
Subject: [PATCH 17/17] Pid-NS(V3) Introduce proc_mnt for pid_ns
Posted by [Sukadev Bhattiprolu](#) on Sat, 16 Jun 2007 23:05:55 GMT
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From: sukadev@linux.vnet.ibm.com
Subject: [PATCH 17/17] Pid-NS(V3) Introduce proc_mnt for pid_ns

The following patch completes the removal of the global proc_mnt.
It fetches the mnt on which to do dentry invalidations from the
pid_namespace in which the task appears.

For now, there is only one pid namespace in mainline so this is
straightforward. In the -lxc tree we'll have to do something
more complex. The proc_flush_task() code takes a task, and
needs to be able to find the corresponding proc superblocks on
which that task's /proc/<pid> directories could appear. We
can tell in which pid namespaces a task appears, so I put a
pointer from the pid namespace to the corresponding proc_mnt.

/proc currently has some special code to make sure that the root
directory gets set up correctly. It proc_mnt variable in order
to find its way to the root inode.

Changelog:

2.6.22-rc4-mm2-pidns1:

- Call proc_fill_super once per pid namespace
- Call proc_flush_task() before detaching a task's 'struct pid'.
- Get a reference to pid namespace when mounting/remounting /proc.
Put this reference when unmounting.

Signed-off-by: Dave Hansen <haveblue@us.ibm.com>

Signed-off-by: Sukadev Bhattiprolu <sukadev@us.ibm.com>

```
fs/proc/base.c      | 30 ++++++++
fs/proc/inode.c     | 12 +++++-
fs/proc/root.c      | 65 ++++++
include/linux/pid_namespace.h | 1
include/linux/proc_fs.h | 1
kernel/exit.c       | 2 -
6 files changed, 87 insertions(+), 24 deletions(-)
```

Index: lx26-22-rc4-mm2/fs/proc/base.c

```
=====
--- lx26-22-rc4-mm2.orig/fs/proc/base.c 2007-06-16 02:37:15.000000000 -0700
+++ lx26-22-rc4-mm2/fs/proc/base.c 2007-06-16 04:15:23.000000000 -0700
```

```

@@ -2164,9 +2164,11 @@ static const struct inode_operations pro
};

/**
- * proc_flush_task - Remove dcache entries for @task from the /proc dcache.
+ * proc_flush_task_from_pid_ns - Remove dcache entries for @task
+ *      from the /proc dcache.
+ *
+ * @task: task that should be flushed.
+ * @pid_ns: pid_namespace in which that task appears
+ *
+ * Looks in the dcache for
+ * /proc/@pid
@@ -2184,11 +2186,20 @@ static const struct inode_operations pro
+ *      that no dcache entries will exist at process exit time it
+ *      just makes it very unlikely that any will persist.
+ */
-void proc_flush_task(struct task_struct *task)
+static void proc_flush_task_from_pid_ns(struct task_struct *task,
+ struct pid_namespace* pid_ns)
{
    struct dentry *dentry, *leader, *dir;
    char buf[PROC_NUMBUF];
    struct qstr name;
+ struct vfsmount *proc_mnt = pid_ns->proc_mnt;
+
+ /*
+ * It is possible that no /procs have been instantiated
+ * for this particular pid namespace.
+ */
+ if (!proc_mnt || !proc_mnt->mnt_root)
+ return;

    name.name = buf;
    name.len = snprintf(buf, sizeof(buf), "%d", task->pid);
@@ -2230,6 +2241,21 @@ out:
    return;
}

+void proc_flush_task(struct task_struct *task)
+{
+ int i;
+ struct pid *pid;
+ struct upid* upid;
+
+ pid = task_pid(task);
+ if (!pid)
+ return;

