
Subject: [RFC][PATCH] memory controller per zone patches take 2 [10/10]
per-zone-lock for memory cgroup
Posted by [KAMEZAWA Hiroyuki](#) on Fri, 16 Nov 2007 10:27:33 GMT
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Now, lru is per-zone.

Then, lru_lock can be (should be) per-zone, too.
This patch implements per-zone lru lock.

lru_lock is placed into mem_cgroup_per_zone struct.

lock can be accessed by

```
mz = mem_cgroup_zoneinfo(mem_cgroup, node, zone);  
&mz->lru_lock
```

or

```
mz = page_cgroup_zoneinfo(page_cgroup, node, zone);  
&mz->lru_lock
```

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```
mm/memcontrol.c | 71 ++++++-----  
1 file changed, 44 insertions(+), 27 deletions(-)
```

Index: linux-2.6.24-rc2-mm1/mm/memcontrol.c

```
=====
```

```
--- linux-2.6.24-rc2-mm1.orig/mm/memcontrol.c  
+++ linux-2.6.24-rc2-mm1/mm/memcontrol.c  
@@ -89,6 +89,10 @@ enum mem_cgroup_zstat_index {  
};  
  
struct mem_cgroup_per_zone {  
+ /*  
+  * spin_lock to protect the per cgroup LRU  
+  */  
+ spinlock_t lru_lock;  
  struct list_head active_list;  
  struct list_head inactive_list;  
  unsigned long count[NR_MEM_CGROUP_ZSTAT];  
@@ -127,10 +131,7 @@ struct mem_cgroup {  
  * per zone LRU lists.  
  */  
  struct mem_cgroup_lru_info info;  
- /*  
-  * spin_lock to protect the per cgroup LRU  
-  */
```

```

- spinlock_t lru_lock;
+
  unsigned long control_type; /* control RSS or RSS+Pagecache */
  int prev_priority; /* for recording reclaim priority */
  /*
@@ -412,15 +413,16 @@ int task_in_mem_cgroup(struct task_struct
  */
  void mem_cgroup_move_lists(struct page_cgroup *pc, bool active)
  {
- struct mem_cgroup *mem;
+ struct mem_cgroup_per_zone *mz;
+ unsigned long flags;
+
    if (!pc)
        return;

- mem = pc->mem_cgroup;
-
- spin_lock(&mem->lru_lock);
+ mz = page_cgroup_zoneinfo(pc);
+ spin_lock_irqsave(&mz->lru_lock, flags);
+ __mem_cgroup_move_lists(pc, active);
- spin_unlock(&mem->lru_lock);
+ spin_unlock_irqrestore(&mz->lru_lock, flags);
  }

  /*
@@ -528,7 +530,7 @@ unsigned long mem_cgroup_isolate_pages(u
    src = &mz->inactive_list;

- spin_lock(&mem_cont->lru_lock);
+ spin_lock(&mz->lru_lock);
    scan = 0;
    list_for_each_entry_safe_reverse(pc, tmp, src, lru) {
        if (scan >= nr_to_scan)
@@ -558,7 +560,7 @@ unsigned long mem_cgroup_isolate_pages(u
    }

    list_splice(&pc_list, src);
- spin_unlock(&mem_cont->lru_lock);
+ spin_unlock(&mz->lru_lock);

    *scanned = scan;
    return nr_taken;
@@ -577,6 +579,7 @@ static int mem_cgroup_charge_common(stru
    struct page_cgroup *pc;
    unsigned long flags;

```

```

    unsigned long nr_retries = MEM_CGROUP_RECLAIM_RETRIES;
+ struct mem_cgroup_per_zone *mz;

/*
 * Should page_cgroup's go to their own slab?
@@ -688,10 +691,11 @@ noreclaim:
    goto retry;
}

- spin_lock_irqsave(&mem->lru_lock, flags);
+ mz = page_cgroup_zoneinfo(pc);
+ spin_lock_irqsave(&mz->lru_lock, flags);
/* Update statistics vector */
__mem_cgroup_add_list(pc);
- spin_unlock_irqrestore(&mem->lru_lock, flags);
+ spin_unlock_irqrestore(&mz->lru_lock, flags);

done:
    return 0;
@@ -733,6 +737,7 @@ int mem_cgroup_cache_charge(struct page
void mem_cgroup_uncharge(struct page_cgroup *pc)
{
    struct mem_cgroup *mem;
+ struct mem_cgroup_per_zone *mz;
    struct page *page;
    unsigned long flags;

