Subject: Re: L2 network namespaces + macvlan performances
Posted by Daniel Lezcano on Sat, 07 Jul 2007 11:39:32 GMT
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Benjamin Thery wrote:
> Following a discussion we had at OLS concerning L2 network namespace
> performances and how the new macvlan driver could potentially improve
> them, I've ported the macvlan patchset on top of Eric's net namespace
> patchset on 2.6.22-rc4-mm2.
>
> A little bit of history:
>
> Some months ago, when we ran some performance tests (using netperf)
> on net namespace, we observed the following things:
>
> Using 'etun', the virtual ethernet tunnel driver, and IP routes
> from inside a network namespace,
>
> - The throughput is the same as the "normal" case(*)
> (* normal case: no namespace, using physical adapters).
> No regression. Good.
>
> - But the CPU load increases a lot. Bad.
> The reasons are:
> - All checksums are done in software. No hardware offloading.
> - Every TCP packets going through the etun devices are
> duplicated in ip_forward() before we decrease the ttl.
> (packets are routed between both ends of etun)
>
> We also made some testing with bridges, and obtained the same results:
> CPU load increase:
> - No hardware offloading
> - Packets are duplicated somewhere in the bridge+netfilter
> code (can't remember where right now)
>
>
> This time, I've replaced the etun interface by the new macvlan,
> which should benefits from the hardware offloading capabilities of the
> physical adapter and suppress the forwarding stuff.
>
> My test setup is:
>
> Host A Host B
> _____ _____
> | _____ | | |
> | | Netns 1 | | | |
> | | | | | |
> | | macvlan0| | | |

```
> | |___|_____|  |         |          |
> |     |       |         |          |
> |_____|_______|         |__________|
>       | eth0 (192.168.0.2)     | eth0 (192.168.0.1)
>       |                        |
> ----------------------------------------
> macvlan0 (192.168.0.3)
```

> - netperf runs on host A
> - netserver runs on host B
> - Adapters speed is 1GB/s
>
> On this setup I ran the following netperf tests: TCP_STREAM, TCP_MAERTS,
> TCP_RR, UDP_STREAM, UDP_RR.
>
> Between the "normal" case and the "net namespace + macvlan" case,
> results are about the same for both the throughput and the local CPU
> load for the following test types: TCP_MAERTS, TCP_RR, UDP_STREAM, UDP_RR.
>
> macvlan looks like a very good candidate for network namespace in these
> cases.
>
> But, with the TCP_STREAM test, I observed the CPU load is about the
> same (that's what we wanted) but the throughput decreases by about 5%:
> from 850MB/s down to 810MB/s.
> I haven't investigated yet why the throughput decrease in the case.
> Does it come from my setup, from macvlan additional treatments, other? I
> don't know yet
>
> Attached to this email you'll find the raw netperf outputs for the three
> cases:
>
> - netperf through a physical adapter, no namespace:
> netperf-results-2.6.22-rc4-mm2-netns1-vanilla.txt
> - netperf through etun, inside a namespace:
> netperf-results-2.6.22-rc4-mm2-netns1-using-etun.txt
> - netperf through macvlan, inside a namespace:
> netperf-results-2.6.22-rc4-mm2-netns1-using-macvlan.txt
>
>
> macvlan looks promising.
>
> Regards,
> Benjamin

Very interesting.
Thank you very much Benjamin for investigating this.
I will update the http://lxc.sf.net web site with your description and

