Subject: [PATCH] Make common helpers for seq_files that work with list_head-s
Posted by xemul on Thu, 17 May 2007 15:15:58 GMT
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Many places in kernel use seq_file API to iterate over a regular
list_head. The code for such iteration is identical in all the
places, so it's worth introducing a common helpers.

This makes code more than 300 lines smaller.

Cc-ed are people, who maintain the code altered by the patch.

Signed-off-by: Pavel Emelianov <xemul@openvz.org>

```
 block/genhd.c                                      |   40 +++-----
 crypto/proc.c                                      |   17 ---
 drivers/char/misc.c                                |   18 ----
 drivers/input/input.c                              |   29 ------
 drivers/isdn/capi/kcapi_proc.c                     |   28 ------
 fs/afs/proc.c                                      |   81 ++----------------
 fs/namespace.c                                     |   14 ---
 fs/nfs/client.c                                    |   54 +-----------
 fs/proc/proc_tty.c                                 |   15 ---
 include/linux/seq_file.h                           |   35 +++++++
 kernel/module.c                                    |   17 ---
 mm/slab.c                                          |   28 +-----
 net/atm/br2684.c                                   |   22 ----
 net/core/sock.c                                    |   39 --------
 net/ipv4/netfilter/nf_conntrack_l3proto_ipv4_compat.c |   27 ------
 net/netfilter/nf_conntrack_expect.c                |   27 ------
 net/rxrpc/ar-proc.c                                |   48 +---------
 17 files changed, 116 insertions(+), 423 deletions(-)
```

```
diff --git a/include/linux/seq_file.h b/include/linux/seq_file.h
index 3e3cccb..6f394a0 100644
--- a/include/linux/seq_file.h
+++ b/include/linux/seq_file.h
@@ -50,5 +50,40 @@ int seq_release_private(struct inode *,

 #define SEQ_START_TOKEN ((void *)1)

+/*
+ * Helpers for iteration over list_head-s in seq_files
+ */
+
+static inline struct list_head *seq_list_start(struct list_head *head,
```

```
+  loff_t pos)
+{
+ struct list_head *lh;
+
+ list_for_each(lh, head)
+  if (pos-- == 0)
+   return lh;
+
+ return NULL;
+}
+
+static inline struct list_head *seq_list_start_head(struct list_head *head,
+  loff_t pos)
+{
+ if (!pos)
+  return head;
+
+ return seq_list_start(head, pos - 1);
+}
+
+static inline struct list_head *seq_list_next(void *v, struct list_head *head,
+  loff_t *ppos)
+{
+ struct list_head *lh;
+
+ lh = ((struct list_head *)v)->next;
+ ++*ppos;
+ return lh == head ? NULL : lh;
+}
+
 #endif
 #endif
diff --git a/block/genhd.c b/block/genhd.c
index 863a8c0..8813c14 100644
--- a/block/genhd.c
+++ b/block/genhd.c
@@ -270,22 +270,13 @@ void __init printk_all_partitions(void)
 /* iterator */
 static void *part_start(struct seq_file *part, loff_t *pos)
 {
- struct list_head *p;
- loff_t l = *pos;
-
   mutex_lock(&block_subsys_lock);
- list_for_each(p, &block_subsys.list)
-  if (!l--)
-   return list_entry(p, struct gendisk, kobj.entry);
- return NULL;
```

```
+ return seq_list_start_head(&block_subsys.list, *pos);
 }

 static void *part_next(struct seq_file *part, void *v, loff_t *pos)
 {
- struct list_head *p = ((struct gendisk *)v)->kobj.entry.next;
- ++*pos;
- return p==&block_subsys.list ? NULL :
-  list_entry(p, struct gendisk, kobj.entry);
+ return seq_list_next(v, &block_subsys.list, pos);
 }

 static void part_stop(struct seq_file *part, void *v)
@@ -295,13 +286,16 @@ static void part_stop(struct seq_file *p

 static int show_partition(struct seq_file *part, void *v)
 {
- struct gendisk *sgp = v;
+ struct gendisk *sgp;
  int n;
  char buf[BDEVNAME_SIZE];

- if (&sgp->kobj.entry == block_subsys.list.next)
+ if (v == &block_subsys.list) {
   seq_puts(part, "major minor  #blocks  name\n\n");
+  return 0;
+ }

