

NCS 5500: Lebensdauer eines Pakets(Übertragung, Stanzen/Injizieren, Ping-Pfad)

Inhalt

[Einleitung](#)

[Lebensdauer eines Pakets in Weiterleitungs-ASIC](#)

[Pipeline Forwarding-ASIC](#)

[IRPP \(Port-Begriff, Parser\)](#)

[Punt-Pfad](#)

[Punt-Pfad zwischen zwei CPU-Knoten](#)

[Punt-Pfad von NPU zu RP-CPU](#)

[Injizieren von RP-CPU zu NPU oder LC-CPU](#)

[Injection-Pfad von LC-CPU zu NPU](#)

[CLI für Punt/Inject Debugging](#)

[Remote-Ping](#)

[Paketpfad: Echoanforderung](#)

[Paketpfad: Echoantwort](#)

[Lokaler Ping](#)

[Paketpfad: Echoanforderung](#)

[Paketpfad: Echoantwort](#)

[Hilfreiche Fehlersuche:](#)

[Topologie](#)

[Befehle zum Überprüfen von Remote Ping](#)

[Echoanforderung: Lokaler RP: TX](#)

[Echoanforderung: Remote-LC: RX](#)

[Echo-Antwort: Remote-Knoten \(LC\): TX](#)

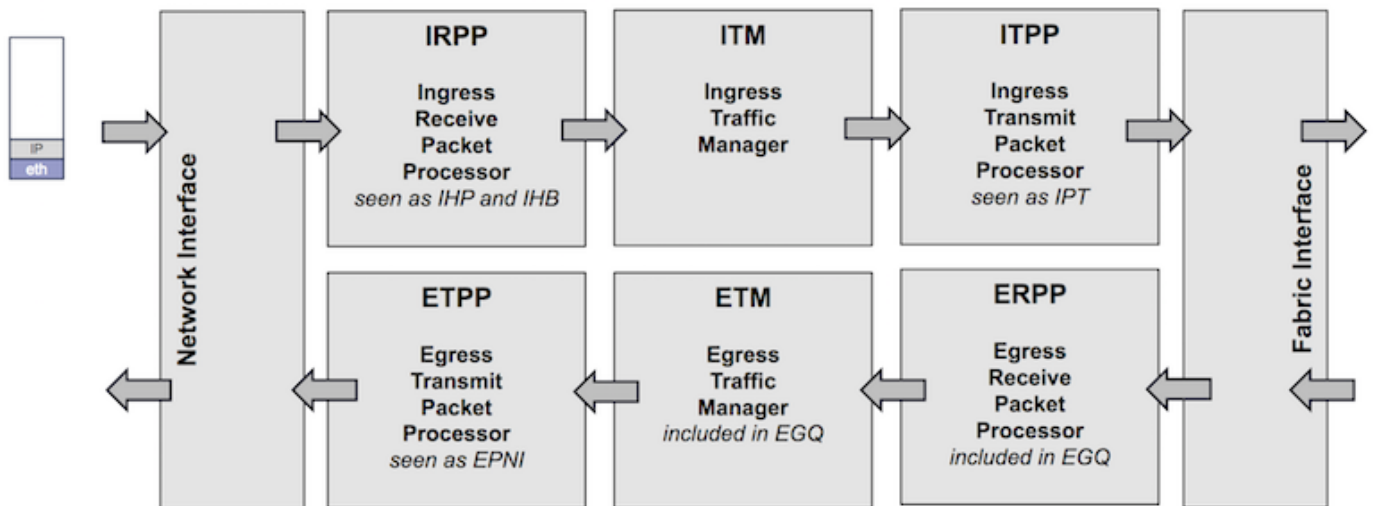
[Echo-Antwort: Lokaler Knoten \(LC\): RX](#)

[Lokaler Ping](#)

Einleitung

Dieses Dokument beschreibt den Pfad, über den ICMP-Echo-Anfragen/Echo-Antworten-Pakete in NCS55xx(Fretta) aufgenommen werden.

Lebensdauer eines Pakets in Weiterleitungs-ASIC



IRPP

Ein Paket wird über eine Schnittstelle empfangen und an IRPP weitergeleitet, wo die ersten 128 Bytes extrahiert und verarbeitet werden. Dadurch wird dem internen System-Header der Header vorangestellt.

ITM

Das Paket wird in DRAM/OCB gespeichert.

ITPP

Bei Bedarf den System-Header neu schreiben (Multicast-Replikation, Port-Spiegelung usw.)

Pakete werden in Zellen aufgeteilt und auf Fabric lastausgeglichen

ERPP

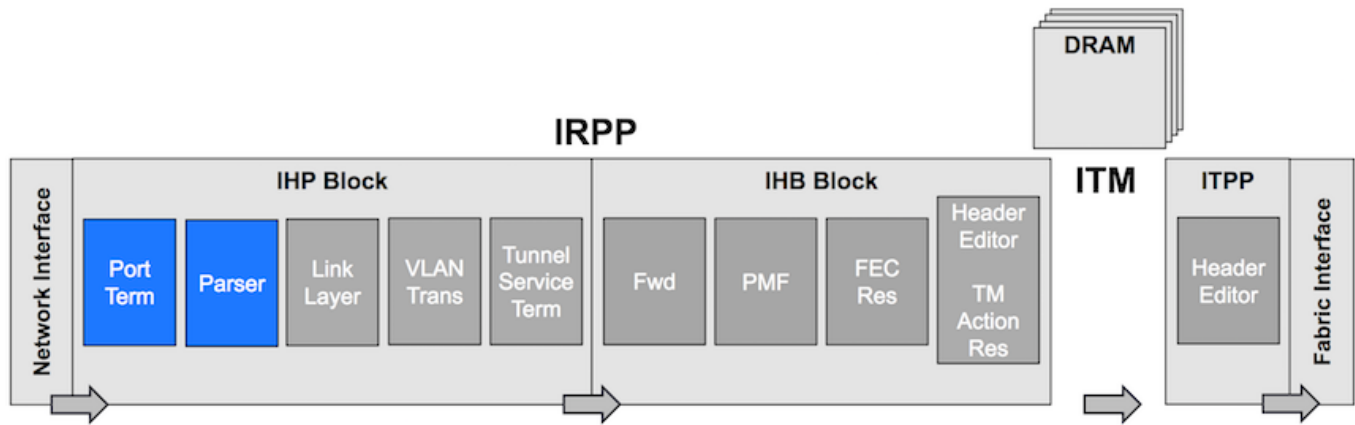
Zellen werden aufgenommen und wieder zusammengesetzt. Die ersten 128 Byte werden extrahiert und wenden alle Link-Layer-Filter, die Ausgangs-ACL und die Ausgangs-Replikation (Multicast) an.

