Emerald NAS Extensions

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SNIA Emerald™ Training

SNIA Emerald Power Efficiency Measurement Specification, for use in EPA ENERGY STAR®

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SNIA™ Green Storage Initiative

SNIA Emerald™

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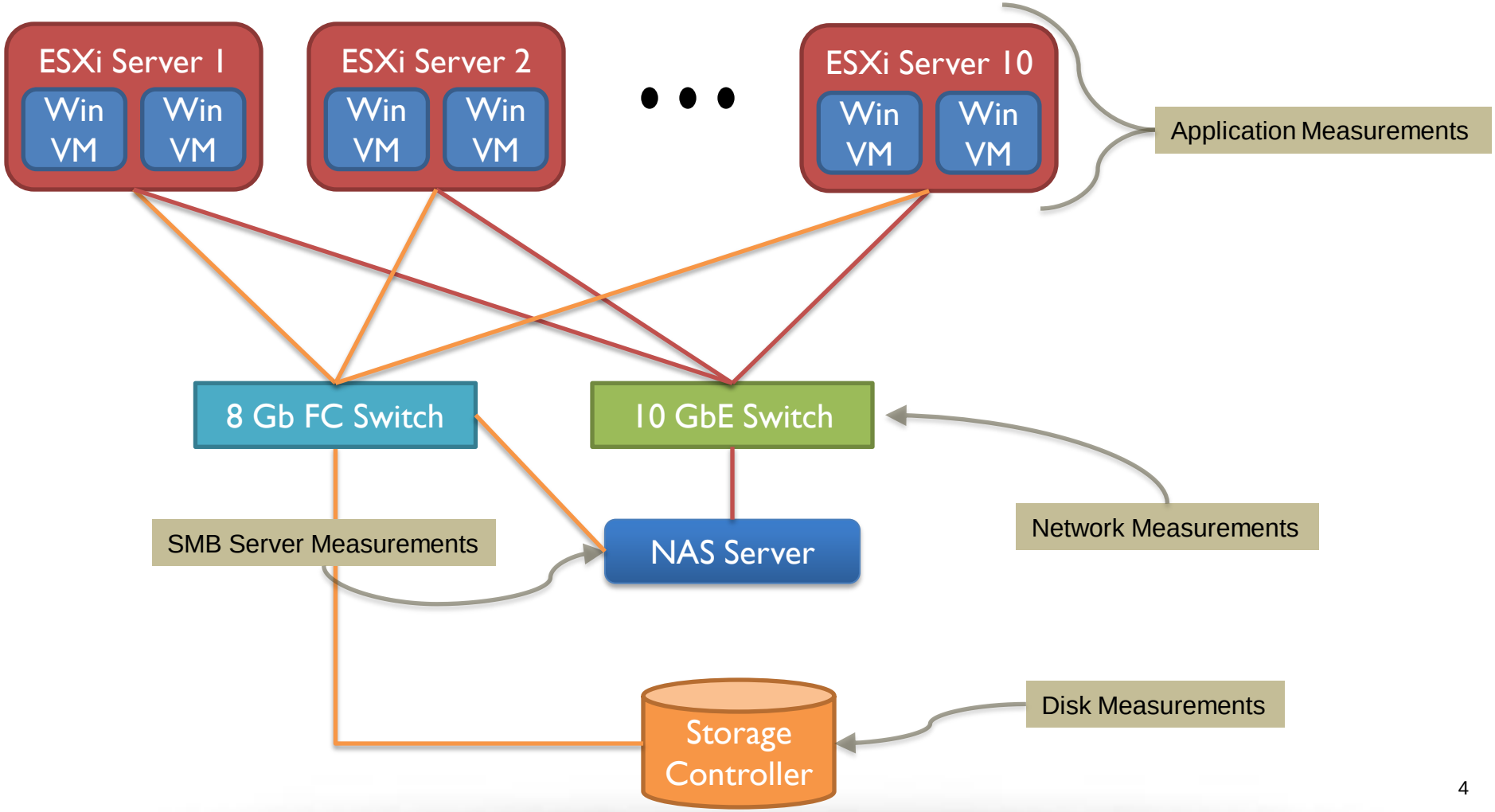
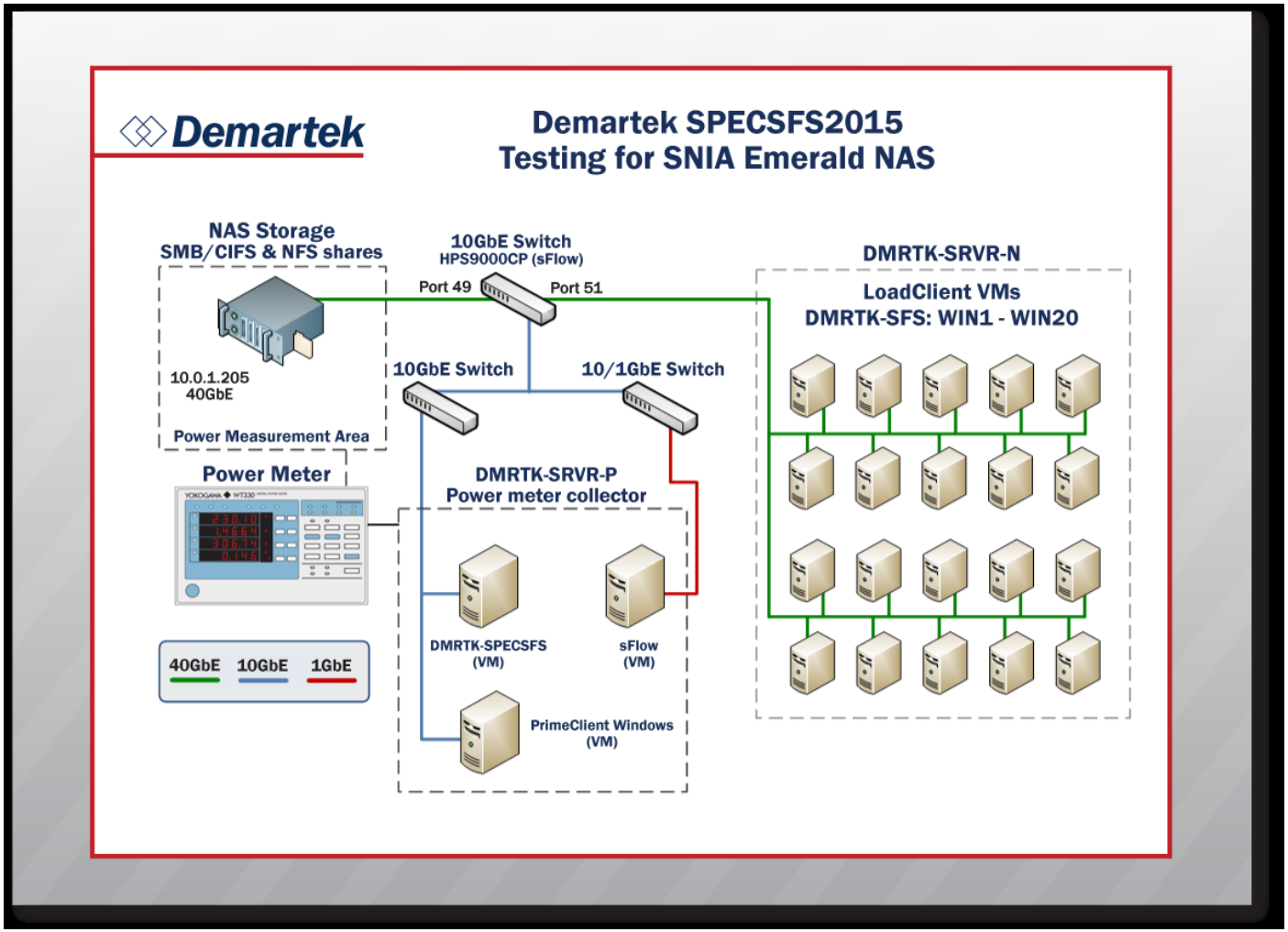
Emerald NAS Test Procedure

