:35:00+00:00 |       300.0 | 0.193315212093 |
| 2016-04-07T21:40:00+00:00 |       300.0 | 0.193272093903 |
| 2016-04-07T21:45:00+00:00 |       300.0 | 0.196677374077 |
| 2016-04-07T21:50:00+00:00 |       300.0 | 0.193300189049 |
+---------------------------+-------------+----------------+
```

Get metric statistics with same metadata

```
$ ceilometer statistics --meter cpu_util --period 300 -q metadata.status='active'
+--------+----------------------------+----------------------------+---------------+----------------+---------------+---------------+-------+------------+----------------------------+----------------------------+
| Period | Period Start               | Period End                 | Max           | Min            | Avg           | Sum           | Count | Duration   | Duration Start             | Duration End               |
+--------+----------------------------+----------------------------+---------------+----------------+---------------+---------------+-------+------------+----------------------------+----------------------------+
| 300    | 2016-04-08T18:17:28.309347 | 2016-04-08T18:22:28.309347 | 93.3483477653 | 0.100756439042 | 8.11665878644 | 170.449834515 | 21    | 199.880373 | 2016-04-08T18:17:28.309347 | 2016-04-08T18:20:48.189720 |
+--------+----------------------------+----------------------------+---------------+----------------+---------------+---------------+-------+------------+----------------------------+----------------------------+
```

```
gnocchi measures aggregation -m cpu_util --resource-type instance --query 'flavor_id="1"' --aggregation median
+---------------------------+-------------+----------------+
| timestamp                 | granularity |          value |
+---------------------------+-------------+----------------+
| 2016-04-07T00:00:00+00:00 |     86400.0 |  0.30323927544 |
| 2016-04-07T17:00:00+00:00 |      3600.0 |   1.2855184725 |
| 2016-04-07T18:00:00+00:00 |      3600.0 | 0.188613527791 |
| 2016-04-07T19:00:00+00:00 |      3600.0 | 0.188871232024 |
| 2016-04-07T20:00:00+00:00 |      3600.0 | 0.188876901916 |
| 2016-04-07T21:00:00+00:00 |      3600.0 | 0.189646641908 |
| 2016-04-07T20:55:00+00:00 |       300.0 | 0.186680764393 |
| 2016-04-07T21:00:00+00:00 |       300.0 | 0.196676137415 |
| 2016-04-07T21:05:00+00:00 |       300.0 | 0.186475467919 |
| 2016-04-07T21:10:00+00:00 |       300.0 | 0.190019839676 |
| 2016-04-07T21:15:00+00:00 |       300.0 | 0.186565358466 |
| 2016-04-07T21:20:00+00:00 |       300.0 | 0.183166934543 |
| 2016-04-07T21:25:00+00:00 |       300.0 | 0.179994544916 |
| 2016-04-07T21:30:00+00:00 |       300.0 | 0.186649908928 |
| 2016-04-07T21:35:00+00:00 |       300.0 | 0.193315212093 |
| 2016-04-07T21:40:00+00:00 |       300.0 | 0.193272093903 |
| 2016-04-07T21:45:00+00:00 |       300.0 | 0.196677374077 |
| 2016-04-07T21:50:00+00:00 |       300.0 | 0.193300189049 |
+---------------------------+-------------+----------------+
```

Get metric statistics for a single resource

```
$ ceilometer statistics --meter cpu_util --period 300 -q 'resource_id=a1ec2585-62e3-40e2-83e2-ff3515ab7f07'
+--------+----------------------------+----------------------------+---------------+----------------+---------------+---------------+-------+------------+----------------------------+----------------------------+
| Period | Period Start               | Period End                 | Max           | Min            | Avg           | Sum           | Count | Duration   | Duration Start             | Duration End               |
+--------+----------------------------+----------------------------+---------------+----------------+---------------+---------------+-------+------------+----------------------------+----------------------------+
| 300    | 2016-04-08T18:17:28.309347 | 2016-04-08T18:22:28.309347 | 93.3483477653 | 0.100756439042 | 8.11665878644 | 170.449834515 | 21    | 199.880373 | 2016-04-08T18:17:28.309347 | 2016-04-08T18:20:48.189720 |
+--------+----------------------------+----------------------------+---------------+----------------+---------------+---------------+-------+------------+----------------------------+----------------------------+
```