ETPP/ETM

Das gesamte Paket wird in einem Puffer gespeichert, bis der Paketablauf geplant ist. System-Header werden entfernt.

Pipeline Forwarding-ASIC

IRPP (Port-Begriff, Parser)

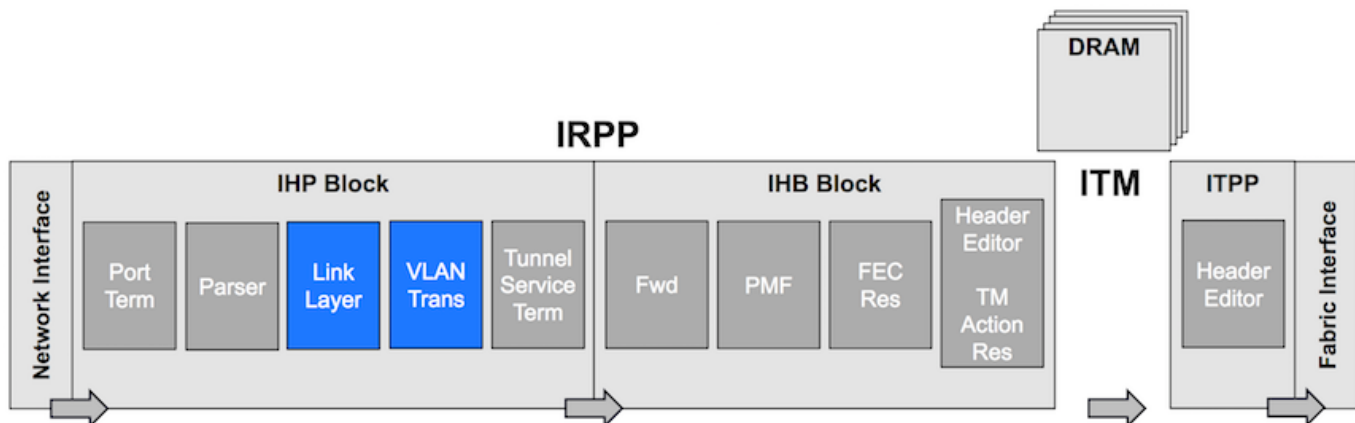


Portabschluss: Pakete, die von der Netzwerkschnittstelle/CPU/Rezirkulation empfangen wurden

- Quellport ermitteln und Paket mit diesem markieren
- Entscheiden Sie, welches Programm Sie in Parser verwenden möchten.
- Identifizieren Sie, wo der Netzwerk-Header beginnt.

Parser: Ethertype extrahieren, MAC-Adressen eingeben, Offset für nächste Phasen in der Pipeline bestimmen.

IRP(Leitungs-Layer, VLAN-Transport)



Verbindungsschicht: Filterung auf L2 und Quelladressenauthentifizierung.

VLAN-Übersetzung: Wir bilden die logische Schnittstelle des Pakets ab.

Punt-Pfad

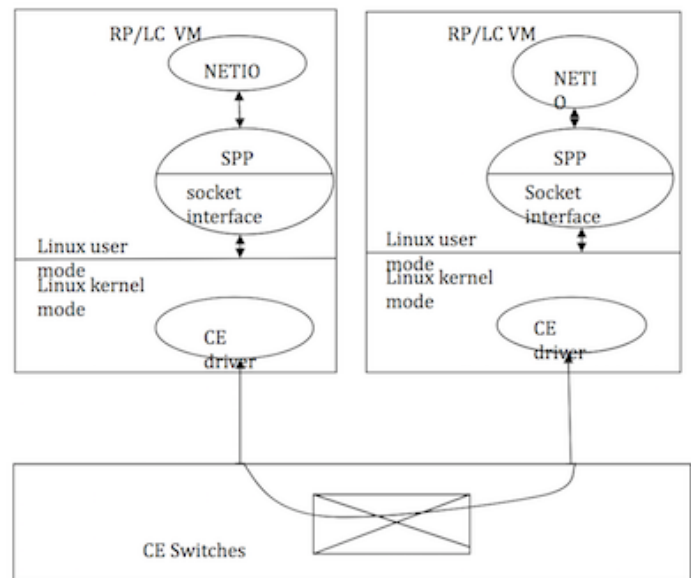
- Auf der NPU sind aufgrund fehlender TCAM-Ressourcen nur wenige LPTS-TCAM-Einträge verfügbar.
- Umfassende LPTS-Suche wird in SW LPTS Pre-IFIB für LC Networks durchgeführt
- LPTS-Punt-Paket von NPU zu RP direkt über PMF-TCAM-Suche:
 - OSPF-, OSPFv3-Multicast- und ISIS-Pakete werden direkt an einen aktiven und einen Standby-RP gesendet.
- LPTS-Punt-Paket von NPU zu lokaler CPU über PMF-TCAM-Suche:

