

IBM CEX6S Performance Data, Linux on Z

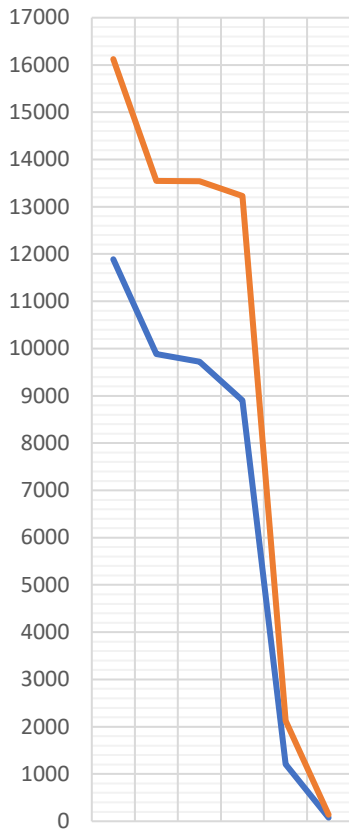
AES 128 bit CBC Encipher
operations / second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
64	AES 128 bit CBC Encipher (CSNBSAE) - 64B	11889	16123
256	AES 128 bit CBC Encipher (CSNBSAE) - 256B	9882	13549
1024	AES 128 bit CBC Encipher (CSNBSAE) - 1024B	9723	13539
4096	AES 128 bit CBC Encipher (CSNBSAE) - 4096B	8904	13228
65536	AES 128 bit CBC Encipher (CSNBSAE) - 64KB	1204	2124
1048576	AES 128 bit CBC Encipher (CSNBSAE) - 1MB	77	139

AES 256 bit CBC Encipher
operations / second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
64	AES 256 bit CBC Encipher (CSNBSAE) - 64B	11917	16091
256	AES 256 bit CBC Encipher (CSNBSAE) - 256B	9792	13321
1024	AES 256 bit CBC Encipher (CSNBSAE) - 1024B	9717	13268
4096	AES 256 bit CBC Encipher (CSNBSAE) - 4096B	8692	13013
65536	AES 256 bit CBC Encipher (CSNBSAE) - 64KB	1151	2065
1048576	AES 256 bit CBC Encipher (CSNBSAE) - 1MB	71	136

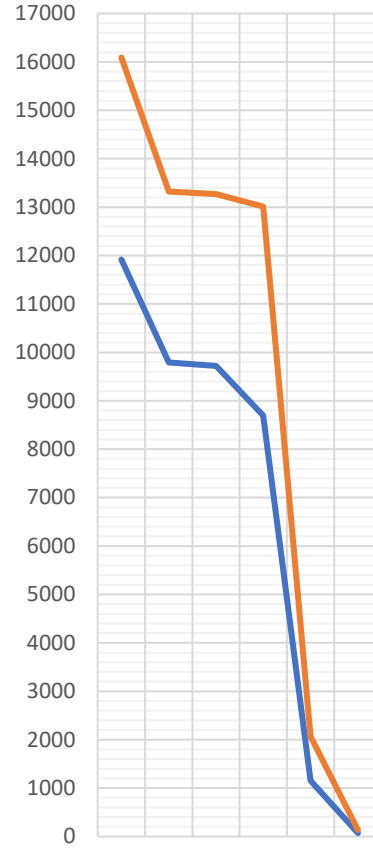
CCA CEX6S Linux on Z
AES 128b CBC Ops



AES 128 bit CBC Encipher (CSNBSAE) - 64B
 AES 128 bit CBC Encipher (CSNBSAE) - 256B
 AES 128 bit CBC Encipher (CSNBSAE) - 1024B
 AES 128 bit CBC Encipher (CSNBSAE) - 4096B
 AES 128 bit CBC Encipher (CSNBSAE) - 64KB
 AES 128 bit CBC Encipher (CSNBSAE) - 1MB