@@ -745,6 +750,7 @@ void mem_cgroup_uncharge(struct page_cgr

    if (atomic_dec_and_test(&pc->ref_cnt)) {
        page = pc->page;
+ mz = page_cgroup_zoneinfo(pc);
/*
 * get page->cgroup and clear it under lock.
 * force_empty can drop page->cgroup without checking refcnt.
@@ -753,9 +759,9 @@ void mem_cgroup_uncharge(struct page_cgr
    mem = pc->mem_cgroup;
    css_put(&mem->css);
    res_counter_uncharge(&mem->res, PAGE_SIZE);
- spin_lock_irqsave(&mem->lru_lock, flags);
+ spin_lock_irqsave(&mz->lru_lock, flags);
    __mem_cgroup_remove_list(pc);
- spin_unlock_irqrestore(&mem->lru_lock, flags);
+ spin_unlock_irqrestore(&mz->lru_lock, flags);
    kfree(pc);
}
}
@@ -794,24 +800,29 @@ void mem_cgroup_page_migration(struct pa

```

```

    struct page_cgroup *pc;
    struct mem_cgroup *mem;
    unsigned long flags;
+ struct mem_cgroup_per_zone *mz;
    retry:
    pc = page_get_page_cgroup(page);
    if (!pc)
        return;
    mem = pc->mem_cgroup;
+ mz = page_cgroup_zoneinfo(pc);
    if (clear_page_cgroup(page, pc) != pc)
        goto retry;
-
- spin_lock_irqsave(&mem->lru_lock, flags);
+ spin_lock_irqsave(&mz->lru_lock, flags);

    __mem_cgroup_remove_list(pc);
+ spin_unlock_irqrestore(&mz->lru_lock, flags);
+
    pc->page = newpage;
    lock_page_cgroup(newpage);
    page_assign_page_cgroup(newpage, pc);
    unlock_page_cgroup(newpage);
- __mem_cgroup_add_list(pc);

- spin_unlock_irqrestore(&mem->lru_lock, flags);
+ mz = page_cgroup_zoneinfo(pc);
+ spin_lock_irqsave(&mz->lru_lock, flags);
+ __mem_cgroup_add_list(pc);
+ spin_unlock_irqrestore(&mz->lru_lock, flags);
    return;
}

```

@@ -822,18 +833,26 @@ retry:

```

    */
#define FORCE_UNCHARGE_BATCH (128)
static void
-mem_cgroup_force_empty_list(struct mem_cgroup *mem, struct list_head *list)
+mem_cgroup_force_empty_list(struct mem_cgroup *mem,
+    struct mem_cgroup_per_zone *mz,
+    int active)
{
    struct page_cgroup *pc;
    struct page *page;
    int count;
    unsigned long flags;
+ struct list_head *list;
+

```

```

+ if (active)
+ list = &mz->active_list;
+ else
+ list = &mz->inactive_list;

if (list_empty(list))
return;
retry:
count = FORCE_UNCHARGE_BATCH;
- spin_lock_irqsave(&mem->lru_lock, flags);
+ spin_lock_irqsave(&mz->lru_lock, flags);

while (--count && !list_empty(list)) {
pc = list_entry(list->prev, struct page_cgroup, lru);
@@ -850,7 +869,7 @@ retry:
} else /* being uncharged ? ...do relax */
break;
}
- spin_unlock_irqrestore(&mem->lru_lock, flags);
+ spin_unlock_irqrestore(&mz->lru_lock, flags);
if (!list_empty(list)) {
cond_resched();
goto retry;
@@ -881,11 +900,9 @@ int mem_cgroup_force_empty(struct mem_cg
struct mem_cgroup_per_zone *mz;
mz = mem_cgroup_zoneinfo(mem, node, zid);
/* drop all page_cgroup in active_list */
- mem_cgroup_force_empty_list(mem,
- &mz->active_list);
+ mem_cgroup_force_empty_list(mem, mz, 1);
/* drop all page_cgroup in inactive_list */
- mem_cgroup_force_empty_list(mem,
- &mz->inactive_list);
+ mem_cgroup_force_empty_list(mem, mz, 0);
}
}
ret = 0;
@@ -1112,6 +1129,7 @@ static int alloc_mem_cgroup_per_zone_inf
mz = &pn->zoneinfo[zone];
INIT_LIST_HEAD(&mz->active_list);
INIT_LIST_HEAD(&mz->inactive_list);
+ spin_lock_init(&mz->lru_lock);
}
return 0;
}
@@ -1136,7 +1154,6 @@ mem_cgroup_create(struct cgroup_subsys *
res_counter_init(&mem->res);

```

```
- spin_lock_init(&mem->lru_lock);  
  mem->control_type = MEM_CGROUP_TYPE_ALL;  
  memset(&mem->info, 0, sizeof(mem->info));
```

Containers mailing list

Containers@lists.linux-foundation.org

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