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Subject: [PATCH v5 14/14] Add documentation about the kmem controller

Posted by [Glauber Costa](#) on Tue, 16 Oct 2012 10:16:51 GMT

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Documentation/cgroups/memory.txt | 58 ++++++  
1 file changed, 57 insertions(+), 1 deletion(-)

diff --git a/Documentation/cgroups/memory.txt b/Documentation/cgroups/memory.txt  
index c07f7b4..dd15be8 100644

--- a/Documentation/cgroups/memory.txt

+++ b/Documentation/cgroups/memory.txt

@@ -71,6 +71,11 @@ Brief summary of control files.

memory.oom\_control # set/show oom controls.

memory.numa\_stat # show the number of memory usage per numa node

+ memory.kmem.limit\_in\_bytes # set/show hard limit for kernel memory

+ memory.kmem.usage\_in\_bytes # show current kernel memory allocation

+ memory.kmem.failcnt # show the number of kernel memory usage hits limits

+ memory.kmem.max\_usage\_in\_bytes # show max kernel memory usage recorded

+

memory.kmem.tcp.limit\_in\_bytes # set/show hard limit for tcp buf memory

memory.kmem.tcp.usage\_in\_bytes # show current tcp buf memory allocation

memory.kmem.tcp.failcnt # show the number of tcp buf memory usage hits limits

@@ -268,20 +273,65 @@ the amount of kernel memory used by the system. Kernel memory is  
fundamentally

different than user memory, since it can't be swapped out, which makes it  
possible to DoS the system by consuming too much of this precious resource.

+Kernel memory won't be accounted at all until limit on a group is set. This

+allows for existing setups to continue working without disruption. The limit

+cannot be set if the cgroup have children, or if there are already tasks in the

+cgroup. When use\_hierarchy == 1 and a group is accounted, its children will

+automatically be accounted regardless of their limit value.

+

+After a controller is first limited, it will be kept being accounted until it

+is removed. The memory limitation itself, can of course be removed by writing

+1 to memory.kmem.limit\_in\_bytes. In this case, kmem will be accounted, but not

+limited.

- + Kernel memory limits are not imposed for the root cgroup. Usage for the root -cgroup may or may not be accounted.
- +cgroup may or may not be accounted. The memory used is accumulated into +memory.kmem.usage\_in\_bytes, or in a separate counter when it makes sense.
- +(currently only for tcp).
- +The main "kmem" counter is fed into the main counter, so kmem charges will +also be visible from the user counter.

Currently no soft limit is implemented for kernel memory. It is future work to trigger slab reclaim when those limits are reached.

### 2.7.1 Current Kernel Memory resources accounted

- +\* stack pages: every process consumes some stack pages. By accounting into +kernel memory, we prevent new processes from being created when the kernel +memory usage is too high.
- +
  - \* sockets memory pressure: some sockets protocols have memory pressure thresholds. The Memory Controller allows them to be controlled individually per cgroup, instead of globally.
  - \* tcp memory pressure: sockets memory pressure for the tcp protocol.

### +2.7.3 Common use cases

- +
  - +Because the "kmem" counter is fed to the main user counter, kernel memory can +never be limited completely independently of user memory. Say "U" is the user +limit, and "K" the kernel limit. There are three possible ways limits can be +set:
  - +
    - + U != 0, K = unlimited:
    - + This is the standard memcg limitation mechanism already present before kmem + accounting. Kernel memory is completely ignored.
    - +
      - + U != 0, K < U:
      - + Kernel memory is a subset of the user memory. This setup is useful in + deployments where the total amount of memory per-cgroup is overcommitted.
      - + Overcommitting kernel memory limits is definitely not recommended, since the + box can still run out of non-reclaimable memory.
      - + In this case, the admin could set up K so that the sum of all groups is + never greater than the total memory, and freely set U at the cost of his + QoS.
    - +
      - + U != 0, K >= U:
      - + Since kmem charges will also be fed to the user counter and reclaim will be + triggered for the cgroup for both kinds of memory. This setup gives the + admin a unified view of memory, and it is also useful for people who just

+ want to track kernel memory usage.

+

### 3. User Interface

#### 0. Configuration

@@ -290,6 +340,7 @@ a. Enable CONFIG\_CGROUPS

b. Enable CONFIG\_RESOURCE\_COUNTERS

c. Enable CONFIG\_MEMCG

d. Enable CONFIG\_MEMCG\_SWAP (to use swap extension)

+d. Enable CONFIG\_MEMCG\_KMEM (to use kmem extension)

1. Prepare the cgroups (see cgroups.txt, Why are cgroups needed?)

# mount -t tmpfs none /sys/fs/cgroup

@@ -406,6 +457,11 @@ About use\_hierarchy, see Section 6.

Because rmdir() moves all pages to parent, some out-of-use page caches can be moved to the parent. If you want to avoid that, force\_empty will be useful.

+ Also, note that when memory.kmem.limit\_in\_bytes is set the charges due to

+ kernel pages will still be seen. This is not considered a failure and the

+ write will still return success. In this case, it is expected that

+ memory.kmem.usage\_in\_bytes == memory.usage\_in\_bytes.

+

About use\_hierarchy, see Section 6.

#### 5.2 stat file

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1.7.11.7