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Subject: Re: [PATCH 1/1, v6] cgroup/freezer: add per freezer duty ratio control  
Posted by [Li Zefan](#) on Wed, 09 Feb 2011 03:07:59 GMT  
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jacob.jun.pan@linux.intel.com wrote:

```
> From: Jacob Pan <jacob.jun.pan@linux.intel.com>
>
> Freezer subsystem is used to manage batch jobs which can start
> stop at the same time. However, sometime it is desirable to let
> the kernel manage the freezer state automatically with a given
> duty ratio.
> For example, if we want to reduce the time that backgroup apps
> are allowed to run we can put them into a freezer subsystem and
> set the kernel to turn them THAWED/FROZEN at given duty ratio.
>
> This patch introduces two file nodes under cgroup
> freezer.duty_ratio_pct and freezer.period_sec
>
> Usage example: set period to be 5 seconds and frozen duty ratio 90%
> [root@localhost aoa]# echo 90 > freezer.duty_ratio_pct
> [root@localhost aoa]# echo 5000 > freezer.period_ms
>
```

So after:

```
# echo FROZEN > freezer.state
# echo 90 > freezer.duty_ratio_pct
# echo 5000 > freezer.period_ms
...
# echo 0 > freezer.duty_ratio_pct
```

All the tasks in this cgroup are in THAWED state, but the cgroup is in FROZEN state. This should be fixed.

```
> Signed-off-by: Jacob Pan <jacob.jun.pan@linux.intel.com>
> ---
> Documentation/cgroups/freezer-subsystem.txt | 23 +++++
> kernel/cgroup_freezer.c                     | 132 +++++
> 2 files changed, 154 insertions(+), 1 deletions(-)
>
> diff --git a/Documentation/cgroups/freezer-subsystem.txt
> b/Documentation/cgroups/freezer-subsystem.txt
> index 41f37fe..7f06f05 100644
> --- a/Documentation/cgroups/freezer-subsystem.txt
> +++ b/Documentation/cgroups/freezer-subsystem.txt
> @@ -100,3 +100,26 @@ things happens:
>   and returns EINVAL)
> 3) The tasks that blocked the cgroup from entering the "FROZEN"
```

```

> state disappear from the cgroup's set of tasks.
> +
> +In embedded systems, it is desirable to manage group of applications
> +for power saving. E.g. tasks that are not in the foreground may be
> +frozen unfrozen periodically to save power without affecting user
> +experience. In this case, user/management software can attach tasks
> +into freezer cgroup then specify duty ratio and period that the
> +managed tasks are allowed to run.
> +
> +Usage example:
> +Assuming freezer cgroup is already mounted, application being managed
> +are included the "tasks" file node of the given freezer cgroup.
> +To make the tasks frozen at 90% of the time every 5 seconds, do:
> +
> +[root@localhost]# echo 90 > freezer.duty_ratio_pct
> +[root@localhost]# echo 5000 > freezer.period_ms
> +
> +After that, the application in this freezer cgroup will only be
> +allowed to run at the following pattern.
> +
> + | |<-- 90% frozen -->| | | |
> +_____| |_____| |_____| |_____|
> +
> + |<---- 5 seconds ---->|
> diff --git a/kernel/cgroup_freezer.c b/kernel/cgroup_freezer.c
> index e7bebb7..5808f28 100644
> --- a/kernel/cgroup_freezer.c
> +++ b/kernel/cgroup_freezer.c
> @@ -21,6 +21,7 @@
> #include <linux/uaccess.h>
> #include <linux/freezer.h>
> #include <linux/seq_file.h>
> +#include <linux/kthread.h>
>
> enum freezer_state {
> CGROUP_THAWED = 0,
> @@ -28,12 +29,28 @@ enum freezer_state {
> CGROUP_FROZEN,
> };
>
> +enum duty_ratio_params {
> + FREEZER_DUTY_RATIO = 0,
> + FREEZER_PERIOD,
> +};
> +
> +struct freezer_duty {
> + u32 ratio; /* percentage of time frozen */
> + u32 period_pct_ms; /* one percent of the period in milliseconds */

