



By Nutanix X-Ray

Test Infrastructure Lifecycle

Content

About X-Ray

Target & Scenario Summary

Test Result Details

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About X-Ray

Test Infrastructure Life Cycle

Enterprise clouds leverage hyper-converged infrastructure technologies, mixing compute and storage resources into systems which are then shared by multiple application workloads. When architecting these infrastructures, it is important to test different real-world datacenter scenarios to understand how controlled and uncontrolled situations affect consistent application performance.

X-Ray models and tests typical datacenter scenarios that mirror the infrastructure lifecycle requirements including: pure infrastructure and application performance, performance while using infrastructure data protection features, performance scaling capabilities, and implications of failure scenarios. As shown below, tests have been categorized into typical phases of the infrastructure lifecycle.

Infrastructure Life Cycle Phase	Related Tests
Infrastructure Performance Measure raw infrastructure performance.	Four Corner Microbenchmark Throughput Scalability
Application Performance Model application-specific workloads and measure performance.	VDI Scalability OLTP Simulator
Data Protection Measure effects of data protection features on application workload performance.	Snapshot Impact VM Clone Impact
Infrastructure Resiliency Measure effects of unplanned infrastructure failure events on running applications.	Sequential Node Failure Rolling Upgrade Extended Node Failure
Infrastructure Scalability Measure effects of introducing new application workloads on infrastructure running existing workloads.	Database Colocation HCI Workflow

Testing Summary

Test Scenarios	Test Result Name	Systems Tested
HCIBenchmark	HCIBenchmark on Nutanix - AWS-i3.metal-3Node	AWS-i3.metal-3Node (3-Node Nutanix 6.0.2.4 on AHV)
HCIBenchmark	HCIBenchmark on Nutanix - AWS-i3.metal-3Node	AWS-i3.metal-3Node (3-Node Nutanix 6.0.2.4 on AHV)
HCIBenchmark	HCIBenchmark on Nutanix - AWS-i3.metal-3Node	AWS-i3.metal-3Node (3-Node Nutanix 6.0.2.4 on AHV)
HCIBenchmark	HCIBenchmark on Nutanix - AWS-i3.metal-3Node	AWS-i3.metal-3Node (3-Node Nutanix 6.0.2.4 on AHV)

Test Result Details

For: HCI-Benchmark_AWS-i3.metal-3nodes (3 VMs) vs HCI-Benchmark_AWS-i3.metal-3nodes (6VMs) vs HCI-Benchmark_AWS-i3.metal-3nodes (9VMs) vs HCI-Benchmark_AWS-i3.metal-3nodes (12VMs)

Test Description - (HCIBenchmark)

This test allows you to run customized storage workloads on one or more VMs. You can adjust common storage microbenchmark parameters, including the working set size, block size, and the target I/O rate. Workloads are evenly distributed across every disk on every VM. Setting the target I/O rate to 0 performs a max throughput test. Higher IOPS and lower latency indicate better performance.

How X-Ray runs the test

Setup

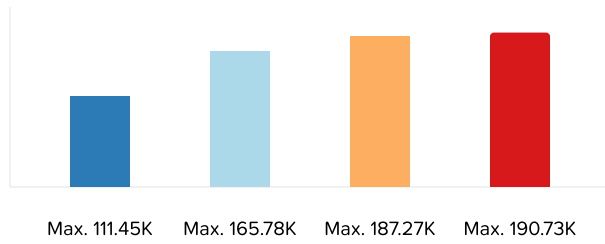
Deploy the desired number of workload VMs per host.

Fill virtual disks with the desired amount of random data.

Measurement

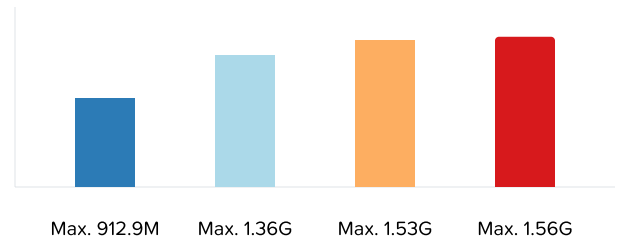
Run the desired workload configuration for the requested amount of time across each VM.

IOPS



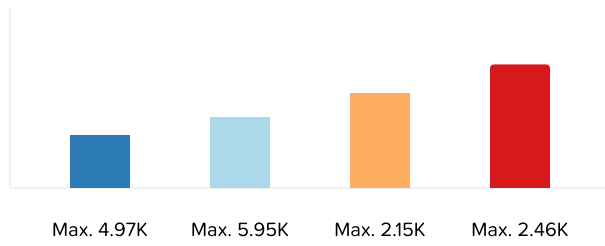
💡 Higher IOPS indicates better performance.