1 job: ops/sec 8 jobs: ops/sec

CCA CEX6S Linux on Z
AES 256b CBC Ops



AES 256 bit CBC Encipher (CSNBSAE) - 64B
 AES 256 bit CBC Encipher (CSNBSAE) - 256B
 AES 256 bit CBC Encipher (CSNBSAE) - 1024B
 AES 256 bit CBC Encipher (CSNBSAE) - 4096B
 AES 256 bit CBC Encipher (CSNBSAE) - 64KB
 AES 256 bit CBC Encipher (CSNBSAE) - 1MB

1 job: ops/sec 8 jobs: ops/sec

IBM CEX6S Performance Data, Linux on Z

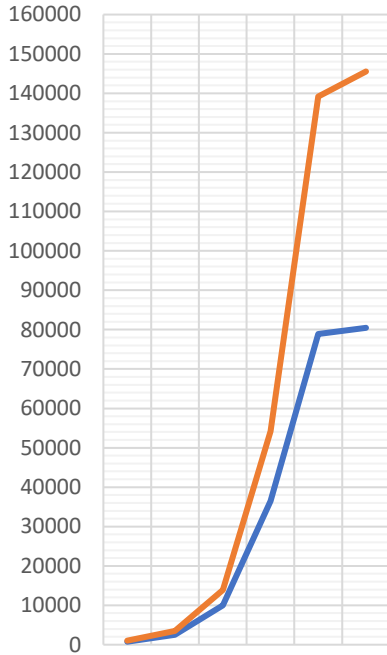
AES 128 bit CBC Encipher
1Kbytes /second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: 1Kbytes/sec	8 jobs: 1Kbytes/sec
64	AES 128 bit CBC Encipher (CSNBSAE) - 64B	761	1032
256	AES 128 bit CBC Encipher (CSNBSAE) - 256B	2530	3469
1024	AES 128 bit CBC Encipher (CSNBSAE) - 1024B	9956	13864
4096	AES 128 bit CBC Encipher (CSNBSAE) - 4096B	36471	54182
65536	AES 128 bit CBC Encipher (CSNBSAE) - 64KB	78905	139198
1048576	AES 128 bit CBC Encipher (CSNBSAE) - 1MB	80457	145542

AES 256 bit CBC Encipher
1Kbytes / second

	Op Type - All measurements made using 1 CEX6S adapter	1 job: 1Kbytes/sec	8 jobs: 1Kbytes/sec
64	AES 256 bit CBC Encipher (CSNBSAE) - 64B	763	1030
256	AES 256 bit CBC Encipher (CSNBSAE) - 256B	2507	3410
1024	AES 256 bit CBC Encipher (CSNBSAE) - 1024B	9950	13586
4096	AES 256 bit CBC Encipher (CSNBSAE) - 4096B	35602	53301
65536	AES 256 bit CBC Encipher (CSNBSAE) - 64KB	75432	135332
1048576	AES 256 bit CBC Encipher (CSNBSAE) - 1MB	74784	142082

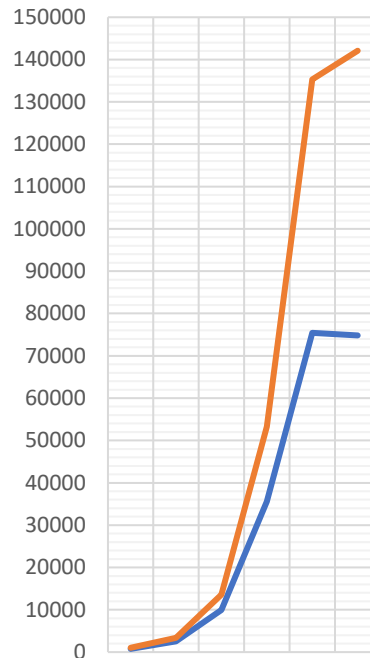
CCA CEX6S Linux on Z AES 128b CBC bandwidth



