



# Benchmark Report

Benchmark: eflatency, sfnt-pingpong

System: **ACE 3120-RZ**

Family: **ACE 3100-RZ**

Additional Equipment: AMD Solarflare X4522-PLUS NIC

Release Date	Revision	Notes
29-Sept-25	1.0	First release
13-Oct-25	1.1	Corrected SUT model details



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## Introduction

Blackcore provide fast, reliable, overclocked, liquid cooled servers that deliver the ultimate competitive edge to our clients within the electronic trading industry.

## Testing

We will run a set of simple tests using eflatency and sfnt-pingpong<sup>[1]</sup> to measure typical round-trip network latency in a Blackcore overclocked server system when coupled with an AMD X4522-PLUS low latency network interface card (NIC).

We will compare stock<sup>[2]</sup> performance to Blackcore's overclocked performance, as well as performance against previous generation Alveo X3522 NIC.

Note: Testing has been performed on pre-release X4522-PLUS hardware and firmware.

<sup>[1]</sup> eflatency and sfnt-pinpong are provided by AMD as part of the Xilinx onload toolset.

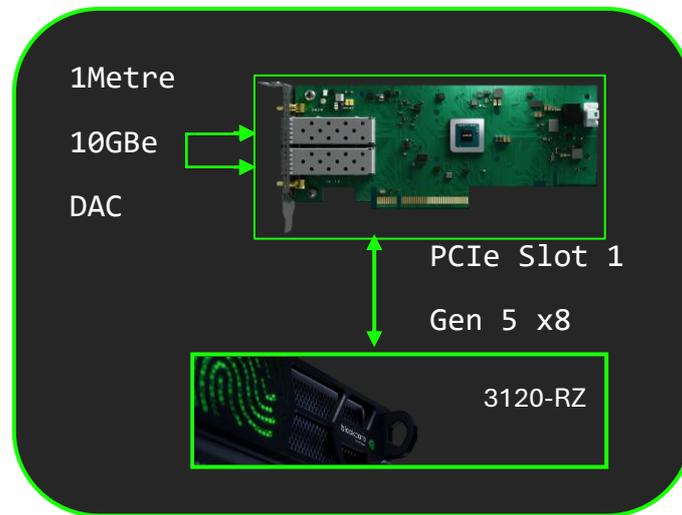
See: [Xilinx-CNS/onload · GitHub](#)

<sup>[2]</sup> Stock is defined as running the system without any BIOS tweaks, as the system would run "out of the box" and adhering to the CPU manufacturers default specifications. This includes Simultaneous Multi-Threading (SMT) / Hyperthreading (HT) and E-Cores enabled (where applicable). Stock testing is still performed in a Blackcore system and so may include cooling enhancements not found in other typical systems. Linux tuning will be identical to overclocked testing except for any adjustments needed to enable stock features (i.e.: enablement of SMT / HT).



## System Under Test (SUT)

The SUT contains an AMD Solarflare X4522-PLUS card in PCIe Slot 1 with a 1 Metre 10Gbe Direct Attach Cable (DAC) connected in loopback.



Hardware		Firmware
Blackcore 3120-RZ	CPU: AMD Ryzen 9950X @ 5.4GHz RAM: 32GB @ 5800MHz CL26	BIOS 9902
AMD Alveo X4522-PLUS		1.0.4.22
DAC	1 Metre, 10Gbe, SFP+	
Software		
Linux	Rocky Linux release 9.5 (Blue Onyx)	Kernel: 5.14.0-503.31.1.el9_5.x86_64
X4522 Driver	sfc	6.1.1.1005
Onload	OpenOnload	onload-9.1~preview3-1

Note: X4522 was tested with pre-release firmware and software, which may not be indicative of release performance.



## Tuning

Note: Tuning is identical for “stock” and “overclocked”.

### Grub Parameters

```
nomodeset rhgb ipv6.disable=1 rcu_nocb_poll
processor.max_cstate=0 idle=poll nmi_watchdog=0 amd_iommu=off
iomem=relaxed hugepagesz=2MB hugepages=6000 default_hugepagez=2MB
transparent_hugepage=never pcie_aspm=performance audit=0
hpet=disabled nohalt noibrs noibpb nopti edd=off selinux=0
cpuidle.off=1 skew_tick=1 acpi_irq_nobalance nokaslr nospectre_v2
nospectre_v1 l1tf=off nospec_store_bypass_disable no_stf_barrier
mds=off tsx=on tsx_async_abort=off mitigations=off
tsc_calibrate=nocpuid tsc=reliable clocksource=tsc nohz=on
nohz_full=1-15 rcu_nocbs=1-15 nosoftlockup cgroup_disable=memory
skew_tick=1 tsc=reliable rcupdate.rcu_normal_after_boot=1 nohz=on
nohz_full=1-15 rcu_nocbs=1-15 tuned.non_isolcpus=ffff0001
nosoftlockup
```

### Tuned

The Tuned service is used to apply AMDLL best practice settings.