Bytes/Sec



💡 Higher throughput indicates better performance.

microseconds



💡 Lower latency indicates better performance.

Comparison Summary

Name	HCI-Benchmark_AWS-i3.metal-3nodes (3 VMs)	HCI-Benchmark_AWS-i3.metal-3nodes (6VMs)	HCI-Benchmark_AWS-i3.metal-3nodes (9VMs)	HCI-Benchmark_AWS-i3.metal-3nodes (12VMs)
Summary	HCIBenchmark	HCIBenchmark	HCIBenchmark	HCIBenchmark
Timestamp	6/30/2022, 5:21:03 PM GMT	6/30/2022, 6:18:19 PM GMT	6/30/2022, 6:41:08 PM GMT	6/30/2022, 7:19:22 PM GMT
Runtime	14 m	14 m	16 m	16 m
Preset	N/A	N/A	N/A	N/A

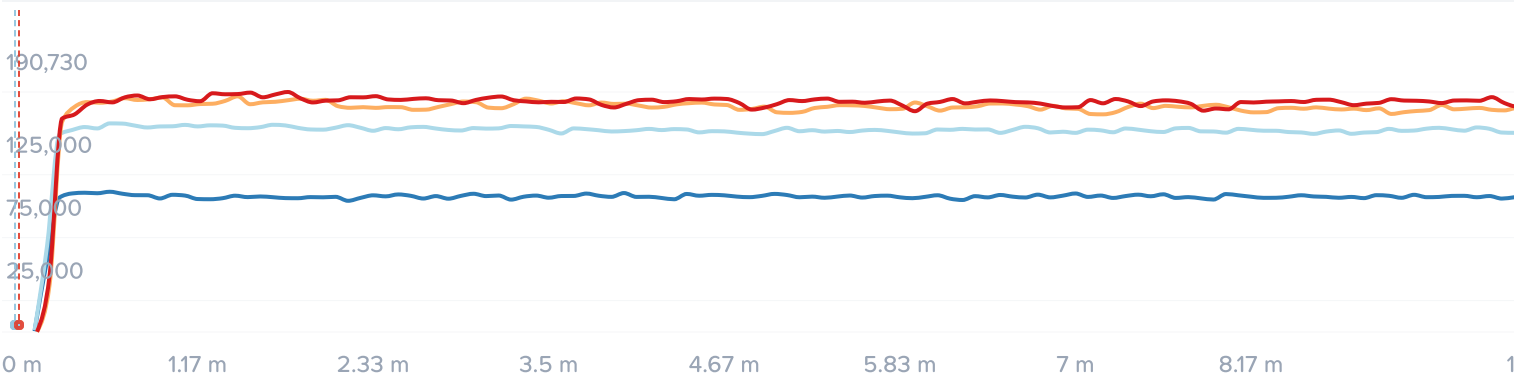
Variables				
Number of VMs deployed across the cluster	3	6	9	12
Number of disks attached to each VM	6	6	6	6
VM working set size (MB)	2048	2048	2048	2048
Workload read percent	50	50	50	50
Workload random percent	50	50	50	50
Number of I/O operations left outstanding per disk	6	6	6	6
Workload block size in kilobytes	8	8	8	8
Target IOPS rate per VM (0 for unlimited)	0	0	0	0
Runtime in seconds	600	600	600	600










Targets				
Name	AWS-i3.metal-3Node	AWS-i3.metal-3Node	AWS-i3.metal-3Node	AWS-i3.metal-3Node
Cluster Version	6.0.2.4	6.0.2.4	6.0.2.4	6.0.2.4
Usable Capcity	18.15 TiB	18.15 TiB	18.15 TiB	18.15 TiB
Nodes	1 Node 1 x Amazon EC2 NVMe Instance Storage 1.49 TiB SSD	1 Node 1 x Amazon EC2 NVMe Instance Storage 1.49 TiB SSD	1 Node 1 x Amazon EC2 NVMe Instance Storage 1.49 TiB SSD	1 Node 1 x Amazon EC2 NVMe Instance Storage 1.49 TiB SSD
	1 x Amazon EC2 NVMe Instance Storage 1.54 TiB SSD	1 x Amazon EC2 NVMe Instance Storage 1.54 TiB SSD	1 x Amazon EC2 NVMe Instance Storage 1.54 TiB SSD	1 x Amazon EC2 NVMe Instance Storage 1.54 TiB SSD
	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD
	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD
	1 Node 1 x Amazon EC2 NVMe Instance Storage 1.54 TiB SSD	1 Node 1 x Amazon EC2 NVMe Instance Storage 1.54 TiB SSD	1 Node 1 x Amazon EC2 NVMe Instance Storage 1.54 TiB SSD	1 Node 1 x Amazon EC2 NVMe Instance Storage 1.54 TiB SSD
	1 x Amazon EC2 NVMe Instance Storage 1.49 TiB SSD	1 x Amazon EC2 NVMe Instance Storage 1.49 TiB SSD	1 x Amazon EC2 NVMe Instance Storage 1.49 TiB SSD	1 x Amazon EC2 NVMe Instance Storage 1.49 TiB SSD
	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD
	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD
	1 Node 1 x Amazon EC2	1 Node 1 x Amazon EC2	1 Node 1 x Amazon EC2	1 Node 1 x Amazon EC2