results.

```
> ----------------------------------------------------------------------
>
> NETPERF RESULTS: the "normal" case :
> ====================================
> No network namespace, traffic goes through real 1GB/s physical adapters.
>
> ------------------------------------------------
> TCP STREAM TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 192.168.76.1 (192.168.76.1) port
0 AF_INET : +/-2.5% @ 95% conf.
> Recv   Send    Send                          Utilization       Service Demand
> Socket Socket  Message  Elapsed              Send     Recv     Send    Recv
> Size   Size    Size     Time     Throughput  local    remote   local   remote
> bytes  bytes   bytes    secs.    10^6bits/s  % S      % S      us/KB   us/KB
>
>  87380  16384   1400    20.03       857.39   6.39     9.75     2.444   3.727
> ------------------------------------------------
>
> ------------------------------------------------
> TCP MAERTS TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 192.168.76.1 (192.168.76.1) port
0 AF_INET : +/-2.5% @ 95% conf.
> Recv   Send    Send                          Utilization       Service Demand
> Socket Socket  Message  Elapsed              Send     Recv     Send    Recv
> Size   Size    Size     Time     Throughput  local    remote   local   remote
> bytes  bytes   bytes    secs.    10^6bits/s  % S      % S      us/KB   us/KB
>
>  87380  16384  87380    20.03       763.15   4.75     10.33    2.038   4.434
> ------------------------------------------------
>
> ------------------------------------------------
> TCP REQUEST/RESPONSE TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 192.168.76.1
(192.168.76.1) port 0 AF_INET : +/-2.5% @ 95% conf.
> Local /Remote
> Socket Size   Request Resp.  Elapsed Trans.   CPU    CPU    S.dem   S.dem
> Send   Recv   Size    Size   Time    Rate     local  remote local   remote
> bytes  bytes  bytes   bytes  secs.   per sec  % S    % S    us/Tr   us/Tr
>
> 16384  87380  1       1      20.00   12594.24  4.16   6.06   13.212  19.231
> 16384  87380
> ------------------------------------------------
>
> ------------------------------------------------
> UDP UNIDIRECTIONAL SEND TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 192.168.76.1
(192.168.76.1) port 0 AF_INET : +/-2.5% @ 95% conf.
> Socket  Message  Elapsed      Messages                  CPU      Service
> Size    Size     Time         Okay Errors   Throughput   Util     Demand
```

```
> bytes   bytes    secs          #      #   10^6bits/sec % SS     us/KB
>
> 110592    1400   20.00     1701653      0      952.9     6.84     2.354
> 107520          20.00     1701647           952.9     9.66     3.321
>
> ------------------------------------------------
>
> ------------------------------------------------
> UDP REQUEST/RESPONSE TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 192.168.76.1
(192.168.76.1) port 0 AF_INET : +/-2.5% @ 95% conf.
> Local /Remote
> Socket Size   Request Resp.  Elapsed Trans.   CPU    CPU    S.dem   S.dem
> Send   Recv   Size    Size   Time     Rate     local  remote local   remote
> bytes  bytes  bytes   bytes  secs.   per sec  % S    % S    us/Tr   us/Tr
>
> 110592 110592 1       1      20.00   13789.92   3.82   6.16   11.087  17.855
> 107520 107520
> ------------------------------------------------
>
>
>
> ---------------------------------------------------------------------
>
> NETPERF RESULTS: the etun case :
> ====================================
> netperf is ran from a network namespace,
> traffic goes through etun adapters.
>
> ------------------------------------------------
> TCP STREAM TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 192.168.76.1 (192.168.76.1) port
0 AF_INET : +/-2.5% @ 95% conf.
> Recv   Send    Send                          Utilization       Service Demand
> Socket Socket  Message  Elapsed              Send     Recv     Send    Recv
> Size   Size    Size     Time     Throughput  local    remote   local   remote
> bytes  bytes   bytes    secs.    10^6bits/s  % S      % U      us/KB   us/KB
>
>  87380  16384   1400    40.02       840.64   12.89    -1.00    5.025   -1.000
> ------------------------------------------------
>
> ------------------------------------------------
> TCP MAERTS TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 192.168.76.1 (192.168.76.1) port
0 AF_INET : +/-2.5% @ 95% conf.
> Recv   Send    Send                          Utilization       Service Demand
> Socket Socket  Message  Elapsed              Send     Recv     Send    Recv
> Size   Size    Size     Time     Throughput  local    remote   local   remote
> bytes  bytes   bytes    secs.    10^6bits/s  % S      % U      us/KB   us/KB
>
>  87380  16384  87380    40.03       763.30   6.29     -1.00    2.701   -1.000
```

