
Subject: [PATCH 4/8] Scanner changes needed to implement per-container scanner
Posted by [Pavel Emelianov](#) on Mon, 04 Jun 2007 13:31:37 GMT

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The core change is that the `isolate_lru_pages()` call is replaced with `struct scan_controll->isolate_pages()` call.

Other changes include exporting `__isolate_lru_page()` for per-container isolator and handling variable-to-pointer changes in `try_to_free_pages()`.

This makes possible to use different isolation routines for per-container page reclamation. This will be used by the following patch.

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```
diff -upr linux-2.6.22-rc2-mm1.orig/include/linux/swap.h
linux-2.6.22-rc2-mm1-2/include/linux/swap.h
--- linux-2.6.22-rc2-mm1.orig/include/linux/swap.h 2007-05-30 12:32:36.000000000 +0400
+++ linux-2.6.22-rc2-mm1-2/include/linux/swap.h 2007-06-01 16:35:13.000000000 +0400
@@ -192,6 +192,11 @@ extern void swap_setup(void);
/* linux/mm/vmscan.c */
extern unsigned long try_to_free_pages(struct zone **zones, int order,
    gfp_t gfp_mask);
+
+struct rss_container;
+extern unsigned long try_to_free_pages_in_container(struct rss_container *);
+int __isolate_lru_page(struct page *page, int mode);
+
extern unsigned long shrink_all_memory(unsigned long nr_pages);
extern int vm_swappiness;
extern int remove_mapping(struct address_space *mapping, struct page *page);
diff -upr linux-2.6.22-rc2-mm1.orig/mm/vmscan.c linux-2.6.22-rc2-mm1-2/mm/vmscan.c
--- linux-2.6.22-rc2-mm1.orig/mm/vmscan.c 2007-05-30 12:32:36.000000000 +0400
+++ linux-2.6.22-rc2-mm1-2/mm/vmscan.c 2007-06-01 16:35:15.000000000 +0400
@@ -47,6 +47,8 @@

#include "internal.h"

+#include <linux/rss_container.h>
+
struct scan_control {
    /* Incremented by the number of inactive pages that were scanned */
    unsigned long nr_scanned;
@@ -70,6 +72,13 @@ struct scan_control {
```

```

int all_unreclaimable;

int order;
+
+ struct rss_container *container;
+
+ unsigned long (*isolate_pages)(unsigned long nr, struct list_head *dst,
+ unsigned long *scanned, int order, int mode,
+ struct zone *zone, struct rss_container *cont,
+ int active);
};

#define lru_to_page(_head) (list_entry((_head)->prev, struct page, lru))
@@ -622,7 +631,7 @@ keep:
*
* returns 0 on success, -ve errno on failure.
*/
-static int __isolate_lru_page(struct page *page, int mode)
+int __isolate_lru_page(struct page *page, int mode)
{
    int ret = -EINVAL;

@@ -774,6 +783,19 @@ static unsigned long clear_active_flags(
    return nr_active;
}

+static unsigned long isolate_pages_global(unsigned long nr,
+ struct list_head *dst, unsigned long *scanned,
+ int order, int mode, struct zone *z,
+ struct rss_container *cont, int active)
+{
+ if (active)
+     return isolate_lru_pages(nr, &z->active_list,
+ dst, scanned, order, mode);
+ else
+     return isolate_lru_pages(nr, &z->inactive_list,
+ dst, scanned, order, mode);
+}
+
/*
* shrink_inactive_list() is a helper for shrink_zone(). It returns the number
* of reclaimed pages
@@ -797,11 +819,11 @@ static unsigned long shrink_inactive_lis
    unsigned long nr_freed;
    unsigned long nr_active;

- nr_taken = isolate_lru_pages(sc->swap_cluster_max,
- &z->inactive_list,

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-    &page_list, &nr_scan, sc->order,
-    (sc->order > PAGE_ALLOC_COSTLY_ORDER)?
-    ISOLATE_BOTH : ISOLATE_INACTIVE);
+ nr_taken = sc->isolate_pages(sc->swap_cluster_max, &page_list,
+    &nr_scan, sc->order,
+    (sc->order > PAGE_ALLOC_COSTLY_ORDER) ?
+    ISOLATE_BOTH : ISOLATE_INACTIVE,
+    zone, sc->container, 0);
    nr_active = clear_active_flags(&page_list);