	Storage 1.53 TiB SSD	Storage 1.53 TiB SSD	Storage 1.53 TiB SSD	Storage 1.53 TiB SSD
	1 x Amazon EC2 NVMe Instance Storage 1.49 TiB SSD	1 x Amazon EC2 NVMe Instance Storage 1.49 TiB SSD	1 x Amazon EC2 NVMe Instance Storage 1.49 TiB SSD	1 x Amazon EC2 NVMe Instance Storage 1.49 TiB SSD
	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD
	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD	3 x Amazon EC2 NVMe Instance Storage 1.51 TiB SSD

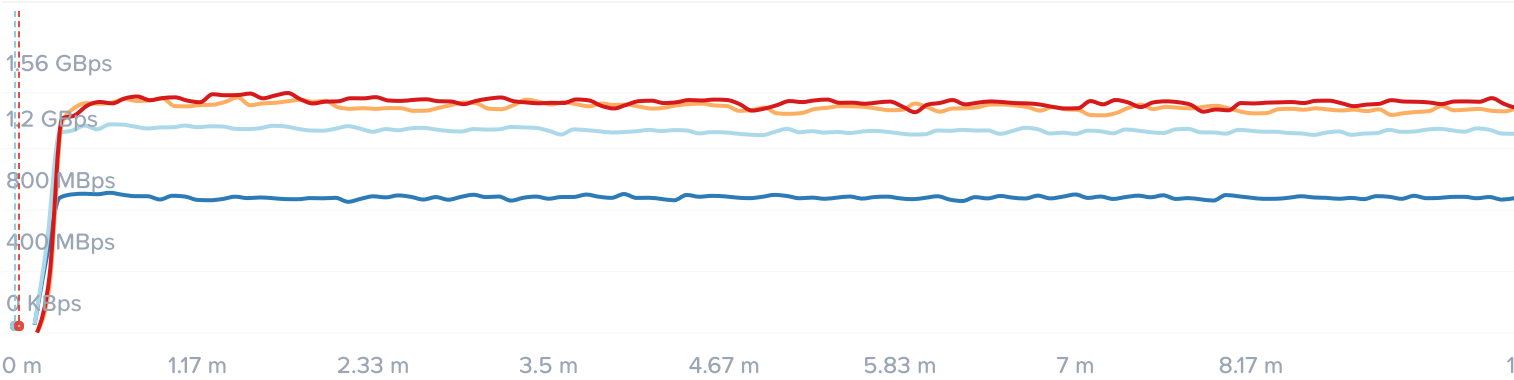
Test: HCIBenchmark

Workload Aggregated IOPS



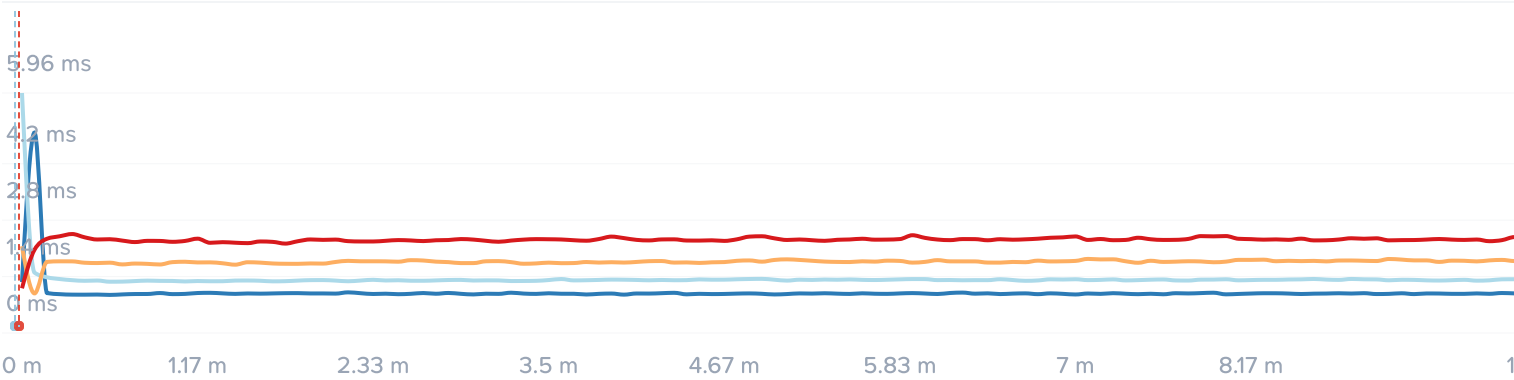
 HCI-Benchmark_AWS-i3.metal-3nodes (3 VMs)		 HCI-Benchmark_AWS-i3.metal-3nodes (6VMs)		 HCI-Benchmark_AWS-i3.metal-3nodes (9VMs)		 HCI-Benchmark_AWS-i3.metal-3nodes (12VMs)	
Baseline	Min	Max	Median	Mean		Standard Deviation	
	 661	111,454	107,602	106,433		10,802	
	 1,445 (118.57%)	165,777 (48.74%)	160,679 (49.33%)	158,696 (49.10%)		16,786 (55.40%)	