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> ------------------------------------------------
>
> ------------------------------------------------
> TCP REQUEST/RESPONSE TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 192.168.76.1
(192.168.76.1) port 0 AF_INET : +/-2.5% @ 95% conf.
> Local /Remote
> Socket Size   Request Resp.  Elapsed Trans.   CPU    CPU    S.dem   S.dem
> Send   Recv   Size    Size   Time    Rate     local  remote local   remote
> bytes  bytes  bytes   bytes  secs.   per sec  % S    % U    us/Tr   us/Tr
>
> 16384  87380  1       1      40.00   12230.34  4.64   -1.00  15.167  -1.000
> 16384  87380
> ------------------------------------------------
>
> ------------------------------------------------
> UDP UNIDIRECTIONAL SEND TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 192.168.76.1
(192.168.76.1) port 0 AF_INET : +/-2.5% @ 95% conf.
> Socket  Message  Elapsed      Messages                CPU      Service
> Size    Size     Time         Okay Errors   Throughput   Util     Demand
> bytes   bytes    secs           #      #   10^6bits/sec % SU     us/KB
>
> 110592    1400   40.00     12981742      0     3634.7     25.64    8.801
> 107520           40.00     3409123             954.5     -1.00    -1.000
>
> ------------------------------------------------
>
> ------------------------------------------------
> UDP REQUEST/RESPONSE TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 192.168.76.1
(192.168.76.1) port 0 AF_INET : +/-2.5% @ 95% conf.
> Local /Remote
> Socket Size   Request Resp.  Elapsed Trans.   CPU    CPU    S.dem   S.dem
> Send   Recv   Size    Size   Time    Rate     local  remote local   remote
> bytes  bytes  bytes   bytes  secs.   per sec  % S    % U    us/Tr   us/Tr
>
> 110592 110592 1       1      40.00   13385.96   4.22   -1.00  12.658  -1.000
> 107520 107520
> ------------------------------------------------
>
>
>
> ---------------------------------------------------------------------
>
> NETPERF RESULTS: the "normal" case :
> ====================================
> netperf is ran from a network namespace,
> traffic goes through a macvlan adapter.
>
> ------------------------------------------------
```

```
> TCP STREAM TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 192.168.76.1 (192.168.76.1) port
0 AF_INET : +/-2.5% @ 95% conf.
> Recv   Send    Send                          Utilization       Service Demand
> Socket Socket  Message  Elapsed              Send     Recv     Send    Recv
> Size   Size    Size     Time     Throughput  local    remote   local   remote
> bytes  bytes   bytes    secs.    10^6bits/s  % S      % S      us/KB   us/KB
>
>  87380  16384   1400    20.03      817.40   7.26     12.96    2.912   5.200
> ------------------------------------------------
>
> ------------------------------------------------
> TCP MAERTS TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 192.168.76.1 (192.168.76.1) port
0 AF_INET : +/-2.5% @ 95% conf.
> Recv   Send    Send                          Utilization       Service Demand
> Socket Socket  Message  Elapsed              Send     Recv     Send    Recv
> Size   Size    Size     Time     Throughput  local    remote   local   remote
> bytes  bytes   bytes    secs.    10^6bits/s  % S      % S      us/KB   us/KB
>
>  87380  16384  87380    20.03      763.33   4.95     10.32    2.127   4.429
> ------------------------------------------------
>
> ------------------------------------------------
> TCP REQUEST/RESPONSE TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 192.168.76.1
(192.168.76.1) port 0 AF_INET : +/-2.5% @ 95% conf.
> Local /Remote
> Socket Size   Request Resp.  Elapsed Trans.   CPU    CPU    S.dem   S.dem
> Send   Recv   Size    Size   Time     Rate     local  remote local   remote
> bytes  bytes  bytes   bytes  secs.    per sec  % S    % S    us/Tr   us/Tr
>
> 16384  87380  1       1      20.00   12448.36  4.34   6.21   13.950  19.939
> 16384  87380
> ------------------------------------------------
>
> ------------------------------------------------
> UDP UNIDIRECTIONAL SEND TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 192.168.76.1
(192.168.76.1) port 0 AF_INET : +/-2.5% @ 95% conf.
> Socket  Message  Elapsed      Messages                  CPU      Service
> Size    Size     Time         Okay Errors   Throughput   Util     Demand
> bytes   bytes    secs           #      #   10^6bits/sec % SS     us/KB
>
> 110592    1400   20.00     1704200      0      954.3     7.11     2.440
> 107520           20.00     1704194             954.3     9.66     3.318
>
> ------------------------------------------------
>
> ------------------------------------------------
> UDP REQUEST/RESPONSE TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 192.168.76.1
(192.168.76.1) port 0 AF_INET : +/-2.5% @ 95% conf.
```

> Local /Remote
> Socket Size Request Resp. Elapsed Trans. CPU CPU S.dem S.dem
> Send Recv Size Size Time Rate local remote local remote
> bytes bytes bytes bytes secs. per sec % S % S us/Tr us/Tr
>
> 110592 110592 1 1 20.00 13751.49 3.98 6.09 11.625 17.788
> 107520 107520
> ----------
>

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