



AEWIN NICs Performance Report with DPDK 25.03

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Purpose

The main purpose of this test report is to implement the Data Plane Development Kit (DPDK) applied to the AEWIN system and network cards for performance evaluation.

System : AEWIN Performance Network System (SCB-1942)

NIC : R386A, R671A

This is achieved through the specified version of the Data Plane Development Kit (DPDK).

The report provides the measured packet rate performance as well as the hardware layout, procedures, and configurations used to replicate these tests.

Test Description

The device under test (DUT) consists of a system with an Intel® architecture motherboard populated with the following:

- Dual processor and PCH chips, except for System on Chip (SoC) cases.
- DRAM memory size and frequency (normally single DIMM per channel).
- Specific AEWIN Network Interface Cards (R671A 、 R386A).
- BIOS settings noting those that updated from the basic settings.
- DPDK build configuration settings, and commands used for tests.

Connected to the DUT is an SPIRENT, a hardware test and simulation platform to generate packet traffic to the DUT ports and determine the throughput at the tester side.

SPIRENT is used to perform RFC2544 testing on the DUT.

DPDK L3fwd Test Case (LPM-based):

This example demonstrates Layer 3 forwarding using DPDK's LPM (Longest Prefix Match) library.

The lookup method—either hash or LPM—is selected at compile time. In this test, the default LPM mode is used without modification.

LPM is used as a routing table to determine the output port for each IPv4 packet. The destination IP address from the packet is used as the lookup key.

The lookup returns a next-hop value, typically representing the output port ID.

LPM rules are statically defined and loaded during initialization.

In the sample application, hash-based forwarding supports IPv4 and IPv6. LPM-based forwarding supports IPv4 only.

RFC2544 Zero packet loss test case: Used to determine the DUT throughput as defined in RFC1242(<https://www.ietf.org/rfc/rfc1242.txt>).

Note RFC6201 <https://www.ietf.org/rfc/rfc6201.txt> has updated RFC2544 and RFC1242.

Please check the link for more details. In this report, RFC2544 test uses DPDK l3fwd as test application.

Procedure: Send a specific number of frames at a specific rate through the DUT and then count the frames that are transmitted by the DUT.

If the count of offered frames is not equal to the count of received frames, the rate of the offered stream is reduced and the test is rerun.

The throughput is the fastest rate at which the count of test frames transmitted by the DUT is equal to the number of test frames sent to it by the test equipment.

Test settings: Spirent 5.51 is used here for the test execution. The duration for each round is 60 seconds, and the acceptable packet loss rate is 0. The traffic is 256 flows per port.

Single core test case: Used to check the maximum IO throughput for a single core. The case requires at least 1x 100GbE ports for the ice DPDK Poll Mode Driver and for the i40e DPDK.


In this case, we don't calculate the packet loss rate but record the average throughput within 60 seconds.

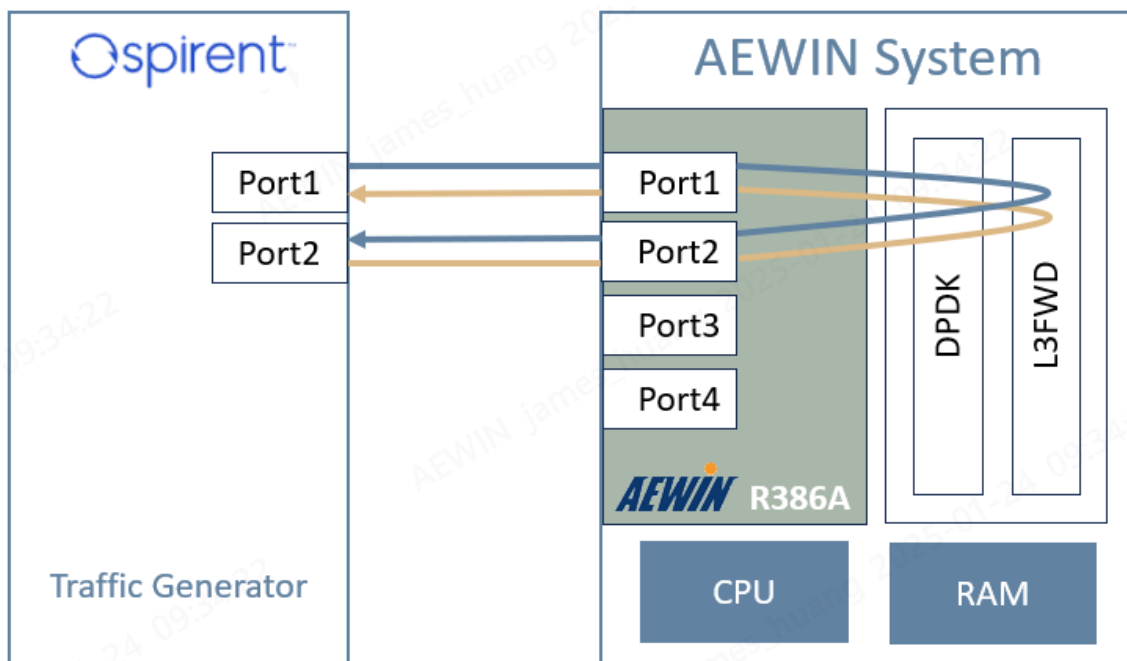
More details about the DPDK setup and BIOS information can be found at

https://doc.dpdk.org/guides/linux_gsg/

1. RFC2544 zero packet loss test on 1x AEWIN R386 Network Expansion Module (2 ports used on 1 NIC)

1-1. Test setup

Item	Description
Test Case	Test#1 RFC2544 zero packet loss test on 1x AEWIN R386 Network Expansion Module (2 ports used on 1 NIC)
Network Platform	AEWIN Performance Network System (SCB-1942)
CPU	Intel® Xeon® Gold 6458Q @3.10 GHz
Memory	Samsung 64 GB DDR5 4800 M321R8GAA0BB0-CQKMG (16PCS)
NIC	<p>AEWIN R386 Network Expansion Module is built upon the Intel® XL710-BM1 chipset, featuring 4x 10GbE SFP+ ports (PCIe Gen3 x8)</p>  A photograph of the AEWIN R386 Network Expansion Module. It is a green printed circuit board (PCB) with a black cooling fan in the center. On the left side, there are four SFP+ ports. On the right side, there is a gold-plated PCIe connector. Various electronic components, including capacitors and integrated circuits, are visible on the board. A small white label with 'AA' is attached to the top right. The board is labeled 'R386 REV A0' and 'SH'.
BIOS	C1942002_t24 (05/27/2024 17:04:20)
Microcode	5.32
Operating System	Ubuntu 22.04.4 LTS
Linux kernel version	5.15.0-94-generic
GCC version	gcc (Ubuntu 11.4.0-1ubuntu1~22.04) 11.4.0
Intel NIC Device ID	8086:1572
Intel NIC Firmware version	9.30 0x8000edd8 0.0.0
DPDK version	25.03
Test configuration	<p>1 NIC card attached to the first processor.</p> <p>1 port assigned per logical core using 1 queue.</p> <p>Totaling 2 logical cores, 2 queues for 2ports</p>

