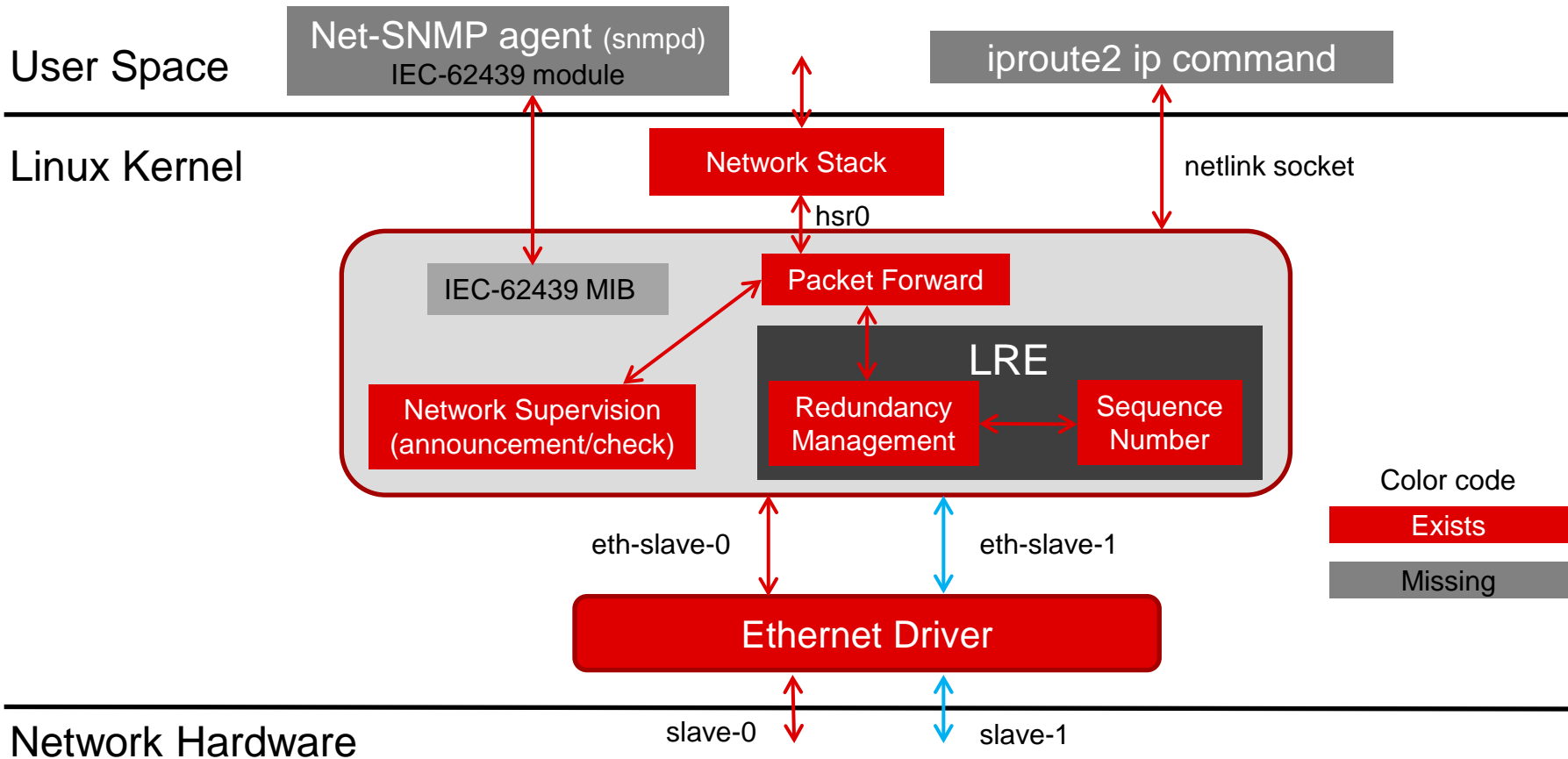


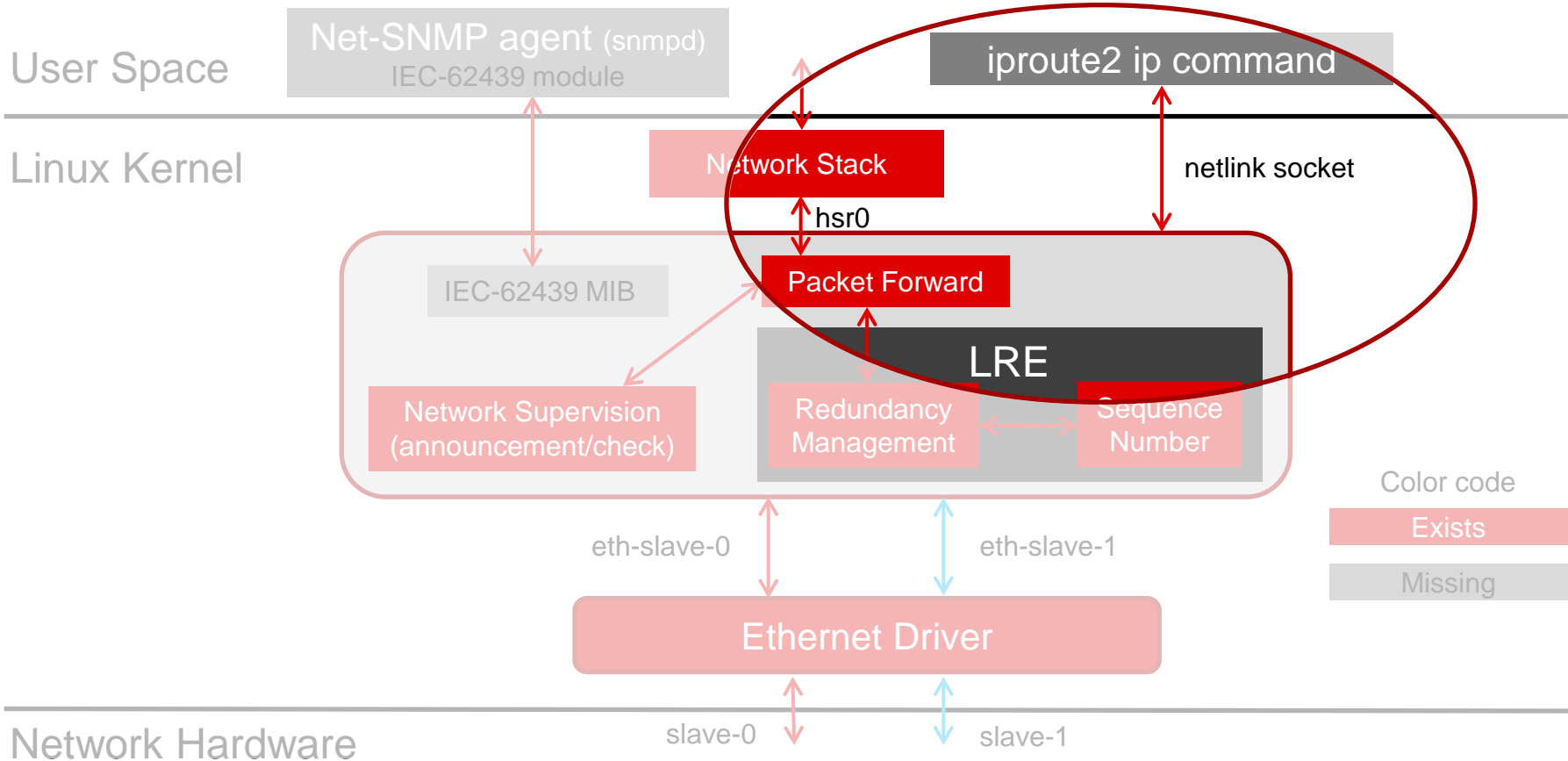
HSR and PRP Redundancy on RT Linux

Part 4: Linux Commands

Linux commands to create link



Linux commands to create link



Start by configuring the ports

User Space

IEC61850 Application