```

```

> +};
> +
> struct freezer {
>     struct cgroup_subsys_state css;
>     enum freezer_state state;
> + struct freezer_duty duty;
> + struct task_struct *fk;
>     spinlock_t lock; /* protects _writes_ to state */
> };
>
> +static struct task_struct *freezer_task;
> +static int try_to_freeze_cgroup(struct cgroup *cgroup, struct freezer *freezer);
> +static void unfreeze_cgroup(struct cgroup *cgroup, struct freezer *freezer);
> +
> static inline struct freezer *cgroup_freezer(
>     struct cgroup *cgroup)
> {
> @@ -63,6 +80,31 @@ int cgroup_freezing_or_frozen(struct task_struct *task)
>     return result;
> }
>
> +static DECLARE_WAIT_QUEUE_HEAD(freezer_wait);
> +
> +static int freezer_kh(void *data)
> +{
> + struct cgroup *cgroup = (struct cgroup *)data;
> + struct freezer *freezer = cgroup_freezer(cgroup);
> +
> + do {
> +     if (freezer->duty.ratio < 100 && freezer->duty.ratio > 0 &&
> +         freezer->duty.period_pct_ms) {
> +         if (try_to_freeze_cgroup(cgroup, freezer))
> +             pr_info("cannot freeze\n");
> +         msleep(freezer->duty.period_pct_ms *
> +             freezer->duty.ratio);
> +         unfreeze_cgroup(cgroup, freezer);
> +         msleep(freezer->duty.period_pct_ms *
> +             (100 - freezer->duty.ratio));
> +     } else {
> +         sleep_on(&freezer_wait);
> +         pr_debug("freezer thread wake up\n");
> +     }
> + } while (!kthread_should_stop());
> + return 0;
> +}
> +
> /*
> * cgroups_write_string() limits the size of freezer state strings to

```

```

> * CGROUP_LOCAL_BUFFER_SIZE
> @@ -150,7 +192,12 @@ static struct cgroup_subsys_state *freezer_create(struct
cgroup_subsys *ss,
> static void freezer_destroy(struct cgroup_subsys *ss,
>     struct cgroup *cgroup)
> {
> - kfree(cgroup_freezer(cgroup));
> + struct freezer *freezer;
> +
> + freezer = cgroup_freezer(cgroup);
> + if (freezer->fk)
> + kthread_stop(freezer->fk);
> + kfree(freezer);
> }
>
> /*
> @@ -282,6 +329,16 @@ static int freezer_read(struct cgroup *cgroup, struct cftype *cft,
>     return 0;
> }
>
> +static u64 freezer_read_duty_ratio(struct cgroup *cgroup, struct cftype *cft)
> +{
> + return cgroup_freezer(cgroup)->duty.ratio;
> +}
> +
> +static u64 freezer_read_period(struct cgroup *cgroup, struct cftype *cft)
> +{
> + return cgroup_freezer(cgroup)->duty.period_pct_ms * 100;
> +}
> +
> static int try_to_freeze_cgroup(struct cgroup *cgroup, struct freezer *freezer)
> {
>     struct cgroup_iter it;
> @@ -368,12 +425,85 @@ static int freezer_write(struct cgroup *cgroup,
>     return retval;
> }
>
>
> +#define FREEZER_KH_PREFIX "freezer_"
> +static int freezer_write_param(struct cgroup *cgroup, struct cftype *cft,
> + u64 val)
> +{
> + struct freezer *freezer;
> + char thread_name[32];
> + int ret = 0;
> +
> + freezer = cgroup_freezer(cgroup);
> +
> + if (!cgroup_lock_live_group(cgroup))

```

```

> + return -ENODEV;
> +
> + switch (cft->private) {
> + case FREEZER_DUTY_RATIO:
> + if (val >= 100 || val < 0) {

```

val will never < 0.

```

> + ret = -EINVAL;
> + goto exit;
> + }
> + freezer->duty.ratio = val;
> + break;
> + case FREEZER_PERIOD:
> + if (val)
> + do_div(val, 100);

```

Is 0 an invalid value for do\_div()?

```

> + freezer->duty.period_pct_ms = val;
> + break;
> + default:
> + BUG();
> + }
> +
> + /* start/stop management kthread as needed, the rule is that
> + * if both duty ratio and period values are zero, then no management
> + * kthread is created. when both are non-zero, we create a kthread
> + * for the cgroup. When user set zero to duty ratio and period again
> + * the kthread is stopped.
> + */
> + if (freezer->duty.ratio && freezer->duty.period_pct_ms) {
> + if (!freezer->fkh) {
> + snprintf(thread_name, 32, "%s%s", FREEZER_KH_PREFIX,
> + cgroup->dentry->d_name.name);
> + freezer->fkh = kthread_run(freezer_kh, (void *)cgroup,
> + thread_name);
> + if (IS_ERR(freezer_task)) {

```

You mean IS\_ERR(freezer->fkh)?

```

> + pr_err("create %s failed\n", thread_name);
> + ret = PTR_ERR(freezer_task);
> + goto exit;
> + }
> + } else
> + wake_up(&freezer_wait);
> + } else if ((!freezer->duty.ratio || !freezer->duty.period_pct_ms) &&

```

```

> + freezer->fkh) {
> + kthread_stop(freezer->fkh);
> + freezer->fkh = NULL;
> + }
> +
> +exit:
> + cgroup_unlock();
> + return ret;
> +}
> +
> static struct cftype files[] = {
> {
> .name = "state",
> .read_seq_string = freezer_read,
> .write_string = freezer_write,
> },
> + {
> + .name = "duty_ratio_pct",
> + .private = FREEZER_DUTY_RATIO,
> + .read_u64 = freezer_read_duty_ratio,
> + .write_u64 = freezer_write_param,
> + },
> + {
> + .name = "period_ms",
> + .private = FREEZER_PERIOD,
> + .read_u64 = freezer_read_period,
> + .write_u64 = freezer_write_param,
> + },
> +
> };
>
> static int freezer_populate(struct cgroup_subsys *ss, struct cgroup *cgroup)