- 1. Set up the power analyzer to capture a log on 5 second intervals
- 2. Set up the Sflow logging process to capture the overall throughput through the switch in MB/S on 5 second intervals.
- 3. For each of the 4 workloads within the SPEC SFS© 2014 benchmark
- a. The IO load should be applied as a sequence of 10 load points, with the load increasing at each point, and ending the sequence with the highest load that the solution can sustain, with acceptable response times
- b. The workloads are to be run in a non-interrupted sequence.
- 4. Terminate the power and throughput rate logging
- 5. Save the 2 output files for further data reduction
- 6. Using the SNIA Emerald NAS data reduction tool create a composite file that has both the power and IO rate measurements, synched up in time for the entire test sequence of all workloads
- 7. Produce a plot of the primary Emerald metric (MB/S/W) for all 4 workloads through the range of business metrics
- 8. Derive the overall metric for the combination of all workloads by calculating the average of the 4 primary workload metrics at their maximum business metric rate.

EMC NAS Test Configuration Schematic



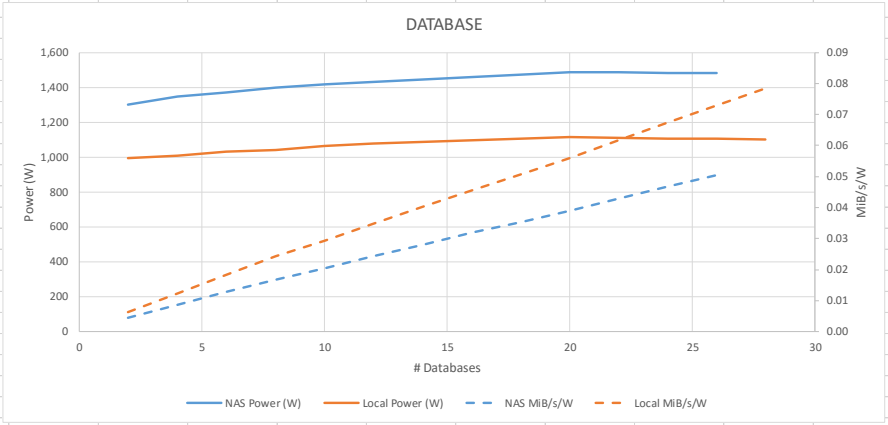
NAS Test Connection Diagram

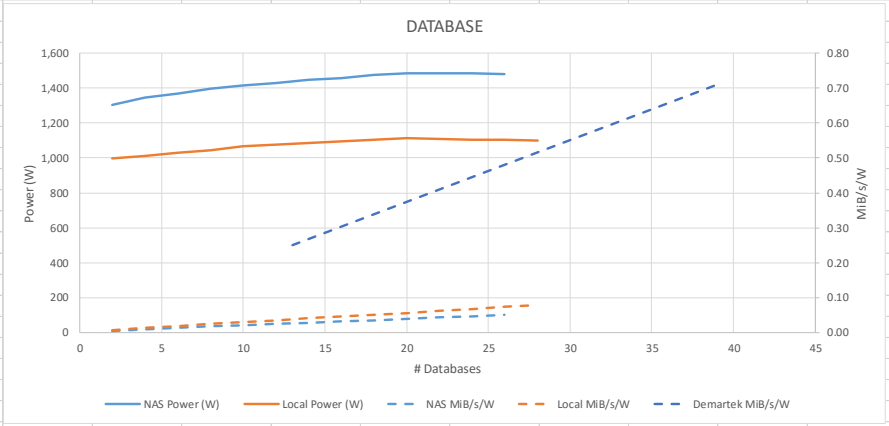


EMC Database Workload Results

DATABASE					