+ sgp = list_entry(v, struct gendisk, kobj.entry);
  /* Don't show non-partitionable removeable devices or empty devices */
  if (!get_capacity(sgp) ||
    (sgp->minors == 1 && (sgp->flags & GENHD_FL_REMOVABLE)))
@@ -622,22 +616,13 @@ decl_subsys(block, &ktype_block, &block_
 /* iterator */
 static void *diskstats_start(struct seq_file *part, loff_t *pos)
 {
- loff_t k = *pos;
- struct list_head *p;
-
  mutex_lock(&block_subsys_lock);
- list_for_each(p, &block_subsys.list)
-  if (!k--)
-   return list_entry(p, struct gendisk, kobj.entry);
- return NULL;
+ return seq_list_start(&block_subsys.list, *pos);
 }

 static void *diskstats_next(struct seq_file *part, void *v, loff_t *pos)
```

```
 {
- struct list_head *p = ((struct gendisk *)v)->kobj.entry.next;
- ++*pos;
- return p==&block_subsys.list ? NULL :
-  list_entry(p, struct gendisk, kobj.entry);
+ return seq_list_next(v, &block_subsys.list, pos);
 }

 static void diskstats_stop(struct seq_file *part, void *v)
@@ -647,18 +632,21 @@ static void diskstats_stop(struct seq_fi

 static int diskstats_show(struct seq_file *s, void *v)
 {
- struct gendisk *gp = v;
+ struct gendisk *gp;
  char buf[BDEVNAME_SIZE];
  int n = 0;

  /*
- if (&sgp->kobj.entry == block_subsys.kset.list.next)
+ if (v == &block_subsys.list) {
   seq_puts(s, "major minor name"
     "     rio rmerge rsect ruse wio wmerge "
     "wsect wuse running use aveq"
     "\n\n");
+  return 0;
+ }
  */

+ gp = list_entry(v, struct gendisk, kobj.entry);
  preempt_disable();
  disk_round_stats(gp);
  preempt_enable();
diff --git a/crypto/proc.c b/crypto/proc.c
index 102c751..3d73323 100644
--- a/crypto/proc.c
+++ b/crypto/proc.c
@@ -23,24 +23,13 @@

 static void *c_start(struct seq_file *m, loff_t *pos)
 {
- struct list_head *v;
- loff_t n = *pos;
-
  down_read(&crypto_alg_sem);
- list_for_each(v, &crypto_alg_list)
-  if (!n--)
-   return list_entry(v, struct crypto_alg, cra_list);
```

```
- return NULL;
+ return seq_list_start(&crypto_alg_list, *pos);
 }

 static void *c_next(struct seq_file *m, void *p, loff_t *pos)
 {
- struct list_head *v = p;
-
- (*pos)++;
- v = v->next;
- return (v == &crypto_alg_list) ?
-  NULL : list_entry(v, struct crypto_alg, cra_list);
+ return seq_list_next(p, &crypto_alg_list, pos);
 }

 static void c_stop(struct seq_file *m, void *p)
@@ -50,7 +39,7 @@ static void c_stop(struct seq_file *m, v

 static int c_show(struct seq_file *m, void *p)
 {
- struct crypto_alg *alg = (struct crypto_alg *)p;
+ struct crypto_alg *alg = list_entry(p, struct crypto_alg, cra_list);

  seq_printf(m, "name         : %s\n", alg->cra_name);
  seq_printf(m, "driver       : %s\n", alg->cra_driver_name);
diff --git a/drivers/char/misc.c b/drivers/char/misc.c
index 4e6fb96..71c8cd7 100644
--- a/drivers/char/misc.c
+++ b/drivers/char/misc.c
@@ -67,25 +67,13 @@ extern int pmu_device_init(void);
 #ifdef CONFIG_PROC_FS
 static void *misc_seq_start(struct seq_file *seq, loff_t *pos)
 {
- struct miscdevice *p;
- loff_t off = 0;
-
  mutex_lock(&misc_mtx);
- list_for_each_entry(p, &misc_list, list) {
-  if (*pos == off++)
-   return p;
- }
- return NULL;
+ return seq_list_start(&misc_list, *pos);
 }

 static void *misc_seq_next(struct seq_file *seq, void *v, loff_t *pos)
 {
- struct list_head *n = ((struct miscdevice *)v)->list.next;
```

```
-
- ++*pos;
-
- return (n != &misc_list) ? list_entry(n, struct miscdevice, list)
-   : NULL;
+ return seq_list_next(v, &misc_list, pos);
 }

 static void misc_seq_stop(struct seq_file *seq, void *v)
@@ -95,7 +83,7 @@ static void misc_seq_stop(struct seq_fil

 static int misc_seq_show(struct seq_file *seq, void *v)
 {
- const struct miscdevice *p = v;
+ const struct miscdevice *p = list_entry(v, struct miscdevice, list);

  seq_printf(seq, "%3i %s\n", p->minor, p->name ? p->name : "");
  return 0;
diff --git a/drivers/input/input.c b/drivers/input/input.c
index ccd8aba..da83c17 100644