Linux Kernel

Network Stack

Ethernet Driver

Network Hardware

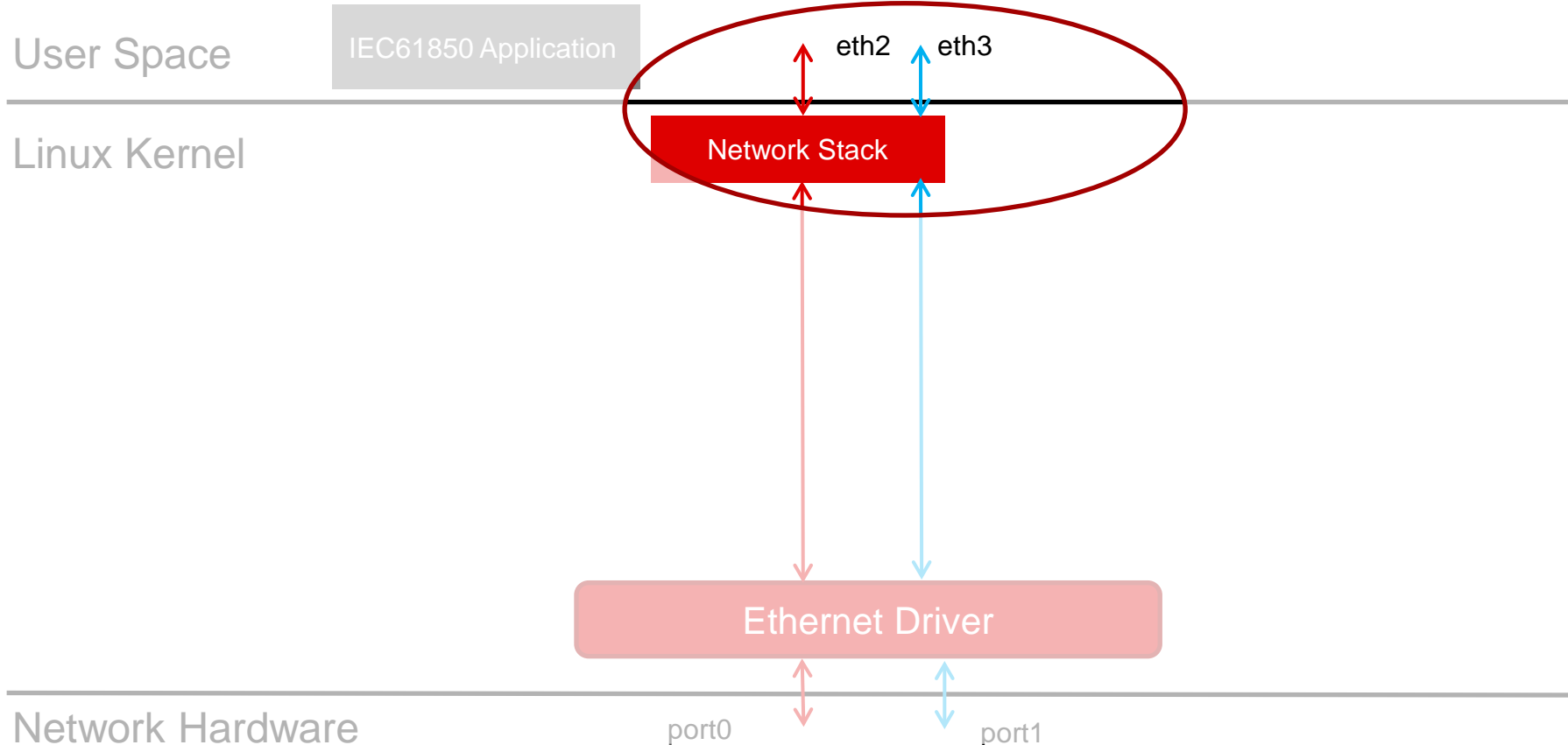
port0

port1

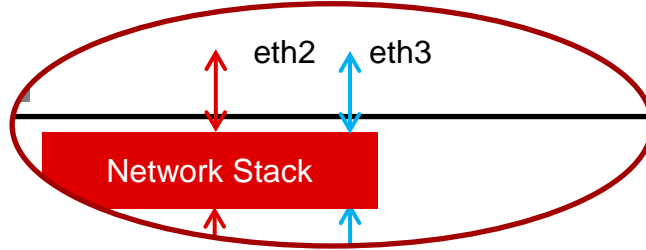
eth2

eth3

Start by configuring the ports

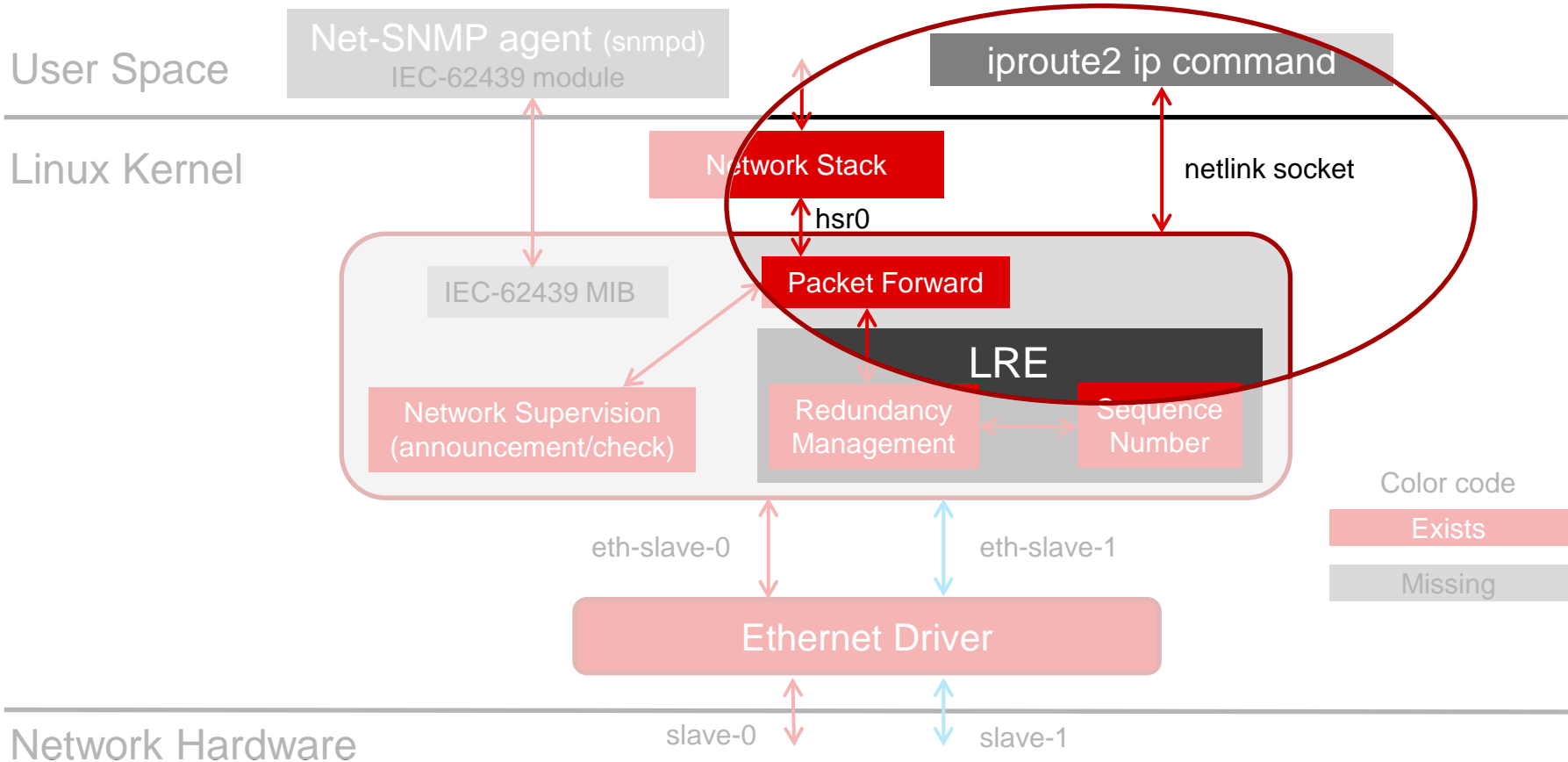


Start by configuring the ports