1x AEWIN R386 Network Expansion Module connected to SPIRENT**(2 ports used on 1 NIC)****1-2. Test setting**

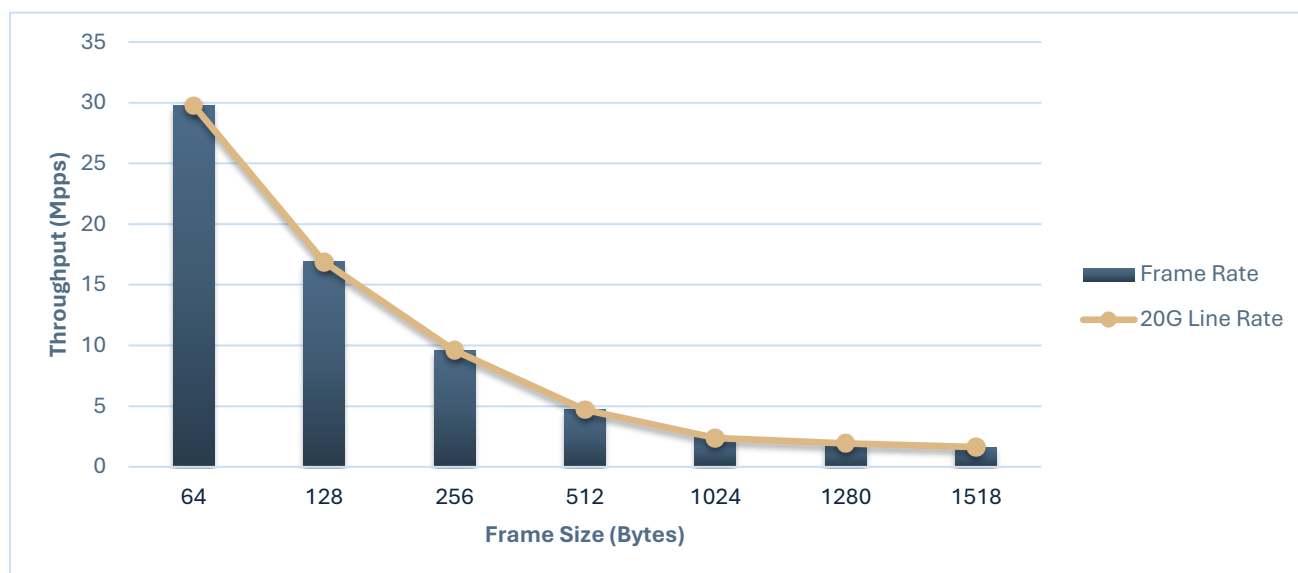
Item	Description
BIOS	CPU Power and Performance Policy [Performance] CPU C-state Disabled CPU P-state Disabled Turbo Boost Disabled
Boot settings	default_hugepagesz=1G hugepagesz=1G hugepages=16 intel_iommu=on iommu=pt
DPDK Settings	CC=gcc meson -Dlibdir=lib -Dexamples=l3fwd -Dc_args=- DRTE_LIBRTE_I40E_16BYTE_RX_DESC --default-library=static x86_64- native linuxapp-gcc
Command line	l3fwd -l 1-2 -n 16 -- -P -p 0x3 --config="(0,0,1),(1,0,2)" --tx-queue-size 4096 -- rx-queue-size 4096

1-3. Test Result

Frame Size (Bytes)	Line Rate[2*10G] (Mpps)	Frame Rate (Mpps)	% Line Rate
64	29.76	29.76	100
128	16.89	16.89	100
256	9.58	9.58	100
512	4.70	4.70	100
1024	2.39	2.39	100
1280	1.92	1.92	100
1518	1.63	1.63	100


RFC2544 zero packet loss test on 1x AEWIN R386 Network Expansion Module

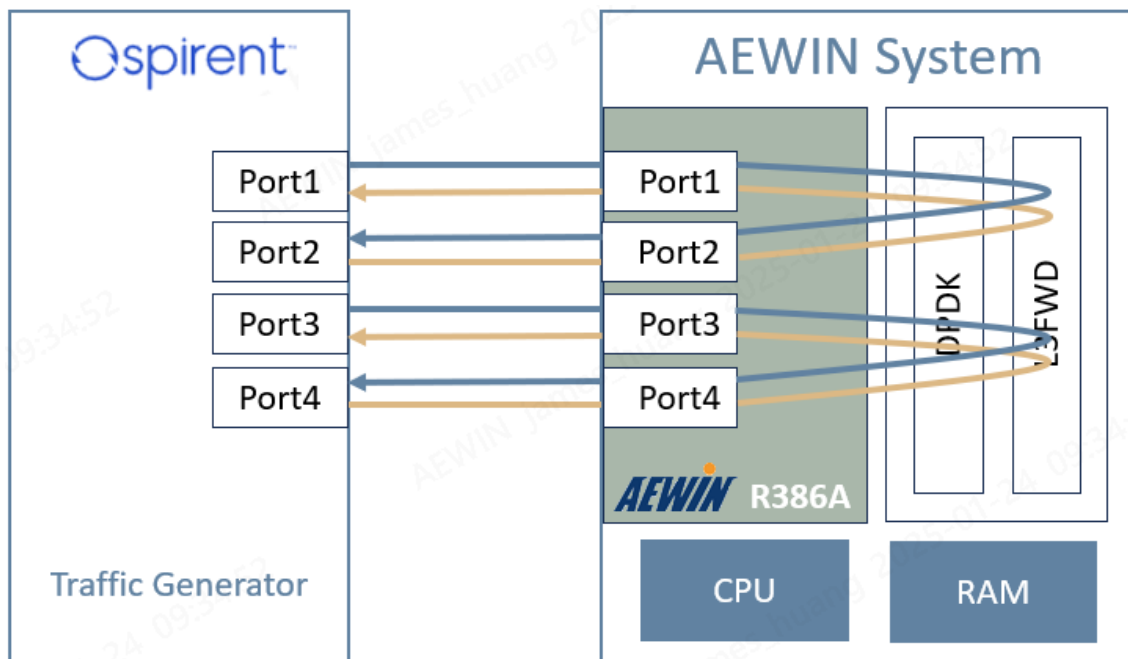
(2 ports used on 1 NIC)