AES 128 bit CBC Encipher (CSNBSAE) - 64B
 AES 128 bit CBC Encipher (CSNBSAE) - 256B
 AES 128 bit CBC Encipher (CSNBSAE) - 1024B
 AES 128 bit CBC Encipher (CSNBSAE) - 4096B
 AES 128 bit CBC Encipher (CSNBSAE) - 64KB
 AES 128 bit CBC Encipher (CSNBSAE) - 1MB

1 job: 1Kbytes/sec 8 jobs: 1Kbytes/sec

CCA CEX6S Linux on Z AES 256b CBC bandwidth



AES 256 bit CBC Encipher (CSNBSAE) - 64B
 AES 256 bit CBC Encipher (CSNBSAE) - 256B
 AES 256 bit CBC Encipher (CSNBSAE) - 1024B
 AES 256 bit CBC Encipher (CSNBSAE) - 4096B
 AES 256 bit CBC Encipher (CSNBSAE) - 64KB
 AES 256 bit CBC Encipher (CSNBSAE) - 1MB

1 job: 1Kbytes/sec 8 jobs: 1Kbytes/sec

IBM CEX6S Performance Data, Linux on Z

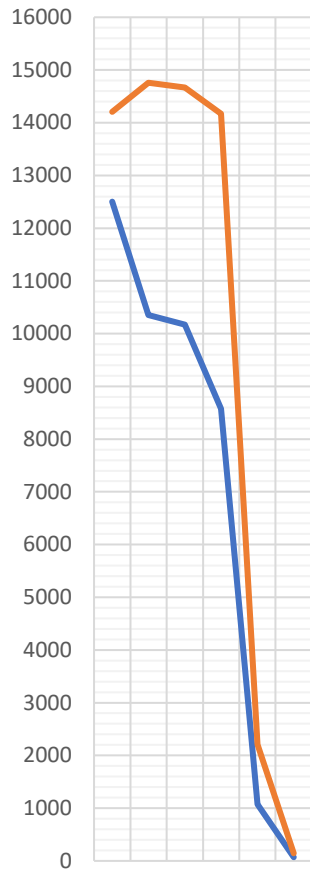
TDES 192 bit CBC Encipher
operations / second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
64	Triple DES 192 bit CBC Encipher (CSNBENC) - 64B	12503	14208
256	Triple DES 192 bit CBC Encipher (CSNBENC) - 256B	10355	14758
1024	Triple DES 192 bit CBC Encipher (CSNBENC) - 1024B	10169	14670
4096	Triple DES 192 bit CBC Encipher (CSNBENC) - 4096B	8576	14172
65536	Triple DES 192 bit CBC Encipher (CSNBENC) - 64KB	1074	2208
1048576	Triple DES 192 bit CBC Encipher (CSNBENC) - 1MB	70	144

TDEA Double Length DES Key 112 bit MAC
operations / second

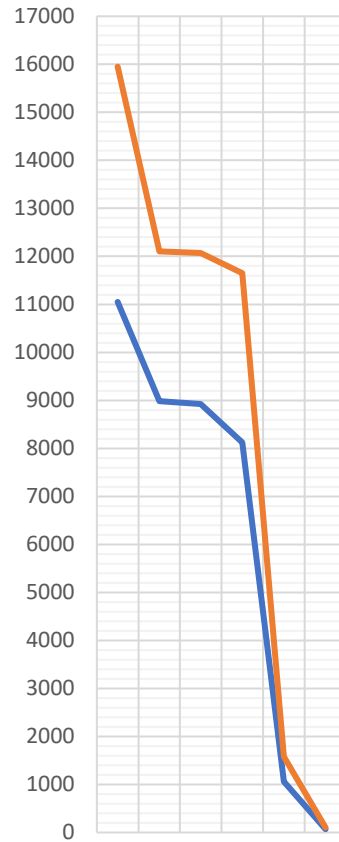
Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
64	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 64B	11051	15951
256	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 256B	8983	12100
1024	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 1024B	8922	12068
4096	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 4096B	8127	11652
65536	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 64KB	1060	1579
1048576	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 1MB	69	104

