Subject: [PATCH] Memory controller Add Documentation
Posted by Balbir Singh on Wed, 22 Aug 2007 13:06:12 GMT
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Signed-off-by: Balbir Singh <balbir@linux.vnet.ibm.com>

Documentation/memcontrol.txt | 193 ++
1 file changed, 193 insertions(+)

diff -puN /dev/null Documentation/memcontrol.txt
--- /dev/null 2007-06-01 20:42:04.000000000 +0530
+++ linux-2.6.23-rc2-mm2-balbir/Documentation/memcontrol.txt 2007-08-22 18:29:29.000000000 +0530
@@ -0,0 +1,193 @@
+Memory Controller
+
+0. Salient features
+
+a. Enable control of both RSS and Page Cache pages
+b. The infrastructures allows easy addition of other types of memory to control
+c. Provides *zero overhead* for non memory controller users
+d. Provides a double LRU, global memory pressure causes reclaim from the
+ global LRU, a container on hitting a limit, reclaims from the per
+ container LRU
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+1. History
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+The memory controller has a long history. A request for comments for the memory
+controller was posted by Balbir Singh [1]. At the time the RFC was posted
+there were several implementations for memory control, the goal of the
+RFC was to build consensus and agreement for the minimal features required
+for memory control. The first RSS controller was posted by Balbir Singh[2]
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+that we handle both page cache and RSS together. Another request was raised
+to allow user space handling of OOM. The current memory controller is
+at version 6, it combines both RSS and Page Cache Control [11].
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+2. Memory Control
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+Memory is a unique resource in the sense that it is present in a limited
+amount. If a task requires a lot of CPU processing, the task can spread
+its processing over a period of hours, days, months or years, but with
+memory, the same physical memory needs to be reused to accomplish the task.
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+The memory controller implementation has been divided into phases, these
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+1. Memory controller
+2. mlock(2) controller
+3. Kernel user memory accounting and slab control
+4. user mappings length controller
+
+The memory controller is the first controller developed.
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+2.1. Design
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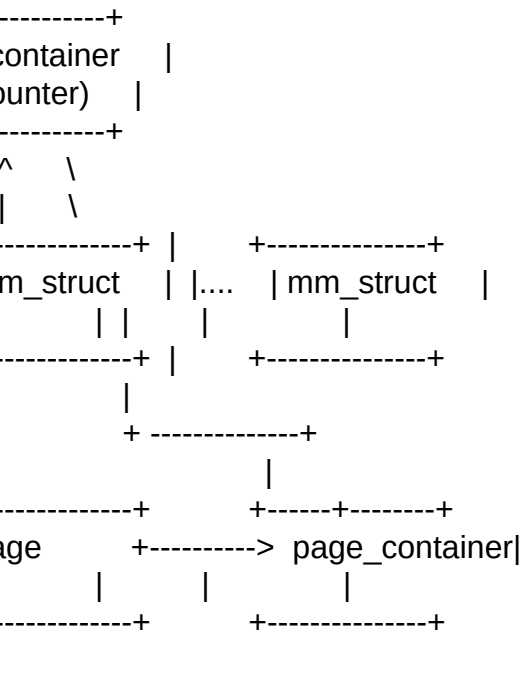
+The core of the design is a counter called the res_counter. The res_counter
+tracks the current memory usage and limit of the group of processes associated
+with the controller. Each container has a memory controller specific data
+structure (mem_container) associated with it.
+
+2.2. Accounting
+
+ 
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+Figure 1 shows the important aspects of the controller
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+1. Accounting happens per container
+2. Each mm_struct knows about which container they belong to
+3. Each page has a pointer to the page_container, which in turn knows the
+ container it belongs to
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+The accounting is done as follows, mem_container_charge() is invoked to setup
+the necessary data structures and check if the container that is being charged
+is over its limit. If it is then reclaim is invoked on the container.

+More details can be found in the reclaim section of this document.
+If everything goes well, a page meta-data-structure called page_container is
+allocated and associated with the page. This routine also adds the page to
+the per container LRU.
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+Shared pages are accounted on the basis of the first touch approach. The
+container that first touches a page is accounted for the page. The principle
+behind this approach is that a container that aggressively uses a shared
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+Each container maintains a per container LRU that consists of an active
+and inactive list. When a container goes over its limit, we first try
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+container.
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+The reclaim algorithm has not been modified for containers, except that
+pages that are selected for reclaiming come from the per container LRU
+list.
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+2.5
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+3. User Interface
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+0. Configuration
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+a. Enable CONFIG_CONTAINERS
+b. Enable CONFIG_RESOURCE_COUNTERS
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+1. Prepare the containers
+# mkdir -p /containers
+# mount -t container none /containers -o memory
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+2. Make the new group and move bash into it
+# mkdir /containers/0
+# echo $$ > /containers/0/tasks
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+Since now we're in the 0 container.
+We can alter the memory limit
+# echo -n 6000 > /containers/0/memory.limit
+