2. RFC2544 zero packet loss test on 1x AEWIN R386 Network Expansion Module (4 ports used on 1 NIC)

2-1. Test setup

Item	Description
Test Case	Test#2 RFC2544 zero packet loss test on 1x AEWIN R386 Network Expansion Module (4 ports used on 1 NIC)
Network Platform	AEWIN Performance Network System (SCB-1942)
CPU	Intel® Xeon® Gold 6458Q @3.10 GHz
Memory	Samsung 64 GB DDR5 4800 M321R8GAA0BB0-CQKMG (16PCS)
NIC	<p>AEWIN R386 Network Expansion Module is built upon the Intel® XL710-BM1 chipset, featuring 4x 10GbE SFP+ ports (PCIe Gen3 x8)</p>  A photograph of the AEWIN R386 Network Expansion Module. It is a green printed circuit board (PCB) with a black cooling fan in the center. On the left side, there are four SFP+ ports. On the right side, there is a gold-plated PCIe connector. Various electronic components, including capacitors and integrated circuits, are visible on the board. A small white label with 'AA' is attached to the top right. The board is labeled 'R386 REV A0' and 'SH'.
BIOS	C1942002_t24 (05/27/2024 17:04:20)
Microcode	5.32
Operating System	Ubuntu 22.04.4 LTS
Linux kernel version	5.15.0-94-generic
GCC version	gcc (Ubuntu 11.4.0-1ubuntu1~22.04) 11.4.0
Intel NIC Device ID	8086:1572
Intel NIC Firmware version	9.30 0x8000edd8 0.0.0
DPDK version	25.03
Test configuration	<p>1 NIC card attached to the first processor.</p> <p>1 port assigned per logical core using 1 queue.</p> <p>Totaling 4 logical cores, 4 queues for 4ports</p>

1x AEWIN R386 Network Expansion Module connected to SPIRENT**(4 ports used on 1 NIC)****2-2. Test setting**

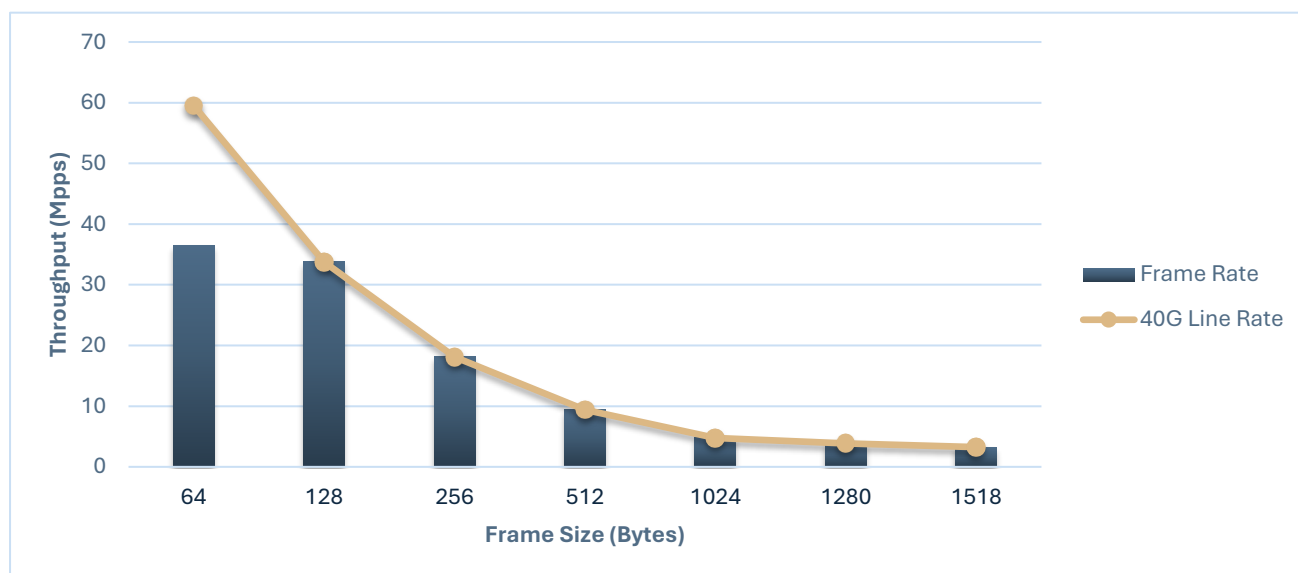
Item	Description
BIOS	CPU Power and Performance Policy [Performance] CPU C-state Disabled CPU P-state Disabled Turbo Boost Disabled
Boot settings	default_hugepagesz=1G hugepagesz=1G hugepages=16 intel_iommu=on iommu=pt
DPDK Settings	CC=gcc meson -Dlibdir=lib -Dexamples=l3fwd -Dc_args=- DRTE_LIBRTE_I40E_16BYTE_RX_DESC --default-library=static x86_64- native linuxapp-gcc
Command line	l3fwd -l 1-4 -n 16 -- -P -p 0xf --config="(0,0,1),(1,0,2),(2,0,3),(3,0,4)" --tx- queue-size 4096 --rx-queue-size 4096

2-3. Test Result

Frame Size (Bytes)	Line Rate[4x10G] (Mpps)	Frame Rate (Mpps)	% Line Rate
64	59.52	36.5	61.328
128	33.78	33.78	100
256	18.11	18.11	100
512	9.39	9.39	100
1024	4.78	4.78	100
1280	3.84	3.84	100
1518	3.25	3.25	100