```

```

+
+ upid = &pid->upid_list[0];
+ for (i = 0; i < pid->num_upids; i++, upid++)
+ proc_flush_task_from_pid_ns(task, upid->pid_ns);
+}
+
static struct dentry *proc_pid_instantiate(struct inode *dir,
      struct dentry * dentry,
      struct task_struct *task, const void *ptr)
Index: lx26-22-rc4-mm2/fs/proc/inode.c
=====
--- lx26-22-rc4-mm2.orig/fs/proc/inode.c 2007-06-16 02:37:15.000000000 -0700
+++ lx26-22-rc4-mm2/fs/proc/inode.c 2007-06-16 04:15:23.000000000 -0700
@@ -6,6 +6,7 @@

#include <linux/time.h>
#include <linux/proc_fs.h>
+#include <linux/hardirq.h>
#include <linux/kernel.h>
#include <linux/mm.h>
#include <linux/string.h>
@@@ -19,6 +20,7 @@@

#include <asm/system.h>
#include <asm/uaccess.h>
+#include <linux/pid_namespace.h>

#include "internal.h"

@@@ -75,8 +77,6 @@@ static void proc_delete_inode(struct ino
clear_inode(inode);
}

-struct vfsmount *proc_mnt;
-
static void proc_read_inode(struct inode * inode)
{
inode->i_mtime = inode->i_atime = inode->i_ctime = CURRENT_TIME;
@@@ -431,6 +431,8 @@@ out_mod:

int proc_fill_super(struct super_block *s, void *data, int silent)
{
+ struct pid_namespace *pid_ns = data;
+ struct proc_inode *ei;
struct inode * root_inode;

s->s_flags |= MS_NODIRATIME | MS_NOSUID | MS_NOEXEC;
@@@ -439,6 +441,7 @@@ int proc_fill_super(struct super_block *
```

```

s->s_magic = PROC_SUPER_MAGIC;
s->s_op = &proc_sops;
s->s_time_gran = 1;
+ s->s_fs_info = get_pid_ns(pid_ns);

de_get(&proc_root);
root_inode = proc_get_inode(s, PROC_ROOT_INO, &proc_root);
@@ -449,6 +452,11 @@ int proc_fill_super(struct super_block *
s->s_root = d_alloc_root(root_inode);
if (!s->s_root)
goto out_no_root;
+ /* Seed the root directory with a pid so it doesn't need
+ * to be special in base.c.
+ */
+ ei = PROC_I(root_inode);
+ ei->pid = find_get_pid(1);
return 0;

out_no_root:
Index: lx26-22-rc4-mm2/fs/proc/root.c
=====
--- lx26-22-rc4-mm2.orig/fs/proc/root.c 2007-06-16 04:15:23.000000000 -0700
+++ lx26-22-rc4-mm2/fs/proc/root.c 2007-06-16 04:15:23.000000000 -0700
@@ -12,38 +12,73 @@
#include <linux/time.h>
#include <linux/proc_fs.h>
#include <linux/stat.h>
+ #include <linux/hardirq.h>
#include <linux/init.h>
#include <linux/sched.h>
#include <linux/module.h>
#include <linux/bitops.h>
#include <linux/smp_lock.h>
#include <linux/mount.h>
+ #include <linux/pid_namespace.h>

#include "internal.h"

struct proc_dir_entry *proc_net, *proc_net_stat, *proc_bus, *proc_root_fs, *proc_root_driver;

+static int proc_test_sb(struct super_block *s, void *data)
+{
+ struct pid_namespace *pid_ns = data;
+ if (s->s_fs_info == pid_ns)
+ return 1;
+ return 0;
+}
+

```

```

static int proc_get_sb(struct file_system_type *fs_type,
int flags, const char *dev_name, void *data, struct vfsmount *mnt)
{
- if (proc_mnt) {
- /* Seed the root directory with a pid so it doesn't need
-  * to be special in base.c. I would do this earlier but
-  * the only task alive when /proc is mounted the first time
-  * is the init_task and it doesn't have any pids.
-  */
- struct proc_inode *ei;
- ei = PROC_I(proc_mnt->mnt_sb->s_root->d_inode);
- if (!ei->pid)
- ei->pid = find_get_pid(1);
+ int error;
+ struct super_block *s;
+ struct pid_namespace *pid_ns;
+
+ /*
+  * We can eventually derive this out of whatever mount
+  * arguments the user supplies, but just take it from
+  * current for now.
+  */
+ pid_ns = task_active_pid_ns(current);
+
+ s = sget(fs_type, proc_test_sb, set_anon_super, pid_ns);
+ if (IS_ERR(s))
+ return PTR_ERR(s);
+
+ if (!s->s_root) {
+ error = proc_fill_super(s, pid_ns, 0);
+ if (error) {
+ deactivate_super(s);
+ return error;
+ }
+ }
- return get_sb_single(fs_type, flags, data, proc_fill_super, mnt);
+
+ if (!pid_ns->proc_mnt)
+ pid_ns->proc_mnt = mnt;
+
+ do_remount_sb(s, flags, data, 0);
+ return simple_set_mnt(mnt, s);
+}
+
+static void proc_kill_sb(struct super_block *s)
+{
+ struct pid_namespace *pid_ns = s->s_fs_info;
+

