

Arista 7050X, 7050X2, 7250X and 7300 Series Performance Validation

Arista Networks was founded to deliver software driven cloud networking solutions for large datacenter and high-performance computing environments.

The Arista 7050X, 7050X2, 7250X, and 7300X series of leaf, spine and spline™ switches are purpose built to deliver ultra high density 10 Gigabit Ethernet and 40GbE switching in compact form factors.

To validate performance of modern high density switches requires having dedicated access to highly specialized and costly testing equipment, access to the devices being tested, knowledge of configuring the test suites and the expertise to obtain accurate and reliable testing results.

While many customers will perform product testing, this whitepaper provides a series of detailed performance testing results achieved with the Arista 7050X, 7050X2, 7250X, and 7300 Series that reduces the need for customers and partners to dedicate their own testing time to validating the performance of these Arista Networks switches.

Introduction

Increased adoption of 10 Gigabit Ethernet servers coupled with applications requiring higher bandwidth is accelerating the need for dense 10 and 40 Gigabit Ethernet switching.

The Arista 7050X, 7050X2 and 7250X Series support a flexible combination of 10G and 40G in highly compact form factors which allows customers to design large leaf and spine networks to accommodate both east- west traffic patterns and a requirement for low latency and power efficiency.

The Arista 7300 series are a purpose built range of modular chassis and a key component of the Arista datacenter product portfolio. When coupled with the 7300X series linecards the 7300 series add a new dimension of design flexibility and scalability in traditional MoR/EoR, Leaf and Spine and Spine™ deployments.

It is the goal of this report to identify and evaluate analytical performance data regarding the 7050X, 7050X2, 7250X and 7300 series of switches from Arista Networks.

Performance data will be evaluated over the two primary metrics critical to data center environments, latency and throughput.

It is not the goal of this report to highlight the 'best of all possible' worlds results, but rather to act as a guide for Arista customers as to what levels of performance can be expected in a real world deployment.

Based on this requirement the tests do not adhere strictly to the RFC standard tests. However they do integrate the spirit of the RFCs with regards to avoiding 'specmanship' and providing accurate and repeatable results.

Platform Choices

All three of the 7050X, 7050X2, 7250X and 7300X Series are designed with a common architecture specifically to meet the challenges of dense 10 Gigabit and 40 Gigabit Ethernet switching, offering low latency of 550ns in cut- through mode and a shared buffer architecture that is allocated dynamically to ports that are congested.

With typical power consumption of less than 5 watts per 40GbE port (or 1.2W per 10GbE equivalent) the 7050X, 7050X2, 7250X and 7300 Series provide industry leading power efficiency. Built on top of the same industry defining EOS image that runs on the entire Arista product portfolio, the 7050X, 7050X2, 7250X and 7300X Series deliver advanced features for big data, cloud, virtualized and traditional designs in a vast choice of form factors.



Figure 1: Arista 7050X, 7250X and 7300 Series portfolio of datacenter switches

With typical power consumption of less than 5 watts per 40GbE port (or 1.2W per 10GbE equivalent) the 7050X, 7050X2, 7250X and 7300 Series provide industry leading power efficiency. Built on top of the same industry defining EOS image that runs on the entire Arista product portfolio, the 7050X, 7050X2, 7250X and 7300X Series deliver advanced features for big data, cloud, virtualized and traditional designs in a vast choice of form factors.

Table 1: Arista Portfolio Overview

Characteristic	7050QX / 7050QX2		7050TX / 7050TX2						7050SX / 7050SX2					7250 QX	7300		
	32	32S	48	64	72	72Q	96	128	64	72	72Q	96	128	64	7304	7308	7316
Switch Height (RU)	1RU	1RU	1RU	1RU	1RU	1RU	1RU	2RU	1RU	1RU	1RU	1RU	2RU	2RU	8RU	12RU	21RU
BaseT Ports	--	--	32	48	48	48	48	48	--	--	--	--	--	--	--	--	--
SFP+ Ports	--	4	--	--	--	--	--	--	48	48	48	48	96	--	192	384	768
QSFP+ Ports	32	32	4	4	--	6	--	8	4	--	6	--	8	64	128	256	512
MXP Ports	--	--	--	--	2	--	4	--	--	2	--	4	--	--	--	--	--
Maximum Density 10GbE	96	96	48	64	72	72	96	96	64	72	72	96	96	256	512	1024	2048
Maximum Density 40GbE	32	32	4	4	6	6	12	8	4	6	6	12	8	64	128	256	512

The Arista 7050X, 7050X2, 7250X and 7300 series switches combined with the Arista leaf-spine or Spline™ design methodologies provide flexible design solutions for network architects looking to deliver market-leading performance driven networks, which scale from several hundred hosts all the way up several hundred thousand hosts.

Test Methodology

To evaluate realistic performance data from the selected switching platforms a thorough set of tests were executed. The tests were designed to focus on the two key aspects of performance, latency and throughput. The design of the tests was such that any results gathered with the test plan are easily reproducible, not only in a lab environment, but a production one also.

All tests used Ixia devices running IxNetwork 7.10 EA-SP1 to generate and account traffic, ensuring the results collected are both detailed and accurate. All 7050SX and 7050QX switches used in this testing are running EOS version 4.13.0, all 7050TX switches are running EOS version 4.14.1, all 7050X2 switches are running an internal EFT build based on the 4.15 train of EOS.

The 7050X, 7050X2, 7250X and 7300 Series were developed to offer operational flexibility to network architects when developing large scale designs, due to that flexibility the exact details of the tests executed on each platform differ slightly, to ensure transparency the following section illustrates the exact test bed in each of the testing scenarios and highlights any per-platform differences.

Latency

This test is to validate realistic latency between a pair of ports when receiving traffic at line rate. The test provides an understanding of both the serialization and forwarding delays incurred by the switch when routing packets of various sizes, between interfaces of differing speeds.

Test Explanation

Packets are transmitted between a pair of physically remote ports, for a fixed duration at a fixed traffic rate, equal to the line rate of the slowest port in the pair.

The traffic generator collects a timestamp on the transmitting port, and a second on the receiving port. The difference between these timestamps is the latency. All latency tests use first in first out (FIFO) testing, this method will account not only forwarding delay but also serialization delay. This ensures the results are taken from an end-to-end latency perspective rather than simply that

of the switch pipeline. It also enables the direct comparison between store-and-forward and cut-through tests.

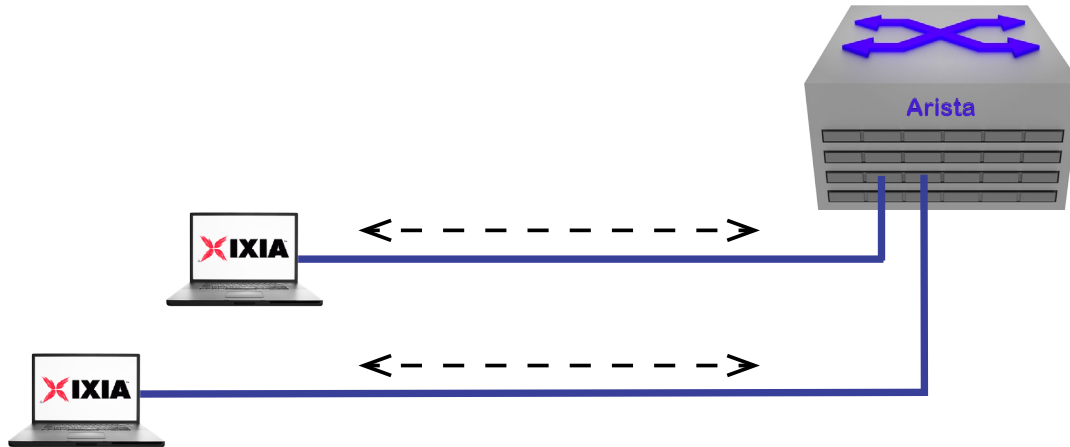


Figure 2: Latency - Test Bed

The latency was measured for L3 routed traffic at packet sizes of 64, 128, 256, 512, 1024, 1280, 1518, 2176 and 9216. In addition the test was repeated over all possible permutations of both ingress/egress interface speed and both store and forward and cut-through forwarding modes.

Test Notes

- 7250QX-64 and 7300 Single chip latency uses ports on the same Packet Processor
- 7250QX-64 and 7300 Multi chip latency uses ports on different Packet Processors
- The 7050SX series share identical latency characteristics, therefore are merged into a single set of results for brevity.
- The 7050TX series share identical latency characteristics, therefore are merged into a single set of results for brevity.
- All DUTs are configured in 10G latency mode.
- Results are based on the average latency observed during a fixed duration test, not the minimum

The following figures illustrate the accepted serialization delays at 10 and 40Gbps interface speeds, allowing more direct comparisons between results irrespective of the forwarding mode used in that test.