- Alle Protokolle, die TCP, UDP verwenden; ICMP, ND
- L2-Protokollpakete werden über BRCM-CPU-Trap an LC gesendet:
 - ARP, RARP, CDP, LACP, LLDP, EtherLink OAM, MACSec
- Ausnahmepakete werden per BRCM-CPU-Trap an LC gesendet.
 - TTL0, TTL1, MTU überschritten, Optionspakete

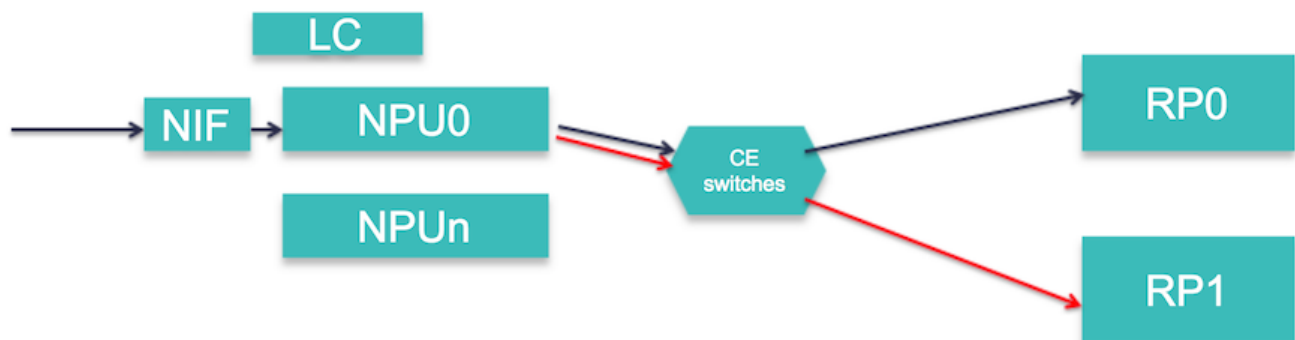
Punt-Pfad zwischen zwei CPU-Knoten

NetIO→SPP→CE switches→SPP→NETIO

CE switches: SC, FC, LC switches

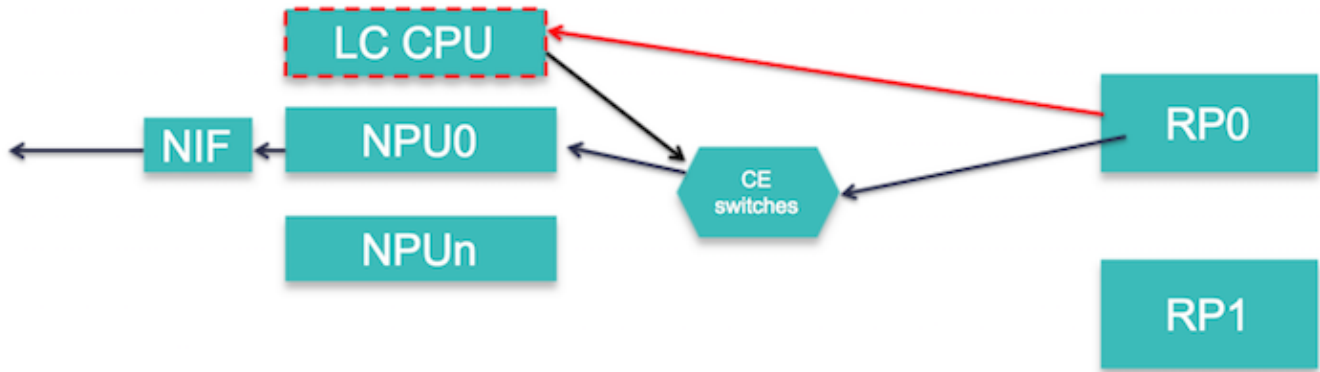


Punt-Pfad von NPU zu RP-CPU



RX-Forus-Pakete werden auf NPU repliziert. Einer wird an aktiven RP und ein anderer an Stby RP gesendet.

Injizieren von RP-CPU zu NPU oder LC-CPU

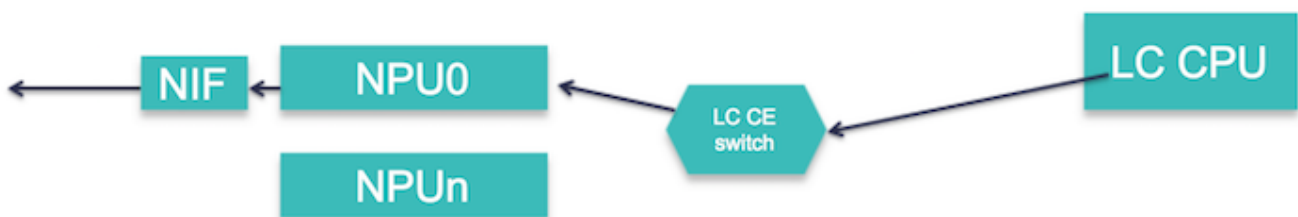


L3-Pakete werden direkt an die NPU injiziert, wenn die Präfix-Adjacency vollständig ist oder ein Pre-Route-Paket vorliegt

L3-Pakete werden in folgenden Fällen an die LC-CPU injiziert:

- Die Präfix-Adjacency ist GLEAN.
- MPLS-Paket vor Routing
- Die Paketgröße überschreitet die MTU.