```

```
+ pid_ns->proc_mnt = NULL;
+ put_pid_ns(pid_ns);
+ kill_anon_super(s);
}
```

```
static struct file_system_type proc_fs_type = {
    .name = "proc",
    .get_sb = proc_get_sb,
- .kill_sb = kill_anon_super,
+ .kill_sb = proc_kill_sb,
    .fs_supers = LIST_HEAD_INIT(proc_fs_type.fs_supers),
};
```

```
@@ -55,12 +90,6 @@ void __init proc_root_init(void)
```

```
    err = register_filesystem(&proc_fs_type);
    if (err)
        return;
- proc_mnt = kern_mount(&proc_fs_type);
- err = PTR_ERR(proc_mnt);
- if (IS_ERR(proc_mnt)) {
-     unregister_filesystem(&proc_fs_type);
-     return;
- }
```

```
    proc_misc_init();
    proc_net = proc_mkdir("net", NULL);
    proc_net_stat = proc_mkdir("net/stat", NULL);
```

```
Index: lx26-22-rc4-mm2/include/linux/pid_namespace.h
```

```
=====
--- lx26-22-rc4-mm2.orig/include/linux/pid_namespace.h 2007-06-16 04:15:23.000000000 -0700
+++ lx26-22-rc4-mm2/include/linux/pid_namespace.h 2007-06-16 04:15:23.000000000 -0700
@@ -28,6 +28,7 @@ struct pid_namespace {
    int last_pid;
    struct task_struct *child_reaper;
    atomic_t terminating;
+ struct vfsmount *proc_mnt;
};
```

```
extern struct pid_namespace init_pid_ns;
```

```
Index: lx26-22-rc4-mm2/include/linux/proc_fs.h
```

```
=====
--- lx26-22-rc4-mm2.orig/include/linux/proc_fs.h 2007-06-16 02:37:15.000000000 -0700
+++ lx26-22-rc4-mm2/include/linux/proc_fs.h 2007-06-16 04:15:23.000000000 -0700
@@ -125,7 +125,6 @@ extern struct proc_dir_entry *create_pro
    struct proc_dir_entry *parent);
extern void remove_proc_entry(const char *name, struct proc_dir_entry *parent);
```

```
-extern struct vfsmount *proc_mnt;
extern int proc_fill_super(struct super_block *, void *, int);
```

```
extern struct inode *proc_get_inode(struct super_block *, unsigned int, struct proc_dir_entry *);
```

Index: lx26-22-rc4-mm2/kernel/exit.c

=====

--- lx26-22-rc4-mm2.orig/kernel/exit.c 2007-06-16 04:15:23.000000000 -0700

+++ lx26-22-rc4-mm2/kernel/exit.c 2007-06-16 04:15:23.000000000 -0700

@@ -157,6 +157,7 @@ void release_task(struct task_struct * p

struct task_struct *leader;

int zap_leader;

repeat:

+ proc_flush_task(p);

atomic_dec(&p->user->processes);

write_lock_irq(&tasklist_lock);

ptrace_unlink(p);

@@ -185,7 +186,6 @@ repeat:

}

write_unlock_irq(&tasklist_lock);

- proc_flush_task(p);

release_thread(p);

call_rcu(&p->rcu, delayed_put_task_struct);

--

Containers mailing list

Containers@lists.linux-foundation.org

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Subject: Re: [PATCH 17/17] Pid-NS(V3) Introduce proc_mnt for pid_ns

Posted by [Pavel Emelianov](#) on Mon, 18 Jun 2007 08:56:56 GMT

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sukadev@us.ibm.com wrote:

> From: sukadev@linux.vnet.ibm.com

> Subject: [PATCH 17/17] Pid-NS(V3) Introduce proc_mnt for pid_ns

>

> The following patch completes the removal of the global proc_mnt.

> It fetches the mnt on which to do dentry invalidations from the

> pid_namespace in which the task appears.

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> For now, there is only one pid namespace in mainline so this is

> straightforward. In the -lxc tree we'll have to do something

> more complex. The proc_flush_task() code takes a task, and

> needs to be able to find the corresponding proc superblocks on

> which that task's /proc/<pid> directories could appear. We

> can tell in which pid namespaces a task appears, so I put a

```

> pointer from the pid namespace to the corresponding proc_mnt.
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> Signed-off-by: Dave Hansen <haveblue@us.ibm.com>
> Signed-off-by: Sukadev Bhattiprolu <sukadev@us.ibm.com>
> ---
>
> fs/proc/base.c          | 30 ++++++++
> fs/proc/inode.c          | 12 +++++-
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> kernel/exit.c            | 2 -
> 6 files changed, 87 insertions(+), 24 deletions(-)
>
[snip]

```

```

> @@ -55,12 +90,6 @@ void __init proc_root_init(void)
>   err = register_filesystem(&proc_fs_type);
>   if (err)
>       return;
>   - proc_mnt = kern_mount(&proc_fs_type);
>   - err = PTR_ERR(proc_mnt);
>   - if (IS_ERR(proc_mnt)) {
>   -   unregister_filesystem(&proc_fs_type);
>   -   return;
>   - }