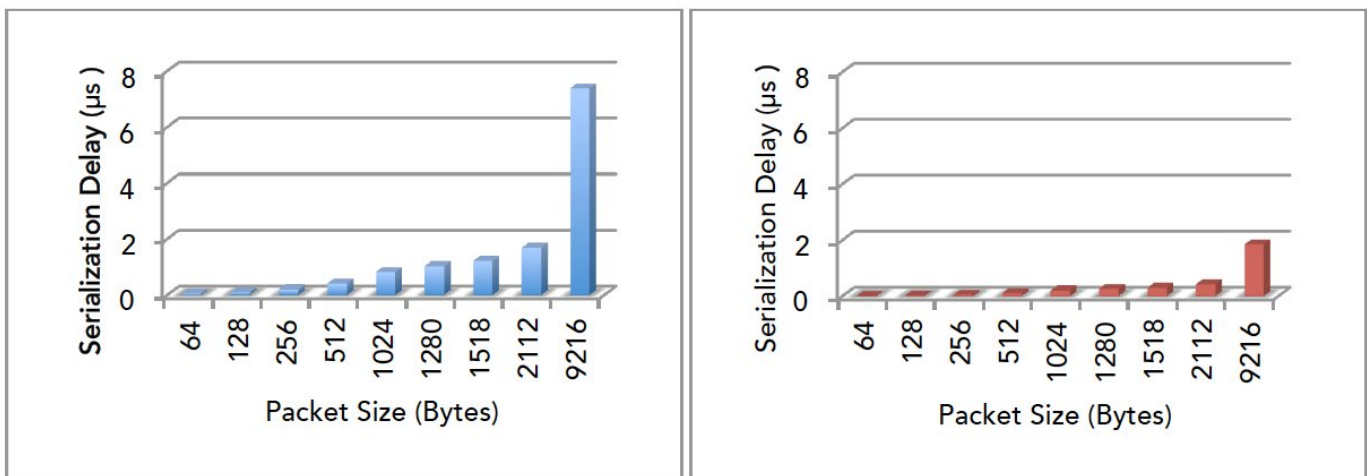


Figure 3: 10Gbps & 40Gbps Serialization delays

Test Results

7050QX/7050QX2 Series

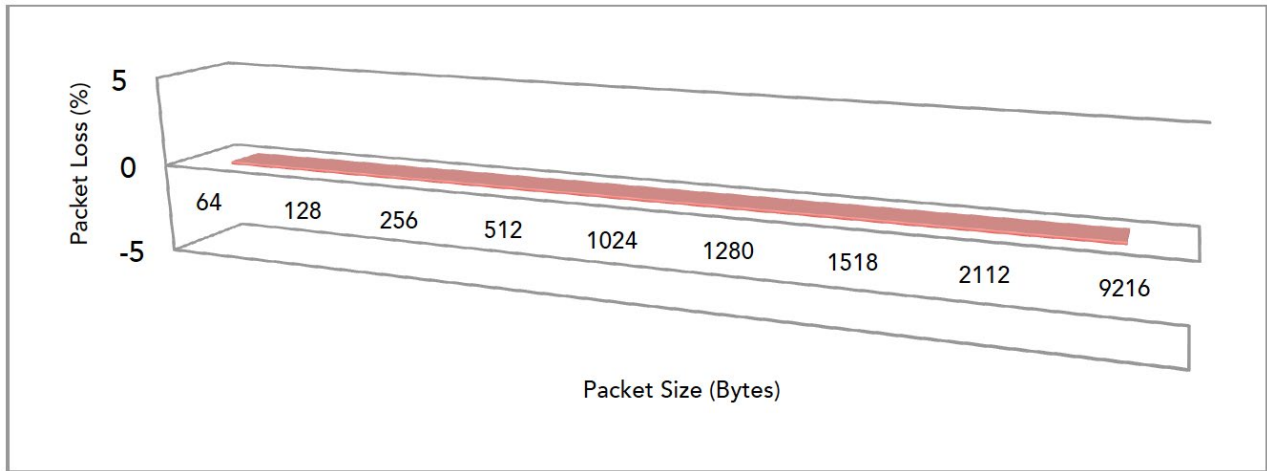


Figure 4: Latency - 7050QX/7050QX2 Series - Packet Loss Data

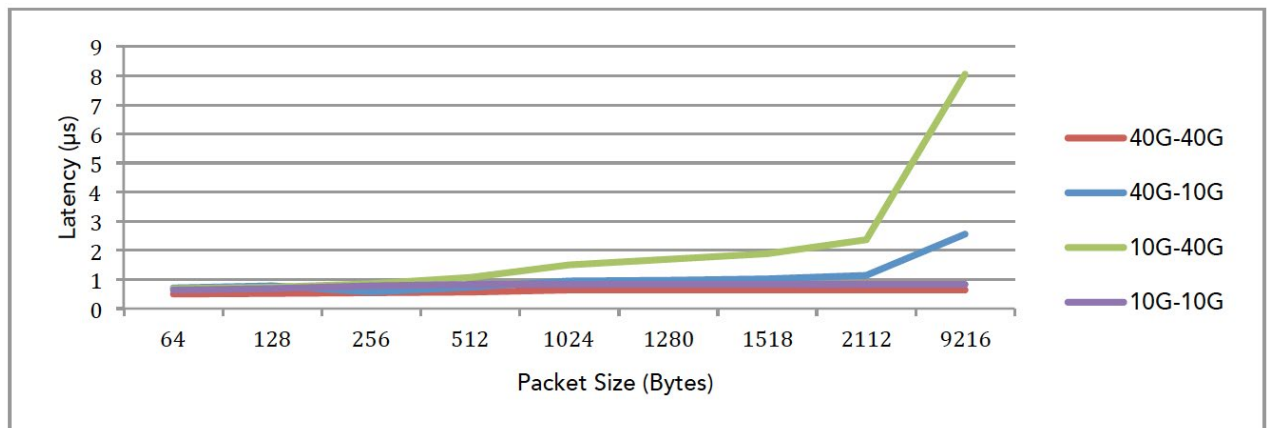


Figure 5: Latency - 7050QX/7050QX2 Series - Results all modes

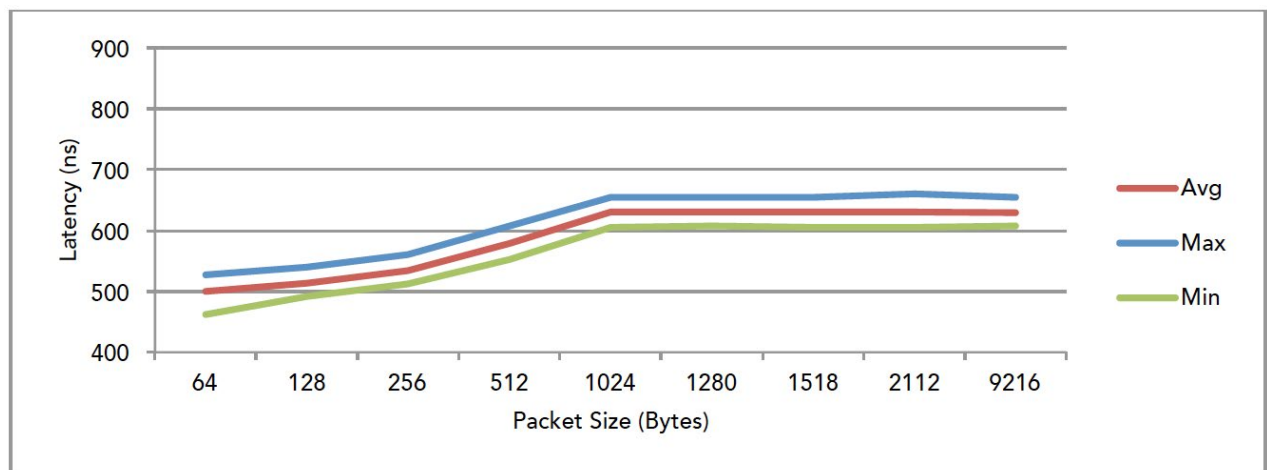


Figure 6: Latency - 7050QX/7050QX2 - 40G Cut-through Latency Range

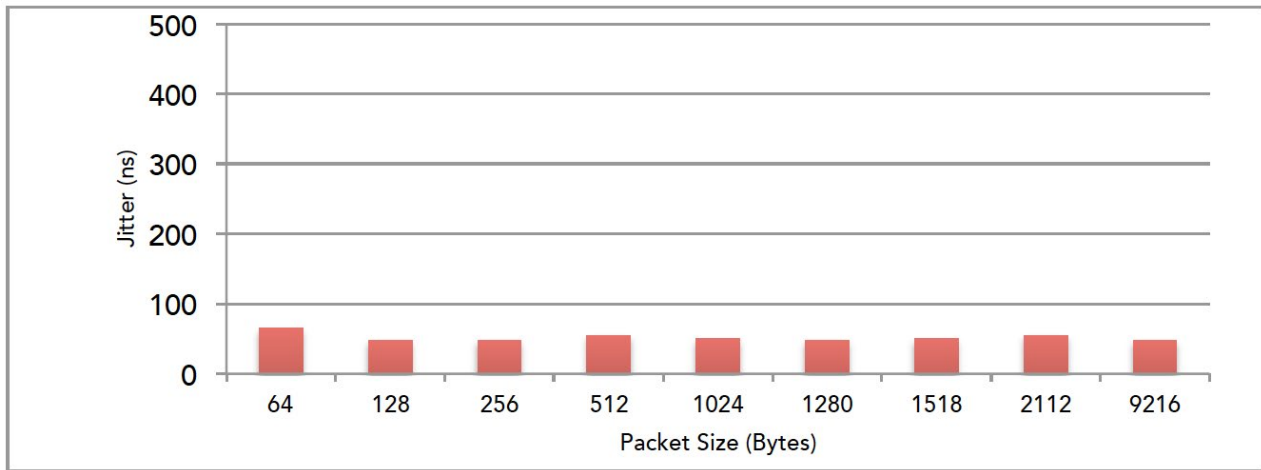


Figure 7: Latency - 7050QX/7050QX2 - Jitter

7050SX/7050SX2 Series

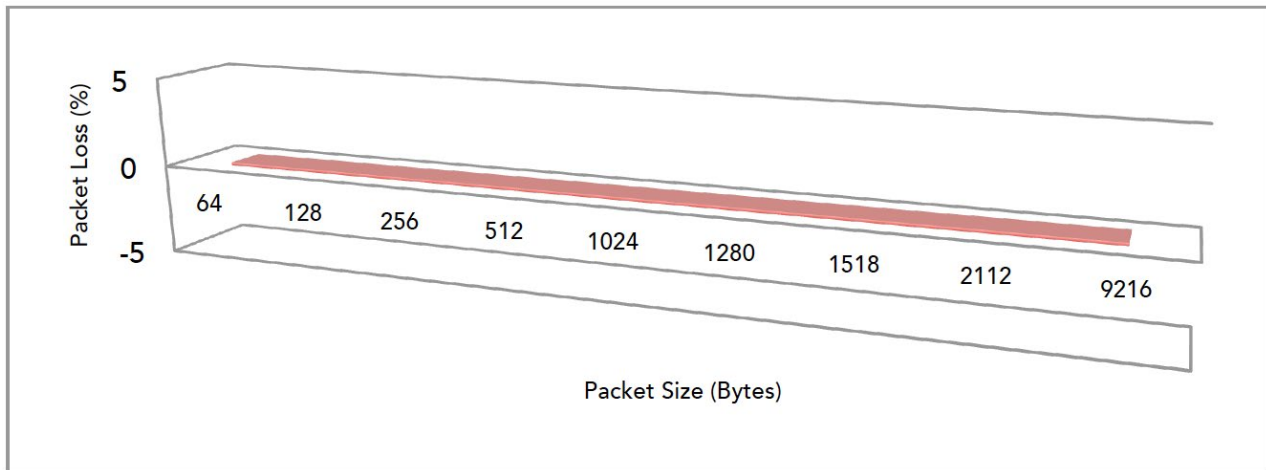


Figure 8: Latency - 7050SX/7050SX2 - Packet Loss Data

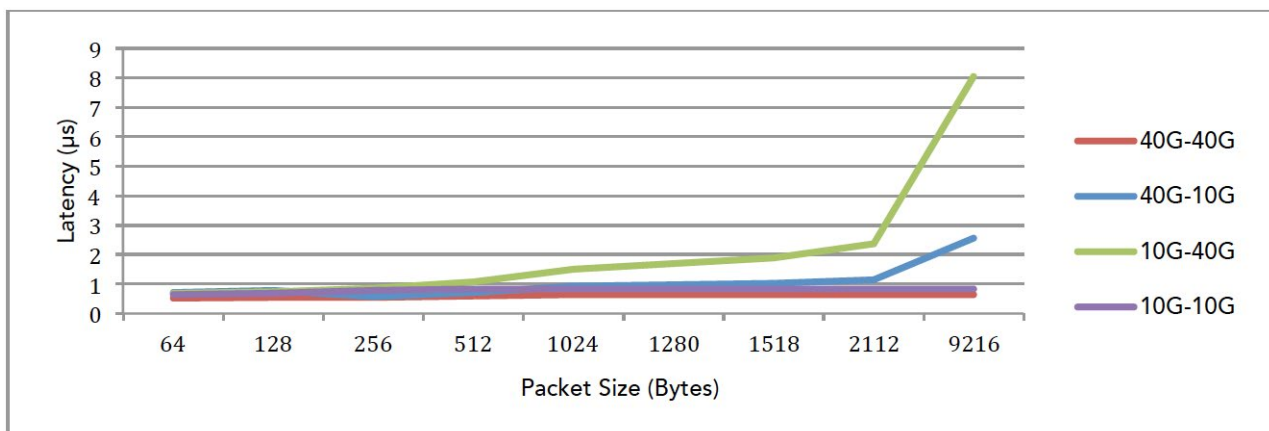


Figure 9: Latency - 7050SX/7050SX2 - Results all modes

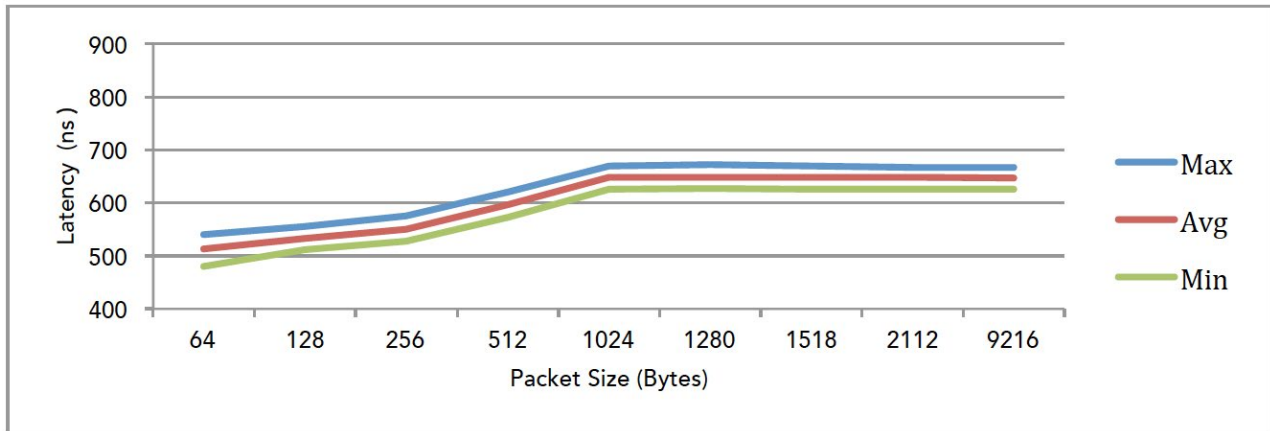


Figure 10: Latency - 7050SX/7050SX2 - 40G Cut-through Latency Range

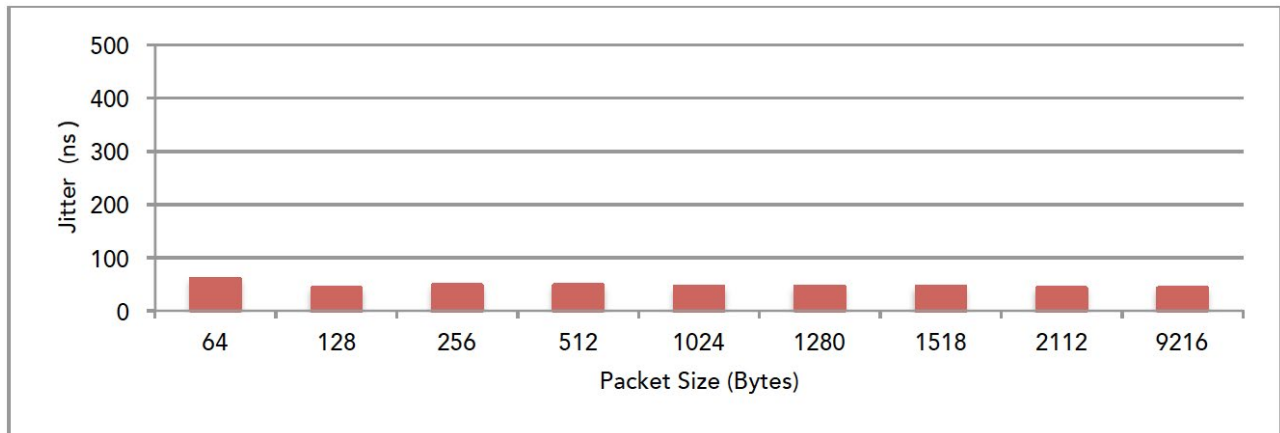


Figure 11: Latency - 7050SX/7050SX2 - Jitter

7050TX/7050TX2 Series

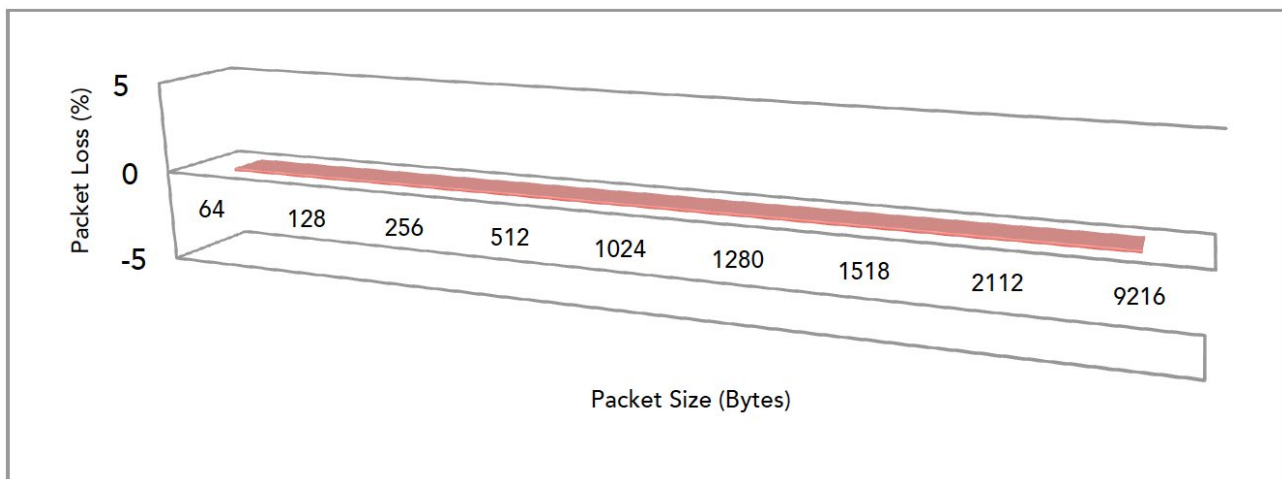


Figure 12: Latency - 7050TX/7050TX2 - Packet Loss Data