Injection-Pfad von LC-CPU zu NPU



Diese Pakete werden von der LC-CPU an die NPU eingespeist:

- ARP, ND, ICMP-Echoantwort, fragmentierte Pakete
- CDP, LACP, LLDP, Ether-Link-OAM-Pakete

CLI für Punt/Inject Debugging

```
<#root>
```

```
Show SPP node counters location <>
```

```
show netio chain <interface> location <>
```

```
show netio drop location <>
```

```
show ipv4/ipv6 traffic location <>
```

```
show fwd statistics location <>
```

```
show lpts pifib entry brief statistics location <>
```

```
show controllers fia diagshell <npu> "diag counters g cdsp" location <>
```

```
show interface <> location <>
```

Remote-Ping

Paketpfad: Echoanforderung

Local Node[ICMP(RP) -> IP I/O(RP) -> NetIO/Forwarder(RP) -> SPP(RP) -> NPU] -> wire -> Remote[NPU -> LPTS(HW) -> SPP(RP) -> NetIO/Forwarder(RP) -> IP I/O(RP) -> ICMP(RP)]

Paketpfad: Echoantwort

Remote Node[IPv4/ICMP (LC) -> FWD/NetIO (LC) -> SPP (LC) -> NPU] -> wire -> Local Node[LPTS(HW) -> SPP(RP) -> NetIO/Forwarder(RP) -> IP I/O(RP) -> ICMP(RP)]

Lokaler Ping

Paketpfad: Echoanforderung

RP(ICMP/IPv4 IO -> netio -> SPP -> CE) -> LC(SPP -> netio -> ICMP/ipv4 IO)

Paketpfad: Echoantwort

LC(IPv4 IO/ICMP -> Netio -> SPP -> CE) -> RP(SPP -> net -> ipv4 io/ICMP)

Hilfreiche Fehlersuche:

```
debug icmp ipv4 location 0/0/CPU0
debug ipv4 packet location 0/0/CPU0
debug ipv4 ping events location 0/0/CPU0
```

Topologie

Fretta_1(GigabitEthernet0/0/0/16) <---->(GigabitEthernet0/0/0/16) Fretta_2

RP/0/RP0/CPU0:fretta_1# ping 1.1.16.2 count 10000

Befehle zum Überprüfen von Remote Ping

Echoanforderung: Lokaler RP: TX

Path: ICMP(RP) -> IP I/O(RP) -> NetIO/Forwarder(RP) -> SPP(RP) -> NPU

1. IP-E/A: Überprüfen Sie, ob eine Echoanforderung generiert wurde:

<#root>

show ipv4 traffic brief

ICMP statistics:

Sent:

```
0 admin unreachable, 0 network unreachable
  0 host unreachable, 0 protocol unreachable
  0 port unreachable, 0 fragment unreachable
  0 time to live exceeded, 0 reassembly ttl exceeded
```

10000 echo request

, 0 echo reply
0 mask request, 0 mask reply
0 parameter error, 0 redirects
10000 total

2. NetIO

<#root>

RP/0/RP0/CPU0:fretta_1#show netio clients location 0/rP0/CPU0

Counters	Errors/Total

Output	0/10019
Input	0/11804
Puntback	0/0
Jump	0/0
Driver Output	0/10002
Mutex Bypass Counters	Total

Egress handled	0
Egress chainwalked	10006
Egress dropped	0
Ingress handled	10000
Ingress chainwalked	0
Ingress dropped	0

ClientID	Drop/Total	Drop/Total	Cur/High/Max	Cur/High/Max

ipv6_icmp	0/0	0/0	0/0/1000	0/0/1000
icmp	0/10000			
	0/0	0/1/1000	0/0/1000	

If ping is failing then check if it is getting dropped in Netio:

RP/0/RP0/CPU0:fretta_1#show netio drops location 0/rP0/CPU0
Thu Apr 20 20:28:09.577 UTC

Drops for interfaces on node 0/RP0/CPU0

No drops

3. SPP

<#root>

RP/0/RP0/CPU0:fretta_1#show spp node-counters

Thu Apr 20 20:29:05.785 UTC

0/0/CPU0:

fretta/classify

forwarded to spp clients:	10006
forwarded NPU packet to NetIO:	10006
dropped in classify node:	24
Fwded to CoPP sampler:	1
PUNT ARP:	1
PUNT IFIB:	10006
IFIB RAWIP4_FM:	10000
IFIB RAWIP6_FM:	6

client/inject

pkts injected into spp:	10002
NetIO->NPU injected into spp:	2
NetIO->CPU injected into spp:	10000
NetIO->NPU PROTO ARP:	2
NetIO->CPU PKT LPTS:	10000

socket/rx

ether raw pkts:	10031
-----------------	-------

socket/tx

ce pkts: 10002

client/punt

punted to client:	10007
-------------------	-------

0/RP0/CPU0:

socket/rx

ether raw pkts:	10002
mgmt interface pkts:	3204

socket/tx

ce pkts:	10000
mgmt interface pkts:	5

fretta/classify

forwarded to spp clients:	13204
forwarded CPU packet to NetIO:	10000
forwarded Mgmt packet to NetIO:	3204
dropped in classify node:	2

client/inject

pkts injected into spp:	10005
NetIO->NPU injected into spp:	10000
MGMT_IF injected into spp:	5
NetIO->NPU PROTO IPV4_PREROUTE:	10000

client/punt

punted to client:	13204
-------------------	-------

4. Überprüfen Sie, ob die Echo-Anfrage an wire gesendet wurde:

```
RP/0/RP0/CPU0:fretta_1#show controllers gigabitEthernet 0/0/0/16 stats | be Egress
Thu Apr 20 21:17:28.176 UTC
```