```

Wow! Is this safe? Everyone expects proc_mnt to be not NULL.

```

> proc_misc_init();
> proc_net = proc_mkdir("net", NULL);
> proc_net_stat = proc_mkdir("net/stat", NULL);

```

[snip]

```
> Index: lx26-22-rc4-mm2/kernel/exit.c
> =====
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> +++ lx26-22-rc4-mm2/kernel/exit.c 2007-06-16 04:15:23.000000000 -0700
> @@ -157,6 +157,7 @@ void release_task(struct task_struct * p
> struct task_struct *leader;
> int zap_leader;
> repeat:
> + proc_flush_task(p);
```

Such a flush won't actually remove *any* dentries from the tree and thus may be omitted.

```
> atomic_dec(&p->user->processes);
> write_lock_irq(&tasklist_lock);
> ptrace_unlink(p);
> @@ -185,7 +186,6 @@ repeat:
> }
>
> write_unlock_irq(&tasklist_lock);
> - proc_flush_task(p);
> release_thread(p);
> call_rcu(&p->rcu, delayed_put_task_struct);
>
>
```

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Subject: Re: [PATCH 17/17] Pid-NS(V3) Introduce proc_mnt for pid_ns
Posted by [Sukadev Bhattiprolu](#) on Wed, 20 Jun 2007 01:19:11 GMT
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Pavel Emelianov [xemul@openvz.org] wrote:
| sukadev@us.ibm.com wrote:
| > From: sukadev@linux.vnet.ibm.com
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| > straightforward. In the -lxc tree we'll have to do something
| > more complex. The proc_flush_task() code takes a task, and

```

| > needs to be able to find the corresponding proc superblocks on
| > which that tasks's /proc/<pid> directories could appear. We
| > can tell in which pid namespaces a task appears, so I put a
| > pointer from the pid namespace to the corresponding proc_mnt.
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| > /proc currently has some special code to make sure that the root
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| > to find its way to the root inode.
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| >
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| >
| > - Call proc_fill_super once per pid namespace
| > - Call proc_flush_task() before detaching a task's 'struct pid'.
| > - Get a reference to pid namespace when mounting/remounting /proc.
| >   Put this reference when unmounting.
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| > Signed-off-by: Dave Hansen <haveblue@us.ibm.com>
| > Signed-off-by: Sukadev Bhattiprolu <sukadev@us.ibm.com>
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| > include/linux/pid_namespace.h | 1
| > include/linux/proc_fs.h   | 1
| > kernel/exit.c           | 2 -
| > 6 files changed, 87 insertions(+), 24 deletions(-)
| >
| [snip]
|
| > @@ -55,12 +90,6 @@ void __init proc_root_init(void)
| > err = register_filesystem(&proc_fs_type);
| > if (err)
| > return;
| > - proc_mnt = kern_mount(&proc_fs_type);
| > - err = PTR_ERR(proc_mnt);
| > - if (IS_ERR(proc_mnt)) {
| > - unregister_filesystem(&proc_fs_type);
| > - return;
| > - }
|
| Wow! Is this safe? Everyone expects proc_mnt to be not NULL.

```

Can you elaborate ? Between the previous patch (i.e 16/17) and this we made sure no one is using the global proc_mnt. Everyone should be using the pid_ns->proc_mnt instead.

```

|
| > proc_misc_init();
| > proc_net = proc_mkdir("net", NULL);
| > proc_net_stat = proc_mkdir("net/stat", NULL);
|
| [snip]
|
| > Index: lx26-22-rc4-mm2/kernel/exit.c
| > =====
| > --- lx26-22-rc4-mm2.orig/kernel/exit.c 2007-06-16 04:15:23.000000000 -0700
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| > @@ -157,6 +157,7 @@ void release_task(struct task_struct * p
| > struct task_struct *leader;
| > int zap_leader;
| > repeat:
| > + proc_flush_task(p);
|
| Such a flush won't actually remove *any* dentries from the tree and thus
| may be omitted.

```

Again, can you elaborate ?

The previous version had `proc_flush_task()` much later in `release_task()` and that did not free dentries bc `task_pid()` was NULL. Moving `proc_flush_task()` up, should fix that and it did fix the leak we were seeing before.

```

|
| > atomic_dec(&p->user->processes);
| > write_lock_irq(&tasklist_lock);
| > ptrace_unlink(p);
| > @@ -185,7 +186,6 @@ repeat:
| > }
| >
| > write_unlock_irq(&tasklist_lock);
| > - proc_flush_task(p);
| > release_thread(p);
| > call_rcu(&p->rcu, delayed_put_task_struct);
| >
| >

```

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