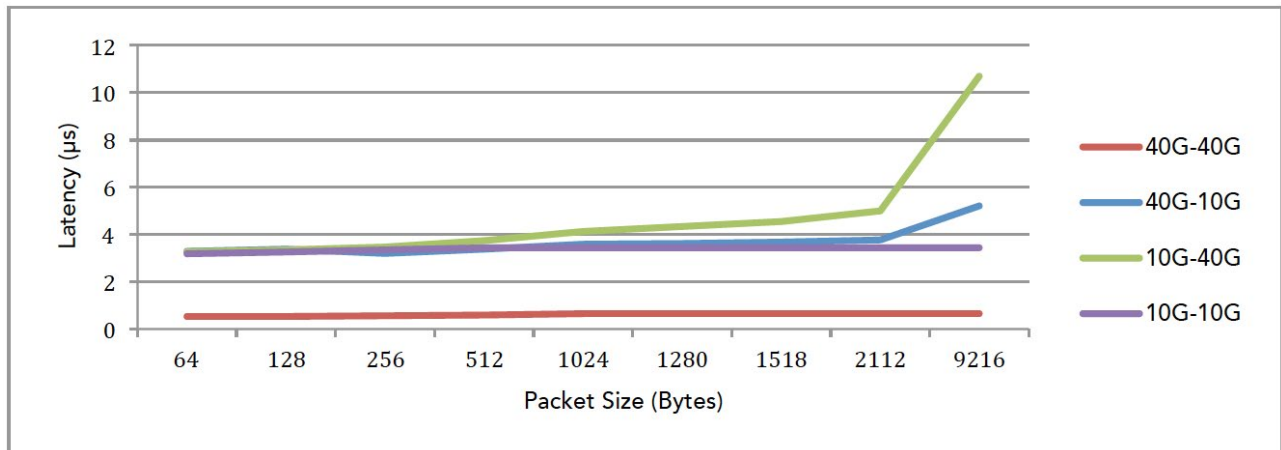


Figure 13: Latency - 7050TX/7050TX2 - Results all modes

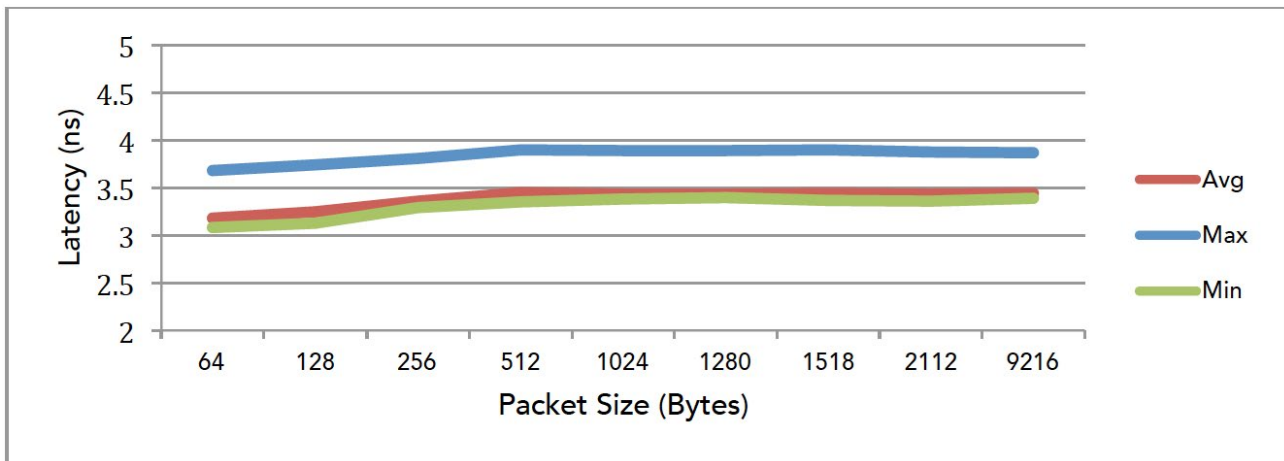


Figure 14: Latency - 7050TX/7050TX2 - 10G Cut-through Latency Range

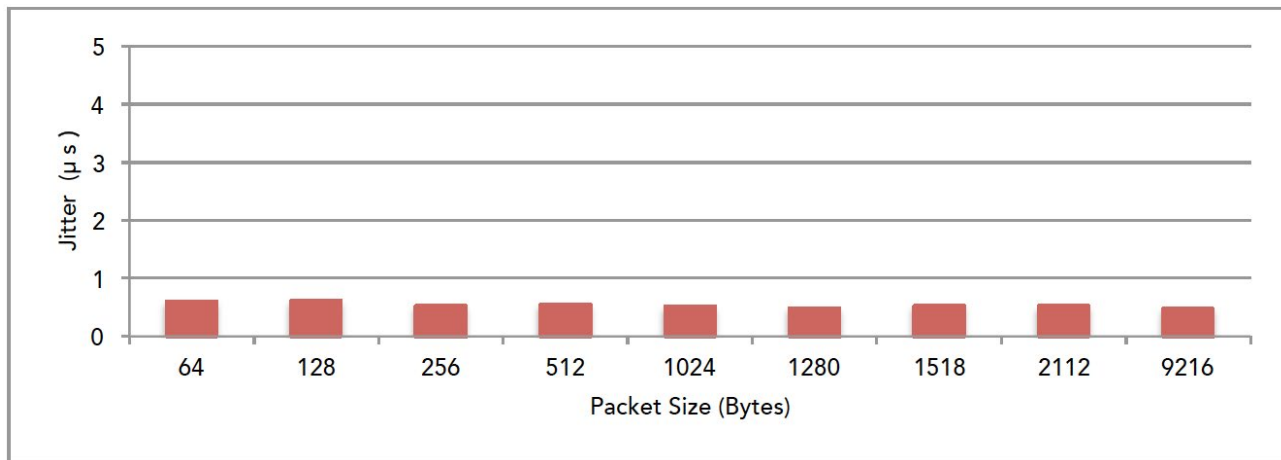


Figure 15: Latency - 7050TX/7050TX2 - Jitter

7250QX Series

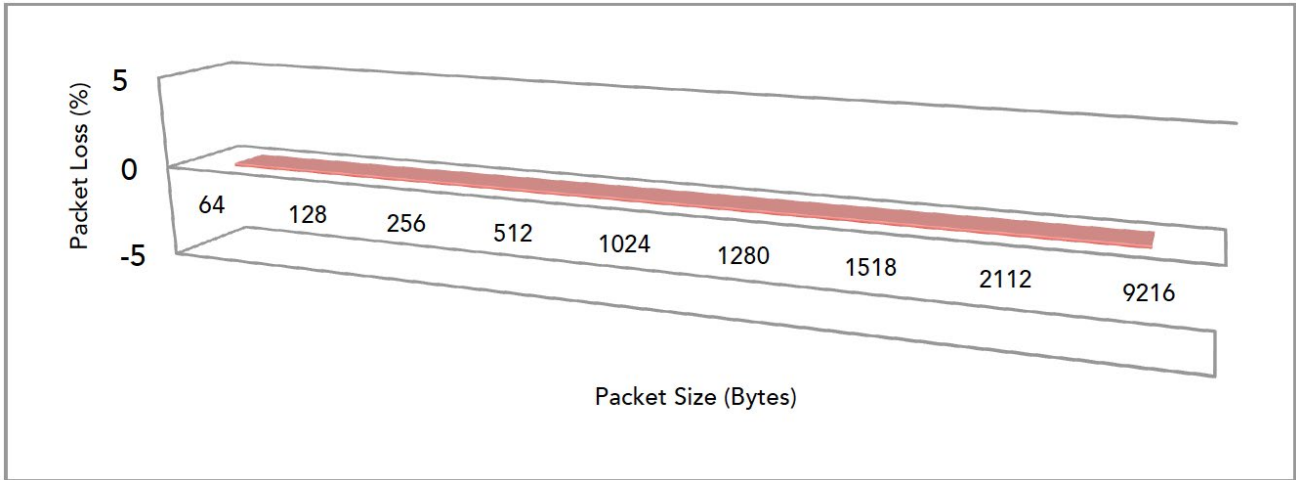


Figure 16: Latency - 7250QX-64 - Packet Loss Data

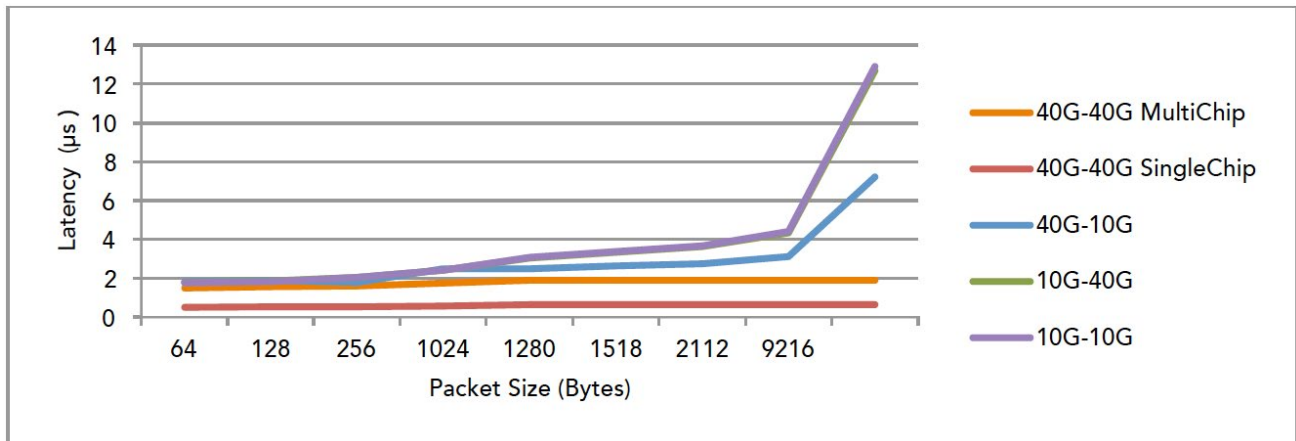


Figure 17: Latency - 7250QX-64 - Results all modes

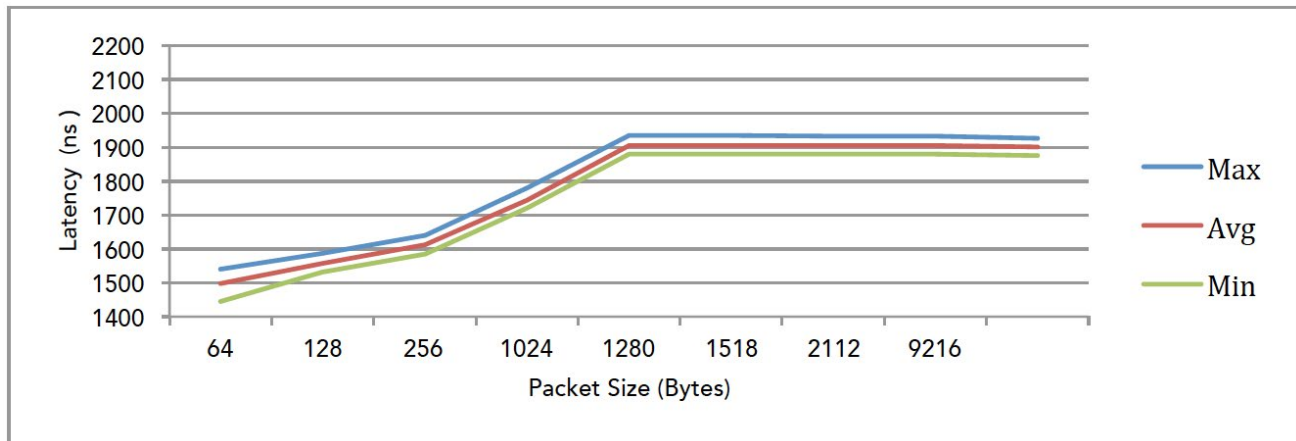


Figure 18: Latency - 7250QX-64 - MultiChip 40G Cut-through Latency Range

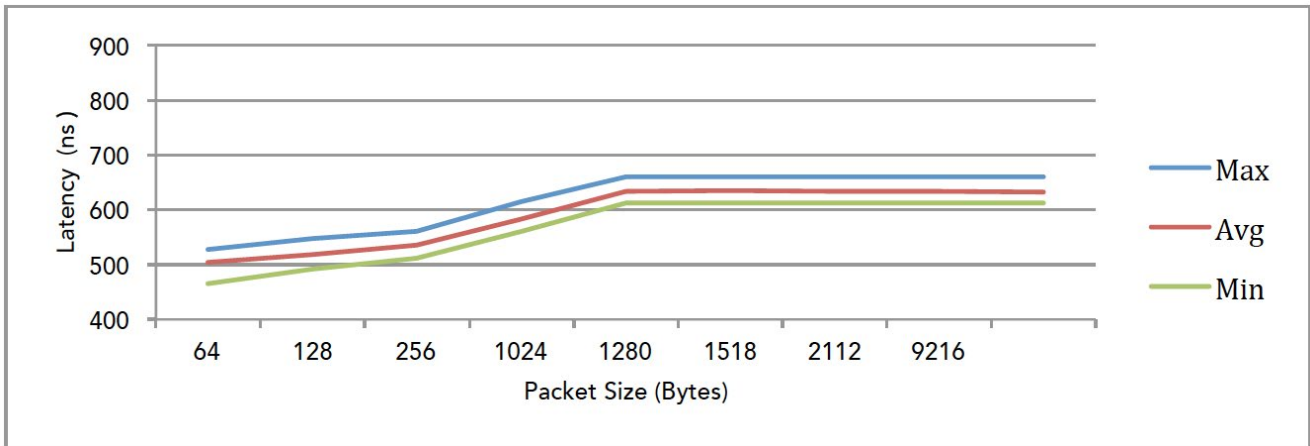


Figure 19: Latency - 7250QX-64 - SingleChip 40G Cut-through Latency Range

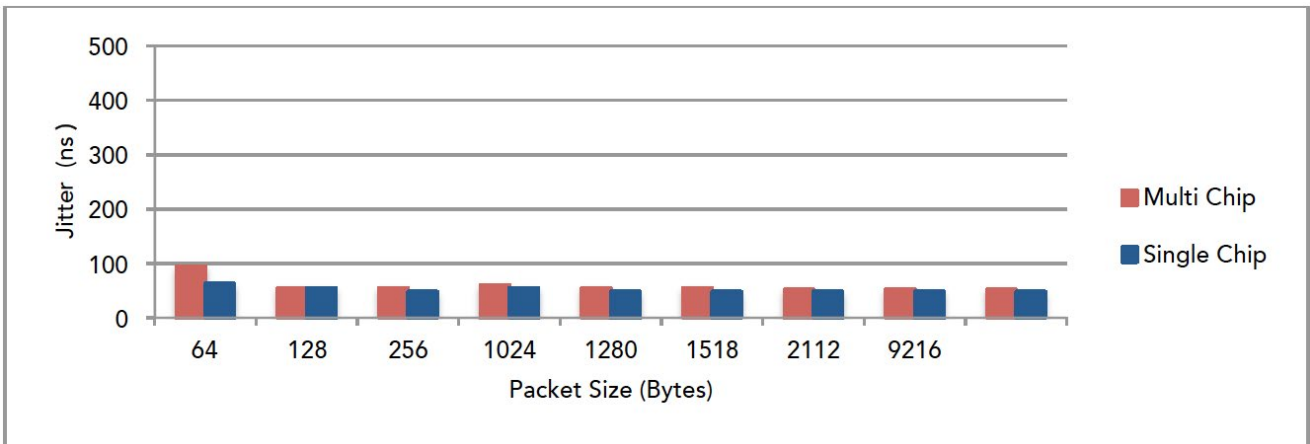


Figure 20: Latency - 7250QX-64 - Jitter

7300 Series

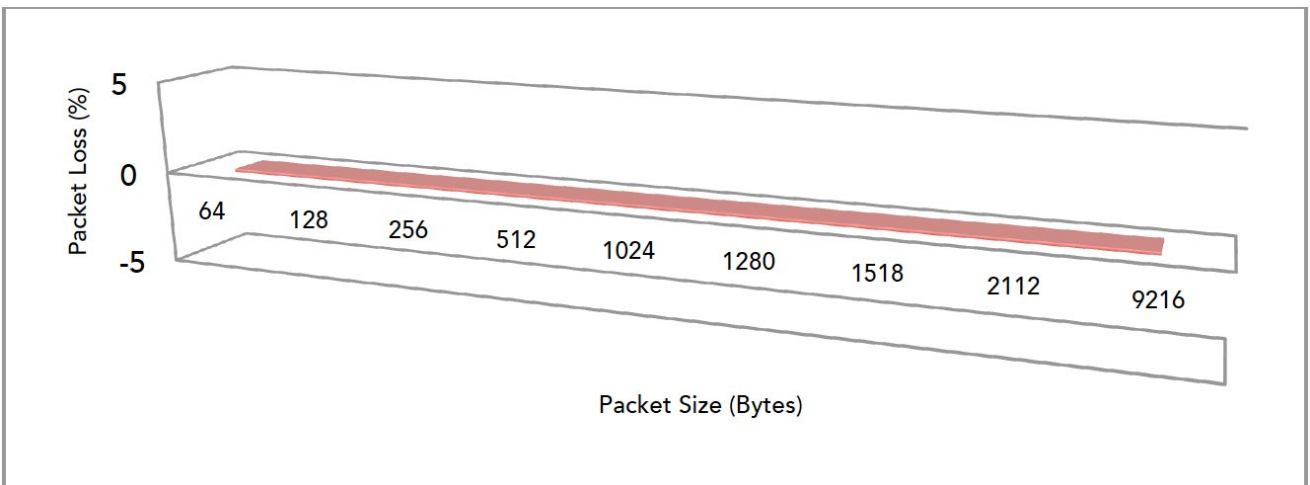


Figure 21: Latency - 7300X Series - Packet Loss Data

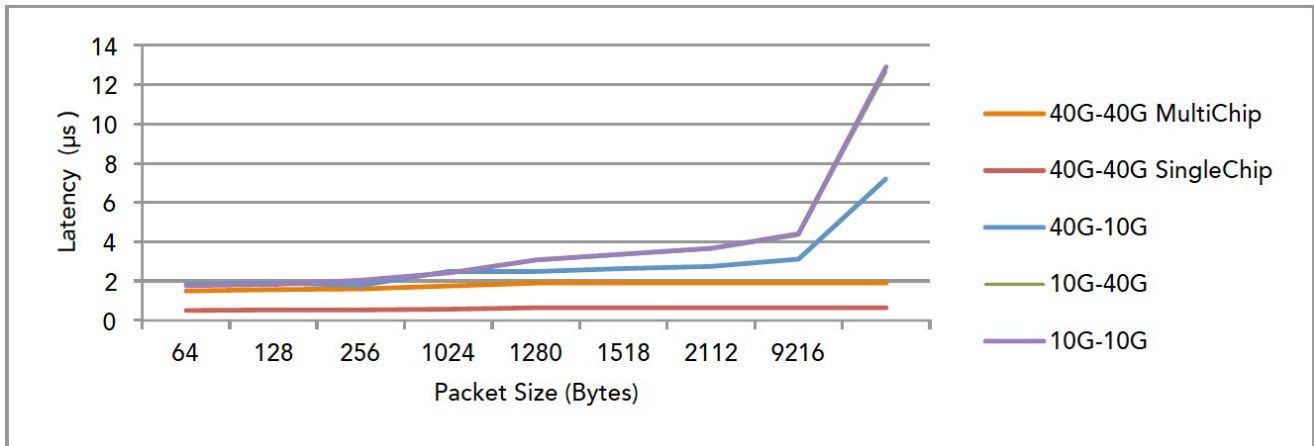


Figure 22: Latency - 7300X Series - Results all modes