Egress:

Output total bytes	= 1140270
Output good bytes	= 1140270
Output total packets	= 10004
Output 802.1Q frames	= 0
Output pause frames	= 0
Output pkts 64 bytes	= 1
Output pkts 65-127 bytes	= 10003
Output pkts 128-255 bytes	= 0
Output pkts 256-511 bytes	= 0
Output pkts 512-1023 bytes	= 0
Output pkts 1024-1518 bytes	= 0
Output pkts 1519-Max bytes	= 0
Output good pkts	= 10004
Output unicast pkts	= 10000
Output multicast pkts	= 3
Output broadcast pkts	= 1
Output drop underrun	= 0
Output drop abort	= 0
Output drop other	= 0
Output error other	= 0

Echoanforderung: Remote-LC: RX

Path: NPU -> LPTS(HW) -> SPP(LC) -> NetIO/Forwarder(LC) -> LPTS(SW)(LC) -> IP I/O (LC) -> ICMP (LC)

1. Überprüfen Sie, ob das Paket von wire empfangen wurde:

<#root>

```
RP/0/RP0/CPU0:fretta_2#show controllers gigabitEthernet 0/0/0/16 stats
Thu Apr 20 20:44:22.115 UTC
Statistics for interface GigabitEthernet0/0/0/16 (cached values):
```

Ingress:

Input total bytes	= 1140270
Input good bytes	= 1140270
Input total packets	= 10004
Input 802.1Q frames	= 0

```
Input pause frames      = 0
Input pkts 64 bytes     = 1
```

Input pkts 65-127 bytes = 10003

2. Überprüfen Sie den LPTS-Zähler.

```
RP/0/RP0/CPU0:fretta_2#show lpts pifib hardware entry brief location 0/0/CPU0 | i ICMP
Thu Apr 20 20:45:54.687 UTC
```

<#root>

DestIP	SrcIP	vrf	L4	LPort/Type	RPort	npu	Flowtype	DestNo
0.0.0.0	0.0.0.0	0	1	ECHO	0	0		

ICMP-local

Local LC MEDIUM

10000

0

3. SPP

```
RP/0/RP0/CPU0:fretta_2#show spp node-counters location 0/0/CPU0
```

<#root>

```
fretta/classify
  forwarded to spp clients:      10006
  forwarded NPU packet to NetIO: 10006
  dropped in classify node:      22
  Fwded to CoPP sampler:        2
    PUNT ARP:                   2
    PUNT IFIB:                  10006
  IFIB IPv4_STACK:              10000
  IFIB RAWIP6_FM:               6
```

```
-----
client/inject
  pkts injected into spp:      10002
  NetIO->NPU injected into spp: 10002
    NetIO->NPU PROTO ARP:      2
    NetIO->NPU PROTO IPV4:     10000
  -----
```

socket/rx

ether raw pkts: 10030

socket/tx

ce pkts: 10002

client/punt

punted to client: 10008

4. Netio

show netio chains gigabitEthernet 0/0/0/16 location 0/0/cpu0

<#root>

<12> (ipv4) Stats IN: 10000 pkts, 1140000 bytes; OUT: 10000 pkts, 1140000 bytes

<#root>

Protocol	SAFI	Pkts In	Bytes In	Pkts Out	Bytes Out
-----	-----	-----	-----	-----	-----
ipv4	Unicast	10000			
1140000	10000	1000000			
ipv4	Multicast	0	0	0	0
ipv4	Broadcast	0	0	0	0
ipv6	Unicast	0	0	0	0
ipv6	Multicast	0	0	0	0

<#root>

RP/0/RP0/CPU0:fretta_2#show netio clients location 0/0/CPU0
Thu Apr 20 20:52:26.802 UTC

Counters	Errors/Total
-----	-----
Output	0/10002
Input	0/10008
Puntback	0/0
Jump	0/0
Driver Output	0/10002

XIPC queues	Dropped/Queued	Cur/High/Max
-----	-----	-----
OutputL	0/10000	0/1/6000
OutputH	0/2	0/1/3000

Puntback		0/0		0/0/6000
ClientID	Input Drop/Total	Punt Drop/Total	XIPC InputQ Cur/High/Max	XIPC PuntQ Cur/High/Max
ipv6_icmp	0/0	0/0	0/0/1000	0/0/1000
icmp	0/10000	0/0	0/1/1000	0/0/1000
c1ns	L 0/0 H 0/0	0/0	L 0/0/1000 H 0/0/1000	0/0/0
ipv6_io	0/0	0/0	0/0/1000	0/0/1000
ipv6_nd	0/0	0/0	0/0/1500	0/0/1000
12snoop	0/0	0/0	0/0/1000	0/0/0
ether_sock	0/0	0/0		
tp_oam	0/0	0/0	0/0/1000	0/0/1000
icmpv6_unreach_jump	0/0	0/0		
arp	0/2	0/0	0/1/1000	0/0/1000
mpls_io	0/0	0/0	0/0/1000	0/0/1000
ipv4	0/0	0/0	0/0/1000	0/0/1000
ipv6	0/0	0/0	0/0/1000	0/0/1000

Key:
L = queue for lower priority packets
H = queue for higher priority packets

5. FWD-Statistiken

<#root>

RP/0/RP0/CPU0:fretta_2#show fwd statistics all location 0/0/cpu0
Thu Apr 20 20:51:50.347 UTC
RECEIVE STATISTICS SUMMARY:

rx_pkts: 10008

punt_pkts: 10008

ingress_total_drops: 0
TRANSMIT STATISTICS SUMMARY:
inject_pkts: 10002
tx_pkts: 10002
egress_total_drops: 0
RP/0/RP0/CPU0:fretta_2#

