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Subject: Infinite loop in `__d_lookup` ?

Posted by [Jakob Goldbach](#) on Mon, 12 May 2008 23:12:45 GMT

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Hi,

I regularly have processes that gets stuck eating all cpu. SysRq-p says it is stuck in `__d_lookup+0x10b` as seen in dmesg output below.

I run vanilla 2.6.18 with 028stab053 and the lustre filesystem. I also run lustre on non-openvz kernel without problems, hence this mail to this group.

I believe I've found where the problem is, but I'm not a kernel hacker so I don't know what to do about this information.

I'd appreciate any hints on what to do next to get this solved.

Below is what I could find out.

Thanks,  
Jakob

gdb find that the process is in the `hlist_for_each_entry_rcu` loop:

```
(gdb) list *__d_lookup+0x10b
0x12f0 is in __d_lookup (fs/dcache.c:1153).
1148     struct dentry *dentry, *found;
1149
1150     rcu_read_lock();
1151
1152     found = NULL;
1153     hlist_for_each_entry_rcu(dentry, node, head, d_hash) {
1154         struct qstr *qstr;
1155
1156         if (dentry->d_name.hash != hash)
1157             continue;
```

I believe this is the relevant part (0x12f0) of the disassembled object:

```
12e0: 4d 8b 24 24    mov  (%r12),%r12
12e4: 4d 85 e4      test %r12,%r12
12e7: 74 2c        je   1315 <__d_lookup+0x130>
12e9: 49 8b 04 24    mov  (%r12),%rax
12ed: 0f 18 08      prefetch0 (%rax)
12f0: 49 8d 5c 24 d8  lea  0xffffffffd8(%r12),
%rbx
12f5: 8b 45 cc      mov  0xffffffffcc(%rbp),
```

```
%eax
12f8: 39 43 40      cmp  %eax,0x40(%rbx)
12fb: 75 e3         jne 12e0 <__d_lookup+0xfb>
```

Dmesg after sysrq-p:

```
[186124.494329] SysRq: Show Regs
[186124.495218] ----- IPI show regs -----
[186124.496136] CPU 3, VCPU 0:1
[186124.496804] Modules linked in: simfs vznetdev vzethdev vzrst ip_nat
vzcpt ip_contrack nfnetlink vzdquota vzmon vzdev xt_length ipt_ttl xt_
tcpmss ipt_TCPMSS iptable_mangle xt_multiport xt_limit ipt_tos
ipt_REJECT iptable_filter ip_tables x_tables 8021q osc mgc lustre lov
lquota mdc
ksocklnd ptlrpc obdclass lnet lvfs libcfs bonding xfs
[186124.503636] Pid: 22699, comm: find Not tainted
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[186124.511480] RBP: ffff810073d63c08 R08: ffff8100ac9e8000 R09:
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[186124.514452] R13: ffff810073d63e38 R14: ffff810118b056b0 R15:
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[186124.530362] DWARF2 unwinder stuck at system\_call+0x7e/0x83  
[186124.531460] Leftover inexact backtrace:  
[186124.532563]

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Subject: Re: Infinite loop in \_\_d\_lookup ?  
Posted by [Pavel Emelianov](#) on Thu, 15 May 2008 11:39:57 GMT  
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Jakob Goldbach wrote:

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> 1148 struct dentry \*dentry, \*found;  
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> 1150 rcu\_read\_lock();  
> 1151  
> 1152 found = NULL;  
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> 1157          continue;
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---

Subject: Sv: Re: Infinite loop in \_\_d\_lookup ?  
Posted by [Jakob Goldbach](#) on Thu, 15 May 2008 14:39:39 GMT  
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That would be great. Thanks. There are usually a few days between it gets stuck.  
/jakob

- oprindelig besked -  
Emne: Re: [Users] Infinite loop in \_\_d\_lookup ?  
Fra: Pavel Emelyanov <xemul@openvz.org>  
Dato: 15-05-2008 12:34

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```

---

Subject: Re: Sv: Re: Infinite loop in \_\_d\_lookup ?  
Posted by [Pavel Emelianov](#) on Thu, 15 May 2008 16:21:49 GMT  
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---

Jakob Goldbach wrote:

> That would be great. Thanks. There are usually a few days between it gets stuck.

Ok. Happily, I've managed to invent what I need to check first before it's too late here in Moscow ;)

I presume, that the infinite loop is really somewhere near the `__d_lookup`. Please, apply this patch in attach (I made it against 2.6.18-028stab053.5, but should fit OK all the other 028stab053 releases) and check for warnings in `dmesg` ;)

Let's see whether this is really `__d_lookup`.