--- a/drivers/input/input.c
+++ b/drivers/input/input.c
@@ -471,37 +471,16 @@ static unsigned int input_proc_devices_p
  return 0;
 }

-static struct list_head *list_get_nth_element(struct list_head *list, loff_t *pos)
-{
- struct list_head *node;
- loff_t i = 0;
-
- list_for_each(node, list)
-  if (i++ == *pos)
-   return node;
-
- return NULL;
-}
-
-static struct list_head *list_get_next_element(struct list_head *list, struct list_head *element, loff_t
*pos)
-{
- if (element->next == list)
-  return NULL;
-
- ++(*pos);
- return element->next;
-}
-
```

```
 static void *input_devices_seq_start(struct seq_file *seq, loff_t *pos)
 {
  /* acquire lock here ... Yes, we do need locking, I knowi, I know... */

- return list_get_nth_element(&input_dev_list, pos);
+ return seq_list_start(&input_dev_list, *pos);
 }

 static void *input_devices_seq_next(struct seq_file *seq, void *v, loff_t *pos)
 {
- return list_get_next_element(&input_dev_list, v, pos);
+ return seq_list_next(v, &input_dev_list, pos);
 }

 static void input_devices_seq_stop(struct seq_file *seq, void *v)
@@ -592,13 +571,13 @@ static void *input_handlers_seq_start(st
 {
  /* acquire lock here ... Yes, we do need locking, I knowi, I know... */
  seq->private = (void *)(unsigned long)*pos;
- return list_get_nth_element(&input_handler_list, pos);
+ return seq_list_start(&input_handler_list, *pos);
 }

 static void *input_handlers_seq_next(struct seq_file *seq, void *v, loff_t *pos)
 {
  seq->private = (void *)(unsigned long)(*pos + 1);
- return list_get_next_element(&input_handler_list, v, pos);
+ return seq_list_next(v, &input_handler_list, pos);
 }

 static void input_handlers_seq_stop(struct seq_file *seq, void *v)
diff --git a/drivers/isdn/capi/kcapi_proc.c b/drivers/isdn/capi/kcapi_proc.c
index 31f4fd8..845a797 100644
--- a/drivers/isdn/capi/kcapi_proc.c
+++ b/drivers/isdn/capi/kcapi_proc.c
@@ -243,36 +243,15 @@ create_seq_entry(char *name, mode_t mode

 //  ------------------------------------------------------------ ---------------

-
-static __inline__ struct capi_driver *capi_driver_get_idx(loff_t pos)
-{
- struct capi_driver *drv = NULL;
- struct list_head *l;
- loff_t i;
-
- i = 0;
- list_for_each(l, &capi_drivers) {
```

```
-  drv = list_entry(l, struct capi_driver, list);
-  if (i++ == pos)
-   return drv;
- }
- return NULL;
-}
-
 static void *capi_driver_start(struct seq_file *seq, loff_t *pos)
 {
- struct capi_driver *drv;
  read_lock(&capi_drivers_list_lock);
- drv = capi_driver_get_idx(*pos);
- return drv;
+ return seq_list_start(&capi_drivers, *pos);
 }

 static void *capi_driver_next(struct seq_file *seq, void *v, loff_t *pos)
 {
- struct capi_driver *drv = (struct capi_driver *)v;
- ++*pos;
- if (drv->list.next == &capi_drivers) return NULL;
- return list_entry(drv->list.next, struct capi_driver, list);
+ return seq_list_next(v, &capi_drivers, pos);
 }

 static void capi_driver_stop(struct seq_file *seq, void *v)
@@ -282,7 +261,8 @@ static void capi_driver_stop(struct seq_

 static int capi_driver_show(struct seq_file *seq, void *v)
 {
- struct capi_driver *drv = (struct capi_driver *)v;
+ struct capi_driver *drv = list_entry(v, struct capi_driver, list);
+
  seq_printf(seq, "%-32s %s\n", drv->name, drv->revision);
  return 0;
 }
diff --git a/fs/afs/proc.c b/fs/afs/proc.c
index d5601f6..d5300e4 100644
--- a/fs/afs/proc.c
+++ b/fs/afs/proc.c
@@ -200,23 +200,9 @@ static int afs_proc_cells_open(struct in
  */
 static void *afs_proc_cells_start(struct seq_file *m, loff_t *_pos)
 {
- struct list_head *_p;
- loff_t pos = *_pos;
-
  /* lock the list against modification */
```

```
  down_read(&afs_proc_cells_sem);
-
- /* allow for the header line */
- if (!pos)
-  return (void *) 1;
- pos--;
-
- /* find the n'th element in the list */
- list_for_each(_p, &afs_proc_cells)
-  if (!pos--)
-   break;
-
- return _p != &afs_proc_cells ? _p : NULL;
