MEMORY PROFILING

Ceph OSD and metadata server daemons can generate heap profiles using `tcmalloc`. To generate heap profiles, ensure you have `google-perftools` installed:

```
sudo apt-get google-perftools
```

The profiler dumps output to your `log file` directory (i.e., `/var/log/ceph`). See Logging and Debugging for details. To view the profiler logs with Google's performance tools, execute the following:

```
google-pprof -gv {log-path/filename}
```

Refer to Google Heap Profiler for additional details.

Once you have the heap profiler installed, start your cluster and begin using the heap profiler. You may enable or disable the heap profiler at runtime, or ensure that it runs continously. For the following commandline usage, replace `{daemon-type}` with `osd` or `mds`, and replace `daemon-id` with the OSD number or metadata server letter.

STARTING THE PROFILER

To start the heap profiler, execute the following:

```
ceph {daemon-type} tell {daemon-id} heap start_profiler
```

For example:

```
ceph osd tell 1 heap start_profiler
```

PRINTING STATS

To print out statistics, execute the following:

```
ceph {daemon-type} tell {daemon-id} heap stats
```

For example:

```
ceph osd tell 0 heap stats
```

Note: Printing stats does not require the profiler to be running and does not dump the heap allocation information to a file.

DUMPING HEAP INFORMATION

To dump heap information, execute the following:

```
ceph {daemon-type} tell {daemon-id} heap dump
```

For example:

```
ceph mds tell a heap dump
```

Note: Dumping heap information only works when the profiler is running.

RELEASING MEMORY

To release memory that `tcmalloc` has allocated but which is not being used by the Ceph daemon itself, execute the following:

```
ceph {daemon-type} tell {daemon-id} heap release
```

For example:

```
ceph osd tell 2 heap release
```

STOPPING THE PROFILER

To stop the heap profiler, execute the following:

```
ceph {daemon-type} tell {daemon-id} heap stop_profiler
```

For example:

```
ceph {daemon-type} tell {daemon-id} heap stop_profiler
```