RFC2544 zero packet loss test on 1x AEWIN R386 Network Expansion Module

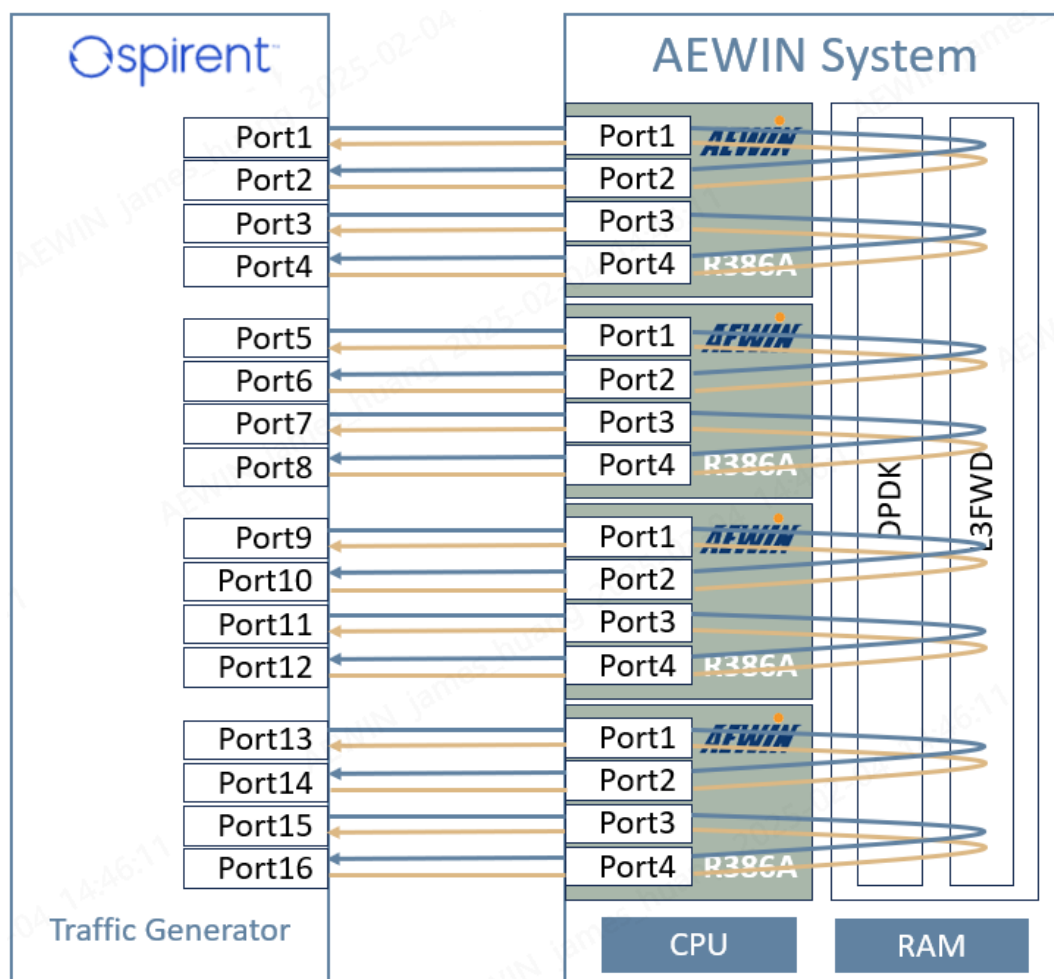
(4 ports used on 1 NIC)



3. RFC2544 zero packet loss test on 4x AEWIN R386 Network Expansion Module (16 ports used on 4 NIC)

3-1. Test setup

Item	Description
Test Case	Test#3 RFC2544 zero packet loss test on 4x AEWIN R386 Network Expansion Module (16 ports used on 4 NICs)
Network Platform	AEWIN Performance Network System (SCB-1942)
CPU	Intel® Xeon® Gold 6458Q @3.10 GHz (2PCS)
Memory	Samsung 64 GB DDR5 4800 M321R8GAA0BB0-CQKMG (16PCS)
NIC	<p>AEWIN R386 Network Expansion Module is built upon the Intel® XL710-BM1 chipset, featuring 4x 10GbE SFP+ ports (PCIe Gen3 x8)</p>  A photograph of the AEWIN R386 Network Expansion Module. It is a green printed circuit board (PCB) with a black cooling fan in the center. On the left side, there are four SFP+ ports. On the right side, there is a gold-plated PCIe connector. The board is populated with various electronic components, including capacitors and integrated circuits. A small white label with 'AA' is visible on the right side of the board. The text 'R386 REV A0' and 'SH' are printed on the PCB.
BIOS	C1942002_t24 (05/27/2024 17:04:20)
Microcode	5.32
Operating System	Ubuntu 22.04.4 LTS
Linux kernel version	5.15.0-94-generic
GCC version	gcc (Ubuntu 11.4.0-1ubuntu1~22.04) 11.4.0
Intel NIC Device ID	8086:1572
Intel NIC Firmware version	9.30 0x8000edd8 0.0.0
DPDK version	25.03
Test configuration	1 port assigned per logical core using 1 queue. Totaling 16 logical cores, 16 queues for 16ports

4x AEWIN R386 Network Expansion Module connected to SPIRENT**(16 ports used on 4 NICs)****3-2. Test setting**

Item	Description
BIOS	CPU Power and Performance Policy [Performance] CPU C-state Disabled CPU P-state Disabled Turbo Boost Disabled
Boot settings	default_hugepagesz=1G hugepagesz=1G hugepages=64 intel_iommu=on iommu=pt
DPDK Settings	CC=gcc meson -Dlibdir=lib -Dexamples=l3fwd -Dc_args=- DRTE_LIBRTE_ICE_16BYTE_RX_DESC --default-library=static x86_64- native linuxapp-gcc
Command line	l3fwd -l 1-8,32-39 -n 16 -- -P -p 0xffff -- config="(0,0,1),(1,0,2),(2,0,3),(3,0,4),(4,0,5),(5,0,6),(6,0,7),(7,0,8)