+ return seq_list_start_head(&afs_proc_cells, *_pos);
 }

 /*
@@ -224,14 +210,7 @@ static void *afs_proc_cells_start(struct
  */
 static void *afs_proc_cells_next(struct seq_file *p, void *v, loff_t *pos)
 {
- struct list_head *_p;
-
- (*pos)++;
-
- _p = v;
- _p = v == (void *) 1 ? afs_proc_cells.next : _p->next;
-
- return _p != &afs_proc_cells ? _p : NULL;
+ return seq_list_next(v, &afs_proc_cells, pos);
 }

 /*
@@ -249,7 +228,7 @@ static int afs_proc_cells_show(struct se
 {
  struct afs_cell *cell = list_entry(v, struct afs_cell, proc_link);

- if (v == (void *) 1) {
+ if (v == &afs_proc_cells) {
   /* display header on line 1 */
   seq_puts(m, "USE NAME\n");
   return 0;
@@ -502,26 +481,13 @@ static int afs_proc_cell_volumes_release
  */
 static void *afs_proc_cell_volumes_start(struct seq_file *m, loff_t *_pos)
 {
- struct list_head *_p;
  struct afs_cell *cell = m->private;
```

```
- loff_t pos = *_pos;

  _enter("cell=%p pos=%Ld", cell, *_pos);

  /* lock the list against modification */
  down_read(&cell->vl_sem);
-
- /* allow for the header line */
- if (!pos)
-  return (void *) 1;
- pos--;
-
- /* find the n'th element in the list */
- list_for_each(_p, &cell->vl_list)
-  if (!pos--)
-   break;
-
- return _p != &cell->vl_list ? _p : NULL;
+ return seq_list_start_head(&cell->vl_list, *_pos);
 }

 /*
@@ -530,17 +496,10 @@ static void *afs_proc_cell_volumes_start
 static void *afs_proc_cell_volumes_next(struct seq_file *p, void *v,
      loff_t *_pos)
 {
- struct list_head *_p;
  struct afs_cell *cell = p->private;

  _enter("cell=%p pos=%Ld", cell, *_pos);
-
- (*_pos)++;
-
- _p = v;
- _p = (v == (void *) 1) ? cell->vl_list.next : _p->next;
-
- return (_p != &cell->vl_list) ? _p : NULL;
+ return seq_list_next(v, &cell->vl_list, _pos);
 }

 /*
@@ -568,11 +527,12 @@ const char afs_vlocation_states[][4] = {
  */
 static int afs_proc_cell_volumes_show(struct seq_file *m, void *v)
 {
+ struct afs_cell *cell = m->private;
  struct afs_vlocation *vlocation =
   list_entry(v, struct afs_vlocation, link);
```

```
  /* display header on line 1 */
- if (v == (void *) 1) {
+ if (v == &cell->vl_list) {
    seq_puts(m, "USE STT VLID[0]  VLID[1]  VLID[2]  NAME\n");
    return 0;
  }
@@ -733,26 +693,13 @@ static int afs_proc_cell_servers_release
 static void *afs_proc_cell_servers_start(struct seq_file *m, loff_t *_pos)
   __acquires(m->private->servers_lock)
 {
- struct list_head *_p;
   struct afs_cell *cell = m->private;
- loff_t pos = *_pos;

   _enter("cell=%p pos=%Ld", cell, *_pos);

   /* lock the list against modification */
   read_lock(&cell->servers_lock);
-
- /* allow for the header line */
- if (!pos)
-  return (void *) 1;
- pos--;
-
- /* find the n'th element in the list */
- list_for_each(_p, &cell->servers)
-  if (!pos--)
-   break;
-
- return _p != &cell->servers ? _p : NULL;
+ return seq_list_start_head(&cell->servers, *_pos);
 }

 /*
@@ -761,17 +708,10 @@ static void *afs_proc_cell_servers_start
 static void *afs_proc_cell_servers_next(struct seq_file *p, void *v,
      loff_t *_pos)
 {
- struct list_head *_p;
   struct afs_cell *cell = p->private;

   _enter("cell=%p pos=%Ld", cell, *_pos);
-
- (*_pos)++;
-
- _p = v;
- _p = v == (void *) 1 ? cell->servers.next : _p->next;
```

```
-
- return _p != &cell->servers ? _p : NULL;
+ return seq_list_next(v, &cell->servers, _pos);
 }

 /*
@@ -790,11 +730,12 @@ static void afs_proc_cell_servers_stop(s
  */
 static int afs_proc_cell_servers_show(struct seq_file *m, void *v)
 {
+ struct afs_cell *cell = m->private;
  struct afs_server *server = list_entry(v, struct afs_server, link);
  char ipaddr[20];

  /* display header on line 1 */
- if (v == (void *) 1) {
+ if (v == &cell->servers) {
   seq_puts(m, "USE ADDR           STATE\n");
   return 0;
  }
diff --git a/fs/namespace.c b/fs/namespace.c
index 11f2fbf..fe15b14 100644
--- a/fs/namespace.c
+++ b/fs/namespace.c
@@ -393,22 +393,16 @@ EXPORT_SYMBOL(mnt_unpin);