```
> /jakob
> - oprindeligt besked -
> Emne: Re: [Users] Infinite loop in __d_lookup ?
> Fra: Pavel Emelyanov <xemul@openvz.org>
> Dato: 15-05-2008 12:34
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>>
>>
--- ./fs/dcache.c.loopdebug 2008-05-15 20:09:04.000000000 +0400
+++ ./fs/dcache.c 2008-05-15 20:16:19.000000000 +0400
@@ -1128,12 +1128,24 @@ struct dentry * d_lookup(struct dentry *
{
    struct dentry * dentry = NULL;
    unsigned long seq;
+ unsigned long loops = 0;
+ static int once = 1;

    do {
        seq = read_seqbegin(&rename_lock);
        dentry = __d_lookup(parent, name);
        if (dentry)
            break;
+
+ if (loops++ > 200) {
+     printk("%s: Abort on 200 seq-retry iteration\n",
+     __func__);
+     if (once) {
+         once = 0;
+         dump_stack();
+     }
+     break;
+ }
}

```

```

} while (read_seqretry(&rename_lock, seq));
return dentry;
}
@@ -1146,6 +1158,8 @@ struct dentry * __d_lookup(struct dentry
    struct hlist_head *head = d_hash(parent,hash);
    struct hlist_node *node;
    struct dentry *dentry, *found;
+ unsigned long loops = 0;
+ static int once = 1;

    rcu_read_lock();

@@ -1154,9 +1168,9 @@ struct dentry * __d_lookup(struct dentry
    struct qstr *qstr;

    if (dentry->d_name.hash != hash)
- continue;
+ goto next_nolock;
    if (dentry->d_parent != parent)
- continue;
+ goto next_nolock;

    spin_lock(&dentry->d_lock);

@@ -1193,6 +1207,16 @@ struct dentry * __d_lookup(struct dentry
    break;
next:
    spin_unlock(&dentry->d_lock);
+next_nolock:
+ if (loops++ > 5000) {
+ printk("%s: Abort on 5000 loop iteration in a chain\n",
+ __func__);
+ if (once) {
+ once = 0;
+ dump_stack();
+ }
+ break;
+ }
    }
    rcu_read_unlock();

```

---

Subject: Re: Sv: Re: Infinite loop in \_\_d\_lookup ?  
 Posted by [Jakob Goldbach](#) on Tue, 20 May 2008 19:22:15 GMT  
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Hi Pavel (and others)

Loop is in \_\_d\_lookup as trace show. Any ideas ?

/Jakob