```

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Containers mailing list

Containers@lists.linux-foundation.org

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

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Subject: Re: [PATCH 1/1, v6] cgroup/freezer: add per freezer duty ratio control

Posted by [jacob.jun.pan](#) on Wed, 09 Feb 2011 18:16:31 GMT

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On Wed, 09 Feb 2011 11:07:59 +0800

Li Zefan <lizf@cn.fujitsu.com> wrote:

> jacob.jun.pan@linux.intel.com wrote:

> > From: Jacob Pan <jacob.jun.pan@linux.intel.com>

> >

> > Freezer subsystem is used to manage batch jobs which can start  
> > stop at the same time. However, sometime it is desirable to let  
> > the kernel manage the freezer state automatically with a given  
> > duty ratio.  
> > For example, if we want to reduce the time that backgroup apps  
> > are allowed to run we can put them into a freezer subsystem and  
> > set the kernel to turn them THAWED/FROZEN at given duty ratio.  
> >  
> > This patch introduces two file nodes under cgroup  
> > freezer.duty\_ratio\_pct and freezer.period\_sec  
> >  
> > Usage example: set period to be 5 seconds and frozen duty ratio 90%  
> > [root@localhost aoa]# echo 90 > freezer.duty\_ratio\_pct  
> > [root@localhost aoa]# echo 5000 > freezer.period\_ms  
> >  
>  
> So after:  
>  
> # echo FROZEN > freezer.state  
> # echo 90 > freezer.duty\_ratio\_pct  
> # echo 5000 > freezer.period\_ms  
> ...  
> # echo 0 > freezer.duty\_ratio\_pct  
>  
> All the tasks in this cgroup are in THAWED state, but the cgroup is  
> in FROZEN state. This should be fixed.  
I don't know how could this ever happen. Is it based on your testing?  
Whenever tasks in a cgroup are thawed/frozen, its freezer state would  
change accordingly.  
After your example, freezer.state should have THAWED. It matches  
user's intention, i.e. if a user do  
echo 0 > freezer.duty\_ratio\_pct  
It must want 0% to be frozen, which is THAWED.

Am I missing anything?

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Containers mailing list  
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Subject: Re: [PATCH 1/1, v6] cgroup/freezer: add per freezer duty ratio control  
Posted by [jacob.jun.pan](#) on Thu, 10 Feb 2011 04:51:33 GMT  
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On Wed, 09 Feb 2011 11:07:59 +0800  
Li Zefan <lizf@cn.fujitsu.com> wrote:

```

> >
> > + #define FREEZER_KH_PREFIX "freezer_"
> > + static int freezer_write_param(struct cgroup *cgroup, struct
> > cftype *cft,
> > + u64 val)
> > + {
> > + struct freezer *freezer;
> > + char thread_name[32];
> > + int ret = 0;
> > +
> > + freezer = cgroup_freezer(cgroup);
> > +
> > + if (!cgroup_lock_live_group(cgroup))
> > + return -ENODEV;
> > +
> > + switch (cft->private) {
> > + case FREEZER_DUTY_RATIO:
> > + if (val >= 100 || val < 0) {
>
> val will never < 0.
good point, I will fix it.

```

```

>
> > + ret = -EINVAL;
> > + goto exit;
> > + }
> > + freezer->duty.ratio = val;
> > + break;
> > + case FREEZER_PERIOD:
> > + if (val)
> > + do_div(val, 100);
>
> Is 0 an invalid value for do_div()?
0 is valid. I was thinking about divide by 0 by mistake. will fix it.

```

```

>
> > + freezer->duty.period_pct_ms = val;
> > + break;
> > + default:
> > + BUG();
> > + }
> > +
> > + /* start/stop management kthread as needed, the rule is
> > that
> > + * if both duty ratio and period values are zero, then no
> > management
> > + * kthread is created. when both are non-zero, we create a

```

```
> > kthread
> > + * for the cgroup. When user set zero to duty ratio and
> > period again
> > + * the kthread is stopped.
> > + */
> > + if (freezer->duty.ratio && freezer->duty.period_pct_ms) {
> > + if (!freezer->fkh) {
> > +   snprintf(thread_name, 32, "%s%s",
> > FREEZER_KH_PREFIX,
> > +   cgroup->dentry->d_name.name);
> > +   freezer->fkh = kthread_run(freezer_kh,
> > (void *)cgroup,
> > +   thread_name);
> > +   if (IS_ERR(freezer_task)) {
>
> You mean IS_ERR(freezer->fkh)?
Right, same bug for PTR_ERR. will fix.
```

thanks.

---

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

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