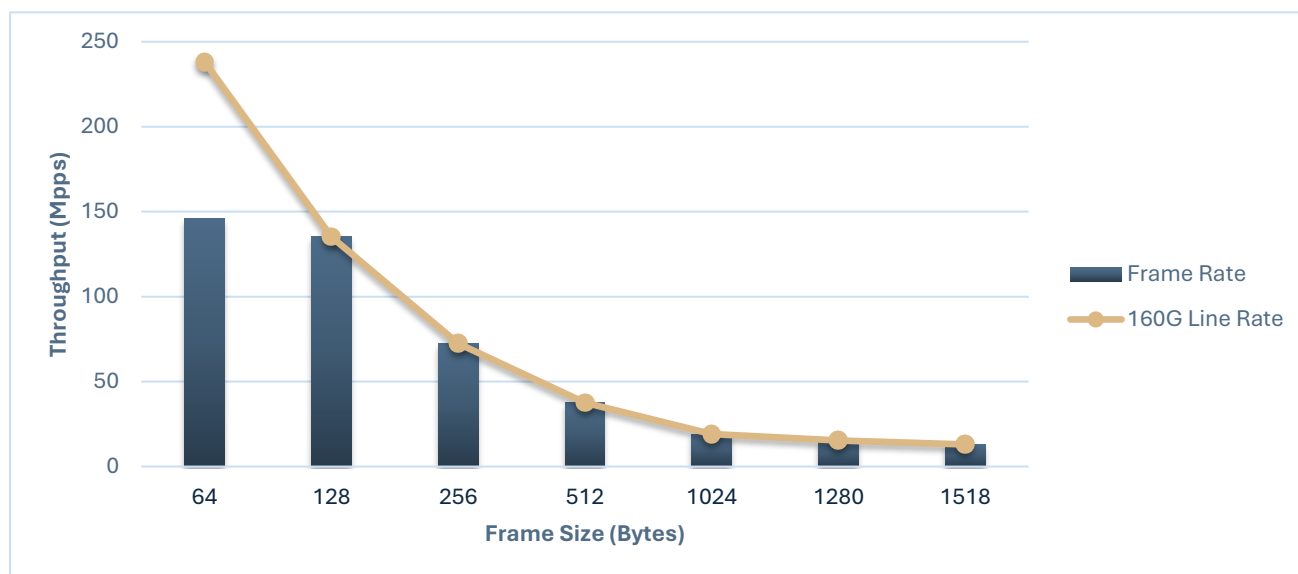
	(8,0,32),(9,0,33),(10,0,34),(11,0,35),(12,0,36),(13,0,37),(14,0,38),(15,0,39) " --tx-queue-size 4096 --rx-queue-size 4096
--	--

3-3. Test Result

Frame Size (Bytes)	Line Rate [16x10G] (Mpps)	Frame Rate (Mpps)	% Line Rate
64	238.09	146.01	61.328
128	135.13	135.13	100
256	72.46	72.46	100
512	37.59	37.59	100
1024	19.15	19.15	100
1280	15.38	15.38	100
1518	13.00	13.00	100


RFC2544 zero packet loss test on 4x AEWIN R386 Network Expansion Module

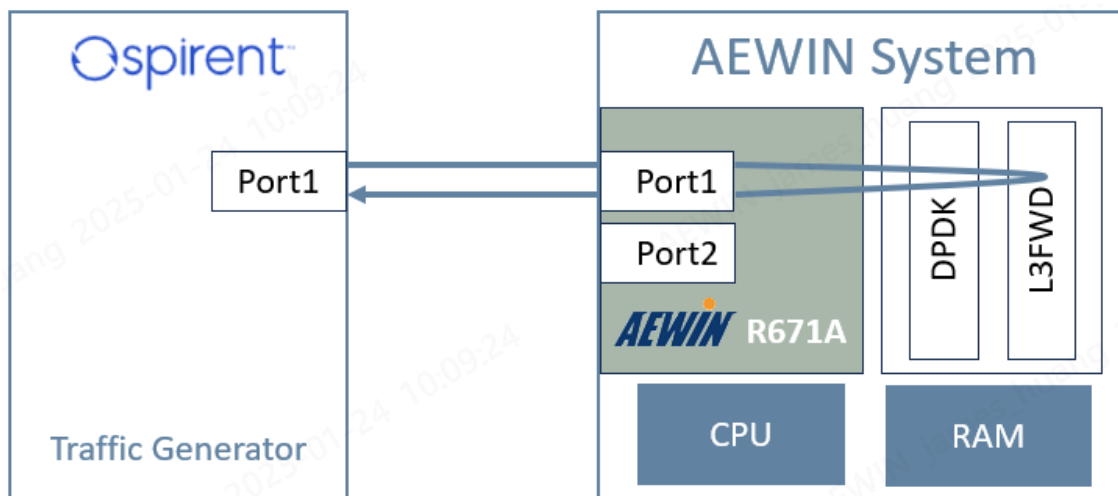
(16ports used on 4 NICs)



4. RFC2544 zero packet loss test on 1x AEWIN R671 Network Expansion Module (Single port)

4-1. Test setup

Item	Description
Test Case	Test#4 RFC2544 zero packet loss test on 1x AEWIN R671 Network Expansion Module (Single port)
Network Platform	AEWIN Performance Network System (SCB-1942)
CPU	Intel® Xeon® Gold 6458Q @3.10 GHz (2PCS)
Memory	Samsung 64 GB DDR5 4800 M321R8GAA0BB0-CQKMG (16PCS)
NIC	<p>AEWIN R671 Network Expansion Module is built upon the Intel® E810-CAM2 chipset, featuring 2x 100GbE QSFP28 ports (PCIe Gen4 x8)</p>  The image shows the AEWIN R671 Network Expansion Module, a green printed circuit board (PCB) with two QSFP28 ports on the left. A black cooling fan is mounted in the center, connected to a power source by a yellow and red cable. The board features various components, including capacitors, resistors, and integrated circuits. The text 'R671 REV A0' and 'AA' are visible on the board. The Intel logo is also present in the top right corner.
BIOS	C1942002_t24 (05/27/2024 17:04:20)
Microcode	5.32
Operating System	Ubuntu 22.04.4 LTS
Linux kernel version	5.15.0-94-generic
GCC version	gcc (Ubuntu 11.4.0-1ubuntu1~22.04) 11.4.0
Intel NIC Device ID	8086:1592
Intel NIC Firmware version	3.00 0x80008273 1.2992.0
DPDK version	25.03
Test configuration	1 port assigned per logical core using 4 queue. Totaling 4 logical cores, 4 queues for 1ports

1x AEWIN R671 Network Expansion Module connected to SPIRENT (Single port)**4-2. Test setting**

