Subject: [PATCH 2/12] L2 network namespace (v3): network devices virtualization
Posted by Mishin Dmitry on Wed, 17 Jan 2007 15:59:17 GMT
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Added ability to have per-namespace network devices.

Signed-off-by: Dmitry Mishin <dim@openvz.org>

---
include/linux/net_namespace.h | 8 +++-
include/linux/netdevice.h | 8 ++++
net/core/dev.c | 77 ++++++++++++++++++++++++++++++++++++++-------
net/core/net-sysfs.c | 23 ++++++++++++
net/core/net_namespace.c | 11 ++++++
5 files changed, 114 insertions(+), 13 deletions(-)

--- linux-2.6.20-rc4-mm1.net_ns.orig/include/linux/net_namespace.h
+++ linux-2.6.20-rc4-mm1.net_ns/include/linux/net_namespace.h
@@ -7,7 +7,9 @@
#include <linux/errno.h>

struct net_namespace {
- struct kref kref;
+ struct kref kref;
+ struct net_device *dev_base_p, **dev_tail_p;
+ unsigned int hash;
};

extern struct net_namespace init_net_ns;
@@ -60,6 +62,8 @@ static inline void pop_net_ns(struct net

#define net_ns_match(target, ns) ((target) == (ns))

+#define net_ns_hash(ns) ((ns)->hash)
+
#else /* CONFIG_NET_NS */

#define INIT_NET_NS(net_ns)
@@ -103,6 +107,8 @@ static inline void pop_net_ns(struct net

#define net_ns_match(target, ns) ((void)(ns), 1)