6. IP-IOS

show ipv4 traffic brief location 0/0/CPU0

<#root>

Rcvd:

0 admin unreachable, 0 network unreachable
0 host unreachable, 0 protocol unreachable
0 port unreachable, 0 fragment unreachable
0 time to live exceeded, 0 reassembly ttl exceeded

10000 echo request

, 0 echo reply
0 mask request, 0 mask reply
0 redirect, 0 parameter error
0 source quench, 0 timestamp, 0 timestamp reply
0 router advertisement, 0 router solicitation
10000 total, 0 checksum errors, 0 unknown

Echo-Antwort: Remote-Knoten (LC): TX

Path: IPv4/ICMP (LC) -> FWD/NetIO (LC) -> SPP (LC) -> NPU

1. IP-IO

RP/0/RP0/CPU0:fretta_2#show ipv4 traffic brief location 0/0/CPU0

<#root>

ICMP statistics:

Sent:

0 admin unreachable, 0 network unreachable
0 host unreachable, 0 protocol unreachable
0 port unreachable, 0 fragment unreachable
0 time to live exceeded, 0 reassembly ttl exceeded
0 echo request,

10000 echo reply

0 mask request, 0 mask reply
0 parameter error, 0 redirects
10000 total

2. Netio

show netio chains gigabitEthernet 0/0/0/16 location 0/0/cpu0

<#root>

<12> (ipv4) Stats IN: 10000 pkts, 1140000 bytes; OUT: 10000 pkts, 1140000 bytes

<#root>

Protocol	SAFI	Pkts In	Bytes In	Pkts Out	Bytes Out
-----	-----	-----	-----	-----	-----
ipv4	Unicast	10000	1140000		
10000					
1000000					
ipv4	Multicast	0	0	0	0
ipv4	Broadcast	0	0	0	0
ipv6	Unicast	0	0	0	0
ipv6	Multicast	0	0	0	0

<#root>

RP/0/RP0/CPU0:fretta_2#show netio clients location 0/0/CPU0
Thu Apr 20 20:52:26.802 UTC

Counters	Errors/Total
-----	-----

Output	0/10002
--------	---------

Input	0/10008
Puntback	0/0
Jump	0/0
Driver Output	0/10002

XIPC queues	Dropped/Queued	Cur/High/Max
-----	-----	-----
OutputL	0/10000	0/1/6000
OutputH	0/2	0/1/3000
Puntback	0/0	0/0/6000

3. FWD-Statistiken

<#root>

RP/0/RP0/CPU0:fretta_2#show fwd statistics all location 0/0/cpu0
Thu Apr 20 20:51:50.347 UTC
RECEIVE STATISTICS SUMMARY:
rx_pkts: 10008
punt_pkts: 10008
ingress_total_drops: 0

TRANSMIT STATISTICS SUMMARY:

inject_pkts: 10002

tx_pkts: 10002

egress_total_drops: 0

4. SPP

show spp node-counters location 0/0/CPU0

<#root>

```
fretta/classify
  forwarded to spp clients:      10006
  forwarded NPU packet to NetIO: 10006
  dropped in classify node:      22
    Fwded to CoPP sampler:      2
      PUNT ARP:                 2
      PUNT IFIB:                10006
    IFIB IPv4_STACK:            10000
    IFIB RAWIP6_FM:             6
```

```
-----
client/inject
  pkts injected into spp:      10002
  NetIO->NPU injected into spp: 10002
    NetIO->NPU PROTO ARP:      2
    NetIO->NPU PROTO IPV4:     10000
```

```
-----
socket/rx
  ether raw pkts:              10030
```

socket/tx

```

  ce pkts:                     10002
```

```
-----
client/punt
  punted to client:            10008
```

5. Überprüfen Sie, ob das Paket an wire gesendet wird.

<#root>

```
RP/0/RP0/CPU0:fretta_2#show controllers gigabitEthernet 0/0/0/16 stats
Thu Apr 20 21:20:22.593 UTC
Statistics for interface GigabitEthernet0/0/0/16 (cached values):
Egress:
```

```
    Output total bytes          = 1140270
    Output good bytes           = 1140270

    Output total packets        = 10004
    Output 802.1Q frames        = 0
    Output pause frames         = 0
    Output pkts 64 bytes        = 1
```

```
Output pkts 65-127 bytes      = 10003
```

```
    Output pkts 128-255 bytes   = 0
    Output pkts 256-511 bytes   = 0
    Output pkts 512-1023 bytes  = 0
    Output pkts 1024-1518 bytes = 0
    Output pkts 1519-Max bytes  = 0

    Output good pkts            = 10004
    Output unicast pkts         = 10000
    Output multicast pkts       = 3
    Output broadcast pkts       = 1

    Output drop underrun        = 0
    Output drop abort           = 0
    Output drop other           = 0

    Output error other          = 0
```

6. Schnittstellenstatistiken

<#root>

```
RP/0/RP0/CPU0:fretta_2#show int gigabitEthernet 0/0/0/16
Thu Apr 20 21:21:37.942 UTC
GigabitEthernet0/0/0/16 is up, line protocol is up
  Interface state transitions: 1
  Hardware is GigabitEthernet, address is 008a.964a.7040 (bia 008a.964a.7040)
  Internet address is 1.1.16.2/24
  MTU 1514 bytes, BW 1000000 Kbit (Max: 1000000 Kbit)
    reliability 255/255, txload 0/255, rxload 0/255
  Encapsulation ARPA,
  Full-duplex, 1000Mb/s, link type is force-up
  output flow control is off, input flow control is off
  Carrier delay (up) is 10 msec
  loopback not set,
  Last link flapped 01:00:13
  ARP type ARPA, ARP timeout 04:00:00
  Last input 00:56:58, output 00:56:58
  Last clearing of "show interface" counters never
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    10004 packets input, 1140270 bytes, 0 total input drops
    3 drops for unrecognized upper-level protocol
```