```
[76893.524305] __d_lookup: Abort on 5000 loop iteration in a chain
[76893.525411]
[76893.525412] Call Trace:
[76893.526538] [<ffffffff8020ae20>] show_trace+0xae/0x360
[76893.527619] [<ffffffff8020b0e7>] dump_stack+0x15/0x17
[76893.528677] [<ffffffff8029b343>] __d_lookup+0x13a/0x187
[76893.529779] [<ffffffff8029105d>] do_lookup+0x2c/0x193
[76893.530846] [<ffffffff80293122>] __link_path_walk+0xb07/0x10ac
[76893.532066] [<ffffffff8029374e>] link_path_walk+0x87/0x140
[76893.533230] [<ffffffff80293c76>] do_path_lookup+0x2d3/0x2f8
[76893.534404] [<ffffffff802945e2>] __user_walk_fd+0x41/0x62
[76893.535559] [<ffffffff80282a09>] sys_faccessat+0xf4/0x1b5
[76893.536705] [<ffffffff80282add>] sys_access+0x13/0x15
[76893.537873] [<ffffffff80209902>] system_call+0x7e/0x83
[76893.538898] DWARF2 unwinder stuck at system_call+0x7e/0x83
[76893.539964] Leftover inexact backtrace:
[76893.540768]
[76893.541202] __d_lookup: Abort on 5000 loop iteration in a chain
```

On Thu, 2008-05-15 at 20:21 +0400, Pavel Emelyanov wrote:

> Jakob Goldbach wrote:

> > That would be great. Thanks. There are usually a few days between it gets stuck.

>

> Ok. Happily, I've managed to invent what I need to check first  
> before it's too late here in Moscow ;)

>

> I presume, that the infinite loop is really somewhere near the  
> \_\_d\_lookup. Please, apply this patch in attach (I made it against  
> 2.6.18-028stab053.5, but should fit OK all the other 028stab053  
> releases) and check for warnings in dmesg ;)

>

> Let's see whether this is really \_\_d\_lookup.

>

> > /jakob

> > - oprindeligt besked -

> > Emne: Re: [Users] Infinite loop in \_\_d\_lookup ?

> > Fra: Pavel Emelyanov <xemul@openvz.org>

> > Dato: 15-05-2008 12:34

> >

> > Jakob Goldbach wrote:

```

> >> Hi,
> >>
> >> I regularly have processes that gets stock eating all cpu. SysRq-p says
> >> it is stock in __d_lookup+0x10b as seen in dmesg output below.
> >
> > If you can reproduce this in a reasonable time I can send you
> > a debugging patch to find out what's going on there.
> >
> > Let's try with it?
> >
> >> I run vanilla 2.6.18 with 028stab053 and the lustre filesystem. I also
> >> run lustre on non-openvz kernel without problems, hence this mail to
> >> this group.
> >>
> >> I believe I've found where the problem is, but I'm not a kernel hacker
> >> so I don't know what to do about this information.
> >>
> >> I'd appreciate any hints on what to do next to get this solved.
> >>
> >> Below is what I could find out.
> >>
> >> Thanks,
> >> Jakob
> >>
> >> gdb find that the process is in the hlist_for_each_entry_rcu loop:
> >>
> >> (gdb) list *__d_lookup+0x10b
> >> 0x12f0 is in __d_lookup (fs/dcache.c:1153).
> >> 1148     struct dentry *dentry, *found;
> >> 1149
> >> 1150     rcu_read_lock();
> >> 1151
> >> 1152     found = NULL;
> >> 1153     hlist_for_each_entry_rcu(dentry, node, head, d_hash) {
> >> 1154         struct qstr *qstr;
> >> 1155
> >> 1156         if (dentry->d_name.hash != hash)
> >> 1157             continue;
> >>
> >> I believe this is the relevant part (0x12f0) of the disassembled object:
> >>
> >> 12e0:  4d 8b 24 24     mov  (%r12),%r12
> >> 12e4:  4d 85 e4        test %r12,%r12
> >> 12e7:  74 2c          je   1315<__d_lookup+0x130>
> >> 12e9:  49 8b 04 24     mov  (%r12),%rax
> >> 12ed:  0f 18 08       prefetcht0 (%rax)
> >> 12f0:  49 8d 5c 24 d8  lea  0xfffffffffd8(%r12),
> >> %rbx

```