+#define net_ns_hash(ns) (0)
+
#endif /* !CONFIG_NET_NS */

#endif /* _LINUX_NET_NAMESPACE_H */
--- linux-2.6.20-rc4-mm1.net_ns.orig/include/linux/netdevice.h

```
+++ linux-2.6.20-rc4-mm1.net_ns/include/linux/netdevice.h
@@ -389,6 +389,7 @@ struct net_device
  int   promiscuity;
  int   allmulti;

+ struct net_namespace *net_ns;

  /* Protocol specific pointers */

@@ -567,9 +568,16 @@ struct packet_type {

 #include <linux/interrupt.h>
 #include <linux/notifier.h>
+#include <linux/net_namespace.h>

 extern struct net_device  loopback_dev;  /* The loopback */
+#ifndef CONFIG_NET_NS
 extern struct net_device  *dev_base;  /* All devices */
+#define dev_base_ns(dev)  dev_base
+#else
+#define dev_base   (current_net_ns->dev_base_p)
+#define dev_base_ns(dev)  (dev->net_ns->dev_base_p)
+#endif
 extern rwlock_t    dev_base_lock;  /* Device list lock */

 extern int    netdev_boot_setup_check(struct net_device *dev);
--- linux-2.6.20-rc4-mm1.net_ns.orig/net/core/dev.c
+++ linux-2.6.20-rc4-mm1.net_ns/net/core/dev.c
@@ -90,6 +90,7 @@
 #include <linux/if_ether.h>
 #include <linux/netdevice.h>
 #include <linux/etherdevice.h>
+#include <linux/net_namespace.h>
 #include <linux/notifier.h>
 #include <linux/skbuff.h>
 #include <net/sock.h>
@@ -174,20 +175,27 @@ static spinlock_t net_dma_event_lock;
  * unregister_netdevice(), which must be called with the rtnl
  * semaphore held.
  */
+#ifndef CONFIG_NET_NS
 struct net_device *dev_base;
 static struct net_device **dev_tail = &dev_base;
-DEFINE_RWLOCK(dev_base_lock);
-
+#define dev_tail_ns(dev) dev_tail
 EXPORT_SYMBOL(dev_base);
+#else
```

```
+#define dev_tail_ns(dev) (dev->net_ns->dev_tail_p)
+#endif
+
+DEFINE_RWLOCK(dev_base_lock);
 EXPORT_SYMBOL(dev_base_lock);

 #define NETDEV_HASHBITS 8
 static struct hlist_head dev_name_head[1<<NETDEV_HASHBITS];
 static struct hlist_head dev_index_head[1<<NETDEV_HASHBITS];

-static inline struct hlist_head *dev_name_hash(const char *name)
+static inline struct hlist_head *dev_name_hash(const char *name,
+       struct net_namespace *ns)
 {
  unsigned hash = full_name_hash(name, strnlen(name, IFNAMSIZ));
+ hash ^= net_ns_hash(ns);
  return &dev_name_head[hash & ((1<<NETDEV_HASHBITS)-1)];
 }

@@ -212,10 +220,12 @@ DEFINE_PER_CPU(struct softnet_data, soft
 extern int netdev_sysfs_init(void);
 extern int netdev_register_sysfs(struct net_device *);
 extern void netdev_unregister_sysfs(struct net_device *);
+extern int netdev_rename_sysfs(struct net_device *);
 #else
 #define netdev_sysfs_init()   (0)
 #define netdev_register_sysfs(dev) (0)
 #define netdev_unregister_sysfs(dev) do { } while(0)
+#define netdev_rename_sysfs(dev) (0)
 #endif


@@ -475,10 +485,13 @@ __setup("netdev=", netdev_boot_setup);
 struct net_device *__dev_get_by_name(const char *name)
 {
  struct hlist_node *p;
+ struct net_namespace *ns = current_net_ns;

- hlist_for_each(p, dev_name_hash(name)) {
+ hlist_for_each(p, dev_name_hash(name, ns)) {
    struct net_device *dev
     = hlist_entry(p, struct net_device, name_hlist);
+  if (!net_ns_match(dev->net_ns, ns))
+   continue;
    if (!strncmp(dev->name, name, IFNAMSIZ))
     return dev;
  }
@@ -751,10 +764,11 @@ int dev_change_name(struct net_device *d
```

```
  else
   strlcpy(dev->name, newname, IFNAMSIZ);

- err = device_rename(&dev->dev, dev->name);
+ err = netdev_rename_sysfs(dev);
  if (!err) {
   hlist_del(&dev->name_hlist);
-  hlist_add_head(&dev->name_hlist, dev_name_hash(dev->name));
+  hlist_add_head(&dev->name_hlist, dev_name_hash(dev->name,
+       current_net_ns));
   raw_notifier_call_chain(&netdev_chain,
     NETDEV_CHANGENAME, dev);
  }
@@ -1481,8 +1495,11 @@ gso:
   spin_lock(&dev->queue_lock);
   q = dev->qdisc;
   if (q->enqueue) {
+   struct net_namespace *orig_net_ns;
+   orig_net_ns = push_net_ns(dev->net_ns);
    rc = q->enqueue(skb, q);
    qdisc_run(dev);
+   pop_net_ns(orig_net_ns);
    spin_unlock(&dev->queue_lock);

   rc = rc == NET_XMIT_BYPASS ? NET_XMIT_SUCCESS : rc;
@@ -1678,7 +1695,10 @@ static void net_tx_action(struct softirq
    clear_bit(__LINK_STATE_SCHED, &dev->state);

    if (spin_trylock(&dev->queue_lock)) {
+    struct net_namespace *orig_net_ns;
+    orig_net_ns = push_net_ns(dev->net_ns);
     qdisc_run(dev);
+    pop_net_ns(orig_net_ns);
     spin_unlock(&dev->queue_lock);
    } else {
     netif_schedule(dev);
@@ -1765,6 +1785,7 @@ int netif_receive_skb(struct sk_buff *sk
 {
  struct packet_type *ptype, *pt_prev;
  struct net_device *orig_dev;
+ struct net_namespace *orig_net_ns;
  int ret = NET_RX_DROP;
  __be16 type;

@@ -1783,6 +1804,8 @@ int netif_receive_skb(struct sk_buff *sk
  if (!orig_dev)
   return NET_RX_DROP;
```

```
+ orig_net_ns = push_net_ns(skb->dev->net_ns);
+
  __get_cpu_var(netdev_rx_stat).total++;

  skb->h.raw = skb->nh.raw = skb->data;
@@ -1851,6 +1874,7 @@ ncls:

 out:
  rcu_read_unlock();
+ pop_net_ns(orig_net_ns);
  return ret;
 }

@@ -2878,6 +2902,7 @@ int register_netdevice(struct net_device