CCA CEX6S Linux on Z
TDES 192b CBC Ops



1 job: ops/sec 8 jobs: ops/sec

CCA CEX6S Linux on Z
Double Length TDES 112b MAC Ops



1 job: ops/sec 8 jobs: ops/sec

IBM CEX6S Performance Data, Linux on Z

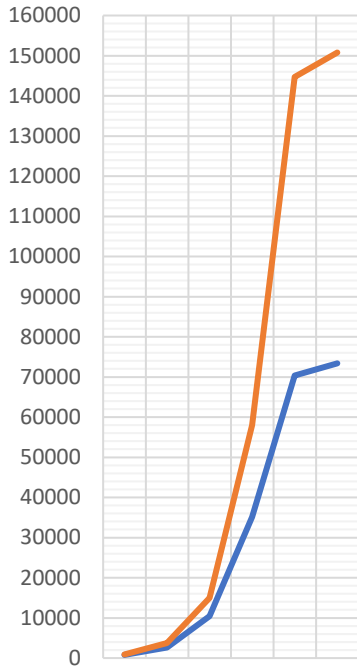
Triple DES 192 bit CBC Encipher
1Kbytes / second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: 1Kbytes/sec	8 jobs: 1Kbytes/sec
64	Triple DES 192 bit CBC Encipher (CSNBENC) - 64B	800	909
256	Triple DES 192 bit CBC Encipher (CSNBENC) - 256B	2651	3778
1024	Triple DES 192 bit CBC Encipher (CSNBENC) - 1024B	10413	15022
4096	Triple DES 192 bit CBC Encipher (CSNBENC) - 4096B	35127	58049
65536	Triple DES 192 bit CBC Encipher (CSNBENC) - 64KB	70386	144703
1048576	Triple DES 192 bit CBC Encipher (CSNBENC) - 1MB	73390	150785

Double Length TDES Key 112 bit MAC
1Kbytes / second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: 1Kbytes/sec	8 jobs: 1Kbytes/sec
64	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 64B	707	1021
256	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 256B	2300	3098
1024	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 1024B	9136	12358
4096	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 4096B	33288	47727
65536	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 64KB	69468	103481
1048576	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 1MB	72582	108947

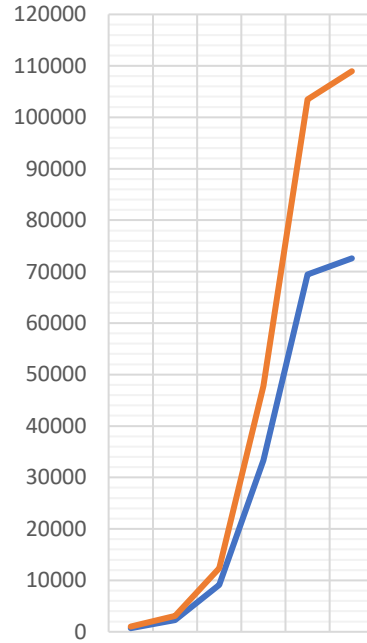
CCA CEX6S Linux on Z
192b TDES CBC bandwidth



Triple DES 192 bit CBC Encipher (CSNBENC) - 64B
 Triple DES 192 bit CBC Encipher (CSNBENC) - 256B
 Triple DES 192 bit CBC Encipher (CSNBENC) - 1024B
 Triple DES 192 bit CBC Encipher (CSNBENC) - 4096B
 Triple DES 192 bit CBC Encipher (CSNBENC) - 64KB
 Triple DES 192 bit CBC Encipher (CSNBENC) - 1MB

1 job: 1Kbytes/sec 8 jobs: 1Kbytes/sec

CCA CEX6S Linux on Z
Double Length TDES 112b MAC
bandwidth



TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 64B
 TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 256B
 TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 1024B
 TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 4096B
 TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 64KB
 TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 1MB