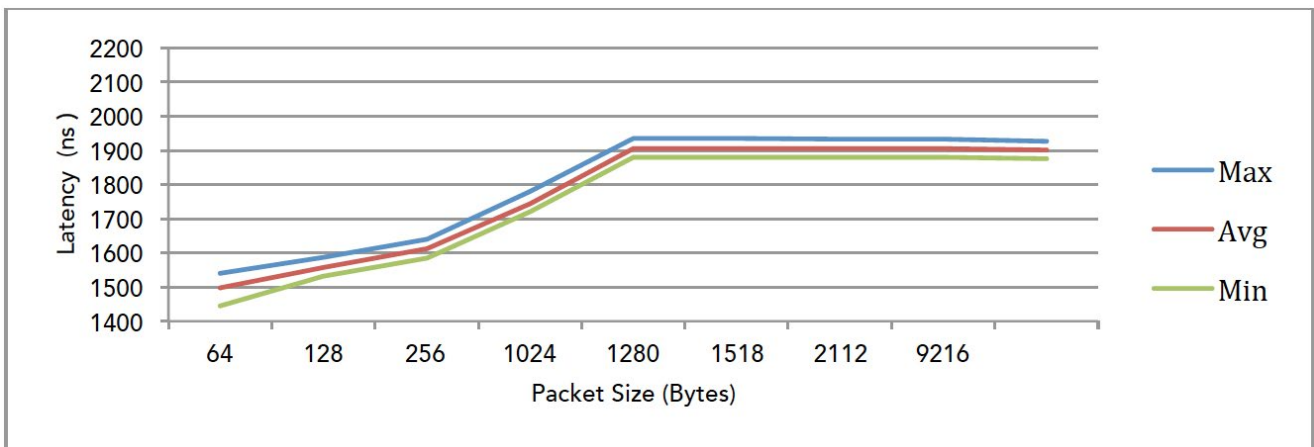


Figure 23: Latency - 7300X Series - MultiChip 40G Cut-through Latency Range

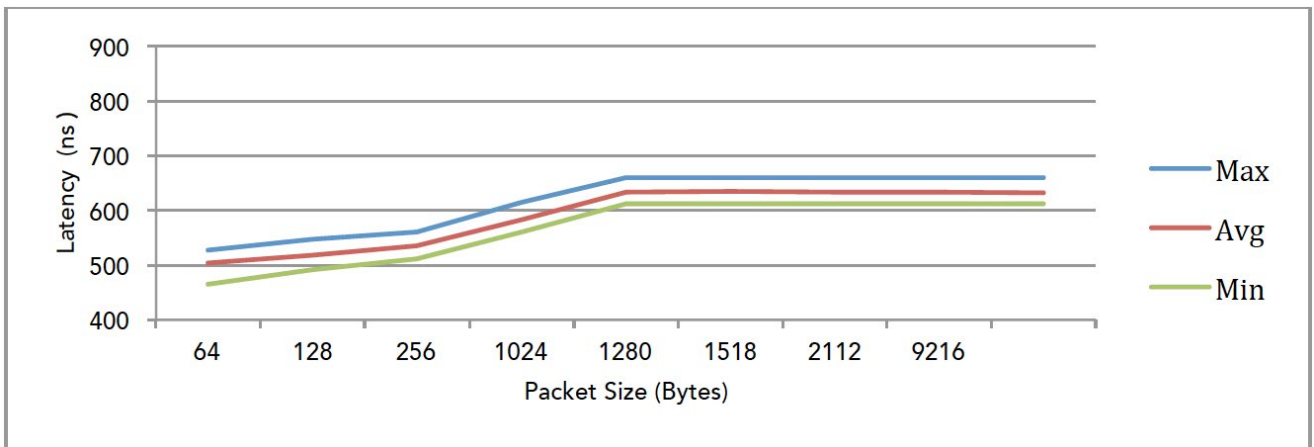


Figure 24: Latency - 7300X Series - SingleChip 40G Cut-through Latency Range

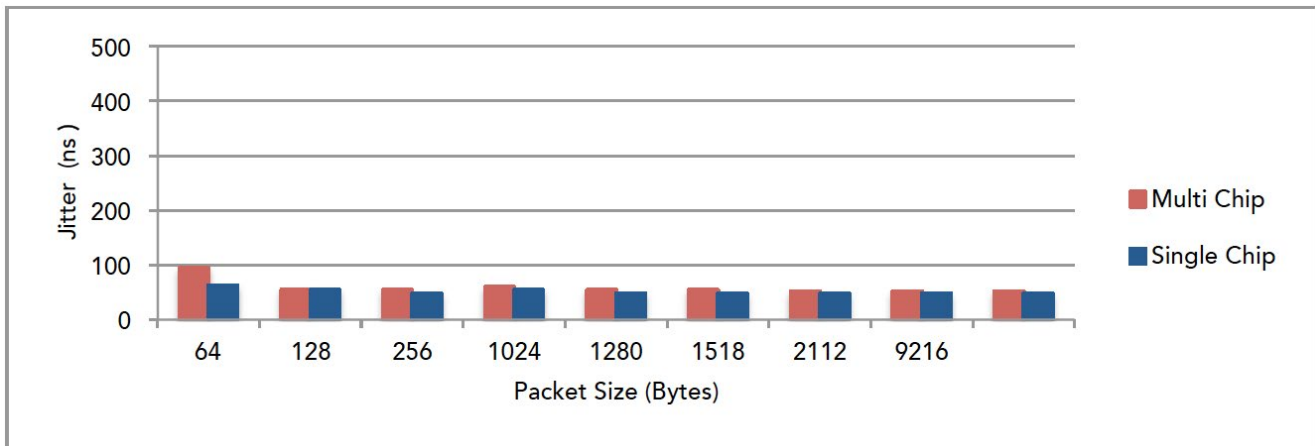


Figure 25: Latency - 7300X Series - Jitter

Throughput

This test verifies the switch performance when line rate traffic is received on all ports simultaneously. Additionally it illustrates any performance differential between the volume of data which can be forwarded through the pipeline, and that can be received on the physical interfaces.

Test Explanation

The lowest and highest numbered ports on the DUT are connected to a pair of Ixia ports. Intermediate ports are looped in a snake configuration. Each Ixia generated packet must therefore pass through all intermediate interfaces before reaching the destination Ixia port ensuring that uniform line rate traffic is received on all interfaces.