More details can be found here:

[https://www.amd.com/content/dam/amd/en/documents/epyc-technical-docs/white-papers/58649\\_amd-epyc-tg-low-latency.pdf](https://www.amd.com/content/dam/amd/en/documents/epyc-technical-docs/white-papers/58649_amd-epyc-tg-low-latency.pdf)



## Other parameters

The sfc driver is set to “latency” mode by creating a .conf file in /etc/modprobe.d with the content:

```
options sfc performance-profile=latency
```

The X4522-PLUS card has its firmware set to “low\_latency” mode by loading a config file:

```
sudo devlink dev flash pci/0000:01:00.0 file amd-solarflare-  
configs/samples/x4522/low_latency/cfg_2pf_Ovf.ini
```

This contains the following parameters:

```
firmware_variant = low_latency  
port_mode = [1x1/10/25/50G][1x1/10/25/50G]  
vf_count = 0  
vf_msix_limit = 128
```

## Test Parameters

The test script runs 3 tests:

eflatency, sfnt-pingpong [TCP], sfnt-pingpong [UDP]

- Each test is run in sequential byte sizes from 4 bytes to 648 bytes in 4 byte increments.
- Each test is run 3 times.
- Each test allocates an isolated core for the RX and TX part of the test.
- Another 2 isolated cores are assigned to the RX/TX IRQs for the NIC.
- The interfaces on the NIC are isolated from each other using ip namespaces.



## Test Code

A snippet of the code is provided below for context of how each test is performed.

```
run_efvi_test () {
    for i in `seq 4 4 648`
    do
        taskset -c ${CORE2} ip netns exec ns1
$ONLOAD_PATH/build/gnu_x86_64/tests/ef_vi/eflatency -s $i pong ${IFACE2} &
        sleep 4
        taskset -c ${CORE1}
$ONLOAD_PATH/build/gnu_x86_64/tests/ef_vi/eflatency -s $i ping ${IFACE1}
    done
}

run_tcp_test () {
    SFNTP="/opt/cns-sfnettest/cns-sfnettest-master/src"
    APP="/sfnt-pingpong"
    taskset -c ${CORE2} ip netns exec ns1 onload -p latency-best $SFNTP$APP
&
    taskset -c ${CORE1} onload -p latency-best $SFNTP$APP --affinity
'${CORE1};${CORE1}' --sizes `seq -s , 4 4 648` tcp ${IP2}
}

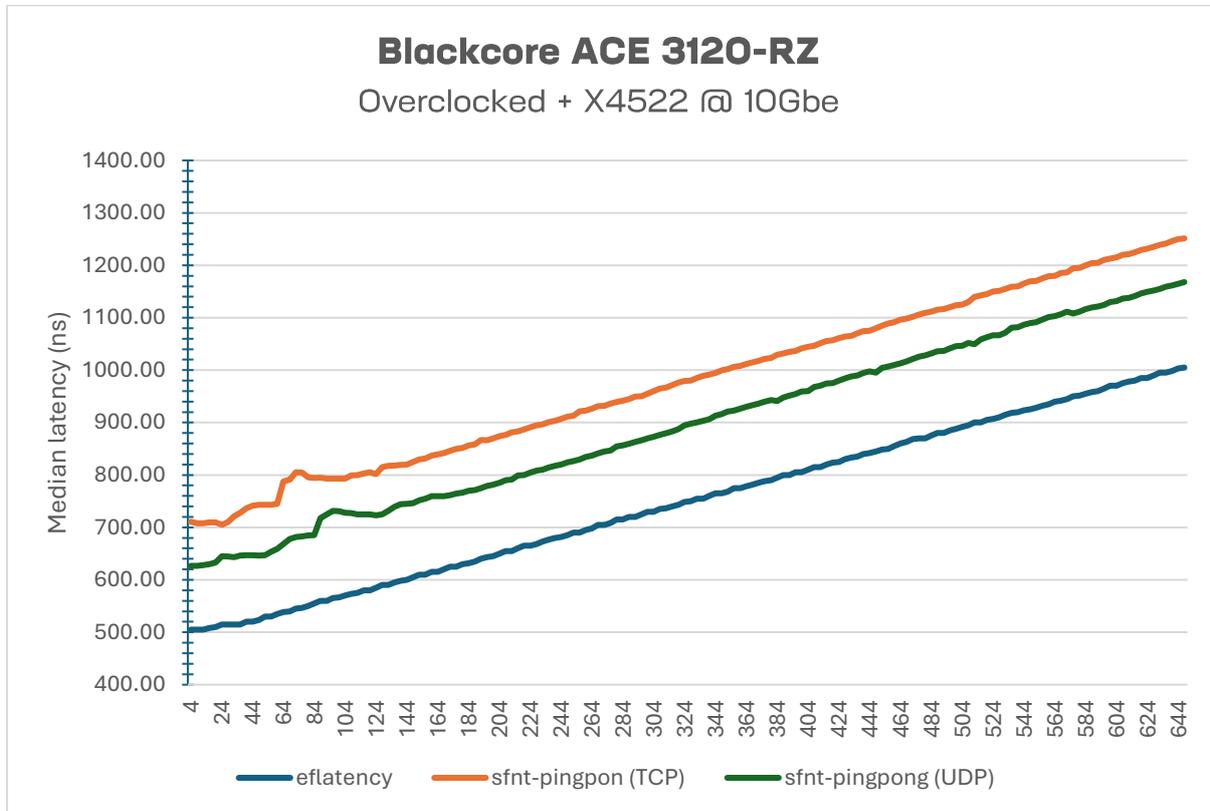
run_udp_test () {
    SFNTP="/opt/cns-sfnettest/cns-sfnettest-master/src"
    APP="/sfnt-pingpong"
    taskset -c ${CORE2} ip netns exec ns1 onload -p latency-best $SFNTP$APP
&
    taskset -c ${CORE1} onload -p latency-best $SFNTP$APP --affinity
'${CORE1};${CORE1}' --sizes `seq -s , 4 4 648` udp ${IP2}
}
```