1 job: 1Kbytes/sec 8 jobs: 1Kbytes/sec

IBM CEX6S Performance Data, Linux on Z

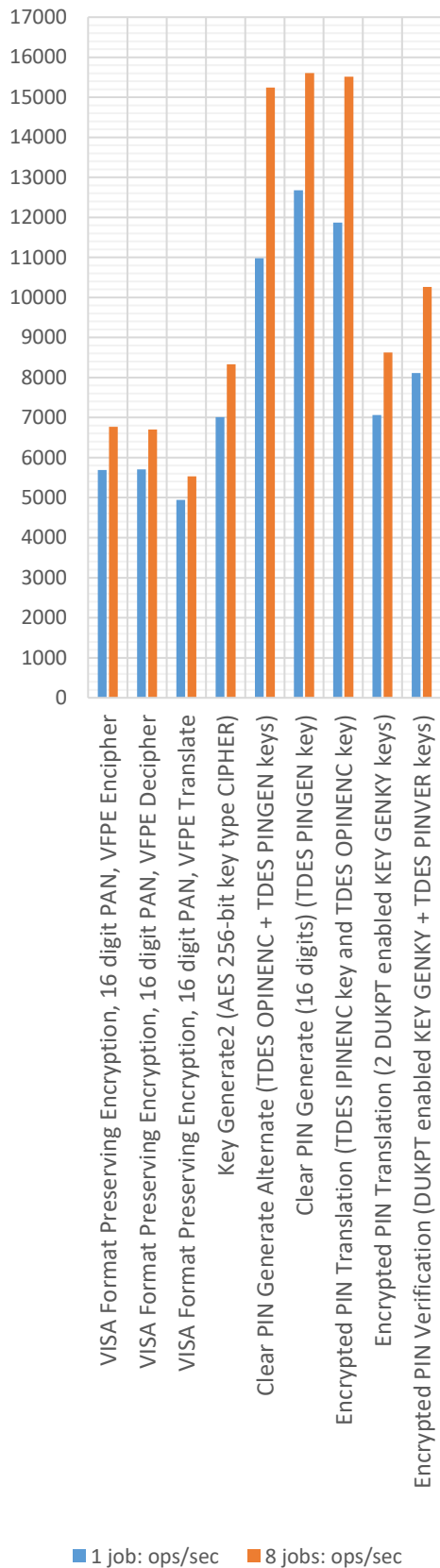
PIN / VFPE
operations / second

Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
VISA Format Preserving Encryption, 16 digit PAN, VFPE Encipher	5692	6769
VISA Format Preserving Encryption, 16 digit PAN, VFPE Decipher	5707	6699
VISA Format Preserving Encryption, 16 digit PAN, VFPE Translate	4943	5532
Key Generate2 (AES 256-bit key type CIPHER)	7012	8333
Clear PIN Generate Alternate (TDES OPINENC + TDES PINGEN keys)	10978	15242
Clear PIN Generate (16 digits) (TDES PINGEN key)	12674	15608
Encrypted PIN Translation (TDES IPINENC key and TDES OPINENC key)	11870	15512
Encrypted PIN Translation (2 DUKPT enabled KEY GENKY keys)	7066	8626
Encrypted PIN Verification (DUKPT enabled KEY GENKY + TDES PINVER keys)	8111	10260