NAS Server			Local FS		
BusMet	Power (W)	MiB/s/W	BusMet	Power (W)	MiB/s/W
2	1,303	0.00	2	997	0.01
4	1,345	0.01	4	1,010	0.01
6	1,371	0.01	6	1,030	0.02
8	1,397	0.02	8	1,042	0.02
10	1,416	0.02	10	1,065	0.03
12	1,431	0.02	12	1,079	0.03
14	1,447	0.03	14	1,087	0.04
16	1,459	0.03	16	1,097	0.05
18	1,474	0.04	18	1,107	0.05
20	1,486	0.04	20	1,114	0.06
22	1,485	0.04	22	1,111	0.06
24	1,484	0.05	24	1,106	0.07
26	1,483	0.05	26	1,104	0.07
			28	1,102	0.08

Demartek MiB/s/W		
BusMet	Power (W)	MiB/s/W
13	145	0.25
26	148	0.48
39	151	0.71





DATABASE Workload

Demartek Database Workload Results

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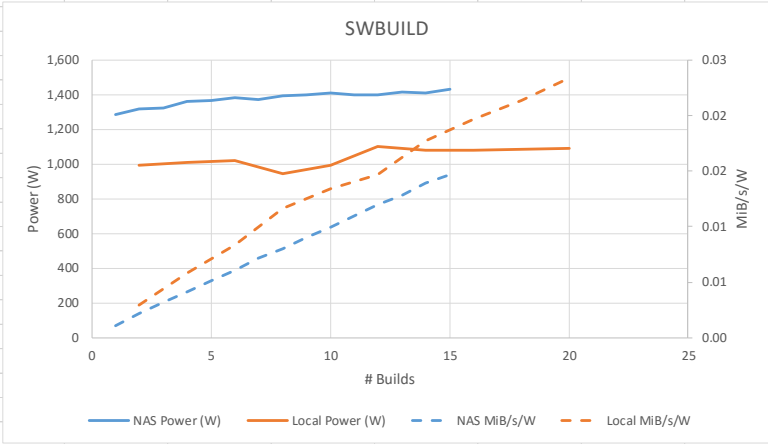
DATABASE Workload

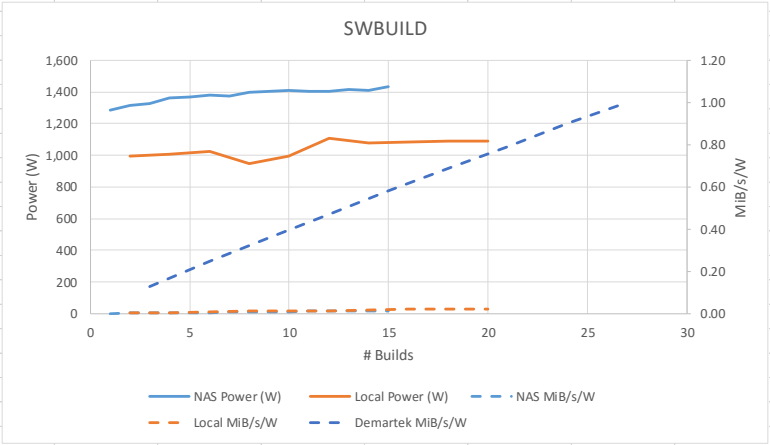
Run	Average Power (W)	Business Metric	Total KBps	MiBps	MiB/s/W	Valid Run
30-1	144.5746	13	37457.17	35.72194	0.247083	
30-2	148.364	26	74529.75	71.07711	0.479073	
30-3	151.3518	39	112035.9	106.8458	0.705943	
30-4	153.5249	52	149654	142.7212	0.929629	
30-5	155.3027	65	187137.5	178.4682	1.149164	
31-1	157.5509	78	225198.1	214.7656	1.36315	
31-2	159.2777	91	262529.6	250.3678	1.571895	
31-3	159.9135	104	299922.3	286.0282	1.788643	
32-1	161.8897	117	337234.3	321.6117	1.986611	
32-2	162.3428	130	374500.8	357.1518	2.199985	
32-3	Initialization did not complete due to lack of available space on storage.					