## Results

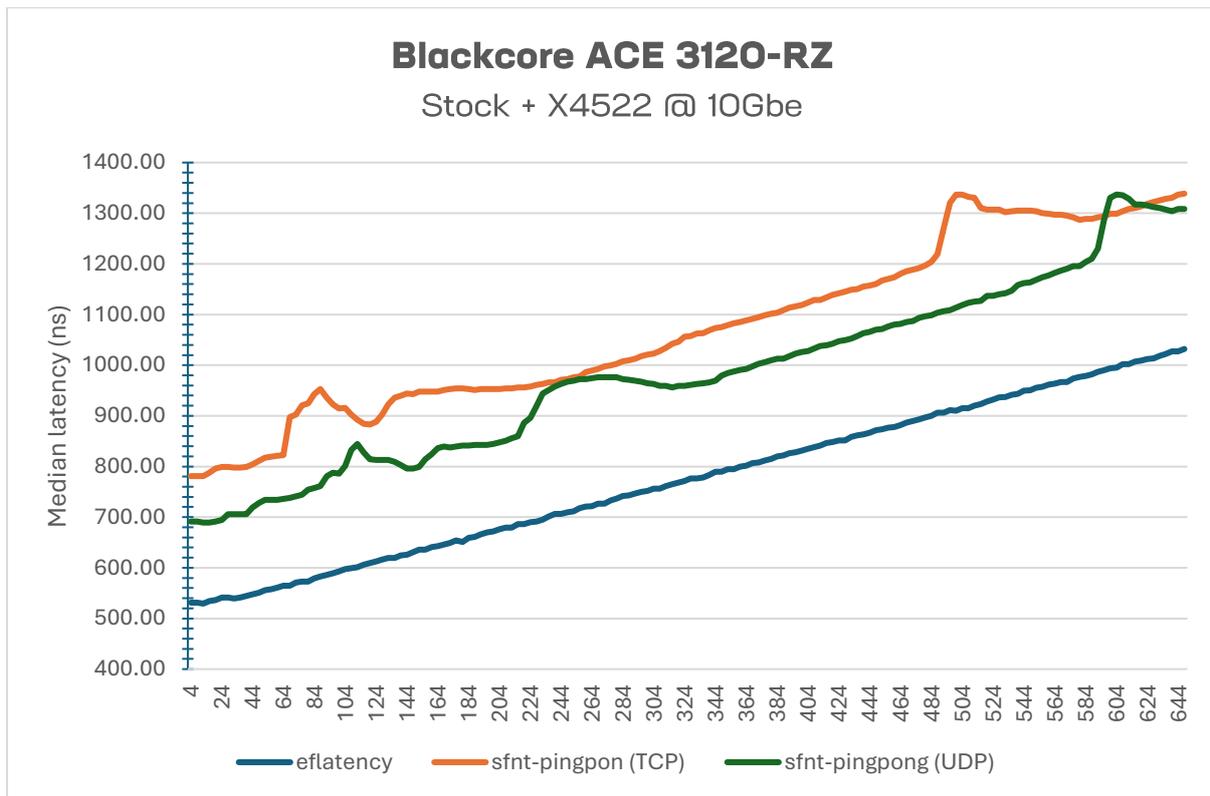
All results presented are half RTT, in nanoseconds [ns].