	 143 (-78.34%)	187,267 (68.02%)	178,945 (66.30%)	176,661 (65.98%)		20,923 (93.69%)	
	 202 (-69.42%)	190,729 (71.13%)	183,388 (70.43%)	180,572 (69.66%)		21,009 (94.49%)	

Workload Aggregated Throughput



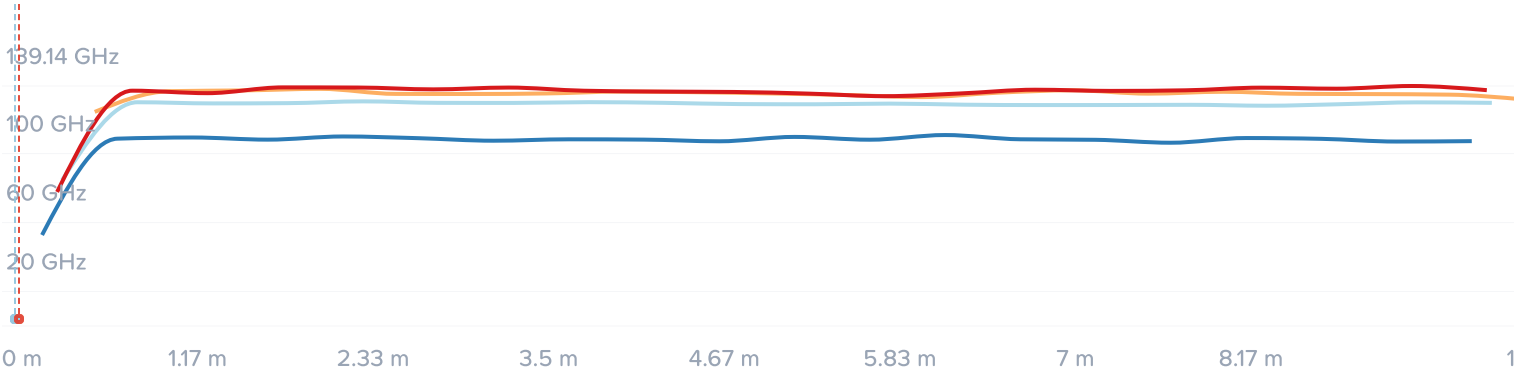
<input checked="" type="checkbox"/>	HCI-Benchmark_AWS-i3.metal-3nodes (3 VMs)		<input checked="" type="checkbox"/>	HCI-Benchmark_AWS-i3.metal-3nodes (6 VMs)		<input checked="" type="checkbox"/>	HCI-Benchmark_AWS-i3.metal-3nodes (9 VMs)		<input checked="" type="checkbox"/>	HCI-Benchmark_AWS-i3.metal-3nodes (12 VMs)	
	Baseline	Min		Max		Median		Mean		Standard Deviation	
		52.69 MBps		912.9 MBps		881.47 MBps		872.64 MBps		83.31 MBps	
		55.85 MBps (6.01%)		1.36 GBps (48.76%)		1.32 GBps (49.34%)		1.3 GBps (49.09%)		132.64 MBps (59.23%)	
		2.5 MBps (-95.25%)		1.53 GBps (68.05%)		1.47 GBps (66.30%)		1.45 GBps (65.86%)		171.03 MBps (105.31%)	
		3.11 MBps (-94.11%)		1.56 GBps (71.15%)		1.5 GBps (70.43%)		1.48 GBps (69.53%)		171.57 MBps (105.95%)	