 {
  struct hlist_head *head;
  struct hlist_node *p;
+ struct net_namespace *ns;
  int ret;

  BUG_ON(dev_boot_phase);
@@ -2895,6 +2920,12 @@ int register_netdevice(struct net_device
  spin_lock_init(&dev->ingress_lock);
 #endif

+ ns = NULL;
+#ifdef CONFIG_NET_NS
+ BUG_ON(!dev->net_ns);
+ ns = dev->net_ns;
+#endif
+
  dev->iflink = -1;

  /* Init, if this function is available */
@@ -2917,10 +2948,12 @@ int register_netdevice(struct net_device
   dev->iflink = dev->ifindex;

  /* Check for existence of name */
- head = dev_name_hash(dev->name);
+ head = dev_name_hash(dev->name, ns);
  hlist_for_each(p, head) {
   struct net_device *d
    = hlist_entry(p, struct net_device, name_hlist);
+  if (!net_ns_match(d->net_ns, ns))
+   continue;
   if (!strncmp(d->name, dev->name, IFNAMSIZ)) {
    ret = -EEXIST;
     goto out;
```

```
@@ -2980,8 +3013,8 @@ int register_netdevice(struct net_device
  dev->next = NULL;
  dev_init_scheduler(dev);
  write_lock_bh(&dev_base_lock);
- *dev_tail = dev;
- dev_tail = &dev->next;
+ *dev_tail_ns(dev) = dev;
+ dev_tail_ns(dev) = &dev->next;
  hlist_add_head(&dev->name_hlist, head);
  hlist_add_head(&dev->index_hlist, dev_index_hash(dev->ifindex));
  dev_hold(dev);
@@ -3195,6 +3228,10 @@ struct net_device *alloc_netdev(int size
  if (sizeof_priv)
   dev->priv = netdev_priv(dev);

+#ifdef CONFIG_NET_NS
+ get_net_ns(current_net_ns);
+ dev->net_ns = current_net_ns;
+#endif
  setup(dev);
  strcpy(dev->name, name);
  return dev;
@@ -3211,6 +3248,15 @@ EXPORT_SYMBOL(alloc_netdev);
  */
 void free_netdev(struct net_device *dev)
 {
+#ifdef CONFIG_NET_NS
+ struct net_namespace *ns;
+
+ ns = dev->net_ns;
+ if (ns != NULL) {
+  put_net_ns(ns);
+  dev->net_ns = NULL;
+ }
+#endif
 #ifdef CONFIG_SYSFS
  /*  Compatibility with error handling in drivers */
  if (dev->reg_state == NETREG_UNINITIALIZED) {
@@ -3221,6 +3267,13 @@ void free_netdev(struct net_device *dev)
  BUG_ON(dev->reg_state != NETREG_UNREGISTERED);
  dev->reg_state = NETREG_RELEASED;

+#ifdef CONFIG_NET_NS
+ if (ns != NULL && ns != &init_net_ns) {
+  kfree((char *)dev - dev->padded);
+  return;
+ }
+#endif
```

```
+
  /* will free via device release */
  put_device(&dev->dev);
 #else
@@ -3268,13 +3321,13 @@ int unregister_netdevice(struct net_devi
   dev_close(dev);

  /* And unlink it from device chain. */
- for (dp = &dev_base; (d = *dp) != NULL; dp = &d->next) {
+ for (dp = &dev_base_ns(dev); (d = *dp) != NULL; dp = &d->next) {
   if (d == dev) {
    write_lock_bh(&dev_base_lock);
    hlist_del(&dev->name_hlist);
    hlist_del(&dev->index_hlist);
-   if (dev_tail == &dev->next)
-    dev_tail = dp;
+   if (dev_tail_ns(dev) == &dev->next)
+    dev_tail_ns(dev) = dp;
    *dp = d->next;
    write_unlock_bh(&dev_base_lock);
    break;
--- linux-2.6.20-rc4-mm1.net_ns.orig/net/core/net-sysfs.c
+++ linux-2.6.20-rc4-mm1.net_ns/net/core/net-sysfs.c
@@ -453,6 +453,12 @@ static struct class net_class = {

 void netdev_unregister_sysfs(struct net_device * net)
 {
+#ifdef CONFIG_NET_NS
+ if (net->net_ns != &init_net_ns)
+  /* not supported yet: sysfs virtualization is required */
+  return;
+#endif
+
  device_del(&(net->dev));
 }

@@ -462,6 +468,12 @@ int netdev_register_sysfs(struct net_dev
  struct device *dev = &(net->dev);
  struct attribute_group **groups = net->sysfs_groups;

+#ifdef CONFIG_NET_NS
+ if (net->net_ns != &init_net_ns)
+  /* not supported yet: sysfs virtualization is required */
+  return 0;
+#endif
+
  device_initialize(dev);
  dev->class = &net_class;
```

```
  dev->platform_data = net;
@@ -481,6 +493,17 @@ int netdev_register_sysfs(struct net_dev
  return device_add(dev);
 }

+int netdev_rename_sysfs(struct net_device *net)
+{
+#ifdef CONFIG_NET_NS
+ if (net->net_ns != &init_net_ns)
+  /* not supported yet: sysfs virtualization is required */
+  return 0;
+#endif
+
+ return device_rename(&net->dev, net->name);
+}
+
 int netdev_sysfs_init(void)
 {
  return class_register(&net_class);
--- linux-2.6.20-rc4-mm1.net_ns.orig/net/core/net_namespace.c
+++ linux-2.6.20-rc4-mm1.net_ns/net/core/net_namespace.c
@@ -9,11 +9,14 @@
 #include <linux/version.h>
 #include <linux/nsproxy.h>
 #include <linux/net_namespace.h>
+#include <linux/net.h>

 struct net_namespace init_net_ns = {
  .kref = {
   .refcount = ATOMIC_INIT(2),
  },
+ .dev_base_p = NULL,
+ .dev_tail_p = &init_net_ns.dev_base_p,
 };

 #ifdef CONFIG_NET_NS
@@ -35,6 +38,9 @@ static struct net_namespace *clone_net_n
   return NULL;

  kref_init(&ns->kref);
+ ns->dev_base_p = NULL;
+ ns->dev_tail_p = &ns->dev_base_p;
+ ns->hash = net_random();
  return ns;
 }

@@ -73,6 +79,11 @@ void free_net_ns(struct kref *kref)
  struct net_namespace *ns;
```

```
  ns = container_of(kref, struct net_namespace, kref);
+ if (ns->dev_base_p != NULL) {
+  printk("NET_NS: BUG: namespace %p has devices! ref %d\n",
+    ns, atomic_read(&ns->kref.refcount));
+  return;
+ }
  kfree(ns);
 }
```

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