Summary of overclocked results:

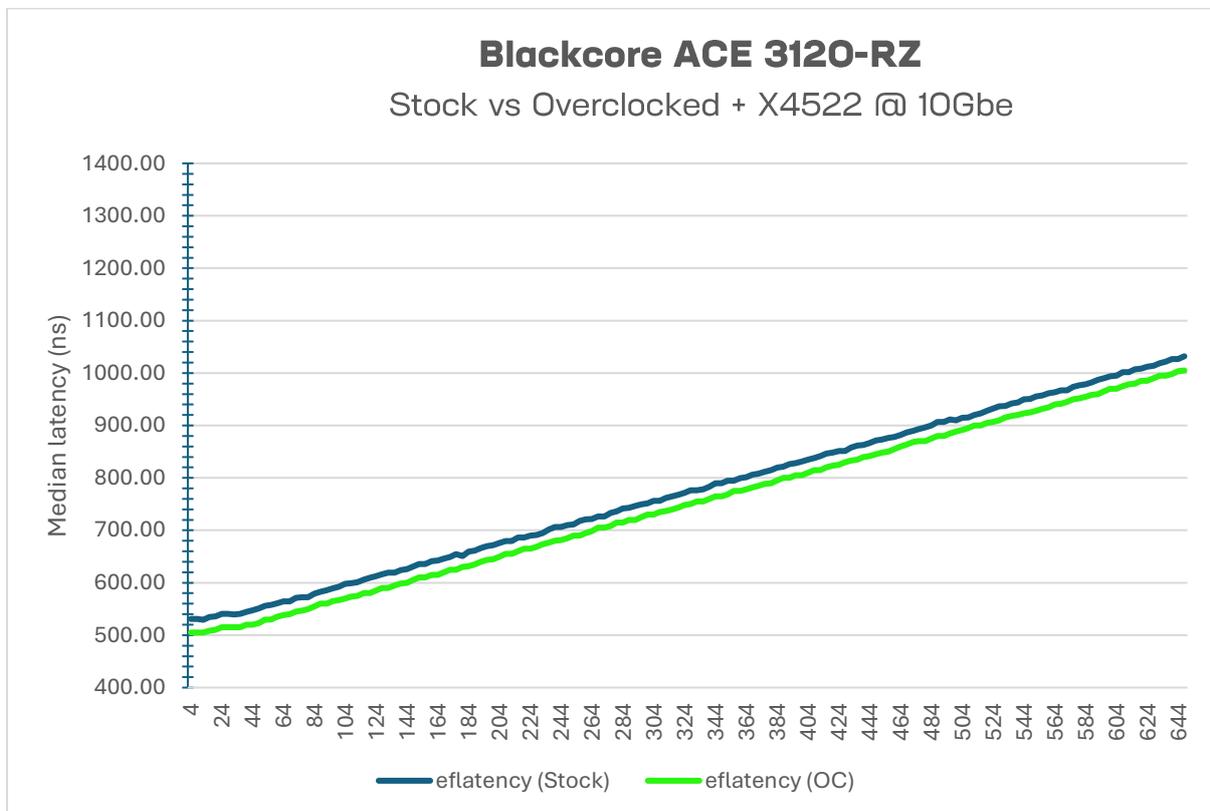




Summary of stock results:

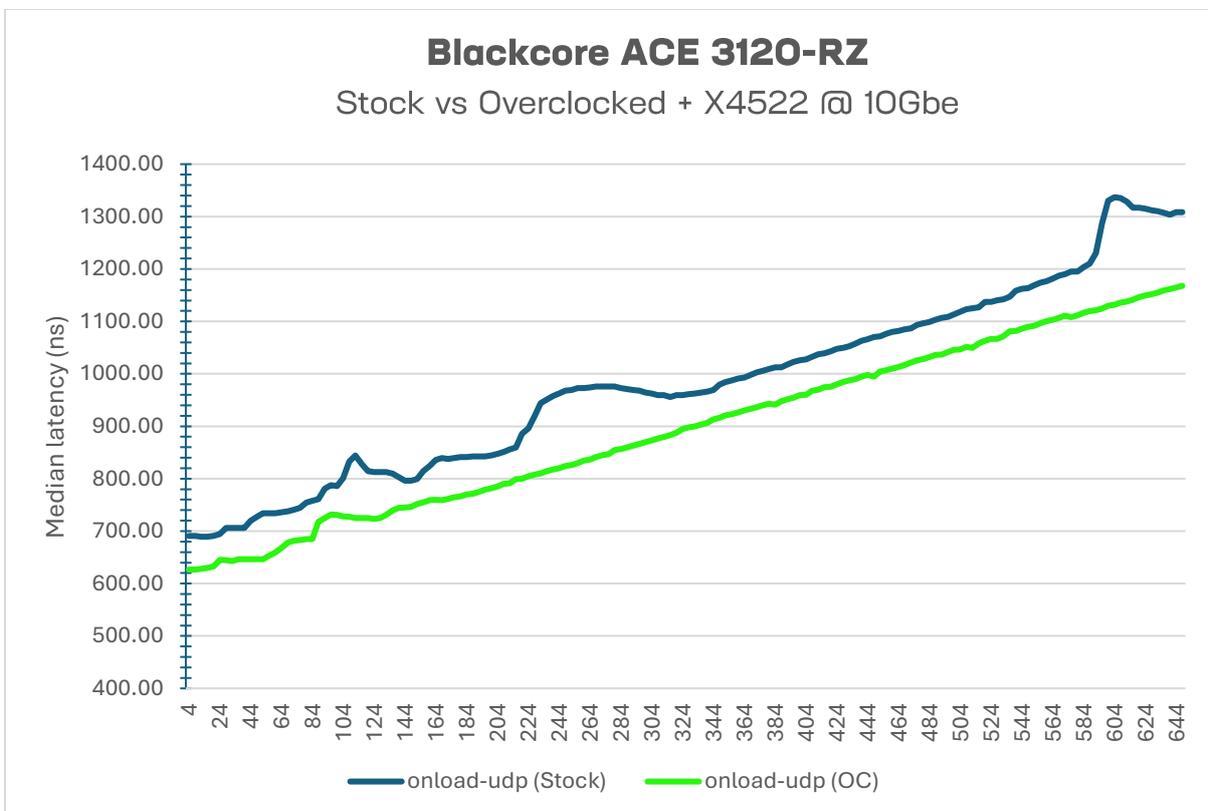
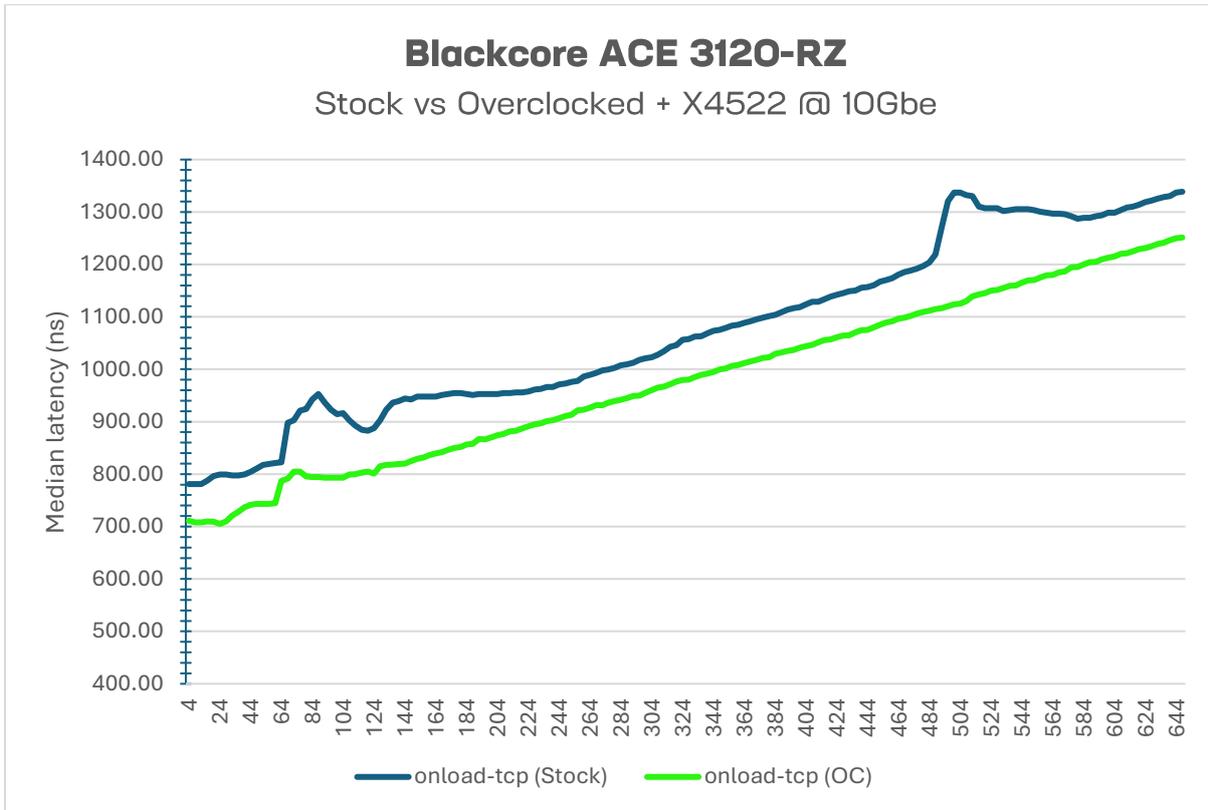


Stock vs. OC - eflatency:





Stock vs. OC - Onload:





Summary comparison at typical byte sizes

4 Bytes

Min Lat - 4 bytes				
Test	Stock	Blackcore	Delta	%
ef_vi	491.00	480.00	-11.00	2.24
Onload-TCP	719.33	663.33	-56.00	7.78
Onload-UDP	662.67	598.67	-64.00	9.66
Median Lat - 4 bytes				
Test	Stock	Blackcore	Delta	%
ef_vi	531.00	505.00	-26.00	4.90
Onload-TCP	781.00	710.67	-70.33	9.01
Onload-UDP	691.00	626.67	-64.33	9.31
99%ile Lat - 4 bytes				
Test	Stock	Blackcore	Delta	%
ef_vi	561.00	538.33	-22.67	4.04
Onload-TCP	1039.33	846.33	-193.00	18.57
Onload-UDP	932.67	744.67	-188.00	20.16

64 Bytes

Min Lat - 64 bytes				
Test	Stock	Blackcore	Delta	%
ef_vi	526.00	513.33	-12.67	2.41
Onload-TCP	776.00	701.67	-74.33	9.58
Onload-UDP	704.33	626.33	-78.00	11.07
Median Lat - 64 bytes				
Test	Stock	Blackcore	Delta	%
ef_vi	564.33	538.33	-26.00	4.61
Onload-TCP	822.67	787.33	-35.33	4.29
Onload-UDP	736.00	668.00	-68.00	9.24
99%ile Lat - 64 bytes				
Test	Stock	Blackcore	Delta	%
ef_vi	594.33	568.33	-26.00	4.37
Onload-TCP	1137.00	916.33	-220.67	19.41
Onload-UDP	959.33	801.67	-157.67	16.44



128 Bytes

Min Lat - 128 bytes				
Test	Stock	Blackcore	Delta	%
ef_vi	576.00	558.33	-17.67	3.07
Onload-TCP	799.33	739.67	-59.67	7.46
Onload-UDP	758.33	677.00	-81.33	10.73
Median Lat - 128 bytes				
Test	Stock	Blackcore	Delta	%
ef_vi	616.00	590.00	-26.00	4.22
Onload-TCP	902.67	815.00	-87.67	9.71
Onload-UDP	812.67	724.67	-88.00	10.83
99%ile Lat - 128 bytes				
Test	Stock	Blackcore	Delta	%
ef_vi	667.83	621.67	-46.17	6.91
Onload-TCP	1148.67	959.67	-189.00	16.45
Onload-UDP	1083.67	867.33	-216.33	19.96

256 Bytes

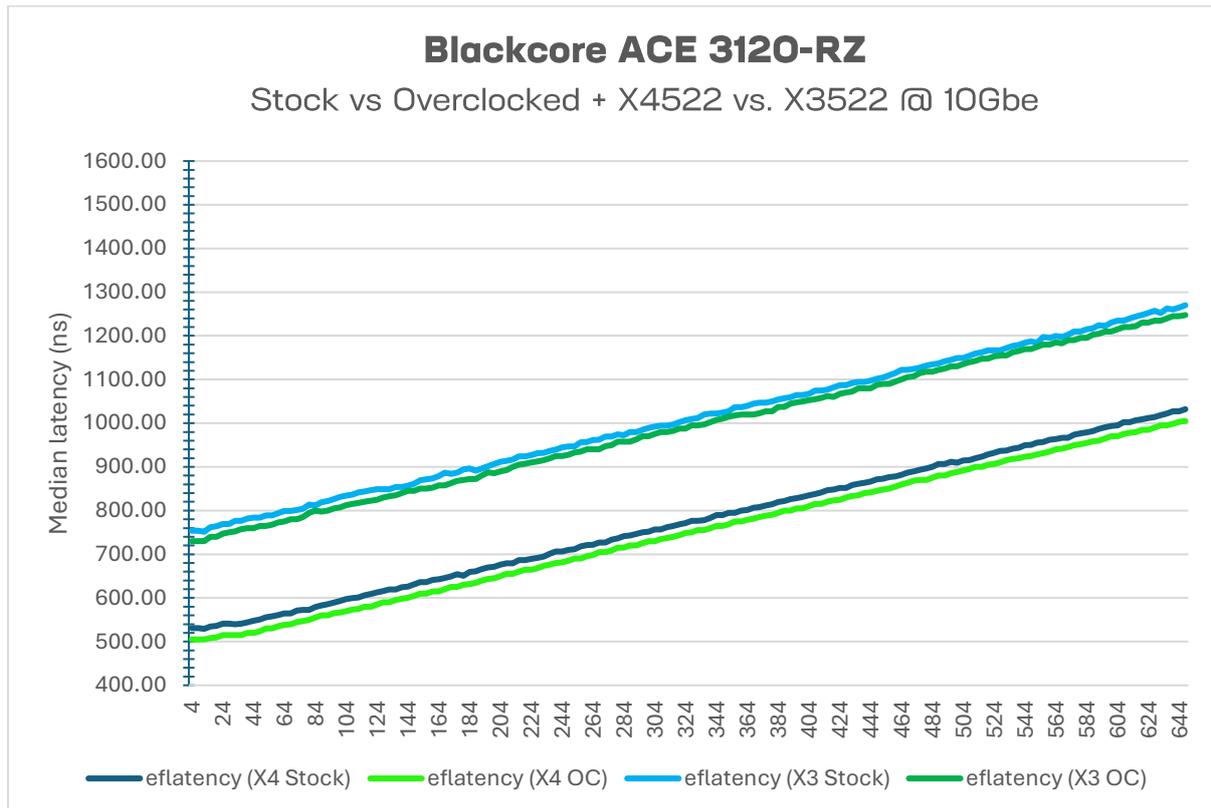
Min Lat - 256 bytes				
Test	Stock	Blackcore	Delta	%
ef_vi	679.50	666.67	-12.83	1.89
Onload-TCP	914.33	854.67	-59.67	6.53
Onload-UDP	872.00	789.33	-82.67	9.48
Median Lat - 256 bytes				
Test	Stock	Blackcore	Delta	%
ef_vi	718.00	690.00	-28.00	3.90
Onload-TCP	977.67	921.67	-56.00	5.73
Onload-UDP	972.67	829.67	-143.00	14.70
99%ile Lat - 256 bytes				
Test	Stock	Blackcore	Delta	%
ef_vi	774.83	725.00	-49.83	6.43
Onload-TCP	1155.33	1064.33	-91.00	7.88
Onload-UDP	1133.67	956.00	-177.67	15.67



