
Subject: [PATCH 0/4] Container Freezer: Reuse Suspend Freezer
Posted by [Matt Helsley](#) on Mon, 07 Jul 2008 22:58:23 GMT
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This patchset reuses the container infrastructure and the swsusp freezer to freeze a group of tasks.

The freezer subsystem in the container filesystem defines a file named freezer.state. Writing "FROZEN" to the state file will freeze all tasks in the cgroup. Subsequently writing "RUNNING" will unfreeze the tasks in the cgroup. Reading will return the current state.

* Examples of usage :

```
# mkdir /containers/freezer
# mount -t cgroup -ofreezer,signal freezer /containers
# mkdir /containers/0
# echo $some_pid > /containers/0/tasks
```

to get status of the freezer subsystem :

```
# cat /containers/0/freezer.state
RUNNING
```

to freeze all tasks in the container :

```
# echo FROZEN > /containers/0/freezer.state
# cat /containers/0/freezer.state
FREEZING
# cat /containers/0/freezer.state
FROZEN
```

to unfreeze all tasks in the container :

```
# echo RUNNING > /containers/0/freezer.state
# cat /containers/0/freezer.state
RUNNING
```

to kill all tasks in the container :

```
# echo 9 > /containers/0/signal.kill
```

I've reworked Cedric's patches to use task_lock() to protect access to the task's cgroup.

Paul, Pavel asked me to send these to Rafael next. They are patches to make the freezer useful for checkpoint/restart using cgroups so it would be nice to get an explicit [N]Ack from you first.

Rafael, if Paul agrees, please consider applying these patches.

Changes since v3:

v4 (Almost all of these changes are confined to patch 3):

Reworked the series to use `task_lock()` instead of RCU.

Reworked the series to use `write_string()` and `read_seq_string()` cgroup methods.

Fixed the race Paul Menage identified.

Fixed up `check_if_frozen()` to do more than just test the FROZEN flag. In some cases tasks could be stopped (T) and marked FREEZING. When that happens we can safely assume that it will be frozen immediately upon waking up in the kernel.

Waiting for it to get marked with PF_FROZEN in order to transition to the FROZEN state would block unnecessarily.

Removed `freezer_` prefix from static functions in `cgroup_freezer.c`.

Simplified `STATE_` switch.

Updated the locking comments.

v3:

Ported to 2.6.26-rc5-mm2 with Rafael's freezer patches

Tested on 24 combinations of 3 architectures (x86, x86_64, ppc64) with 8 different kernel configs varying power management and cgroup config variables. Each patch builds and boots in these 24 combinations.

Passes functional testing.

v2 (roughly patches 3 and 5):

Moved the "kill" file into a separate cgroup subsystem (signal) and it's own patch.

Changed the name of the file from `freezer.freeze` to `freezer.state`.

Switched from taking 1 and 0 as input to the strings "FROZEN" and "RUNNING", respectively. This helps keep the interface human-usable if/when we need to more states.

Checked that stopped or interrupted is "frozen enough"

Since `try_to_freeze()` is called upon wakeup of these tasks this should be fine. This idea comes from recent changes to the freezer.

Checked that if `(task == current)` whilst freezing cgroup we're ok

Fixed bug where `-EBUSY` would always be returned when freezing

Added code to handle userspace retries for any remaining `-EBUSY`

Cheers,

-Matt Helsley

--

Containers mailing list

Containers@lists.linux-foundation.org

<https://lists.linux-foundation.org/mailman/listinfo/containers>

Subject: [PATCH 4/4] Container Freezer: Skip frozen cgroups during power management resume

Posted by [Matt Helsley](#) on Mon, 07 Jul 2008 22:58:27 GMT

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From: Cedric Le Goater <clg@fr.ibm.com>

Subject: [PATCH 4/4] Container Freezer: Skip frozen cgroups during power management resume

When a system is resumed after a suspend, it will also unfreeze frozen cgroups.

This patchs modifies the resume sequence to skip the tasks which are part of a frozen control group.

Signed-off-by: Cedric Le Goater <clg@fr.ibm.com>

Signed-off-by: Matt Helsley <matthltc@us.ibm.com>

Tested-by: Matt Helsley <matthltc@us.ibm.com>

kernel/power/process.c | 4 ++++

1 file changed, 4 insertions(+)

Index: linux-2.6.26-rc5-mm2/kernel/power/process.c

=====

--- linux-2.6.26-rc5-mm2.orig/kernel/power/process.c

+++ linux-2.6.26-rc5-mm2/kernel/power/process.c

@@ -11,10 +11,11 @@

#include <linux/interrupt.h>

#include <linux/suspend.h>

#include <linux/module.h>

#include <linux/syscalls.h>

#include <linux/freezer.h>

+#include <linux/cgroup_freezer.h>

/*

* Timeout for stopping processes

*/

#define TIMEOUT (20 * HZ)

@@ -133,10 +134,13 @@ static void thaw_tasks(bool nosig_only)
continue;

if (nosig_only && should_send_signal(p))
continue;

+ if (cgroup_frozen(p))

+ continue;

+

thaw_process(p);

} while_each_thread(g, p);

read_unlock(&tasklist_lock);