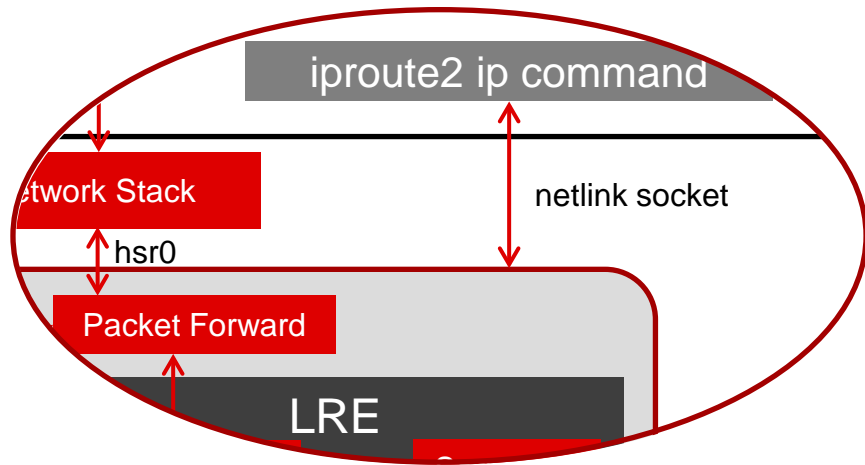


1. Take the interfaces down to change their properties
2. Make the MACs the same for both ports
3. Bring the interfaces back up

Linux commands to create link



Linux commands to create link



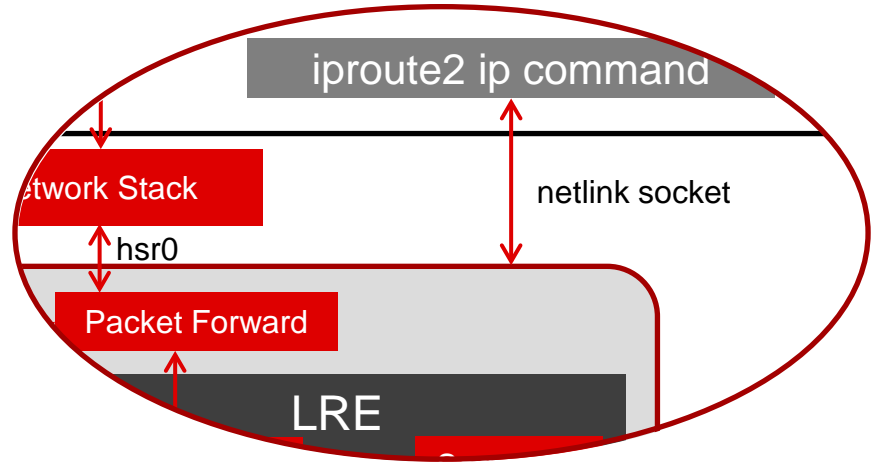
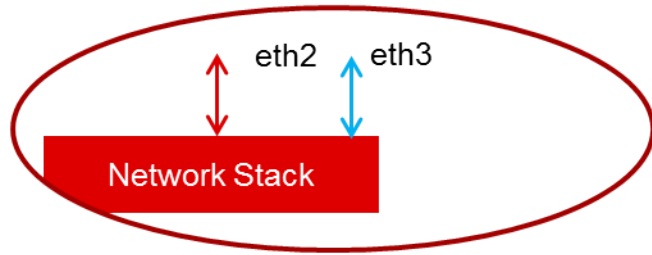
1. Use the IP command to add a new HSR or PRP link

```
ip link add name hsr0 type hsr slave1 eth2 slave2 eth3 supervision 45 version 1  
or
```

```
ip link add name prp0 type prp slave1 eth2 slave2 eth3 supervision 45
```