## X4522 vs. X3522 Comparisons

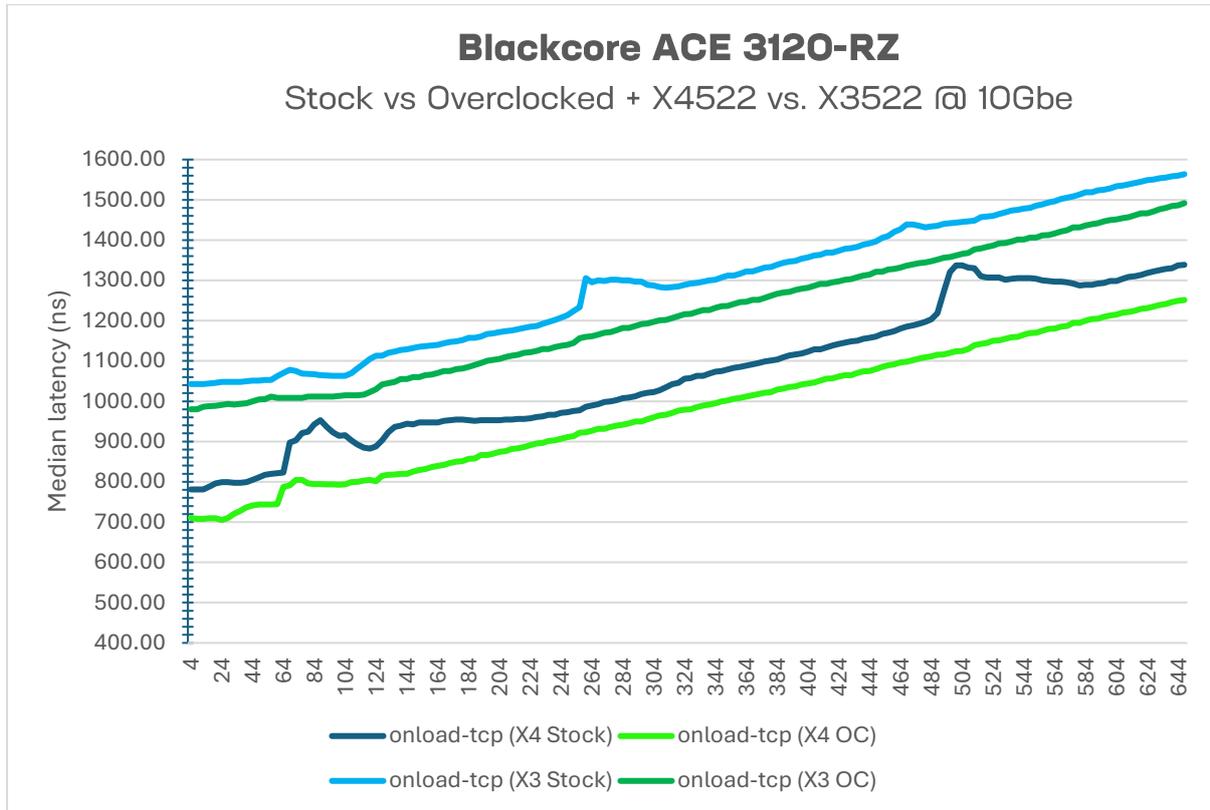
We compare the above results on the X4522 NIC with the results gathered for X3522 in previous benchmark whitepaper. SUT is identical between testing, with only the physical card, and onload version being changed for X4522 compatibility.