```

>>> 12f5: 8b 45 cc      mov  0xffffffffffffcc(%rbp),
>>> %eax
>>> 12f8: 39 43 40      cmp  %eax,0x40(%rbx)
>>> 12fb: 75 e3        jne  12e0 <__d_lookup+0xfb>
>>>
>>>
>>> Dmesg after sysrq-p:
>>>
>>>
>>>
>>> [186124.494329] SysRq: Show Regs
>>> [186124.495218] ----- IPI show regs -----
>>> [186124.496136] CPU 3, VCPU 0:1
>>> [186124.496804] Modules linked in: simfs vznetdev vzethdev vzrst ip_nat
>>> vzcpt ip_contrack nfnetlink vzdquota vzmon vzdev xt_length ipt_ttl xt_
>>> tcpmss ipt_TCPMSS iptable_mangle xt_multiport xt_limit ipt_tos
>>> ipt_REJECT iptable_filter ip_tables x_tables 8021q osc mgc lustre lov
>>> lquota mdc
>>> ksocklnd ptlrpc obdclass lnet lvfs libcfs bonding xfs
>>> [186124.503636] Pid: 22699, comm: find Not tainted
>>> 2.6.18.8-openvz-028stab053-bnx2-1.6.7b-arpannounce1 #3 028stab053
>>> [186124.505535] RIP: 0060:[<ffffffff8029b314>] [<ffffffff8029b314>]
>>> __d_lookup+0x10b/0x142
>>> [186124.507265] RSP: 0068:ffff810073d63bc8 EFLAGS: 00000282
>>> [186124.508296] RAX: ffff8101016dc298 RBX: ffff8101016dc270 RCX:
>>> 0000000000000013
>>> [186124.509768] RDX: 0000000000025ff5 RSI: 00c38320c56a5ff5 RDI:
>>> ffff810118b056b0
>>> [186124.511480] RBP: ffff810073d63c08 R08: ffff8100ac9e8000 R09:
>>> ffff810118b056b0
>>> [186124.512963] R10: 0000000000000000 R11: 0000000000000000 R12:
>>> ffff8101016dc298
>>> [186124.514452] R13: ffff810073d63e38 R14: ffff810118b056b0 R15:
>>> ffff810073d63c78
>>> [186124.515931] FS: 00002ba786cb56d0(0000) GS:ffff81012a693340(0000)
>>> knlGS:0000000000000000
>>> [186124.517538] CS: 0060 DS: 0000 ES: 0000 CR0: 0000000080050033
>>> [186124.518587] CR2: 000000000539938 CR3: 0000000073f06000 CR4:
>>> 000000000000006e0
>>> [186124.520022]
>>> [186124.520023] Call Trace:
>>> [186124.521245] [<ffffffff8029105d>] do_lookup+0x2c/0x193
>>> [186124.522363] [<ffffffff80293122>] __link_path_walk+0xb07/0x10ac
>>> [186124.523642] [<ffffffff8029374e>] link_path_walk+0x87/0x140
>>> [186124.524818] [<ffffffff80293c76>] do_path_lookup+0x2d3/0x2f8
>>> [186124.526000] [<ffffffff802945e2>] __user_walk_fd+0x41/0x62
>>> [186124.527156] [<ffffffff8028cecb>] vfs_lstat_fd+0x24/0x5a

```

```

> >> [186124.528278] [<ffffff8028cf23>] sys_newlstat+0x22/0x3c
> >> [186124.529383] [<ffffff80209902>] system_call+0x7e/0x83
> >> [186124.530362] DWARF2 unwinder stuck at system_call+0x7e/0x83
> >> [186124.531460] Leftover inexact backtrace:
> >> [186124.532563]
> >>
> >>
> plain text document attachment (diff-dlookup-lockup-debug)
> --- ./fs/dcache.c.loopdebug 2008-05-15 20:09:04.000000000 +0400
> +++ ./fs/dcache.c 2008-05-15 20:16:19.000000000 +0400
> @@ -1128,12 +1128,24 @@ struct dentry * d_lookup(struct dentry *
> {
>     struct dentry * dentry = NULL;
>     unsigned long seq;
>     + unsigned long loops = 0;
>     + static int once = 1;
>
>     do {
>         seq = read_seqbegin(&rename_lock);
>         dentry = __d_lookup(parent, name);
>         if (dentry)
>             break;
>     +
>     + if (loops++ > 200) {
>     +     printk("%s: Abort on 200 seq-retry iteration\n",
>     +     __func__);
>     +     if (once) {
>     +         once = 0;
>     +         dump_stack();
>     +     }
>     +     break;
>     + }
>     } while (read_seqretry(&rename_lock, seq));
>     return dentry;
> }
> @@ -1146,6 +1158,8 @@ struct dentry * __d_lookup(struct dentry
> struct hlist_head *head = d_hash(parent,hash);
> struct hlist_node *node;
> struct dentry *dentry, *found;
> + unsigned long loops = 0;
> + static int once = 1;
>
>     rcu_read_lock();
>
> @@ -1154,9 +1168,9 @@ struct dentry * __d_lookup(struct dentry
> struct qstr *qstr;
>
>     if (dentry->d_name.hash != hash)

```