All platforms are benchmarked in two situations, all ports active and 75% of ports active. Each test will send packets over a set duration for multiple fixed packet sizes, confirming at which packet sizes the switch is truly line rate.

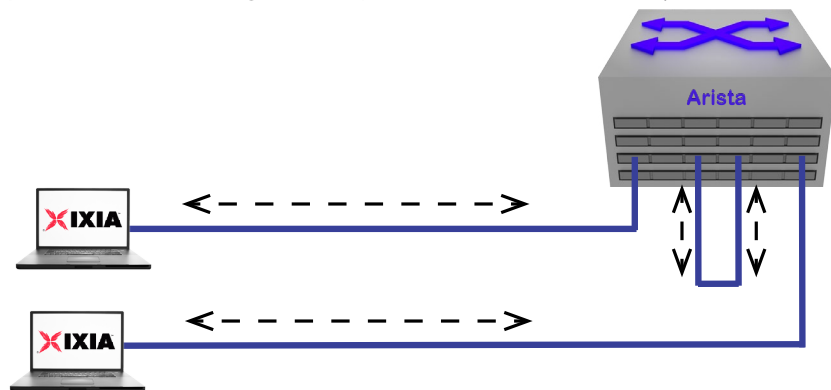


Figure 26: Throughput - Test Bed

Test Explanation

- All switches which offer a mix of 10GbE and 40GbE interfaces have two simultaneous traffic profiles. A 10G Flow is sent/received and snaked between the SFP+ ports (Ethernet1 - Ethernet 96). A 40G Flow is sent/received and snaked between the QSFP+ ports (Ethernet 97 – Ethernet 104).
- All 7050X tests use adjacent interface pairs for the snake.
- The 7250QX-64 and 7300 series use non-adjacent pairs for the snake, to ensure all packets traverse the switching fabric.
- All DUTs are configured in performance mode.

- The 7050SX-64, 7050SX-72, 7050SX-72Q and 7050SX-96 offer identical performance, therefore are merged into a single set of results.
- The 7050TX-48, 7050TX-64, 7050TX-72, 7050TX-72Q and 7050TX-96 offer identical performance, therefore are merged into a single set of diagrams.