    __mod_zone_page_state(zone, NR_ACTIVE, -nr_active);
@@ -950,8 +975,8 @@ force_reclaim_mapped:

    lru_add_drain();
    spin_lock_irq(&zone->lru_lock);
- pgmoved = isolate_lru_pages(nr_pages, &zone->active_list,
-    &l_hold, &pgscanned, sc->order, ISOLATE_ACTIVE);
+ pgmoved = sc->isolate_pages(nr_pages, &l_hold, &pgscanned,
+    sc->order, ISOLATE_ACTIVE, zone, sc->container, 1);
    zone->pages_scanned += pgscanned;
    __mod_zone_page_state(zone, NR_ACTIVE, -pgmoved);
    spin_unlock_irq(&zone->lru_lock);
@@ -1142,7 +1169,8 @@ static unsigned long shrink_zones(int pr
    * holds filesystem locks which prevent writeout this might not work, and the
    * allocation attempt will fail.
    */
-unsigned long try_to_free_pages(struct zone **zones, int order, gfp_t gfp_mask)
+unsigned long do_try_to_free_pages(struct zone **zones, gfp_t gfp_mask,
+    struct scan_control *sc)
{
    int priority;
    int ret = 0;
@@ -1151,14 +1179,6 @@ unsigned long try_to_free_pages(struct z
    struct reclaim_state *reclaim_state = current->reclaim_state;
    unsigned long lru_pages = 0;
    int i;
- struct scan_control sc = {
-    .gfp_mask = gfp_mask,
-    .may_writepage = !laptop_mode,
-    .swap_cluster_max = SWAP_CLUSTER_MAX,
-    .may_swap = 1,
-    .swappiness = vm_swappiness,
-    .order = order,
- };
    delay_swap_prefetch();
    count_vm_event(ALLOCSTALL);
@@ -1174,17 +1194,23 @@ unsigned long try_to_free_pages(struct z

```

```

}

for (priority = DEF_PRIORITY; priority >= 0; priority--) {
- sc.nr_scanned = 0;
+ sc->nr_scanned = 0;
  if (!priority)
    disable_swap_token();
- nr_reclaimed += shrink_zones(priority, zones, &sc);
- shrink_slab(sc.nr_scanned, gfp_mask, lru_pages);
+ nr_reclaimed += shrink_zones(priority, zones, sc);
+ if (sc->container == NULL)
+ /*
+  * we do not shrink slabs as this won't unmap any
+  * pages from user and thus won't help him to charge
+  * more pages --xemul
+  */
+ shrink_slab(sc->nr_scanned, gfp_mask, lru_pages);
  if (reclaim_state) {
    nr_reclaimed += reclaim_state->reclaimed_slab;
    reclaim_state->reclaimed_slab = 0;
  }
- total_scanned += sc.nr_scanned;
- if (nr_reclaimed >= sc.swap_cluster_max) {
+ total_scanned += sc->nr_scanned;
+ if (nr_reclaimed >= sc->swap_cluster_max) {
  ret = 1;
  goto out;
}
@@ -1196,18 +1222,23 @@ unsigned long try_to_free_pages(struct z
  * that's undesirable in laptop mode, where we *want* lumpy
  * writeout. So in laptop mode, write out the whole world.
  */
- if (total_scanned > sc.swap_cluster_max +
-     sc.swap_cluster_max / 2) {
+ if (total_scanned > sc->swap_cluster_max +
+     sc->swap_cluster_max / 2) {
  wakeup_pdflush(laptop_mode ? 0 : total_scanned);
- sc.may_writepage = 1;
+ sc->may_writepage = 1;
}

/* Take a nap, wait for some writeback to complete */
- if (sc.nr_scanned && priority < DEF_PRIORITY - 2)
+ if (sc->nr_scanned && priority < DEF_PRIORITY - 2)
  congestion_wait(WRITE, HZ/10);
}
- /* top priority shrink_caches still had more to do? don't OOM, then */
- if (!sc.all_unreclaimable)

```

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+ /*
+ * top priority shrink_caches still had more to do? don't OOM, then
+ *
+ * we cannot hope shrink_caches to help us in case we are trying
+ * to shrink container pages --xemul
+ */
+ if (!sc->all_unreclaimable && sc->container == NULL)
+     ret = 1;
+ out:
+ /*
@@ -1230,6 +1261,22 @@ out:
+     return ret;
+ }

+unsigned long try_to_free_pages(struct zone **zones, int order, gfp_t gfp_mask)
+{
+ struct scan_control sc = {
+     .gfp_mask = gfp_mask,
+     .may_writepage = !laptop_mode,
+     .swap_cluster_max = SWAP_CLUSTER_MAX,
+     .may_swap = 1,
+     .swappiness = vm_swappiness,
+     .order = order,
+     .container = NULL,
+     .isolate_pages = isolate_pages_global,
+ };
+
+ return do_try_to_free_pages(zones, gfp_mask, &sc);
+}
+
+/*
+ * For kswapd, balance_pgdat() will work across all this node's zones until
+ * they are all at pages_high.
@@ -1265,6 +1347,8 @@ static unsigned long balance_pgdat(pg_da
+     .swap_cluster_max = SWAP_CLUSTER_MAX,
+     .swappiness = vm_swappiness,
+     .order = order,
+     .container = NULL,
+     .isolate_pages = isolate_pages_global,
+ };
+ /*
+ * temp_priority is used to remember the scanning priority at which
@@ -1604,6 +1688,8 @@ unsigned long shrink_all_memory(unsigned
+     .swap_cluster_max = nr_pages,
+     .may_writepage = 1,
+     .swappiness = vm_swappiness,
+     .container = NULL,
+     .isolate_pages = isolate_pages_global,

```

```
};

delay_swap_prefetch();
@@ -1789,6 +1875,8 @@ static int __zone_reclaim(struct zone *z
    SWAP_CLUSTER_MAX),
    .gfp_mask = gfp_mask,
    .swappiness = vm_swappiness,
+ .container = NULL,
+ .isolate_pages = isolate_pages_global,
};
unsigned long slab_reclaimable;
```