2. Use ifconfig to set IP Address of hsr0 or prp0

Linux commands to create link

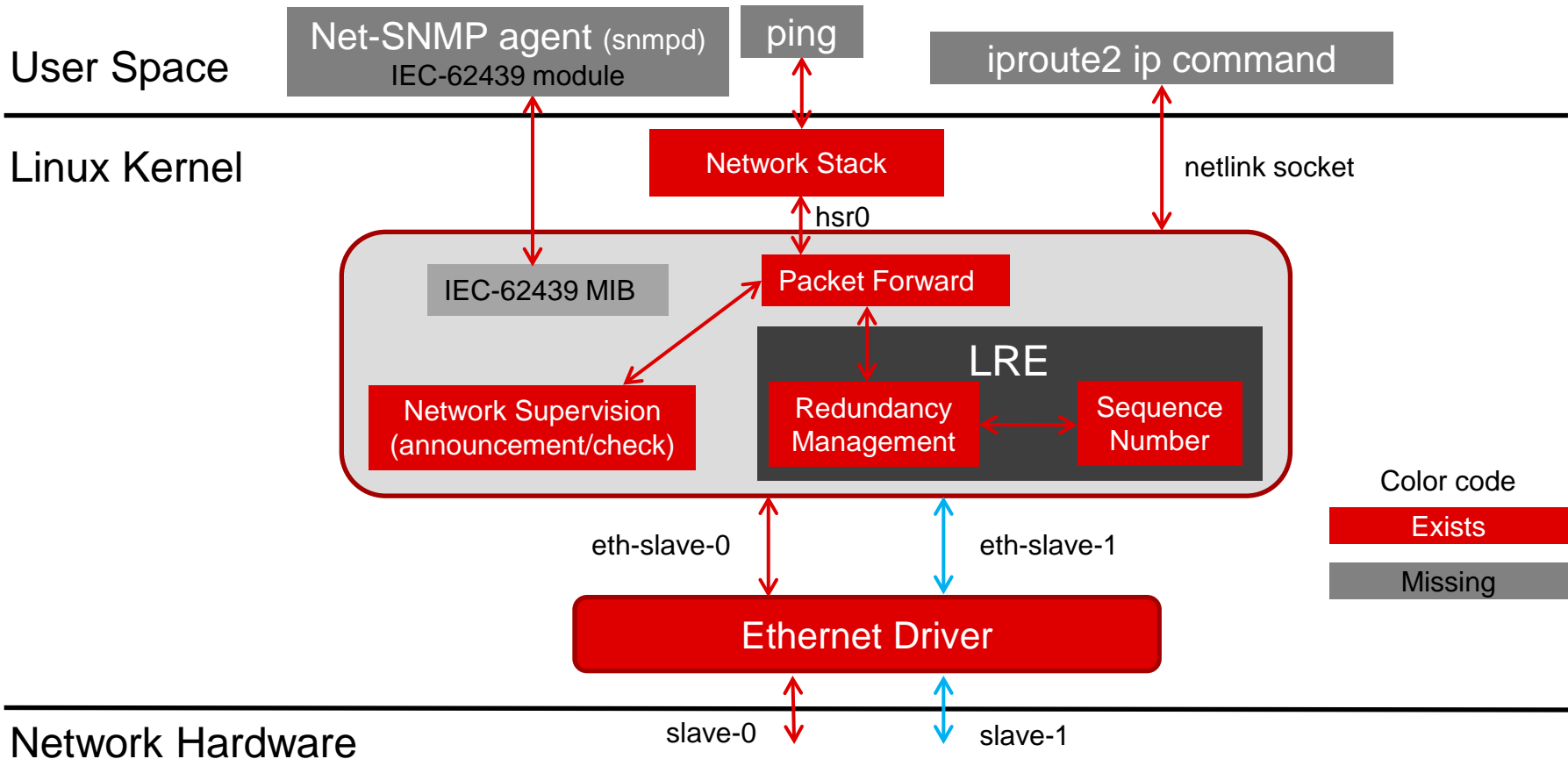


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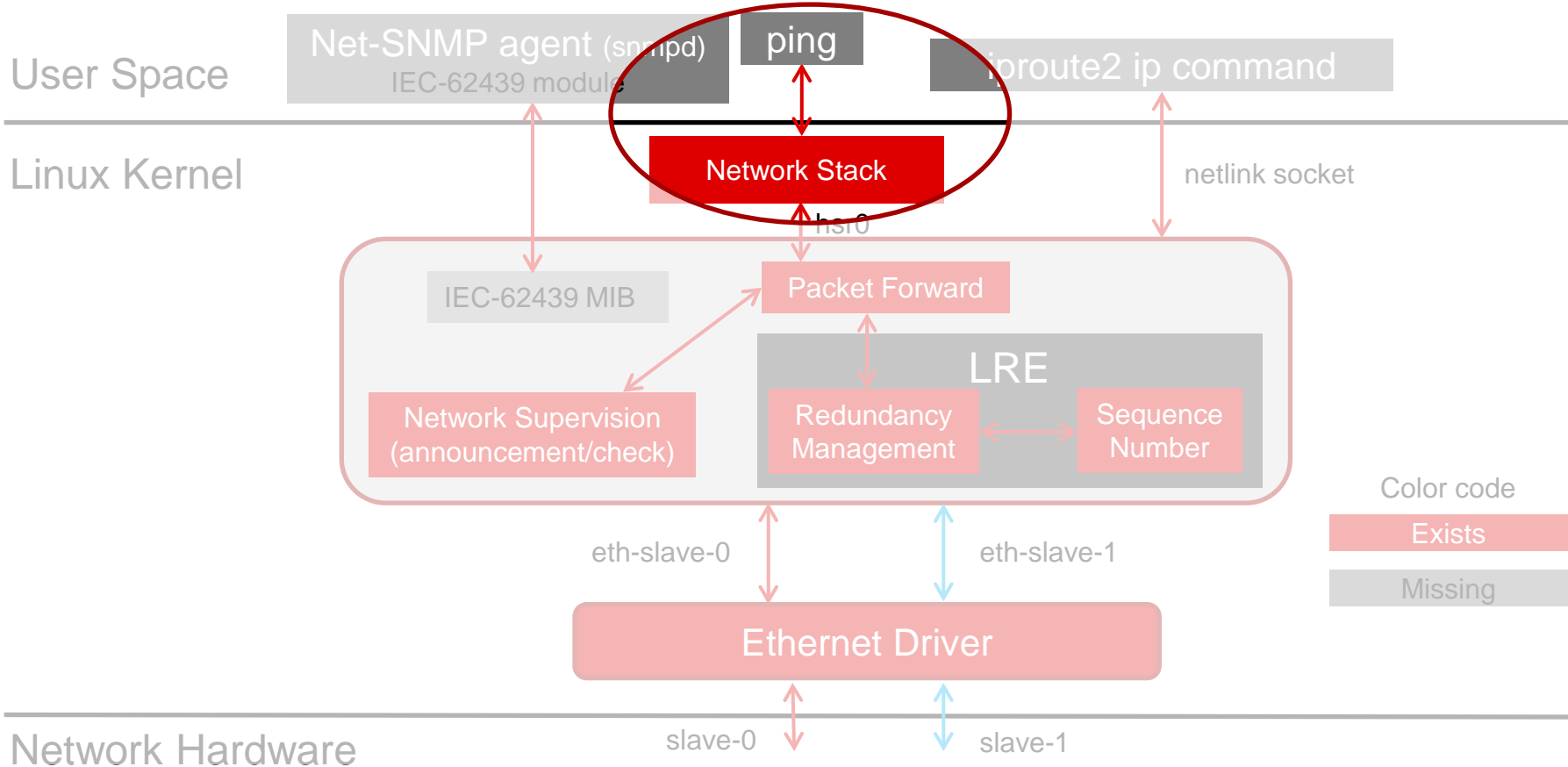
```
ip link add name hsr0 type hsr slave1 eth2 slave2 eth3 supervision 45 version 1  
or  
ip link add name prp0 type prp slave1 eth2 slave2 eth3 supervision 45
```