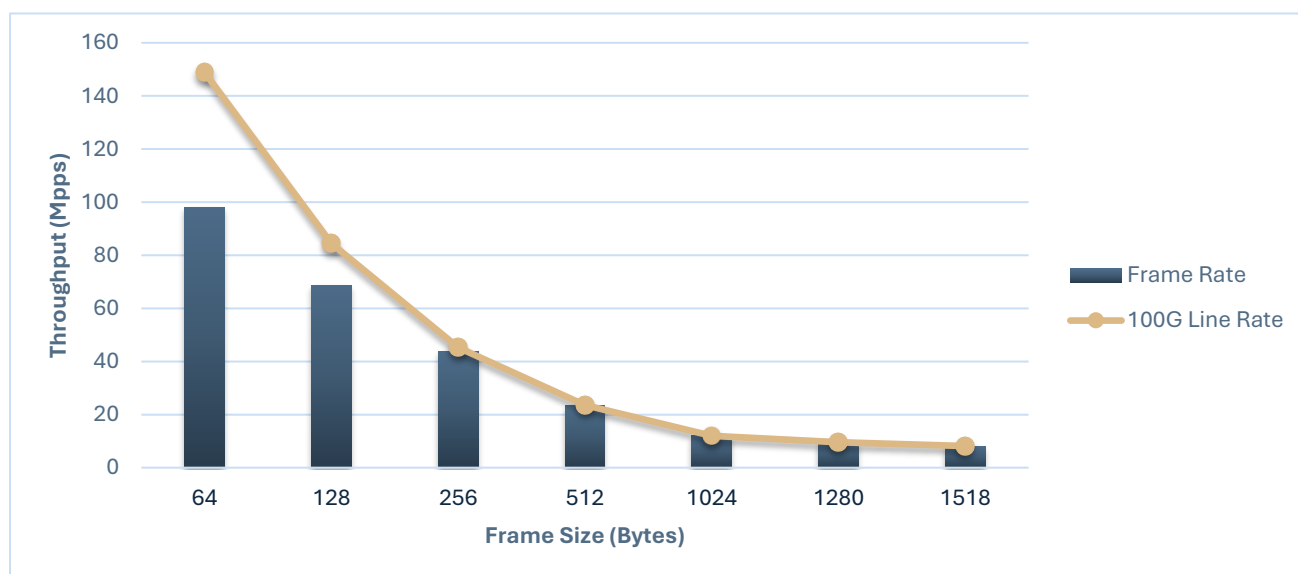
Item	Description
BIOS	CPU Power and Performance Policy [Performance] CPU C-state Disabled CPU P-state Disabled Turbo Boost Disabled
Boot settings	default_hugepagesz=1G hugepagesz=1G hugepages=64 intel_iommu=on iommu=pt
DPDK Settings	CC=gcc meson -Dlibdir=lib -Dexamples=l3fwd -Dc_args=- DRTE_LIBRTE_ICE_16BYTE_RX_DESC --default-library=static x86_64- native linuxapp-gcc
Command line	l3fwd -l 1-4 -n 8 --force-max-simd-bitwidth=512 -- -P -p 0x1 -- config="(0,0,1),(0,1,2),(0,2,3),(0,3,4)" --tx-queue-size 2048 --rx-queue-size 2048

4-3. Test Result

Frame Size (Bytes)	Line Rate [100G] (Mpps)	Frame Rate (Mpps)	% Line Rate
64	148.8	98.17	65.969
128	84.46	68.78	81.438
256	45.29	43.89	96.906
512	23.50	23.50	100
1024	11.97	11.97	100
1280	9.62	9.62	100
1518	8.13	8.13	100


RFC2544 zero packet loss test on 1x AEWIN R671 Network Expansion Module

(Single port)



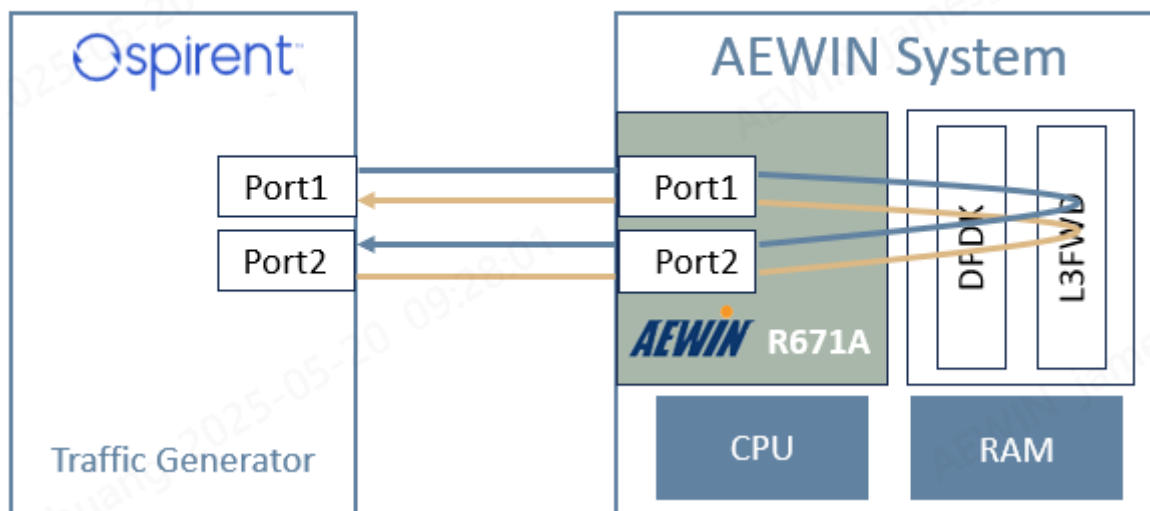
5. RFC2544 zero packet loss test on 1x AEWIN R671 Network Expansion Module (2 ports used on 1 NIC)

5-1. Test setup

Item	Description
Test Case	Test#5 RFC2544 zero packet loss test on 1x AEWIN R671 Network Expansion Module (2 ports used on 1 NIC)
Network Platform	AEWIN Performance Network System (SCB-1942)
CPU	Intel® Xeon® Gold 6458Q @3.10 GHz (2PCS)
Memory	Samsung 64 GB DDR5 4800 M321R8GAA0BB0-CQKMG (16PCS)
NIC	<p>AEWIN R671 Network Expansion Module is built upon the Intel® E810-CAM2 chipset, featuring 2x 100GbE QSFP28 ports (PCIe Gen4 x8)</p>  A photograph of the AEWIN R671 Network Expansion Module. It is a green printed circuit board (PCB) with two QSFP28 ports on the left side, each labeled 'MAC'. A black cooling fan is mounted in the center. On the right side, there are several status LEDs and a small label that reads 'R671 REV A0'. A yellow cable is connected to the module.
BIOS	C1942002_t24 (05/27/2024 17:04:20)
Microcode	5.32
Operating System	Ubuntu 22.04.4 LTS
Linux kernel version	5.15.0-94-generic
GCC version	gcc (Ubuntu 11.4.0-1ubuntu1~22.04) 11.4.0
Intel NIC Device ID	8086:1592
Intel NIC Firmware version	3.00 0x80008273 1.2992.0
DPDK version	25.03
Test configuration	2 port assigned per logical core using 8 queue. Totaling 8 logical cores, 8 queues for 2ports

