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Subject: Re: [PATCH v4] cgroup/freezer: add per freezer duty ratio control  
Posted by [Kirill A. Shutsemov](#) on Tue, 08 Feb 2011 09:22:19 GMT  
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On Mon, Feb 07, 2011 at 03:30:24PM -0800, 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  
>  
> Signed-off-by: Jacob Pan <jacob.jun.pan@linux.intel.com>  
> ---  
> Documentation/cgroups/freezer-subsystem.txt | 23 +++++  
> kernel/cgroup\_freezer.c | 130 ++++++-----  
> 2 files changed, 152 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..b1c5d19 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 *fkh;
> 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 +80,35 @@ 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 if (freezer->duty.ratio == 100) {
> +     if (try_to_freeze_cgroup(cgroup, freezer))
> +       pr_info("cannot freeze\n");
> +     sleep_on(&freezer_wait);
> +   } 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 +196,12 @@ 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->fkf)
> + kthread_stop(freezer->fkf);
> + kfree(freezer);
> }
>
> /*
> @@ -282,6 +333,16 @@ 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 +429,79 @@ 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];
> +
> + freezer = cgroup_freezer(cgroup);
> +
> + if (!cgroup_lock_live_group(cgroup))
> + return -ENODEV;
> +
> + switch (cft->private) {
> + case FREEZER_DUTY_RATIO:
> + if (val > 100)
> + val = 100;
> + else if (val <= 0)
> + val = 0;

```

Better to return -EINVAL instead of silent correction.

```
> + freezer->duty.ratio = val;
> + break;
> + case FREEZER_PERIOD:
> + if (val)
> + do_div(val, 100);
> + 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) {
```

There is also no reason to create thread if ratio == 100. Just freeze the cgroup. Or better not to allow 100 as ratio.

```
> + 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))
> + pr_debug("create %s failed\n", thread_name);
```

I think we have to return non-zero error code in this case.

```
> + } else
> + wake_up(&freezer_wait);
> + } else if (!freezer->duty.ratio && !freezer->duty.period_pct_ms) {
```

I think you mean ||, not && here.

```
> + kthread_stop(freezer->fkh);
> + freezer->fkh = NULL;
> + }
> + cgroup_unlock();
> +
> + return 0;
> +}
> +
```

```
> 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)
> --
> 1.7.0.4
>
```

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Containers mailing list  
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