2. Use ifconfig to set IP Address of hsr0 or prp0 and bring it up

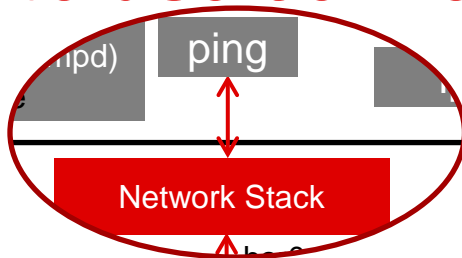
Use standard tools to use connection



Use standard tools to use connection

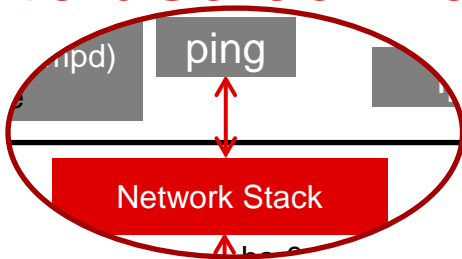


Use standard tools to use connection



1. ping can be used to test connections
2. iperf can be used to measure bandwidth and validate stability
3. HSR/PRP treated as any other eth interface, but with redundancy

Use standard tools to use connection



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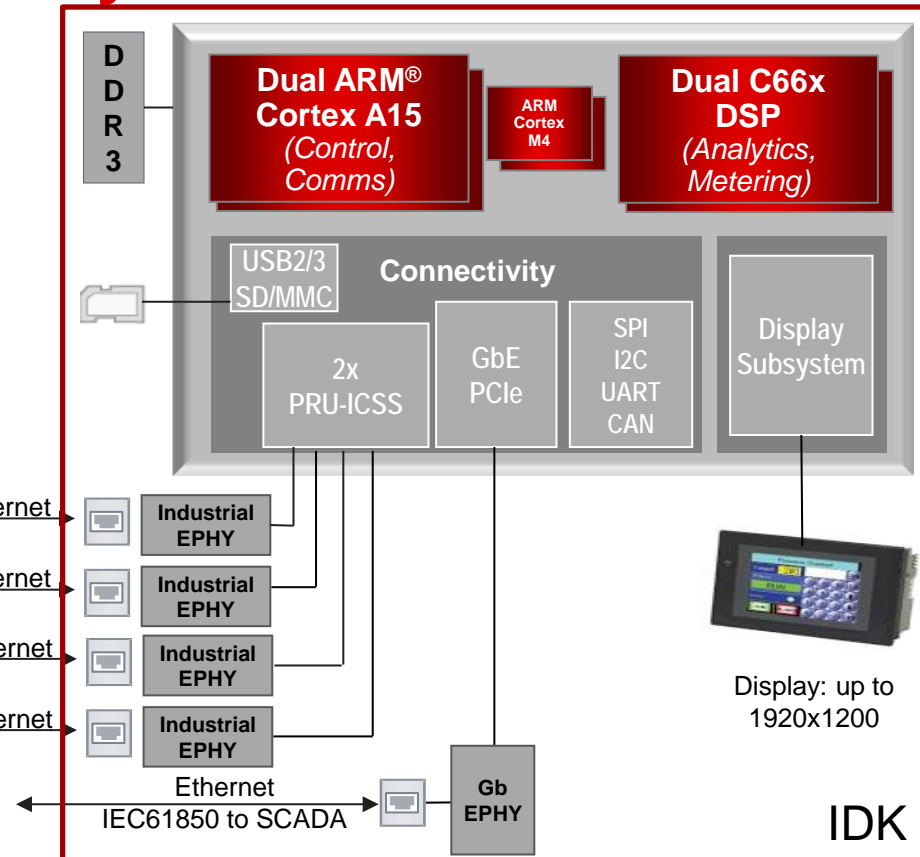
What should happen if one of the Ethernet cables gets disconnected?