 static void *m_start(struct seq_file *m, loff_t *pos)
 {
  struct mnt_namespace *n = m->private;
- struct list_head *p;
- loff_t l = *pos;

  down_read(&namespace_sem);
- list_for_each(p, &n->list)
-  if (!l--)
-   return list_entry(p, struct vfsmount, mnt_list);
- return NULL;
+ return seq_list_start(&n->list, *pos);
 }

 static void *m_next(struct seq_file *m, void *v, loff_t *pos)
 {
  struct mnt_namespace *n = m->private;
- struct list_head *p = ((struct vfsmount *)v)->mnt_list.next;
- (*pos)++;
- return p == &n->list ? NULL : list_entry(p, struct vfsmount, mnt_list);
+
+ return seq_list_next(v, &n->list, pos);
 }
```

```
 static void m_stop(struct seq_file *m, void *v)
@@ -423,7 +417,7 @@ static inline void mangle(struct seq_fil

 static int show_vfsmnt(struct seq_file *m, void *v)
 {
- struct vfsmount *mnt = v;
+ struct vfsmount *mnt = list_entry(v, struct vfsmount, mnt_list);
  int err = 0;
  static struct proc_fs_info {
   int flag;
diff --git a/fs/nfs/client.c b/fs/nfs/client.c
index 50c6821..10355ec 100644
--- a/fs/nfs/client.c
+++ b/fs/nfs/client.c
@@ -1232,23 +1232,9 @@ static int nfs_server_list_open(struct i
  */
 static void *nfs_server_list_start(struct seq_file *m, loff_t *_pos)
 {
- struct list_head *_p;
- loff_t pos = *_pos;
-
  /* lock the list against modification */
  spin_lock(&nfs_client_lock);
-
- /* allow for the header line */
- if (!pos)
-  return SEQ_START_TOKEN;
- pos--;
-
- /* find the n'th element in the list */
- list_for_each(_p, &nfs_client_list)
-  if (!pos--)
-   break;
-
- return _p != &nfs_client_list ? _p : NULL;
+ return seq_list_start_head(&nfs_client_list, *_pos);
 }

 /*
@@ -1256,14 +1242,7 @@ static void *nfs_server_list_start(struc
  */
 static void *nfs_server_list_next(struct seq_file *p, void *v, loff_t *pos)
 {
- struct list_head *_p;
-
- (*pos)++;
-
```

```
- _p = v;
- _p = (v == SEQ_START_TOKEN) ? nfs_client_list.next : _p->next;
-
- return _p != &nfs_client_list ? _p : NULL;
+ return seq_list_next(v, &nfs_client_list, pos);
 }

 /*
@@ -1282,7 +1261,7 @@ static int nfs_server_list_show(struct s
  struct nfs_client *clp;

  /* display header on line 1 */
- if (v == SEQ_START_TOKEN) {
+ if (v == &nfs_client_list) {
   seq_puts(m, "NV SERVER   PORT USE HOSTNAME\n");
   return 0;
  }
@@ -1323,23 +1302,9 @@ static int nfs_volume_list_open(struct i
  */
 static void *nfs_volume_list_start(struct seq_file *m, loff_t *_pos)
 {
- struct list_head *_p;
- loff_t pos = *_pos;
-
  /* lock the list against modification */
  spin_lock(&nfs_client_lock);
-
- /* allow for the header line */
- if (!pos)
-  return SEQ_START_TOKEN;
- pos--;
-
- /* find the n'th element in the list */
- list_for_each(_p, &nfs_volume_list)
-  if (!pos--)
-   break;
-
- return _p != &nfs_volume_list ? _p : NULL;
+ return seq_list_start_head(&nfs_volume_list, *_pos);
 }

 /*
@@ -1347,14 +1312,7 @@ static void *nfs_volume_list_start(struc
  */
 static void *nfs_volume_list_next(struct seq_file *p, void *v, loff_t *pos)
 {
- struct list_head *_p;
-
```

```
- (*pos)++;
-
- _p = v;
- _p = (v == SEQ_START_TOKEN) ? nfs_volume_list.next : _p->next;
-
- return _p != &nfs_volume_list ? _p : NULL;
+ return seq_list_next(v, &nfs_volume_list, pos);
 }

 /*
@@ -1375,7 +1333,7 @@ static int nfs_volume_list_show(struct s
  char dev[8], fsid[17];

  /* display header on line 1 */
- if (v == SEQ_START_TOKEN) {
+ if (v == &nfs_volume_list) {
   seq_puts(m, "NV SERVER   PORT DEV     FSID\n");
   return 0;
  }
diff --git a/fs/proc/proc_tty.c b/fs/proc/proc_tty.c
index b3a473b..2284622 100644
--- a/fs/proc/proc_tty.c
+++ b/fs/proc/proc_tty.c
@@ -69,7 +69,7 @@ static void show_tty_range(struct seq_fi

 static int show_tty_driver(struct seq_file *m, void *v)
 {
- struct tty_driver *p = v;
+ struct tty_driver *p = list_entry(v, struct tty_driver, tty_drivers);
  dev_t from = MKDEV(p->major, p->minor_start);