+We can check the usage
+# cat /containers/0/memory.usage
+25
+
+The memory.failcnt gives the number of times that the container limit was
+exceeded.
+
+4. Testing
+
+Balbir posted lmbench, AIM9, LTP and vmmstress results [10] and [11].
+Apart from that v6 has been tested with several applications and regular
+daily use. The controller has also been tested on the PPC64, x86_64 and
+UML platforms.
+
+4.1 Troubleshooting
+
+Sometimes a user might find that the application under a container is
+terminated, there are several causes for this
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+1. The container limit is too low (just too low to do anything useful)
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+echo 1 > /proc/sys/vm/drop_pages will help get rid of some of the pages
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+Overall, the memory controller has been a stable controller and has been
+commented and discussed on quite extensively in the community.
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+References
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+   http://lwn.net/Articles/222762/

+3. Emelianov, Pavel. Resource controllers based on process containers
+ http://lkml.org/lkml/2007/3/6/198
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+ http://lkml.org/lkml/2007/5/30/244
+6. Menage, Paul. Containers v10, http://lwn.net/Articles/236032/
+7. Vaidyanathan, Srinivasan, Containers: Pagecache accounting and control
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+8. Singh, Balbir. RSS controller V2 test results (lmbench),
+ http://lkml.org/lkml/2007/5/17/232
+9. Singh, Balbir. RSS controller V2 AIM9 results
+ http://lkml.org/lkml/2007/5/18/1
+10. Singh, Balbir. Memory controller v6 results,
+ http://lkml.org/lkml/2007/8/19/36
+11. Singh, Balbir. Memory controller v6, http://lkml.org/lkml/2007/8/17/69

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Warm Regards,
Balbir Singh
Linux Technology Center
IBM, ISTL

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Subject: Re: [PATCH] Memory controller Add Documentation
Posted by KAMEZAWA Hiroyuki on Thu, 23 Aug 2007 08:36:21 GMT
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Thank you for documentaion. How about adding following topics ?

- Benefit and Purpose. When this function help a user.
- What is accounted as RSS.
- What is accounted as page-cache.
- What are not accoutned now.
- When a page is accounted (charged.)
- about mem_control_type
- When a user can remove memory controller with no tasks (by rmdir)
  and What happens if a user does.
- What happens when a user migrates a task to other container.

Writing all above may be too much :)

I'm sorry if I say something pointless.

Thanks,
-Kame

On Wed, 22 Aug 2007 18:36:12 +0530
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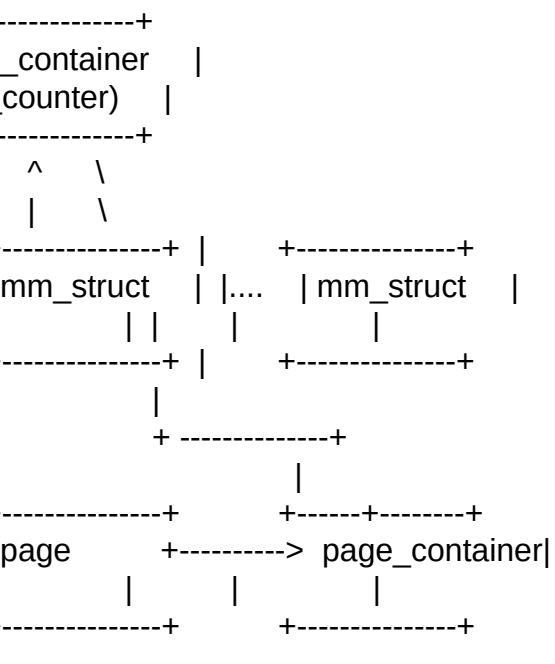
> + 
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>
> --
> Warm Regards,
> Balbir Singh
> Linux Technology Center
> IBM, ISTL
> -
> To unsubscribe from this list: send the line "unsubscribe linux-kernel" in
> the body of a message to majordomo@vger.kernel.org
> More majordomo info at http://vger.kernel.org/majordomo-info.html
> Please read the FAQ at http://www.tux.org/lkml/
>

Subject: Re: [PATCH] Memory controller Add Documentation
Posted by Balbir Singh on Thu, 23 Aug 2007 08:38:37 GMT
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Thanks for your input. I'll try and incorporate your comments into
the documentation (I think it will help developers and users alike).

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> I'm sorry if I say something pointless.
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No.. not at all! Thank you for reading the documentation and commenting
on it.

> Thanks,
> -Kame
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--
Warm Regards,
Balbir Singh
Linux Technology Center
IBM, ISTL

_____
Containers mailing list
Containers@lists.linux-foundation.org
https://lists.linux-foundation.org/mailman/listinfo/containers

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Subject: Re: [PATCH] Memory controller Add Documentation
Posted by yamamoto on Fri, 24 Aug 2007 08:48:15 GMT
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drop_caches

YAMAMOTO Takashi

_____

Containers mailing list
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