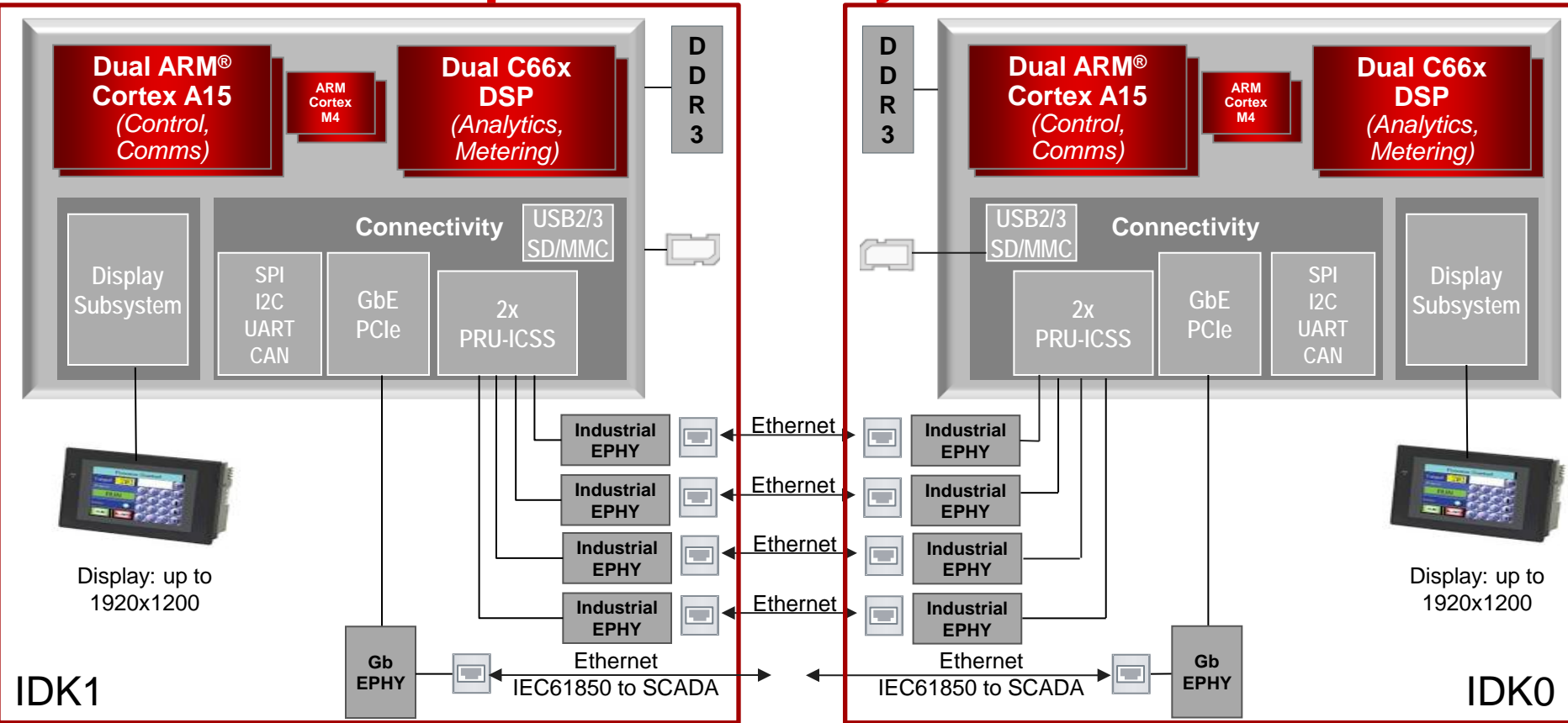
Demonstration possible today with AM57xx IDKs



IEC61850



Demonstration possible today with 2 AM57xx IDKs



Other useful commands

- `cat /sys/kernel/debug/hsr/stats`

- Example output:

Stats entries

`cnt_tx_a = 533`

`cnt_tx_b = 538`

`cnt_tx_c = 77`

`cnt_rx_wrong_lan_a = 0`

`cnt_rx_wrong_lan_b = 0`

`cnt_rx_a = 268`

`cnt_rx_b = 253`

`cnt_rx_c = 34`

`cnt_rx_errors_a = 7`

`cnt_rx_errors_b = 22`

`cnt_own_rx_a = 0`

`cnt_own_rx_b = 0`

- `cat /sys/kernel/debug/hsr/node_table`

- Example output:

MAC-Address-A c2:73:c2:b9:1c:c8

MAC-Address-B 00:00:00:00:00:00

time_in[A] 0x49c4ba4

time_in[B] 0x49c4ba4

address-B port 0x0

Section summary

- Standard Linux commands/tools are used to create and manage HSR/PRP
- Standard tools like ping/iperf can be used to test these interfaces
- This capability is available today and can be shown on AM57xx SDKs
- The HSR driver provides some useful statistics and node_table information
- If the cable gets “disconnected”, the packets keep flowing

For more information

- HSR and PRP on RT Linux Training Series: <http://training.ti.com/hsr-prp-rt-linux-training-series>
- Sitara Processors Product Overview: <http://www.ti.com/sitara>
- AM571x Industrial Development Kit (IDK): <http://www.ti.com/tool/tmdxidek5718>
- AM572x Industrial Development Kit (IDK): <http://www.ti.com/tool/tmdxidek5728>
- Processor SDK Software Developer Guides:
 - Linux: http://processors.wiki.ti.com/index.php/Processor_SDK_Linux_Software_Developer's_Guide
 - RTOS: http://processors.wiki.ti.com/index.php/Processor_SDK_RTOS_Software_Developer_Guide
- PRP TI Design using TI-RTOS: <http://www.ti.com/tool/tidep0054>
- HSR TI Design using TI-RTOS: <http://www.ti.com/tool/tidep0053>
- For questions regarding topics covered in this training, visit the Sitara Processors support forum at the TI E2E Community website: https://e2e.ti.com/support/arm/sitara_arm/f/791