Received 1 broadcast packets, 3 multicast packets
0 runs, 0 giants, 0 throttles, 0 parity
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort

10004 packets output

, 1140270 bytes, 0 total output drops
Output 1 broadcast packets, 3 multicast packets
0 output errors, 0 underruns, 0 applique, 0 resets
0 output buffer failures, 0 output buffers swapped out
0 carrier transitions

Echo-Antwort: Lokaler Knoten (LC): RX

LPTS(HW) -> SPP(LC) -> NetIO/Forwarder(LC) -> LPTS PreIFIB Lookup -> SPP(LC) -> CE(LC) -> SPP(RP) -> Ne

1. Überprüfen Sie, ob Pakete von der Leitung eingehen.

<#root>

RP/0/RP0/CPU0:fretta_1#show controllers gigabitEthernet 0/0/0/16 stats
Thu Apr 20 21:17:28.176 UTC
Statistics for interface GigabitEthernet0/0/0/16 (cached values):

Ingress:

Input total bytes	= 1140270
Input good bytes	= 1140270

Input total packets	= 10004
Input 802.1Q frames	= 0
Input pause frames	= 0
Input pkts 64 bytes	= 1

Input pkts 65-127 bytes = 10003

Input pkts 128-255 bytes	= 0
Input pkts 256-511 bytes	= 0
Input pkts 512-1023 bytes	= 0
Input pkts 1024-1518 bytes	= 0
Input pkts 1519-Max bytes	= 0

Input good pkts	= 10004
Input unicast pkts	= 10000
Input multicast pkts	= 3
Input broadcast pkts	= 1

Input drop overrun	= 0
Input drop abort	= 0
Input drop invalid VLAN	= 0
Input drop invalid DMAC	= 0
Input drop invalid encap	= 0
Input drop other	= 0

```

Input error giant          = 0
Input error runt           = 0
Input error jabbers        = 0
Input error fragments      = 0
Input error CRC            = 0
Input error collisions     = 0
Input error symbol         = 0
Input error other          = 0

Input MIB giant            = 0
Input MIB jabber           = 0
Input MIB CRC              = 0

```

2. LPTS-Zähler

RP/0/RP0/CPU0:fretta_1#show lpts pifib hardware entry brief locatio 0/0/CPU0

<#root>

```

0.0.0.0          0.0.0.0          0      1

```

ECHOREPLY

```

    0      0      ICMP-app-default  Local LC      LOW

```

10000

0

3. SPP auf LC

<#root>

RP/0/RP0/CPU0:fretta_1#show spp node-counters location 0/0/CPU0

Thu Apr 20 21:01:31.974 UTC

fretta/classify

```

    forwarded to spp clients:          10006
    forwarded NPU packet to NetIO:     10006
    dropped in classify node:           24
    Fwded to CoPP sampler:              1
    PUNT ARP:                           1
    PUNT IFIB:                          10006
    IFIB RAWIP4_FM:                     10000
    IFIB RAWIP6_FM:                      6
-----

```

client/inject

```

    pkts injected into spp:            10002
    NetIO->NPU injected into spp:       2
    NetIO->CPU injected into spp:       10000
    NetIO->NPU PROTO ARP:               2

```

```

NetIO->CPU PKT LPTS:          10000
-----
socket/rx

ether raw pkts:                10031

-----
socket/tx
ce pkts:                      10002
-----
client/punt
punted to client:             10007
-----

```

4. Netio auf LC

RP/0/RP0/CPU0:fretta_1# show netio chains gigabitEthernet 0/0/0/16 location 0/0/cpu0

<#root>

<12> (ipv4) Stats IN: 10000 pkts, 1140000 bytes; OUT: 0 pkts, 0 bytes

<#root>

Protocol SAFI counts:

```

-----
Protocol      SAFI      Pkts In   Bytes In   Pkts Out   Bytes Out
-----
ipv4          Unicast    10000    1140000
0              0
  ipv4      Multicast      0         0         0         0
  ipv4      Broadcast      0         0         0         0
  ipv6      Unicast       0         0         0         0
  ipv6      Multicast      0         0         0         0

```

5. FWD-Statistiken auf LC.

<#root>

RP/0/RP0/CPU0:fretta_1#show fwd statistics all location 0/0/CPU0
Thu Apr 20 21:04:27.767 UTC

RECEIVE STATISTICS SUMMARY:

rx_pkts: 10007

punt_pkts: 10007

ingress_total_drops: 0

TRANSMIT STATISTICS SUMMARY:

inject_pkts: 10002

tx_pkts: 10002

egress_total_drops: 0

RP/0/RP0/CPU0:fretta_1#

5. SPP auf LC zum Senden an SPP auf RP.

<#root>

RP/0/RP0/CPU0:fretta_1#show spp node-counters location 0/0/CPU0

Thu Apr 20 21:01:31.974 UTC

fretta/classify

forwarded to spp clients: 10006

forwarded NPU packet to NetIO: 10006

dropped in classify node: 24

Fwded to CoPP sampler: 1

PUNT ARP: 1

PUNT IFIB: 10006

IFIB RAWIP4_FM: 10000

IFIB RAWIP6_FM: 6

client/inject

pkts injected into spp: 10002

NetIO->NPU injected into spp: 2

NetIO->CPU injected into spp: 10000

NetIO->NPU PROTO ARP: 2

NetIO->CPU PKT LPTS: 10000

socket/rx

ether raw pkts: 10031

socket/tx

ce pkts: 10002

client/punt

punted to client: 10007

6. SPP auf RP

<#root>

RP/0/RP0/CPU0:fretta_1#show spp node-counters location 0/rp0/CPU0
Thu Apr 20 21:06:33.045 UTC