}

--

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Subject: Re: [PATCH 0/4] Container Freezer: Reuse Suspend Freezer
Posted by [Matt Helsley](#) on Mon, 07 Jul 2008 23:02:24 GMT
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On Mon, 2008-07-07 at 15:58 -0700, Matt Helsley wrote:

```
> This patchset reuses the container infrastructure and the swsusp freezer to
> freeze a group of tasks.
>
> The freezer subsystem in the container filesystem defines a file named
> freezer.state. Writing "FROZEN" to the state file will freeze all tasks in the
> cgroup. Subsequently writing "RUNNING" will unfreeze the tasks in the cgroup.
> Reading will return the current state.
>
> * Examples of usage :
>
> # mkdir /containers/freezer
> # mount -t cgroup -ofreezer,sigfreezer /containers
> # mkdir /containers/0
> # echo $some_pid > /containers/0/tasks
>
> to get status of the freezer subsystem :
>
> # cat /containers/0/freezer.state
> RUNNING
>
> to freeze all tasks in the container :
>
> # echo FROZEN > /containers/0/freezer.state
> # cat /containers/0/freezer.state
> FREEZING
> # cat /containers/0/freezer.state
> FROZEN
>
> to unfreeze all tasks in the container :
>
> # echo RUNNING > /containers/0/freezer.state
> # cat /containers/0/freezer.state
> RUNNING
```

>
> to kill all tasks in the container :
>
> # echo 9 > /containers/0/signal.kill
>
> I've reworked Cedric's patches to use task_lock() to protect access to the
> task's cgroup.
>
> Paul, Pavel asked me to send these to Rafael next. They are patches to make
> the freezer useful for checkpoint/restart using cgroups so it would be nice
> to get an explicit [N]Ack from you first.
>
> Rafael, if Paul agrees, please consider applying these patches.
>
> Changes since v3:
> v4 (Almost all of these changes are confined to patch 3):
> Reworked the series to use task_lock() instead of RCU.
> Reworked the series to use write_string() and read_seq_string()
> cgroup methods.

FYI - This means these patches need Paul's patches introducing write_string(). I can certainly restore the old code for .read and .write, but I was anticipating write_string() making it into various trees first. If that's not necessarily the case please let me know.

Cheers,
-Matt

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Subject: Re: [PATCH 0/4] Container Freezer: Reuse Suspend Freezer
Posted by [KAMEZAWA Hiroyuki](#) on Tue, 08 Jul 2008 03:27:40 GMT
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Hi, could I make brief questions ?

On Mon, 07 Jul 2008 15:58:23 -0700
Matt Helsley <matthltc@us.ibm.com> wrote:
> to get status of the freezer subsystem :
>
> # cat /containers/0/freezer.state
> RUNNING
>
> to freeze all tasks in the container :

```
>
> # echo FROZEN > /containers/0/freezer.state
> # cat /containers/0/freezer.state
> FREEZING
> # cat /containers/0/freezer.state
> FROZEN
>
I'm just curious.
```

1. When we see FREEZING and have to retry ?
While there are some threads which wait for some event ?
2. What happens when FROZEN threads are moved to other group ?
Can we move them ?
Can we wake them up (if it can be moved) ?
What operations are allowed to frozen threads ?

Thanks,
-Kame

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Subject: Re: [PATCH 0/4] Container Freezer: Reuse Suspend Freezer
Posted by [Matt Helsley](#) on Tue, 08 Jul 2008 19:39:14 GMT
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Cedric was accidentally not Cc'd on the introduction (PATCH 0). Adding him.

On Tue, 2008-07-08 at 12:31 +0900, KAMEZAWA Hiroyuki wrote:

```
> Hi, could I make brief questions ?
>
> On Mon, 07 Jul 2008 15:58:23 -0700
> Matt Helsley <matthlrc@us.ibm.com> wrote:
> > to get status of the freezer subsystem :
> >
> > # cat /containers/0/freezer.state
> > RUNNING
> >
> > to freeze all tasks in the container :
> >
> > # echo FROZEN > /containers/0/freezer.state
> > # cat /containers/0/freezer.state
> > FREEZING
```

```
> > # cat /containers/0/freezer.state
> > FROZEN
> >
> I'm just curious.
>
> 1. When we see FREEZING and have to retry ?
```

One example is when some processes are in the a specific portion of vfork() you might see FREEZING and have to retry.

> While there are some threads which wait for some event ?

Depending on which kind of "wait" they are performing, yes. If it's uninterruptible sleep and the PF_FROZEN flag is not set then you might see FREEZING.

```
> 2. What happens when FROZEN threads are moved to other group ?
> Can we move them ?
```

If the destination cgroup is not FROZEN, yes.

If the destination cgroup is FREEZING this works as expected.

If the destination cgroup is RUNNING you'd have a problem unfreezing the task. This happens because the cgroup has a state inconsistent with the task's state. To unfreeze the task you'd have to try to freeze and then unfreeze the destination cgroup.

There are several ways I could change this.

One is to try and disallow users from moving frozen tasks. That doesn't seem like a good approach since it would require a new cgroups interface "can_detach()".

However we can prevent attach so I could add checks that look at the attaching tasks's state and refuse the attach when the task's state (unfrozen, frozen) is inconsistent with the cgroup state (RUNNING, FREEZING, FROZEN). I'll send a fifth patch on top of this series showing this idea.

Rather than refuse to allow attach we could change the destination cgroup's state during attach so that the two states are consistent. However, this introduces more ugly cases for userspace to be aware of.

> Can we wake them up (if it can be moved) ?

You can't wake them until you've unfrozen them.

> What operations are allowed to frozen threads ?

Any operation that doesn't require the threads to run.

Cheers,
-Matt Helsley

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