EMC SW Build Workload Results

SWBUILD					
NAS Server			Local FS		
BusMet	Power (W)	MiB/s/W	BusMet	Power (W)	MiB/s/W
1	1,285	0.00	2	994	0.00
2	1,316	0.00	4	1,008	0.01
3	1,326	0.00	6	1,023	0.01
4	1,362	0.00	8	948	0.01
5	1,369	0.01	10	993	0.01
6	1,381	0.01	12	1,105	0.01
7	1,375	0.01	14	1,080	0.02
8	1,395	0.01	16	1,083	0.02
9	1,402	0.01	18	1,088	0.02
10	1,412	0.01	20	1,092	0.02
11	1,402	0.01			
12	1,401	0.01			
13	1,417	0.01			
14	1,411	0.01			
15	1,434	0.01			



Demartek MiB/s/W		
BusMet	Power (W)	MiB/s/W
3	144	0.13
6	147	0.25
9	150	0.36
12	153	0.47
15	155	0.58
18	157	0.69
21	159	0.79
24	160	0.9
27	162	1



Demartek VDA Workload Results

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VDA Workload

Run	Average Power (W)	Business Metric	Total KBps	MiBps	MiB/s/W	Valid Run
1	137.986791	12	54805.96	52.27	0.378783	
2	140.0764312	24	110944.27	105.8	0.755335	
3	141.8647388	36	167360.45	159.6	1.125067	
4	143.8150186	48	221113.33	210.9	1.466259	
5	145.8055351	60	276943.15	264.1	1.81141	
6	147.7285609	72	331725.56	316.4	2.141483	
7	149.8446468	84	386901.04	369	2.462401	
8	152.1864045	96	443535.86	423	2.779412	
9	153.4335556	108	498780.46	475.7	3.100196	
10	156.0042963	120	552849.77	527.2	3.379642	
11	158.2355762	132	609294	581.1	3.672171	
12	Initialization did not complete due to lack of available space on storage.					

Demartek SW Build Workload Results

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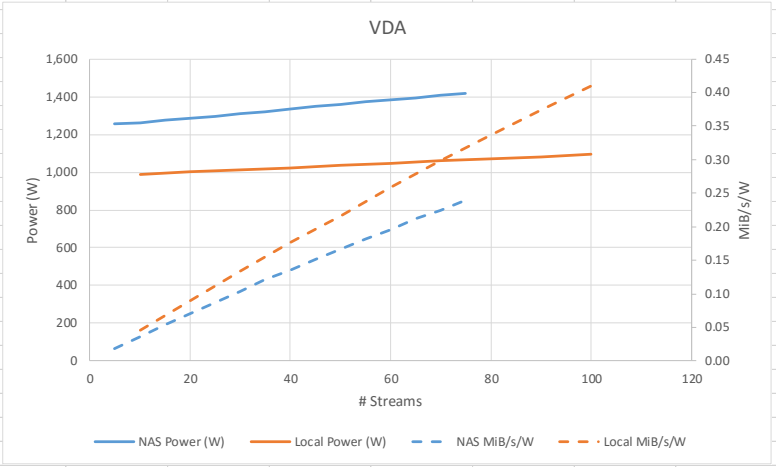
SWBUILD Workload