1x AEWIN R671 Network Expansion Module connected to SPIRENT**(2ports used on 1 NIC)**

DPDK NIC performance test setup (2 port per 1NIC) :

**5-2. Test setting**

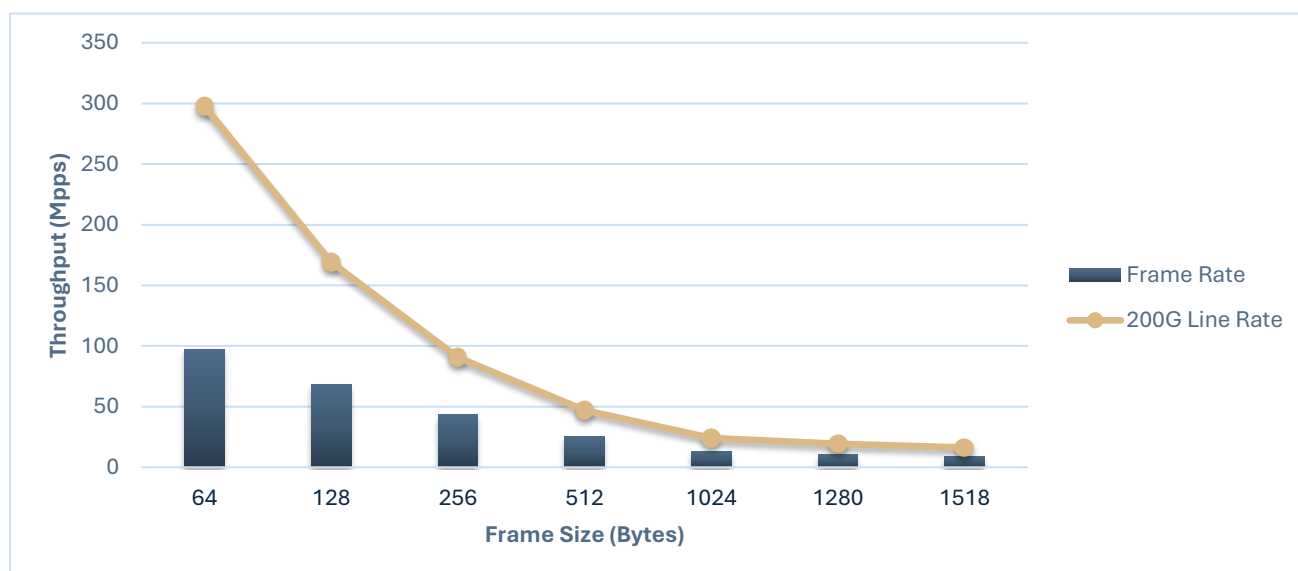
Item	Description
BIOS	CPU Power and Performance Policy [Performance] CPU C-state Disabled CPU P-state Disabled Turbo Boost Disabled
Boot settings	default_hugepagesz=1G hugepagesz=1G hugepages=64 intel_iommu=on iommu=pt
DPDK Settings	CC=gcc meson -Dlibdir=lib -Dexamples=l3fwd -Dc_args=- DRTE_LIBRTE_ICE_16BYTE_RX_DESC --default-library=static x86_64- native linuxapp-gcc
Command line	l3fwd -l 1-8 -n 16 -- -P -p 0x3 -- config="(0,0,1),(0,1,2),(0,2,3),(0,3,4),(1,0,5),(1,1,6),(1,2,7),(1,3,8)" --tx- queue-size 2048 --rx-queue-size 2048

5-3. Test Result

Frame Size (Bytes)	Line Rate [200G] (Mpps)	Frame Rate (Mpps)	% Line Rate
64	297.61	97.36	32.711
128	168.91	68.31	40.445
256	90.58	43.64	48.180
512	46.99	25.19	53.594
1024	23.94	13.21	55.141
1280	19.23	10.60	55.141
1518	16.25	9.09	55.914


RFC2544 zero packet loss test on 1x AEWIN R671 Network Expansion Module

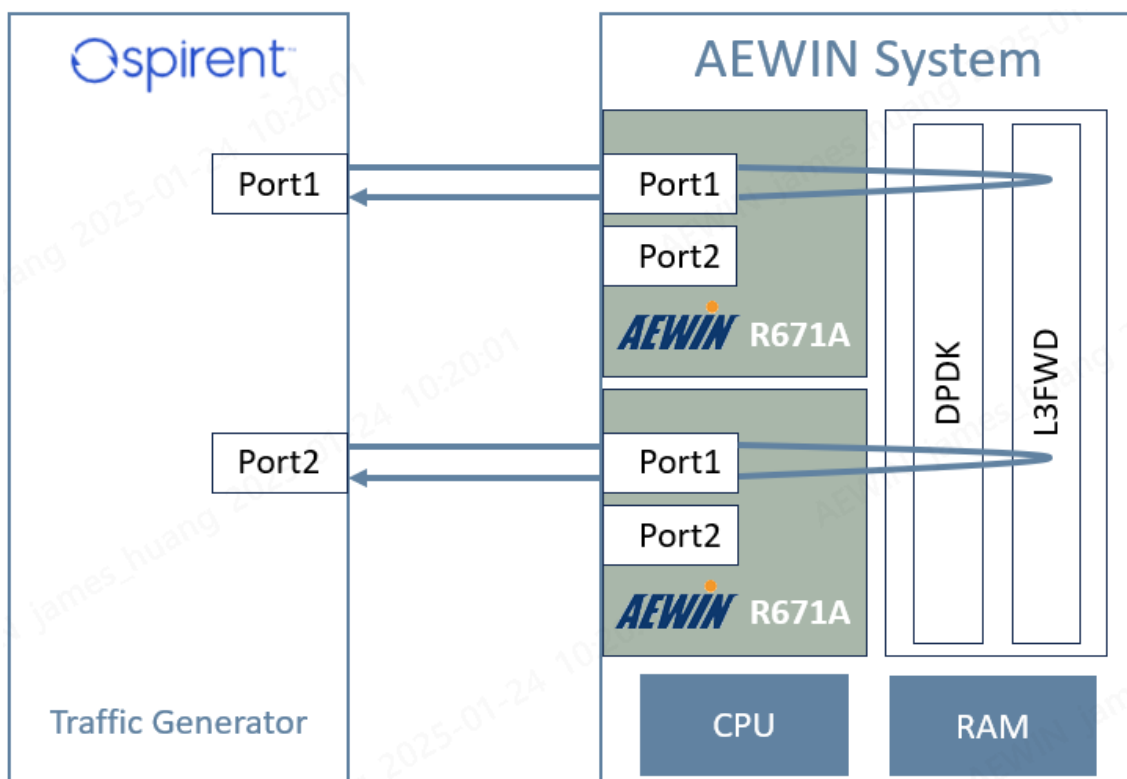
(2ports used on 1 NIC)