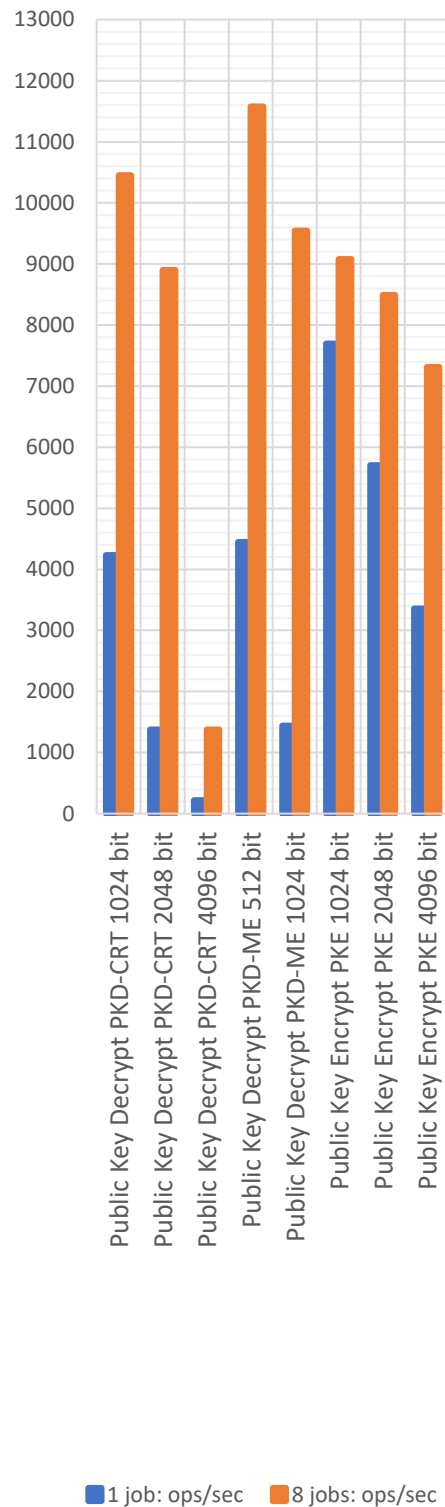
Public key Decrypt and Encrypt
operations / second

Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
Public Key Decrypt PKD-CRT 1024 bit	4231	10453
Public Key Decrypt PKD-CRT 2048 bit	1378	8903
Public Key Decrypt PKD-CRT 4096 bit	221	1376
Public Key Decrypt PKD-ME 512 bit	4448	11578
Public Key Decrypt PKD-ME 1024 bit	1438	9547