7050QX/7050QX2 Series

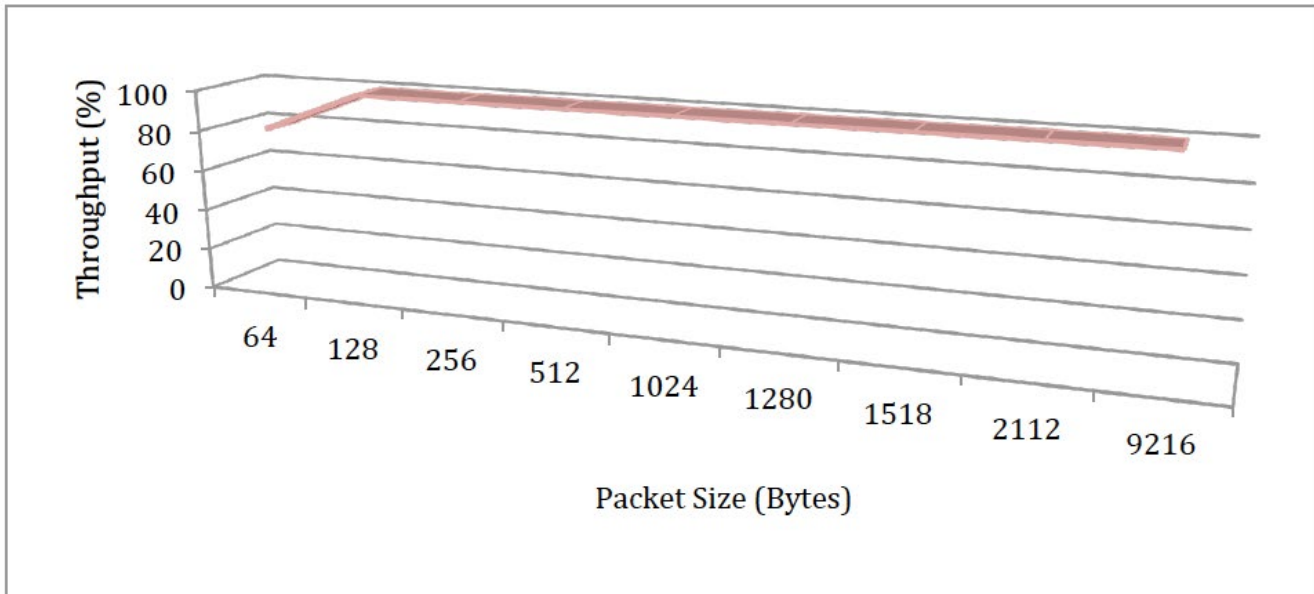


Figure 27: Throughput - 7050QX/7050QX2 Series - 100% Active Ports

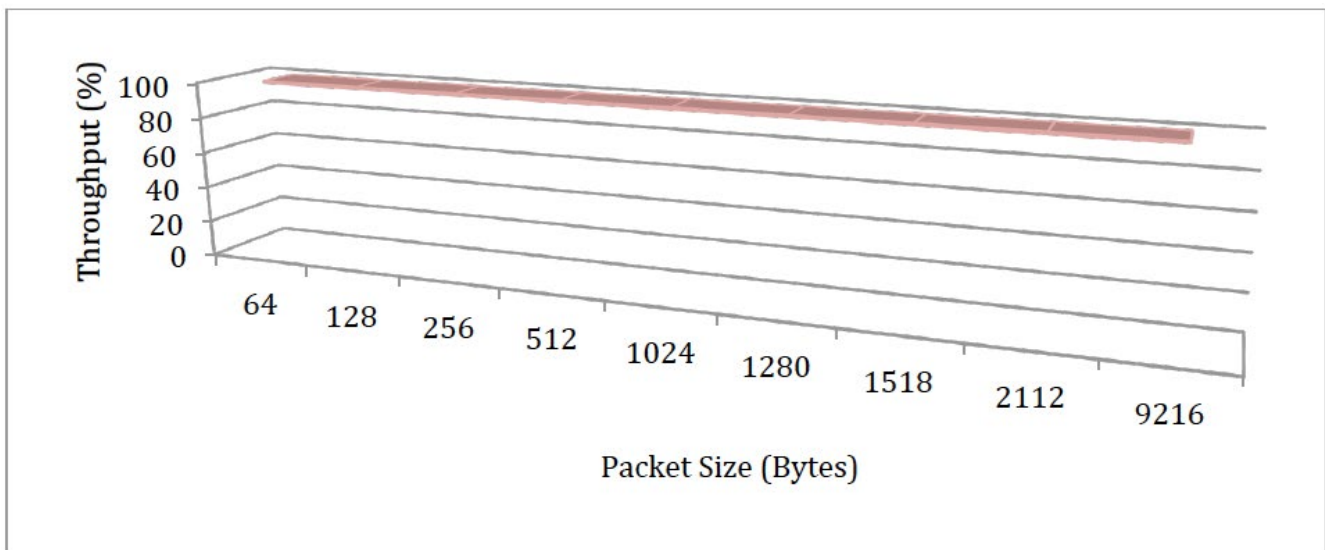


Figure 28: Throughput - 7050QX/7050QX2 Series - 75% Active Ports

7050SX (-64/-72/-72Q/-96)