  dev_t to = from + p->num;

@@ -106,22 +106,13 @@ static int show_tty_driver(struct seq_fi
 /* iterator */
 static void *t_start(struct seq_file *m, loff_t *pos)
 {
- struct list_head *p;
- loff_t l = *pos;
-
  mutex_lock(&tty_mutex);
- list_for_each(p, &tty_drivers)
-  if (!l--)
-   return list_entry(p, struct tty_driver, tty_drivers);
- return NULL;
+ return seq_list_start(&tty_drivers, *pos);
 }

 static void *t_next(struct seq_file *m, void *v, loff_t *pos)
```

```
 {
- struct list_head *p = ((struct tty_driver *)v)->tty_drivers.next;
- (*pos)++;
- return p==&tty_drivers ? NULL :
-   list_entry(p, struct tty_driver, tty_drivers);
+ return seq_list_next(v, &tty_drivers, pos);
 }

 static void t_stop(struct seq_file *m, void *v)
diff --git a/kernel/module.c b/kernel/module.c
index 015d60c..7a1a4d3 100644
--- a/kernel/module.c
+++ b/kernel/module.c
@@ -2232,26 +2232,13 @@ unsigned long module_kallsyms_lookup_nam
 /* Called by the /proc file system to return a list of modules. */
 static void *m_start(struct seq_file *m, loff_t *pos)
 {
- struct list_head *i;
- loff_t n = 0;
-
  mutex_lock(&module_mutex);
- list_for_each(i, &modules) {
-  if (n++ == *pos)
-   break;
- }
- if (i == &modules)
-  return NULL;
- return i;
+ return seq_list_start(&modules, *pos);
 }

 static void *m_next(struct seq_file *m, void *p, loff_t *pos)
 {
- struct list_head *i = p;
- (*pos)++;
- if (i->next == &modules)
-  return NULL;
- return i->next;
+ return seq_list_next(p, &modules, pos);
 }

 static void m_stop(struct seq_file *m, void *p)
diff --git a/mm/slab.c b/mm/slab.c
index 6edfd34..faad0d7 100644
--- a/mm/slab.c
+++ b/mm/slab.c
@@ -4161,26 +4161,17 @@ static void print_slabinfo_header(struct
 static void *s_start(struct seq_file *m, loff_t *pos)
```

```
 {
  loff_t n = *pos;
- struct list_head *p;

  mutex_lock(&cache_chain_mutex);
  if (!n)
   print_slabinfo_header(m);
- p = cache_chain.next;
- while (n--) {
-  p = p->next;
-  if (p == &cache_chain)
-   return NULL;
- }
- return list_entry(p, struct kmem_cache, next);
+
+ return seq_list_start(&cache_chain, *pos);
 }

 static void *s_next(struct seq_file *m, void *p, loff_t *pos)
 {
- struct kmem_cache *cachep = p;
- ++*pos;
- return cachep->next.next == &cache_chain ?
-  NULL : list_entry(cachep->next.next, struct kmem_cache, next);
+ return seq_list_next(p, &cache_chain, pos);
 }

 static void s_stop(struct seq_file *m, void *p)
@@ -4190,7 +4181,7 @@ static void s_stop(struct seq_file *m, v

 static int s_show(struct seq_file *m, void *p)
 {
- struct kmem_cache *cachep = p;
+ struct kmem_cache *cachep = list_entry(p, struct kmem_cache, next);
  struct slab *slabp;
  unsigned long active_objs;
  unsigned long num_objs;
@@ -4359,17 +4350,8 @@ ssize_t slabinfo_write(struct file *file

 static void *leaks_start(struct seq_file *m, loff_t *pos)
 {
- loff_t n = *pos;
- struct list_head *p;
-
  mutex_lock(&cache_chain_mutex);
- p = cache_chain.next;
- while (n--) {
-  p = p->next;
```

```
-  if (p == &cache_chain)
-   return NULL;
- }
- return list_entry(p, struct kmem_cache, next);
+ return seq_list_start(&cache_chain, *pos);
 }

 static inline int add_caller(unsigned long *n, unsigned long v)
diff --git a/net/atm/br2684.c b/net/atm/br2684.c
index 0e9f00c..3e26438 100644
--- a/net/atm/br2684.c
+++ b/net/atm/br2684.c
@@ -699,28 +699,13 @@ static struct atm_ioctl br2684_ioctl_ops
 #ifdef CONFIG_PROC_FS
 static void *br2684_seq_start(struct seq_file *seq, loff_t *pos)
 {
- loff_t offs = 0;
- struct br2684_dev *brd;
-
  read_lock(&devs_lock);
-
- list_for_each_entry(brd, &br2684_devs, br2684_devs) {
-  if (offs == *pos)
-   return brd;
-  ++offs;
- }
- return NULL;
+ return seq_list_start(&br2684_devs, *pos);
 }

 static void *br2684_seq_next(struct seq_file *seq, void *v, loff_t *pos)
 {
- struct br2684_dev *brd = v;
-
- ++*pos;
-
- brd = list_entry(brd->br2684_devs.next,
-    struct br2684_dev, br2684_devs);