```
> - continue;
> + goto next_nolock;
> if (dentry->d_parent != parent)
> - continue;
> + goto next_nolock;
>
> spin_lock(&dentry->d_lock);
>
> @@ -1193,6 +1207,16 @@ struct dentry * __d_lookup(struct dentry
> break;
> next:
> spin_unlock(&dentry->d_lock);
> +next_nolock:
> + if (loops++ > 5000) {
> + printk("%s: Abort on 5000 loop iteration in a chain\n",
> + __func__);
> + if (once) {
> + once = 0;
> + dump_stack();
> + }
> + break;
> + }
> }
> rcu_read_unlock();
>
```

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Subject: Re: Sv: Re: Infinite loop in \_\_d\_lookup ?  
Posted by [Jakob Goldbach](#) on Tue, 20 May 2008 19:50:14 GMT  
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Hi,

I was a little fast on the trigger before - Although a loop was detected I see no process stuck on the system this time. Does dump\_stack kill the process ?

/Jakob

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Subject: Re: Sv: Re: Infinite loop in \_\_d\_lookup ?  
Posted by [Jakob Goldbach](#) on Tue, 20 May 2008 19:58:35 GMT  
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```
> . Does dump_stack kill the
> process ?
>
```



Ah - there was a break; after the dump\_stack()

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Subject: Re: Sv: Re: Infinite loop in \_\_d\_lookup ?  
Posted by [Pavel Emelianov](#) on Wed, 21 May 2008 08:04:35 GMT  
[View Forum Message](#) <> [Reply to Message](#)

---

Jakob Goldbach wrote:

> Hi,  
>  
> I was a little fast on the trigger before - Although a loop was detected  
> I see no process stuck on the system this time. Does dump\_stack kill the  
> process ?

No - my debugging patch aborted this infinite loop.  
I will send you one more in a couple of hours.

This \*indeed\* look very strange :(

> /Jakob  
>  
>

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Subject: Re: Sv: Re: Infinite loop in \_\_d\_lookup ?  
Posted by [xemul](#) on Wed, 21 May 2008 11:46:11 GMT  
[View Forum Message](#) <> [Reply to Message](#)

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Jakob Goldbach wrote:

> Hi Pavel (and others)  
>  
> Loop is in \_\_d\_lookup as trace show. Any ideas ?

Well. If this really happens, then we have a corrupted chain of dentries. Let's try to catch this corruption early.

Here's the debugging patch that checks the chain to be consistent when entries are added/removed from it.

Thanks for your help, Jakob :)