6. RFC2544 zero packet loss test on 2x AEWIN R671 Network Expansion Module (2 ports used on 2 NICs)

6-1. Test setup

Item	Description
Test Case	Test#7 RFC2544 zero packet loss test on 2x AEWIN R671 Network Expansion Module (2 ports used on 2 NICs)
Network Platform	AEWIN Performance Network System (SCB-1942)
CPU	Intel® Xeon® Gold 6458Q @3.10 GHz (2PCS)
Memory	Samsung 64 GB DDR5 4800 M321R8GAA0BB0-CQKMG (16PCS)
NIC	<p>AEWIN R671 Network Expansion Module is built upon the Intel® E810-CAM2 chipset, featuring 2x 100GbE QSFP28 ports (PCIe Gen4 x8)</p>  The image shows the AEWIN R671 Network Expansion Module, a green printed circuit board (PCB) populated with various electronic components. It features two large, tan-colored QSFP28 ports on the left side, each labeled 'MAC'. A central black cooling fan is mounted on a silver heat sink. To the right of the fan, there are several status LEDs and a small white label that reads 'R671 REV A0'. The board has a gold-plated PCIe edge connector on the right side. Various other components like capacitors, resistors, and integrated circuits are visible across the surface.
BIOS	C1942002_t24 (05/27/2024 17:04:20)
Microcode	5.32
Operating System	Ubuntu 22.04.4 LTS
Linux kernel version	5.15.0-94-generic
GCC version	gcc (Ubuntu 11.4.0-1ubuntu1~22.04) 11.4.0
Intel NIC Device ID	8086:1592
Intel NIC Firmware version	3.00 0x80008273 1.2992.0
DPDK version	25.03
Test configuration	2 port assigned per logical core using 8 queue. Totaling 8 logical cores, 8 queues for 2ports

2x AEWIN R671 Network Expansion Module connected to SPIRENT**(2 ports used on 2 NICs)****6-2. Test setting**

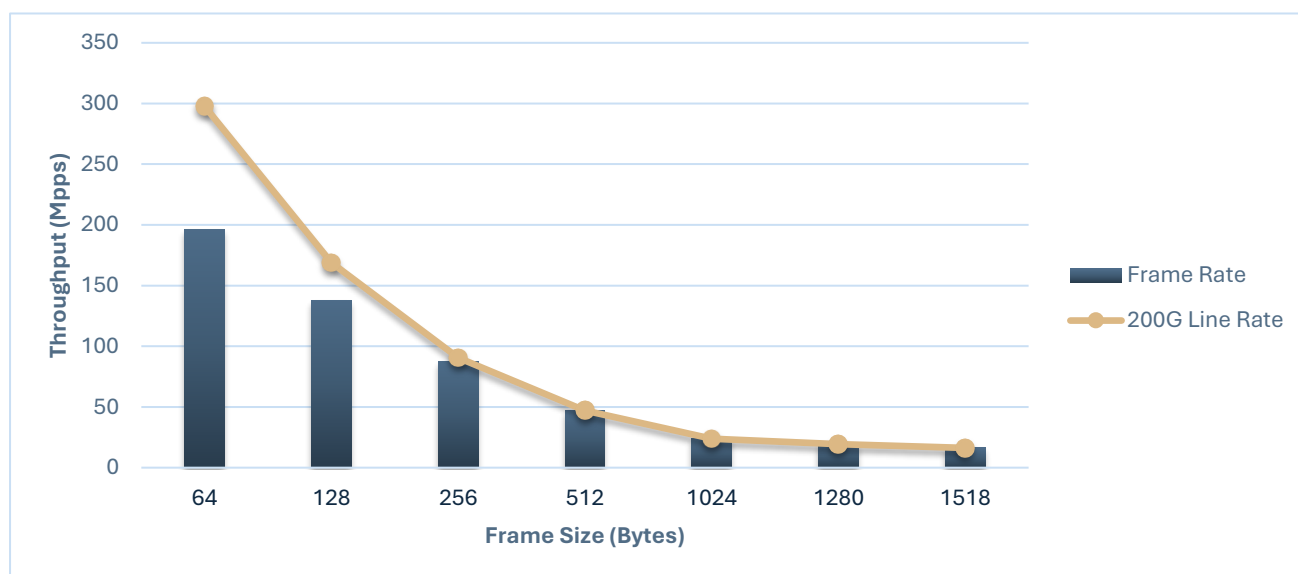
Item	Description
BIOS	CPU Power and Performance Policy [Performance] CPU C-state Disabled CPU P-state Disabled Turbo Boost Disabled
Boot settings	default_hugepagesz=1G hugepagesz=1G hugepages=64 intel_iommu=on iommu=pt
DPDK Settings	CC=gcc meson -Dlibdir=lib -Dexamples=l3fwd -Dc_args=- DRTE_LIBRTE_ICE_16BYTE_RX_DESC --default-library=static x86_64- native linuxapp-gcc
Command line	l3fwd -l 1-8 -n 16 -- -P -p 0x3 -- config="(0,0,1),(0,1,2),(0,2,3),(0,3,4),(1,0,5),(1,1,6),(1,2,7),(1,3,8)" --tx- queue-size 2048 --rx-queue-size 2048

6-3. Test Result

Frame Size (Bytes)	Line Rate [2x100G] (Mpps)	Frame Rate (Mpps)	% Line Rate
64	297.61	196.34	65.969
128	168.91	137.56	81.438
256	90.58	87.78	96.906
512	47.00	47.00	100
1024	23.94	23.94	100
1280	19.23	19.23	100
1518	16.25	16.25	100

RFC2544 zero packet loss test on 2x AEWIN R671 Network Expansion Module

(2 ports used on 2 NICs)



DISCLAIMERS

Products described herein.

Tests document performance of components on a particular test, in specific systems.

Differences in hardware, software, or configuration will affect actual performance. For more complete information about performance and benchmark results, visit <https://www.aewin.com>

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