- return (&brd->br2684_devs != &br2684_devs) ? brd : NULL;
+ return seq_list_next(v, &br2684_devs, pos);
 }

 static void br2684_seq_stop(struct seq_file *seq, void *v)
@@ -730,7 +715,8 @@ static void br2684_seq_stop(struct seq_f

 static int br2684_seq_show(struct seq_file *seq, void *v)
 {
- const struct br2684_dev *brdev = v;
```

```
+ const struct br2684_dev *brdev = list_entry(v, struct br2684_dev,
+   br2684_devs);
  const struct net_device *net_dev = brdev->net_dev;
  const struct br2684_vcc *brvcc;

diff --git a/net/core/sock.c b/net/core/sock.c
index 22183c2..528f65b 100644
--- a/net/core/sock.c
+++ b/net/core/sock.c
@@ -1839,46 +1839,15 @@ void proto_unregister(struct proto *prot
 EXPORT_SYMBOL(proto_unregister);

 #ifdef CONFIG_PROC_FS
-static inline struct proto *__proto_head(void)
-{
- return list_entry(proto_list.next, struct proto, node);
-}
-
-static inline struct proto *proto_head(void)
-{
- return list_empty(&proto_list) ? NULL : __proto_head();
-}
-
-static inline struct proto *proto_next(struct proto *proto)
-{
- return proto->node.next == &proto_list ? NULL :
-  list_entry(proto->node.next, struct proto, node);
-}
-
-static inline struct proto *proto_get_idx(loff_t pos)
-{
- struct proto *proto;
- loff_t i = 0;
-
- list_for_each_entry(proto, &proto_list, node)
-  if (i++ == pos)
-   goto out;
-
- proto = NULL;
-out:
- return proto;
-}
-
 static void *proto_seq_start(struct seq_file *seq, loff_t *pos)
 {
  read_lock(&proto_list_lock);
- return *pos ? proto_get_idx(*pos - 1) : SEQ_START_TOKEN;
+ return seq_list_start_head(&proto_list, *pos);
```

```
 }

 static void *proto_seq_next(struct seq_file *seq, void *v, loff_t *pos)
 {
- ++*pos;
- return v == SEQ_START_TOKEN ? proto_head() : proto_next(v);
+ return seq_list_next(v, &proto_list, pos);
 }

 static void proto_seq_stop(struct seq_file *seq, void *v)
@@ -1926,7 +1895,7 @@ static void proto_seq_printf(struct seq_

 static int proto_seq_show(struct seq_file *seq, void *v)
 {
- if (v == SEQ_START_TOKEN)
+ if (v == &proto_list)
   seq_printf(seq, "%-9s %-4s %-8s %-6s %-5s %-7s %-4s %-10s %s",
       "protocol",
       "size",
@@ -1938,7 +1907,7 @@ static int proto_seq_show(struct seq_fil
       "module",
       "cl co di ac io in de sh ss gs se re sp bi br ha uh gp em\n");
  else
-  proto_seq_printf(seq, v);
+  proto_seq_printf(seq, list_entry(v, struct proto, node));
  return 0;
 }

diff --git a/net/ipv4/netfilter/nf_conntrack_l3proto_ipv4_compat.c
b/net/ipv4/netfilter/nf_conntrack_l3proto_ipv4_compat.c
index 89f933e..bec843a 100644
--- a/net/ipv4/netfilter/nf_conntrack_l3proto_ipv4_compat.c
+++ b/net/ipv4/netfilter/nf_conntrack_l3proto_ipv4_compat.c
@@ -208,35 +208,15 @@ static const struct file_operations ct_f
 /* expects */
 static void *exp_seq_start(struct seq_file *s, loff_t *pos)
 {
- struct list_head *e = &nf_conntrack_expect_list;
- loff_t i;
-
  /* strange seq_file api calls stop even if we fail,
   * thus we need to grab lock since stop unlocks */
  read_lock_bh(&nf_conntrack_lock);
-
- if (list_empty(e))
-  return NULL;
-
- for (i = 0; i <= *pos; i++) {
```

```
-  e = e->next;
-  if (e == &nf_conntrack_expect_list)
-   return NULL;
- }
- return e;
+ return seq_list_start(&nf_conntrack_expect_list, *pos);
 }

 static void *exp_seq_next(struct seq_file *s, void *v, loff_t *pos)
 {
- struct list_head *e = v;
-
- ++*pos;
- e = e->next;
-
- if (e == &nf_conntrack_expect_list)
-  return NULL;
-
- return e;
+ return seq_list_next(v, &nf_conntrack_expect_list, pos);
 }

 static void exp_seq_stop(struct seq_file *s, void *v)
@@ -246,7 +226,8 @@ static void exp_seq_stop(struct seq_file

 static int exp_seq_show(struct seq_file *s, void *v)
 {
- struct nf_conntrack_expect *exp = v;
+ struct nf_conntrack_expect *exp = list_entry(v,
+    struct nf_conntrack_expect, list);

   if (exp->tuple.src.l3num != AF_INET)
    return 0;