Workload Aggregated Latency



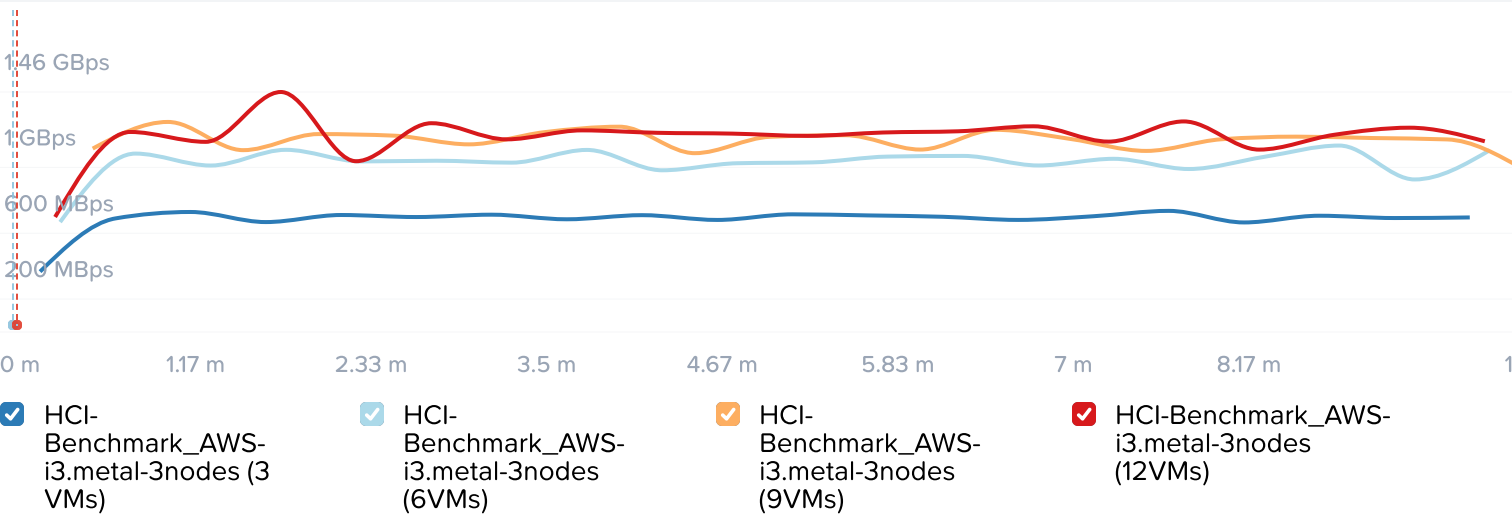
<input checked="" type="checkbox"/> HCI-Benchmark_AWS-i3.metal-3nodes (3 VMs) Baseline	Min	<input checked="" type="checkbox"/> HCI-Benchmark_AWS-i3.metal-3nodes (6 VMs) Max	<input checked="" type="checkbox"/> HCI-Benchmark_AWS-i3.metal-3nodes (9 VMs) Median	Mean	<input checked="" type="checkbox"/> HCI-Benchmark_AWS-i3.metal-3nodes (12 VMs) Standard Deviation
	0.95 ms	4.97 ms	0.98 ms	1.01 ms	0.36 ms
	1.27 ms (34.64%)	5.95 ms (19.75%)	1.31 ms (34.53%)	1.35 ms (33.79%)	0.42 ms (15.99%)
	0.98 ms (4.00%)	2.15 ms (-56.69%)	1.77 ms (81.59%)	1.77 ms (74.72%)	0.08 ms (-76.58%)
	1.11 ms (17.34%)	2.46 ms (-50.62%)	2.32 ms (137.20%)	2.31 ms (128.07%)	0.12 ms (-67.37%)

Cluster CPU Usage



<input checked="" type="checkbox"/> HCI-Benchmark_AWS-i3.metal-3nodes (3 VMs)	<input checked="" type="checkbox"/> HCI-Benchmark_AWS-i3.metal-3nodes (6 VMs)	<input checked="" type="checkbox"/> HCI-Benchmark_AWS-i3.metal-3nodes (9 VMs)	<input checked="" type="checkbox"/> HCI-Benchmark_AWS-i3.metal-3nodes (12 VMs)
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Cluster Network Received



Cluster Network Transmitted