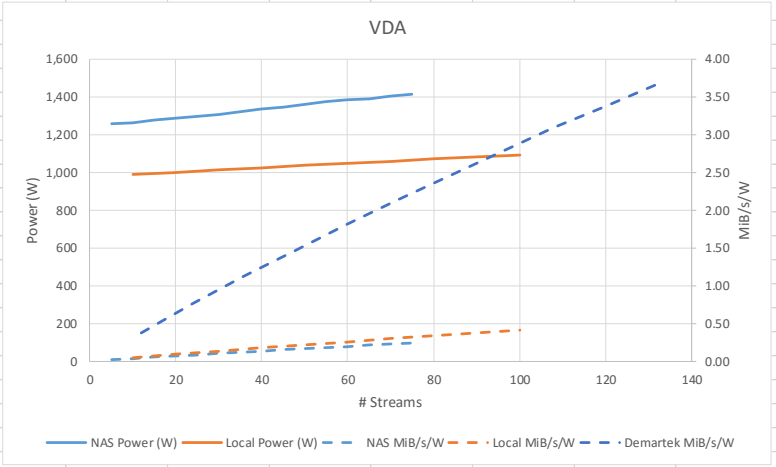
Run	Average Power (W)	Business Metric	Total KBps	MiBps	MiB/s/W	Valid Run
1	144.2499	3	18951.79	18.07	0.125295	
2	147.0002	6	37898.32	36.14	0.245868	
3	150.2084	9	56949.50	54.31	0.361573	
4	152.6251	12	75863.26	72.35	0.47403	
5	154.8648	15	94837.16	90.44	0.584018	
6	157.2171	18	113763.27	108.49	0.690085	
7	158.9216	21	132804.62	126.65	0.796949	
8	160.7436	24	151747.37	144.72	0.9003	
9	162.28	27	170840.45	162.93	1.003981	
10	165.9042	30	189738.80	180.95	1.090684	
11	167.4628	33	208636.09	198.97	1.188149	
12	170.1205	36	227674.77	217.13	1.276316	
13	171.2024	39	236525.70	225.57	1.317554	
14	170.7744	42	231057.91	220.35	1.290322	INVALID_RUN
15	171.7311	45	229436.65	218.81	1.27413	INVALID_RUN

EMC VDA Workload Results

VDA					
NAS Server			Local FS		
BusMet	Power (W)	MiB/s/W	BusMet	Power (W)	MiB/s/W
5	1,257	0.02	10	989	0.05
10	1,264	0.04	20	1,000	0.09
15	1,275	0.05	30	1,014	0.13
20	1,285	0.07	40	1,024	0.18
25	1,297	0.09	50	1,036	0.22
30	1,308	0.10	60	1,047	0.26
35	1,322	0.12	70	1,059	0.30
40	1,334	0.14	80	1,071	0.34
45	1,347	0.15	90	1,081	0.37
50	1,359	0.17	100	1,093	0.41
55	1,374	0.18			
60	1,383	0.20			
65	1,392	0.21			
70	1,406	0.22			
75	1,415	0.24			

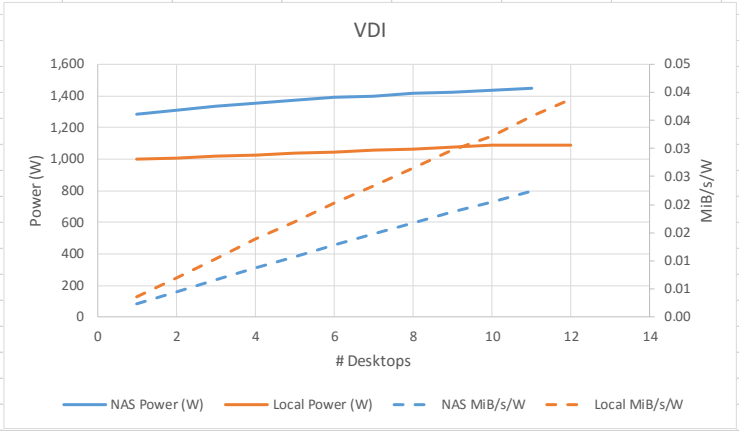


Demartek MiB/s/W		
BusMet	Power (W)	MiB/s/W
12	138	0.38
24	140	0.76
36	142	1.13
48	144	1.47
60	146	1.81
72	148	2.14
84	150	2.46
96	152	2.78
108	153	3.1
120	156	3.38
132	158	3.67