diff --git a/net/netfilter/nf_conntrack_expect.c b/net/netfilter/nf_conntrack_expect.c
index 117cbfd..7ea80e4 100644
--- a/net/netfilter/nf_conntrack_expect.c
+++ b/net/netfilter/nf_conntrack_expect.c
@@ -366,35 +366,15 @@ EXPORT_SYMBOL_GPL(nf_conntrack_expect_re
 #ifdef CONFIG_PROC_FS
 static void *exp_seq_start(struct seq_file *s, loff_t *pos)
 {
- struct list_head *e = &nf_conntrack_expect_list;
- loff_t i;
-
   /* strange seq_file api calls stop even if we fail,
    * thus we need to grab lock since stop unlocks */
   read_lock_bh(&nf_conntrack_lock);
-
```

```
- if (list_empty(e))
-  return NULL;
-
- for (i = 0; i <= *pos; i++) {
-  e = e->next;
-  if (e == &nf_conntrack_expect_list)
-   return NULL;
- }
- return e;
+ return seq_list_start(&nf_conntrack_expect_list, *pos);
 }

 static void *exp_seq_next(struct seq_file *s, void *v, loff_t *pos)
 {
- struct list_head *e = v;
-
- ++*pos;
- e = e->next;
-
- if (e == &nf_conntrack_expect_list)
-  return NULL;
-
- return e;
+ return seq_list_next(v, &nf_conntrack_expect_list, pos);
 }

 static void exp_seq_stop(struct seq_file *s, void *v)
@@ -404,7 +384,8 @@ static void exp_seq_stop(struct seq_file

 static int exp_seq_show(struct seq_file *s, void *v)
 {
- struct nf_conntrack_expect *expect = v;
+ struct nf_conntrack_expect *expect = list_entry(v,
+    struct nf_conntrack_expect, list);

   if (expect->timeout.function)
    seq_printf(s, "%ld ", timer_pending(&expect->timeout)
diff --git a/net/rxrpc/ar-proc.c b/net/rxrpc/ar-proc.c
index 1c0be0e..56a5317 100644
--- a/net/rxrpc/ar-proc.c
+++ b/net/rxrpc/ar-proc.c
@@ -30,31 +30,13 @@ static const char *rxrpc_conn_states[] =
  */
 static void *rxrpc_call_seq_start(struct seq_file *seq, loff_t *_pos)
 {
- struct list_head *_p;
- loff_t pos = *_pos;
-
```

```
  read_lock(&rxrpc_call_lock);
- if (!pos)
-  return SEQ_START_TOKEN;
- pos--;
-
- list_for_each(_p, &rxrpc_calls)
-  if (!pos--)
-   break;
-
- return _p != &rxrpc_calls ? _p : NULL;
+ return seq_list_start(&rxrpc_calls, *_pos);
 }

 static void *rxrpc_call_seq_next(struct seq_file *seq, void *v, loff_t *pos)
 {
- struct list_head *_p;
-
- (*pos)++;
-
- _p = v;
- _p = (v == SEQ_START_TOKEN) ? rxrpc_calls.next : _p->next;
-
- return _p != &rxrpc_calls ? _p : NULL;
+ return seq_list_next(v, &rxrpc_calls, pos);
 }

 static void rxrpc_call_seq_stop(struct seq_file *seq, void *v)
@@ -68,7 +50,7 @@ static int rxrpc_call_seq_show(struct se
  struct rxrpc_call *call;
  char lbuff[4 + 4 + 4 + 4 + 5 + 1], rbuff[4 + 4 + 4 + 4 + 5 + 1];

- if (v == SEQ_START_TOKEN) {
+ if (v == &rxrpc_calls) {
   seq_puts(seq,
     "Proto Local                Remote               "
     " SvID ConnID   CallID   End Use State    Abort   "
@@ -129,32 +111,14 @@ struct file_operations rxrpc_call_seq_fo
  */
 static void *rxrpc_connection_seq_start(struct seq_file *seq, loff_t *_pos)
 {
- struct list_head *_p;
- loff_t pos = *_pos;
-
  read_lock(&rxrpc_connection_lock);
- if (!pos)
-  return SEQ_START_TOKEN;
- pos--;
-
```

```
- list_for_each(_p, &rxrpc_connections)
-  if (!pos--)
-   break;
-
- return _p != &rxrpc_connections ? _p : NULL;
+ return seq_list_start(&rxrpc_connections, *_pos);
 }

 static void *rxrpc_connection_seq_next(struct seq_file *seq, void *v,
           loff_t *pos)
 {
- struct list_head *_p;
-
- (*pos)++;
-
- _p = v;
- _p = (v == SEQ_START_TOKEN) ? rxrpc_connections.next : _p->next;
-
- return _p != &rxrpc_connections ? _p : NULL;
+ return seq_list_next(v, &rxrpc_connections, pos);
 }

 static void rxrpc_connection_seq_stop(struct seq_file *seq, void *v)
@@ -168,7 +132,7 @@ static int rxrpc_connection_seq_show(str
  struct rxrpc_transport *trans;
  char lbuff[4 + 4 + 4 + 4 + 5 + 1], rbuff[4 + 4 + 4 + 4 + 5 + 1];

- if (v == SEQ_START_TOKEN) {
+ if (v == &rxrpc_connections) {
   seq_puts(seq,
     "Proto Local                Remote               "
     " SvID ConnID   Calls    End Use State    Key     "
```