I've added a BUG with this issue - please, continue communication via bugzilla since now:  
[http://bugzilla.openvz.org/show\\_bug.cgi?id=895](http://bugzilla.openvz.org/show_bug.cgi?id=895)

```

> /Jakob
>
>
> [76893.524305] __d_lookup: Abort on 5000 loop iteration in a chain
> [76893.525411]
> [76893.525412] Call Trace:
> [76893.526538] [<ffffffff8020ae20>] show_trace+0xae/0x360
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> [76893.529779] [<ffffffff8029105d>] do_lookup+0x2c/0x193
> [76893.530846] [<ffffffff80293122>] __link_path_walk+0xb07/0x10ac
> [76893.532066] [<ffffffff8029374e>] link_path_walk+0x87/0x140
> [76893.533230] [<ffffffff80293c76>] do_path_lookup+0x2d3/0x2f8
> [76893.534404] [<ffffffff802945e2>] __user_walk_fd+0x41/0x62
> [76893.535559] [<ffffffff80282a09>] sys_faccessat+0xf4/0x1b5
> [76893.536705] [<ffffffff80282add>] sys_access+0x13/0x15
> [76893.537873] [<ffffffff80209902>] system_call+0x7e/0x83
> [76893.538898] DWARF2 unwinder stuck at system_call+0x7e/0x83
> [76893.539964] Leftover inexact backtrace:
> [76893.540768]
> [76893.541202] __d_lookup: Abort on 5000 loop iteration in a chain

```

```

--- ./fs/dcache.c.ddebug2 2008-05-21 14:52:15.000000000 +0400
+++ ./fs/dcache.c 2008-05-21 15:10:06.000000000 +0400
@@ -1350,6 +1350,18 @@ static void __d_rehash(struct dentry * e
{
    entry->d_flags &= ~DCACHE_UNHASHED;
+ if (!spin_is_locked(&dcache_lock)) {
+ printk(KERN_ERR "Dcache lock is not taken on add\n");
+ dump_stack();
+ } else if (list->first != NULL &&
+ list->first->pprev != &list->first) {
+ printk(KERN_ERR "Dcache chain corruption:\n");
+ printk(KERN_ERR "Chain %p --next-> %p\n",
+ list, list->first);
+ printk(KERN_ERR "First %p <-pprev- %p\n",
+ list->first, list->first->pprev);
+ dump_stack();
+ }
    hlist_add_head_rcu(&entry->d_hash, list);
}

@@ -1443,6 +1455,32 @@ static void switch_names(struct dentry *
* dcache entries should not be moved in this way.
*/

```

```

+void d_node_check(struct hlist_node *n)
+{
+ if (!spin_is_locked(&dcache_lock)) {
+ printk(KERN_ERR "Dcache lock is not taken on del\n");
+ dump_stack();
+ }
+
+ if (n->next != NULL &&
+ n->next->pprev != &n->next) {
+ printk(KERN_ERR "Dentry d_hash node corruption(m1):\n");
+ printk(KERN_ERR "Node %p --next-> %p\n",
+ n, n->next);
+ printk(KERN_ERR "Next %p <-pprev- %p\n",
+ n->next, n->next->pprev);
+ dump_stack();
+ }
+
+ if (*n->pprev != n) {
+ printk(KERN_ERR "Dentry d_hash node corruption(m2):\n");
+ printk(KERN_ERR "Node %p <-pprev- %p -> %p\n",
+ n, n->pprev, *n->pprev);
+ dump_stack();
+ }
+}
+EXPORT_SYMBOL(d_node_check);
+
void d_move(struct dentry * dentry, struct dentry * target)
{
struct hlist_head *list;
@@ -1467,6 +1505,7 @@ void d_move(struct dentry * dentry, stru
if (dentry->d_flags & DCACHE_UNHASHED)
goto already_unhashed;

+ d_node_check(&dentry->d_hash);
hlist_del_rcu(&dentry->d_hash);

already_unhashed:
--- ./include/linux/dcache.h.ddebug2 2008-05-21 14:50:31.000000000 +0400
+++ ./include/linux/dcache.h 2008-05-21 15:09:03.000000000 +0400
@@ -203,10 +203,13 @@ extern spinlock_t dcache_lock;
* __d_drop requires dentry->d_lock.
*/

+void d_node_check(struct hlist_node *n);
+
static inline void __d_drop(struct dentry *dentry)
{
if (!(dentry->d_flags & DCACHE_UNHASHED)) {

```

```
    dentry->d_flags |= DCACHE_UNHASHED;
+   d_node_check(&dentry->d_hash);
    hlist_del_rcu(&dentry->d_hash);
  }
}
```

---