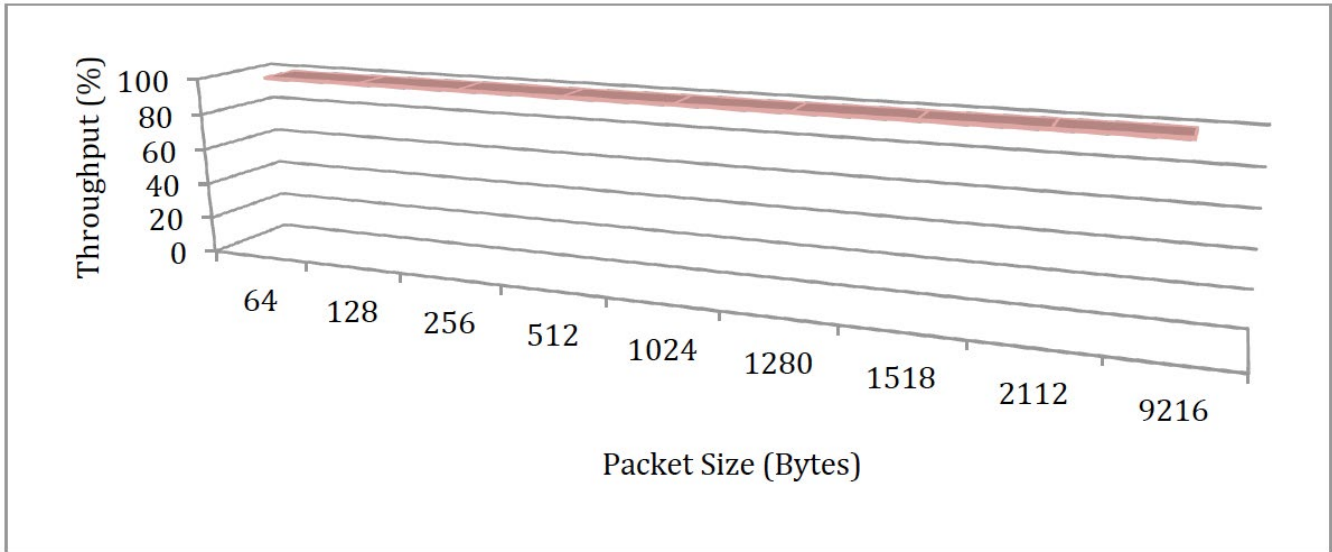


Figure 29: Throughput - 7050SX(-64/-72/-96) - 100% Active Ports

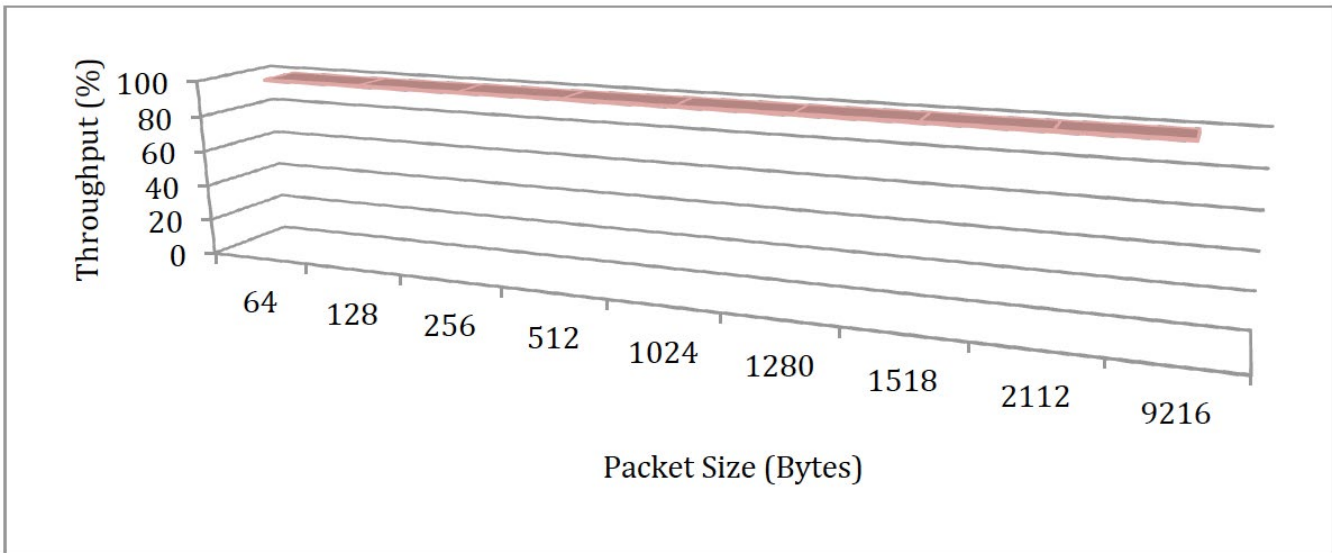


Figure 30: Throughput - 7050SX(-64/-72/-96) - 75% Active Ports

7050SX-128, 7050SX2-128

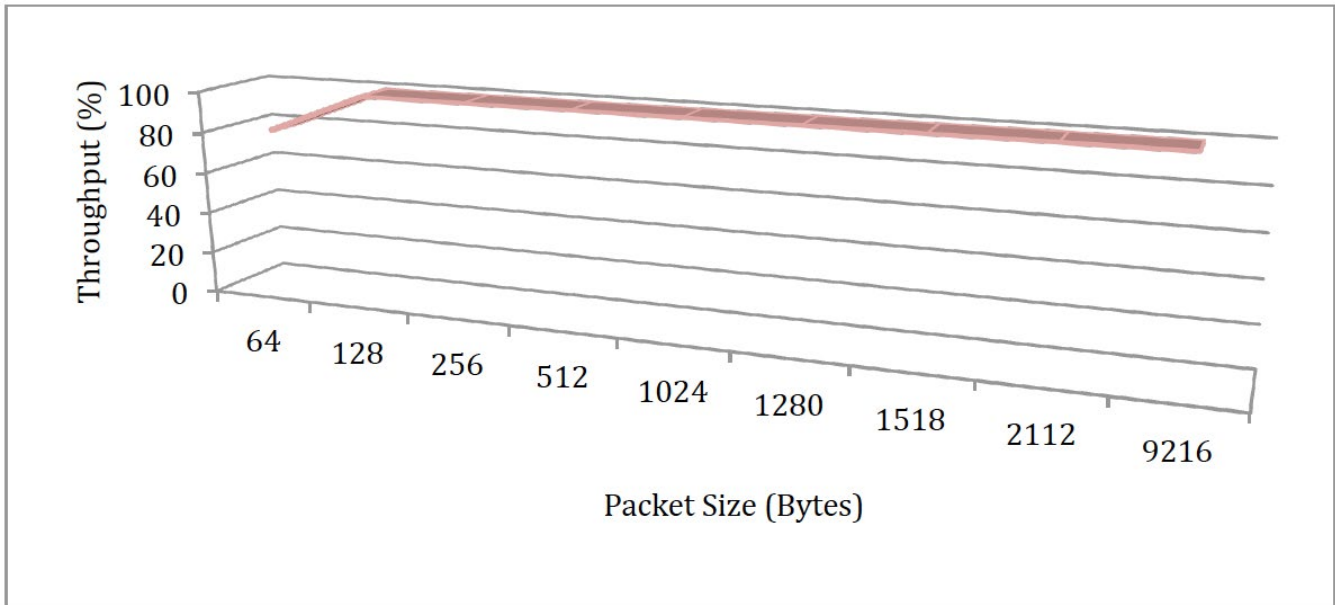


Figure 31: Throughput - 7050SX-128/7050SX2-128 - 100% Active Ports

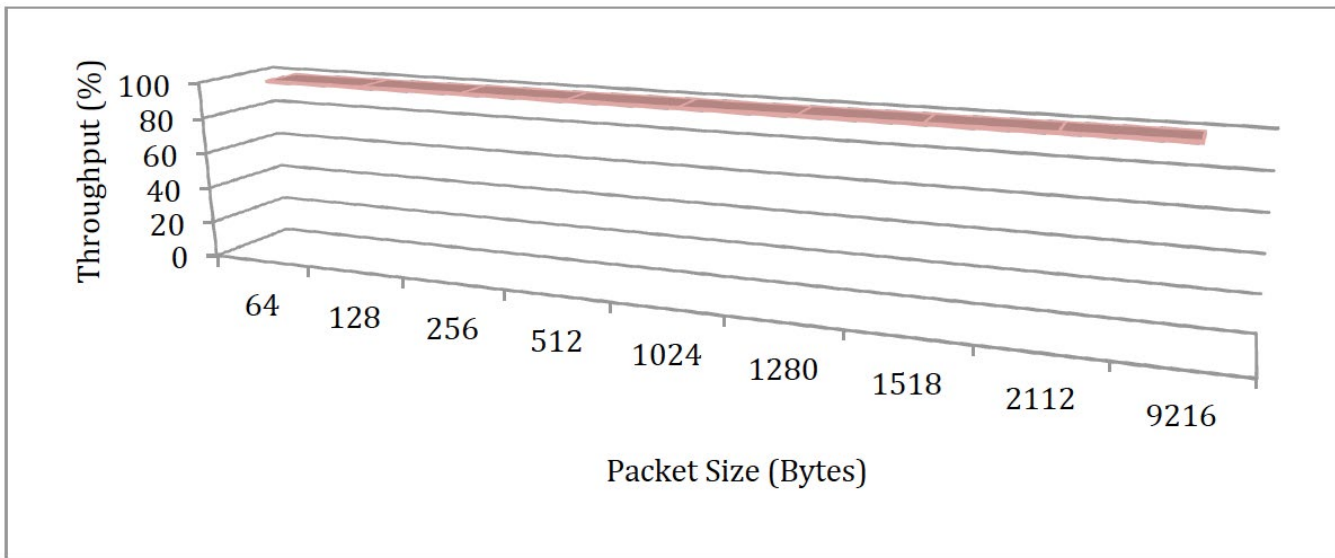


Figure 32: Throughput - 7050SX-128/7050SX2-128 - 75% Active Ports

7050TX (-48/-64/-72/-72Q/-96)