eflatency:

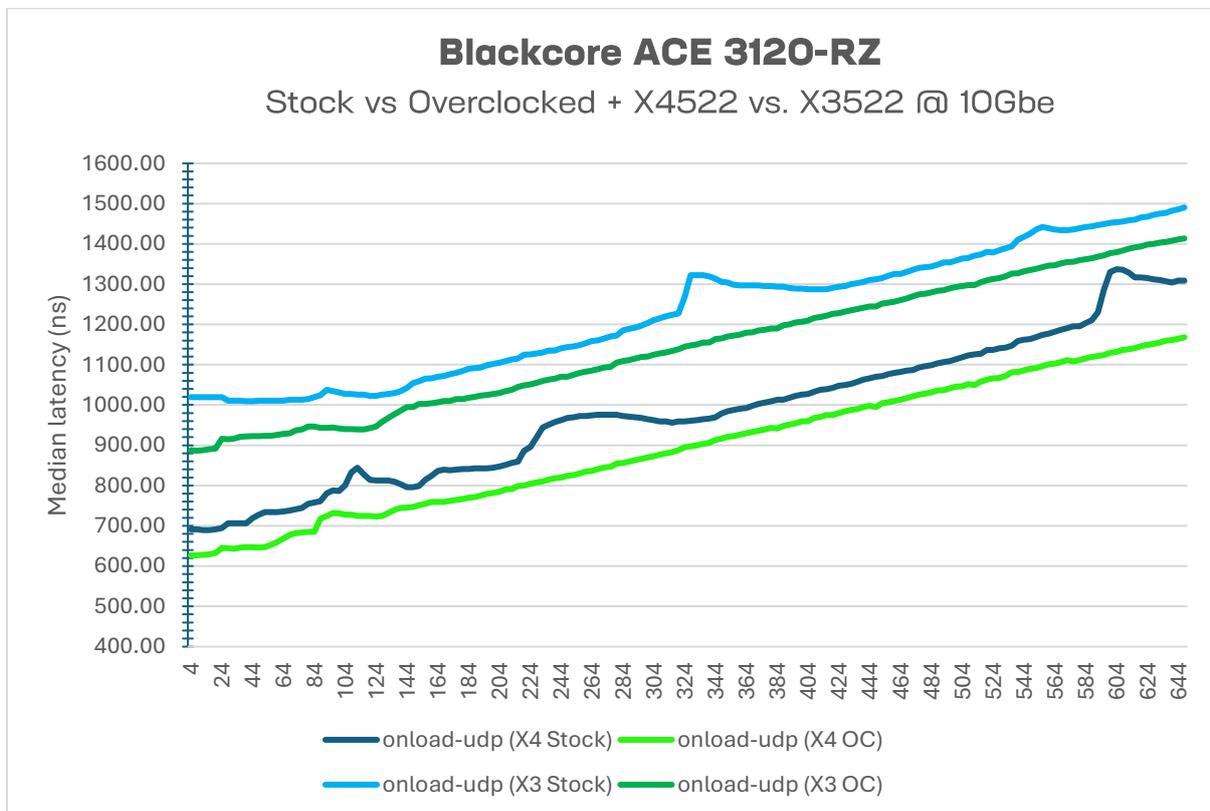




Onload (TCP):



Onload (UDP):





## Conclusion

Blackcore servers provide demonstrable latency improvements over a stock system when looking at all metrics. Lower minimum achievable latency, lower median latency, and significantly more consistent 99%ile performance.

The X4522 provides an impressive uplift in performance versus the X3522, providing 200ns lower latency in comparison.

The Blackcore ACE 3120-RZ along with AMD Solarflare X4522 measures incredible 540ns latency when using ef\_vi at 64 byte payloads or less, a 30% improvement over X3522. Sub-700ns latency is possible for 256 bytes or less, a 26% improvement. For UDP traffic accelerated with onload, latencies can be reduced by 10-20% with Blackcore's overclocking compared to stock configuration.

Further information on the **ACE 3120-RZ**:

<https://blackcoretech.com/ace-3100-rz>

Learn more about the Blackcore Labs Program:

See <https://blackcoretech.com/lab-center>

Contact [labs@blackcoretech.com](mailto:labs@blackcoretech.com)

Sales enquiries:

See <https://blackcoretech.com/get-a-quote>

Contact [sales@blackcoretech.com](mailto:sales@blackcoretech.com)