socket/rx

ether raw pkts:	10002
mgmt interface pkts:	16651

socket/tx	
ce pkts:	10000
mgmt interface pkts:	14

fretta/classify	
forwarded to spp clients:	26651
forwarded CPU packet to NetIO:	10000
forwarded Mgmt packet to NetIO:	16651
dropped in classify node:	2

client/inject	
pkts injected into spp:	10014
NetIO->NPU injected into spp:	10000
MGMT_IF injected into spp:	14
NetIO->NPU PROTO IPV4_PREROUTE:	10000

client/punt	
punted to client:	26651

7. Netio auf RP.

<#root>

RP/0/RP0/CPU0:fretta_1#show netio clients location 0/RP0/CPU0
Thu Apr 20 21:05:05.977 UTC

Counters	Errors/Total	

Output	0/10031	
Input	0/25872	
Puntback	0/0	
Jump	0/0	
Driver Output	0/10014	

Mutex Bypass Counters	Total	

Egress handled	0	
Egress chainwalked	10018	
Egress dropped	0	
Ingress handled	10000	
Ingress chainwalked	0	
Ingress dropped	0	

XIPC queues	Dropped/Queued	Cur/High/Max

```
-----
OutputL          0/10004      0/1/6000
OutputH          0/14        0/1/3000
Puntback         0/0         0/0/6000
PMutex_egressL   0/10004      0/1/6000
PMutex_egressH   0/14        0/1/1500
PMutex_ingressL  0/0         0/0/6000
PMutex_ingressH  0/0         0/0/1500
```

ClientID	Input Drop/Total	Punt Drop/Total	XIPC InputQ Cur/High/Max	XIPC PuntQ Cur/High/Max
-----	-----	-----	-----	-----
ipv6_icmp	0/0	0/0	0/0/1000	0/0/1000
icmp	0/10000	0/0	0/1/1000	0/0/1000
 cIns	L 0/0 H 0/0	0/0	L 0/0/1000 H 0/0/1000	0/0/0
eth_mgmt	0/0	0/0		
ipv6_io	0/0	0/4	0/0/1000	0/1/1000
ipv6_nd	0/4	0/0	0/1/1500	0/0/1000
l2snoop	0/0	0/0	0/0/1000	0/0/0
ether_sock	0/0	0/0		
icmpv6_unreach_jump	0/0	0/0		
raw	L 0/0 H 0/0	0/0	L 0/0/1600 H 0/0/1600	0/0/0
tcp	L 0/0 H 0/0	0/0	L 0/0/1600 H 0/0/1600	0/0/0
udp	L 0/307 H 0/0	0/0	L 0/1/1600 H 0/0/1600	0/0/0
arp	0/15565	0/0	0/4/1000	0/0/1000
mpls_io	0/0	0/0	0/0/1000	0/0/1000
lspv_server	0/0	0/0		
ipv4	0/0	0/0	0/0/1000	0/0/1000
ipv6	0/0	0/0	0/0/1000	0/0/1000

Key:
 L = queue for lower priority packets
 H = queue for higher priority packets

8. IP-IO

RP/0/RP0/CPU0:fretta_1#

RP/0/RP0/CPU0:fretta_1#show ipv4 traffic brief

<#root>

Rcvd

```
: 0 admin unreachable, 0 network unreachable
    0 host unreachable, 0 protocol unreachable
    0 port unreachable, 0 fragment unreachable
    0 time to live exceeded, 0 reassembly ttl exceeded
    0 echo request,
```

10000 echo reply

```
    0 mask request, 0 mask reply
    0 redirect, 0 parameter error
    0 source quench, 0 timestamp, 0 timestamp reply
    0 router advertisement, 0 router solicitation
    10000 total, 0 checksum errors, 0 unknown
```

9. Schnittstellenstatistiken:

<#root>

```
RP/0/RP0/CPU0:fretta_1# show int gigabitEthernet 0/0/0/16
Thu Apr 20 21:22:12.822 UTC
GigabitEthernet0/0/0/16 is up, line protocol is up
  Interface state transitions: 1
  Hardware is GigabitEthernet, address is 008a.964b.7040 (bia 008a.964b.7040)
  Internet address is 1.1.16.1/24
  MTU 1514 bytes, BW 1000000 Kbit (Max: 1000000 Kbit)
    reliability 255/255, txload 0/255, rxload 0/255
  Encapsulation ARPA,
  Full-duplex, 1000Mb/s, link type is force-up
  output flow control is off, input flow control is off
  Carrier delay (up) is 10 msec
  loopback not set,
  Last link flapped 01:01:11
  ARP type ARPA, ARP timeout 04:00:00
  Last input 00:58:03, output 00:58:03
  Last clearing of "show interface" counters never
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
```

10004 packets input

```
, 1140270 bytes, 0 total input drops
  3 drops for unrecognized upper-level protocol
  Received 1 broadcast packets, 3 multicast packets
    0 runts, 0 giants, 0 throttles, 0 parity
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  10004 packets output, 1140270 bytes, 0 total output drops
  Output 1 broadcast packets, 3 multicast packets
  0 output errors, 0 underruns, 0 applique, 0 resets
  0 output buffer failures, 0 output buffers swapped out
  0 carrier transitions
```

```
RP/0/RP0/CPU0:fretta_1#
```

Lokaler Ping

<Noch festzulegen>

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