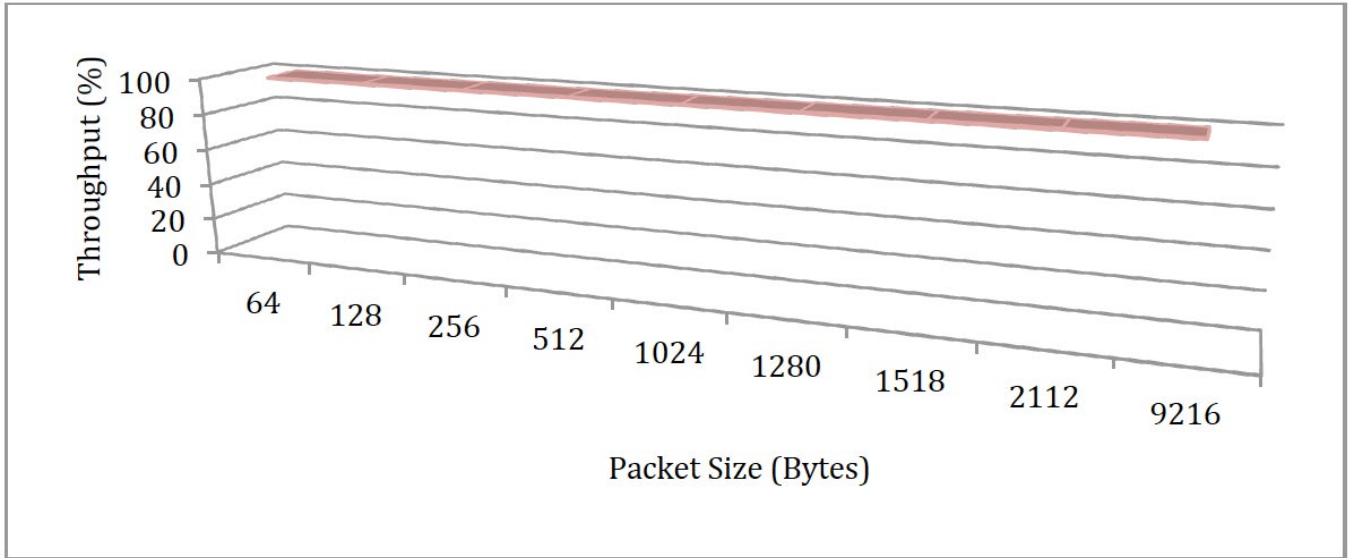


Figure 33: Throughput - 7050TX (-48/-64/-72/-96) - 100% Active Ports

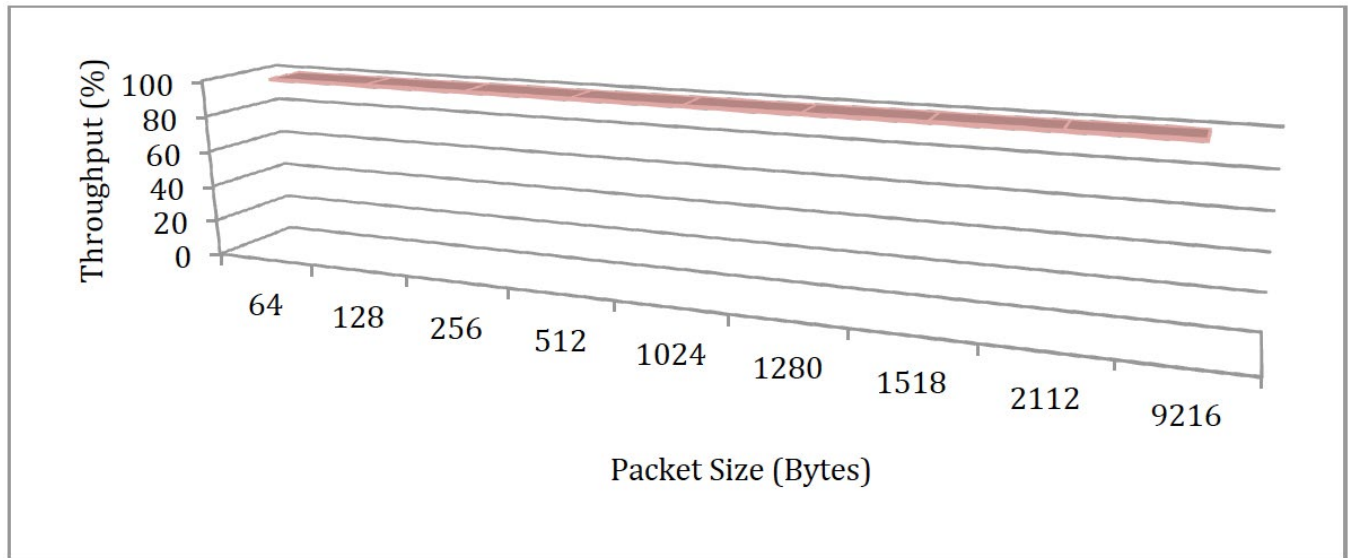


Figure 34: Throughput - 7050TX (-48/-64/-72/-96) - 75% Active Ports

7050TX-128, 7050TX2-128

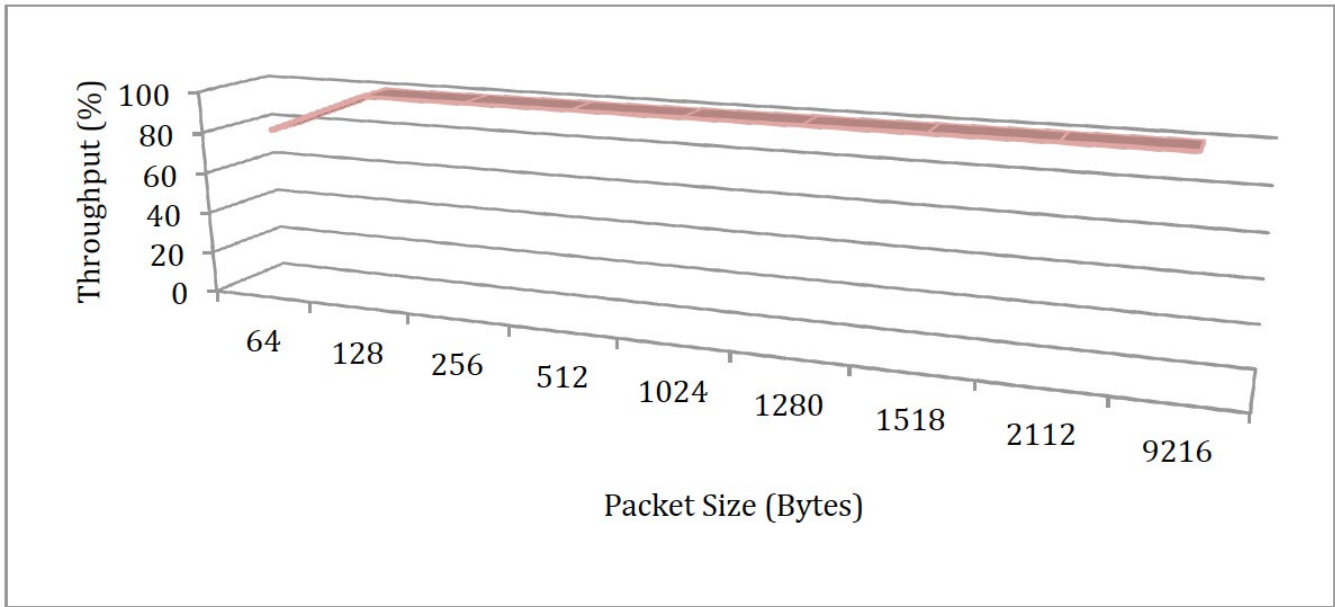


Figure 35: Throughput - 7050TX-128/7050TX2-128 - 100% Active Ports

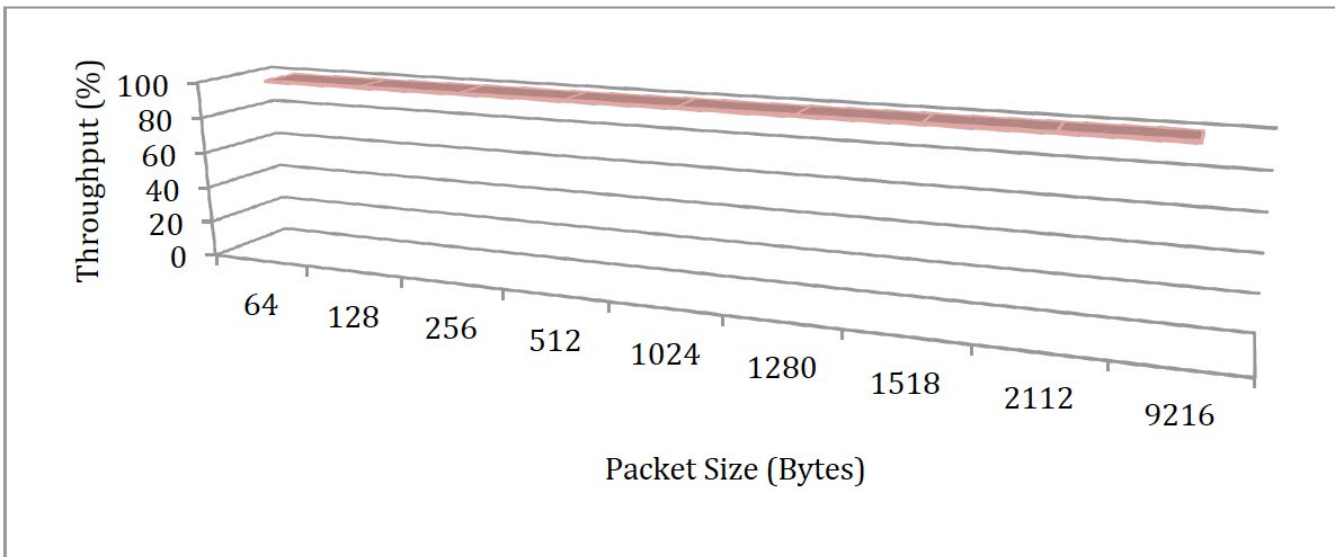


Figure 36: Throughput - 7050TX-128/7050TX2-128 - 75% Active Ports

7250QX-64

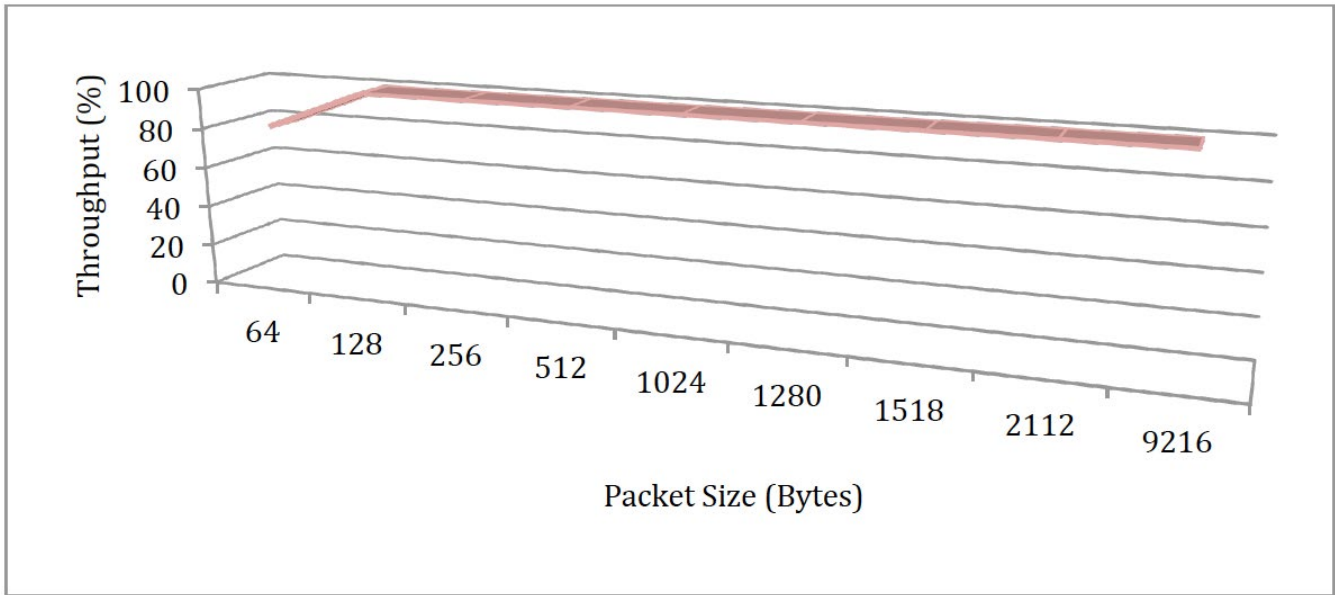


Figure 37: Throughput - 7250QX-64 - 100% Active Ports

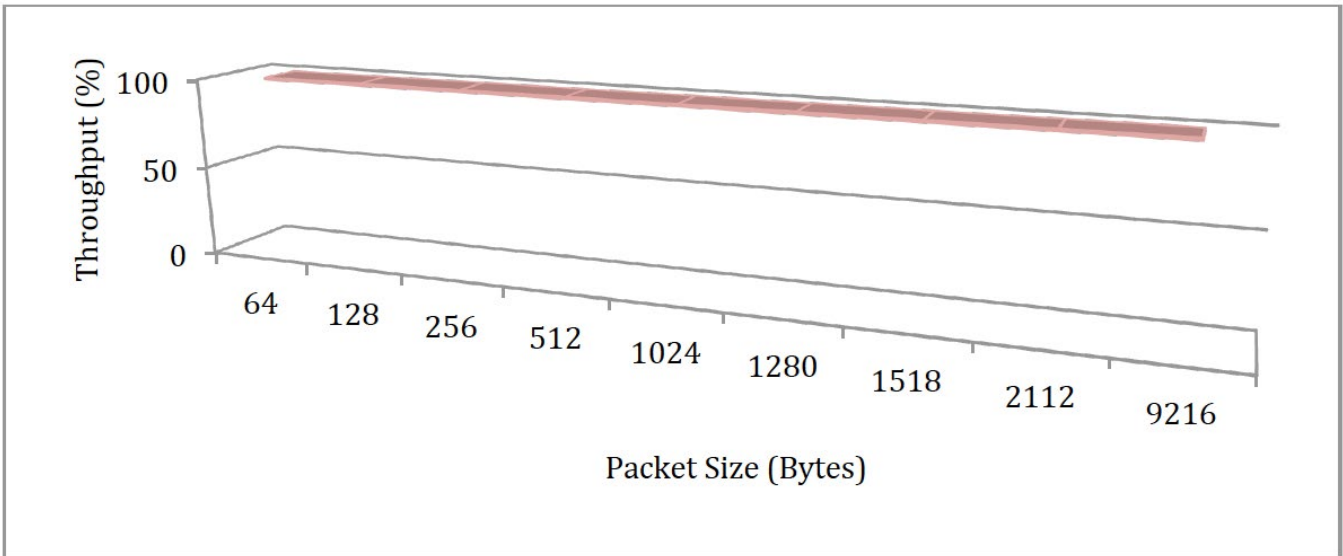


Figure 38: Throughput - 7250QX-64 - 75% Active Ports

7300X Series

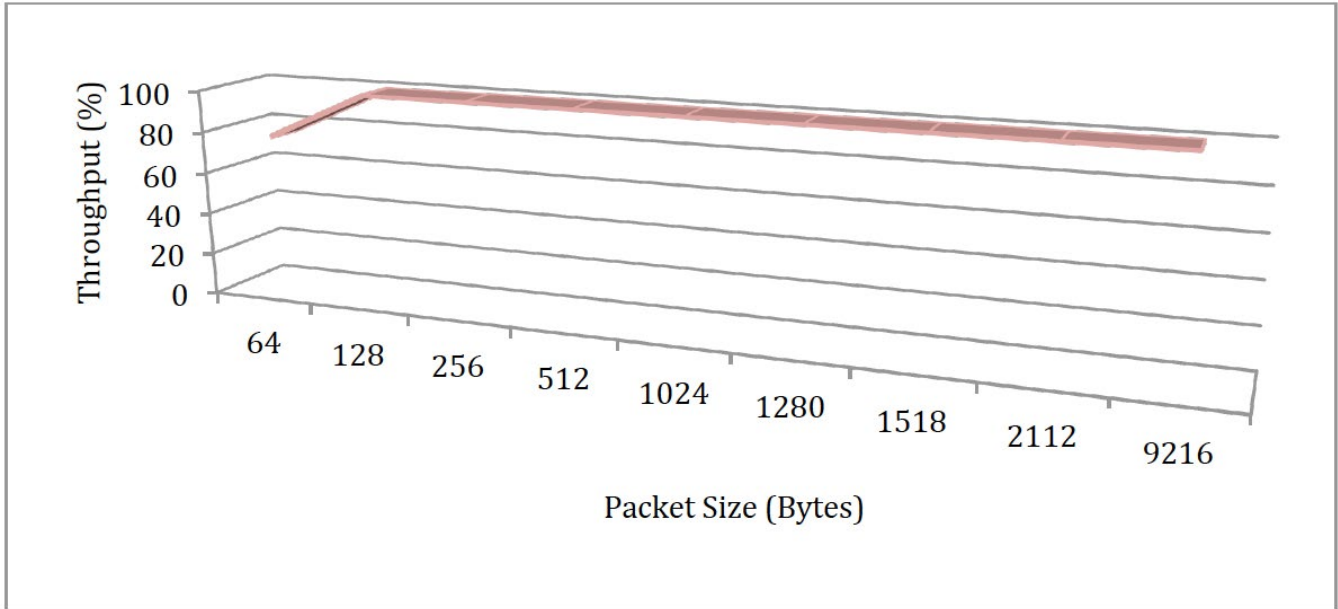


Figure 39: Throughput - 7300X Series- 100% Active Ports

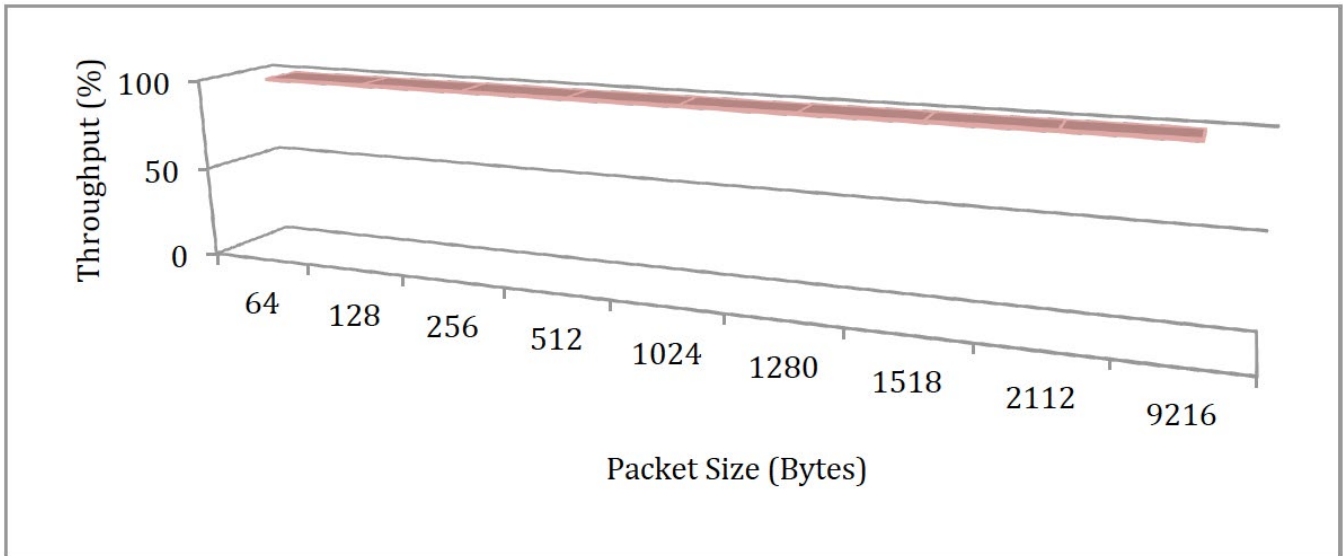


Figure 40: Throughput - 7300X Series - 75% Active Ports

Conclusion

The Arista 7050X, 7050X2, 7250X and 7300X Series provide a high-performance, high-density, power efficient solution for modern datacenter environments. Combining advanced functionality with a variety of form factors to suit all possible deployments.

The switches have proven to provide consistently low latency, with a very tight jitter band across all packet sizes. It has also been verified that the 7050X, 7050X2, 7250X and 7300X offer line rate forwarding and replication across all ports, in a real world deployment where the aggregate packet size is greater than 200B, or for all packet sizes when 6 out of every 8 40GbE ports are used.

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