```
$ gnocchi measures show cpu_util --resource-id --aggregation max OR gnocchi measures show <metric_id>
+---------------------------+-------------+----------------+
| timestamp                 | granularity |          value |
+---------------------------+-------------+----------------+
| 2016-04-07T00:00:00+00:00 |     86400.0 |  0.30323927544 |
| 2016-04-07T17:00:00+00:00 |      3600.0 |   1.2855184725 |
| 2016-04-07T18:00:00+00:00 |      3600.0 | 0.188613527791 |
| 2016-04-07T19:00:00+00:00 |      3600.0 | 0.188871232024 |
| 2016-04-07T20:00:00+00:00 |      3600.0 | 0.188876901916 |
| 2016-04-07T21:00:00+00:00 |      3600.0 | 0.189646641908 |
| 2016-04-07T20:55:00+00:00 |       300.0 | 0.186680764393 |
| 2016-04-07T21:00:00+00:00 |       300.0 | 0.196676137415 |
| 2016-04-07T21:05:00+00:00 |       300.0 | 0.186475467919 |
| 2016-04-07T21:10:00+00:00 |       300.0 | 0.190019839676 |
| 2016-04-07T21:15:00+00:00 |       300.0 | 0.186565358466 |
| 2016-04-07T21:20:00+00:00 |       300.0 | 0.183166934543 |
| 2016-04-07T21:25:00+00:00 |       300.0 | 0.179994544916 |
| 2016-04-07T21:30:00+00:00 |       300.0 | 0.186649908928 |
| 2016-04-07T21:35:00+00:00 |       300.0 | 0.193315212093 |
| 2016-04-07T21:40:00+00:00 |       300.0 | 0.193272093903 |
| 2016-04-07T21:45:00+00:00 |       300.0 | 0.196677374077 |
| 2016-04-07T21:50:00+00:00 |       300.0 | 0.193300189049 |
+---------------------------+-------------+----------------+
```

Get metric statistics group by resource

```
$ ceilometer statistics --meter cpu_util --groupby resource_id
+--------+----------------------------+----------------------------+-----------------------------------------------------------+---------------+----------------+---------------+---------------+-------+-----------
+----------------------------+----------------------------+
| Period | Period Start               | Period End                 | Group By                                                  | Max           | Min            | Avg           | Sum           | Count | Duration   |
Duration Start             | Duration End               |
+--------+----------------------------+----------------------------+-----------------------------------------------------------+---------------+----------------+---------------+---------------+-------+-----------
+----------------------------+----------------------------+
| 0      | 2016-04-08T18:17:28.309347 | 2016-04-08T18:20:48.189720 | {u'resource_id': u'e996cb04-3d78-484a-ad88-3dc089cdf6cc'} | 93.3483477653 | 0.100756439042 | 8.11665878644 | 170.449834515 | 21    | 199.880373 |
2016-04-08T18:17:28.309347 | 2016-04-08T18:20:48.189720 |
+--------+----------------------------+----------------------------+-----------------------------------------------------------+---------------+----------------+---------------+---------------+-------+-----------
+----------------------------+----------------------------+
```

Not available via gnocchiclient (currently). Requires REST API

POST /v1/aggregation/resource/instance/metric/cpu.util?groupby=host&groupby=flavor_id HTTP/1.1
Content-Length: 47
Content-Type: application/json

See: http://docs.openstack.org/developer/gnocchi/rest.html

A few more tricks…

- gnocchi resource history <resource_id>
    - Get a list of all the changes to resource metadata
- --start and --stop to define time ranges
- More diverse aggregation support
    - min, max, median, mean, stdev, first, last, moving-average, etc...
- complex filtering rules
    - --query “not (flavor_id!=\"1\" and memory>=24)”

More info

- http://gnocchi.xyz/
- REST API: http://gnocchi.xyz/rest.html
- Statsd interface: http://gnocchi.xyz/statsd.html
- Autoscaling: http://blogs.rdoproject.org/7437/autoscaling-with-heat-ceilometer-gnocchi