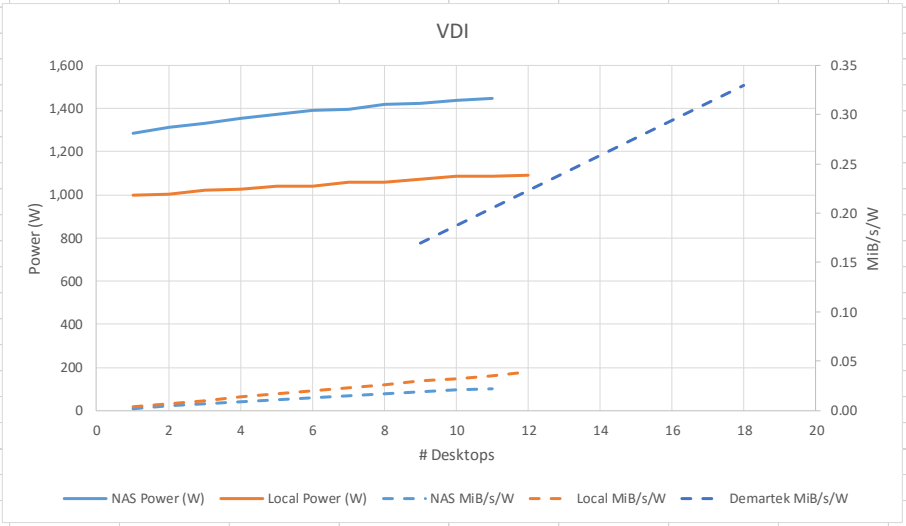


EMC VDI Workload Results

VDI					
NAS Server			Local FS		
BusMet	Power (W)	MiB/s/W	BusMet	Power (W)	MiB/s/W
1	1,283	0.00	1	996	0.00
2	1,311	0.00	2	1,004	0.01
3	1,333	0.01	3	1,021	0.01
4	1,353	0.01	4	1,025	0.01
5	1,370	0.01	5	1,038	0.02
6	1,390	0.01	6	1,042	0.02
7	1,398	0.01	7	1,057	0.02
8	1,417	0.02	8	1,060	0.03
9	1,421	0.02	9	1,074	0.03
10	1,437	0.02	10	1,088	0.03
11	1,445	0.02	11	1,087	0.04
			12	1,089	0.04



Demartek MiB/s/W		
BusMet	Power (W)	MiB/s/W
9	144	0.17
18	149	0.33



Demartek VDI Workload Results

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VDI Workload

Run	Average Power (W)	Business Metric	Total KBps	MiBps	MiB/s/W	Valid Run
1	144.2368401	9	26345.15	25.12	0.1741905	
2	148.8969888	18	52676.19	50.24	0.3373871	
3	151.3155597	27	79063.63	75.40	0.4983027	
4	153.2113806	36	104965.82	100.10	0.6533667	
5	155.4200373	45	131103.89	125.03	0.8044678	
6	156.9507836	54	157340.51	150.05	0.9560424	
7	158.1027138	63	184015.56	175.49	1.1099804	
8	160.6298513	72	210229.21	200.49	1.2481503	
9	161.2325556	81	236585.56	225.63	1.3993797	
10	161.5771481	90	250213.28	238.62	1.47683	
11	159.9356296	99	250567.41	238.96	1.4940992	INVALID_RUN
12	161.7166171	108	250110.87	238.52	1.4749524	INVALID_RUN
13	159.367026	117	246471.65	235.05	1.4749204	INVALID_RUN

Composite Metric Calculations and Results

Net/Disk	NAS	Local FS	Demartek
DATABASE	0.05	0.08	2.2
SWBUILD	0.01	0.02	1.3
VDA	0.24	0.41	3.7
VDI	0.02	0.04	1.5
COMPOSITE	0.08	0.14	2.18