Public Key Encrypt PKE 1024 bit	7695	9080
Public Key Encrypt PKE 2048 bit	5704	8495
Public Key Encrypt PKE 4096 bit	3357	7315

CCA CEX6S Linux on Z PIN/VFPE Ops



CCA CEX6S Linux on Z PKD/PKE Ops



IBM CEX6S Performance Data, Linux on Z

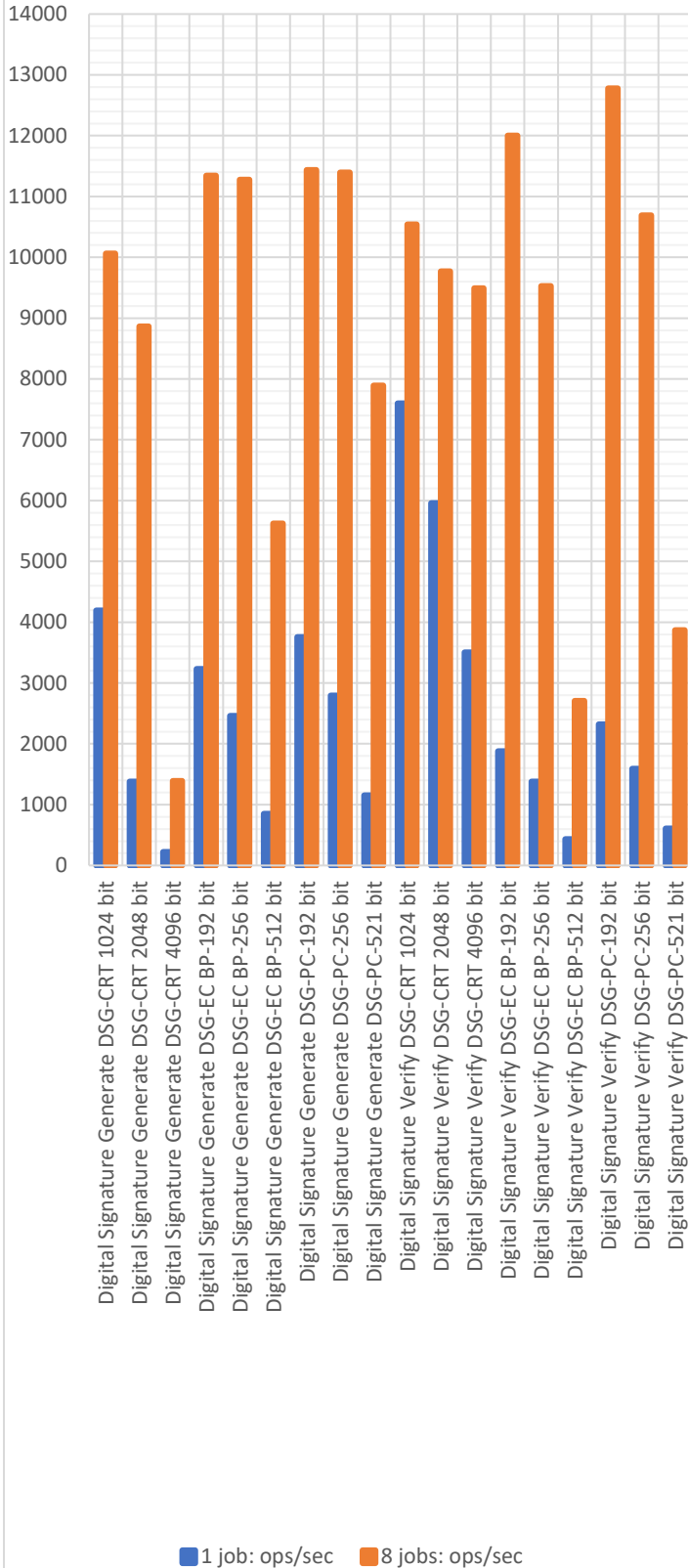
Digital Signature Generate / Verify PIN
operations / second

Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
Digital Signature Generate DSG-CRT 1024 bit	4193	10062
Digital Signature Generate DSG-CRT 2048 bit	1381	8863
Digital Signature Generate DSG-CRT 4096 bit	223	1388
Digital Signature Generate DSG-EC BP-192 bit	3234	11344
Digital Signature Generate DSG-EC BP-256 bit	2460	11278
Digital Signature Generate DSG-EC BP-512 bit	849	5625
Digital Signature Generate DSG-PC-192 bit	3759	11438
Digital Signature Generate DSG-PC-256 bit	2797	11393
Digital Signature Generate DSG-PC-521 bit	1153	7890
Digital Signature Verify DSG-CRT 1024 bit	7599	10543
Digital Signature Verify DSG-CRT 2048 bit	5958	9769
Digital Signature Verify DSG-CRT 4096 bit	3502	9490
Digital Signature Verify DSG-EC BP-192 bit	1881	12000
Digital Signature Verify DSG-EC BP-256 bit	1379	9528
Digital Signature Verify DSG-EC BP-512 bit	434	2709
Digital Signature Verify DSG-PC-192 bit	2323	12778
Digital Signature Verify DSG-PC-256 bit	1589	10690
Digital Signature Verify DSG-PC-521 bit	608	3868

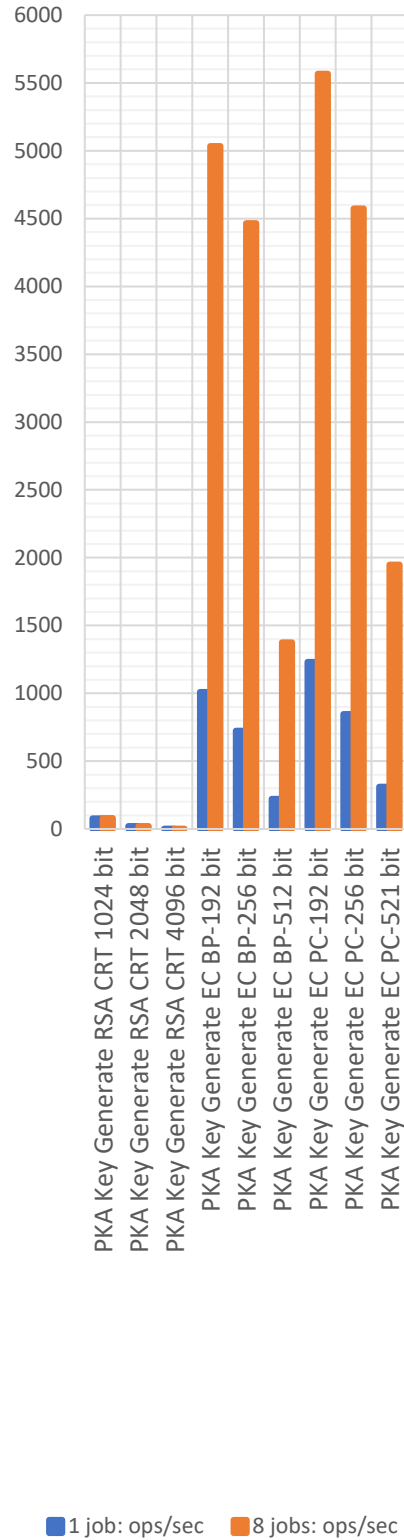
PKA key Generate
operations / second

Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
PKA Key Generate RSA CRT 1024 bit	78	81
PKA Key Generate RSA CRT 2048 bit	21	22
PKA Key Generate RSA CRT 4096 bit	2	2
PKA Key Generate EC BP-192 bit	1011	5035
PKA Key Generate EC BP-256 bit	725	4467
PKA Key Generate EC BP-512 bit	223	1376
PKA Key Generate EC PC-192 bit	1233	5567
PKA Key Generate EC PC-256 bit	847	4576
PKA Key Generate EC PC-521 bit	313	1949

CCA CEX6S Linux on Z DSG/DSV Ops

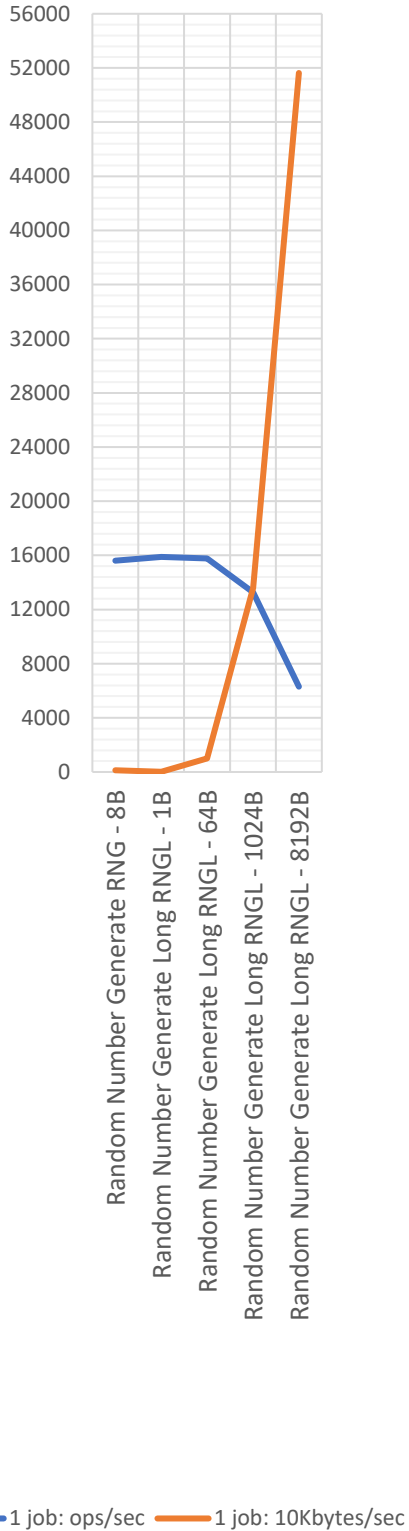


CCA CEX6S Linux on Z PKA Key Gen Ops

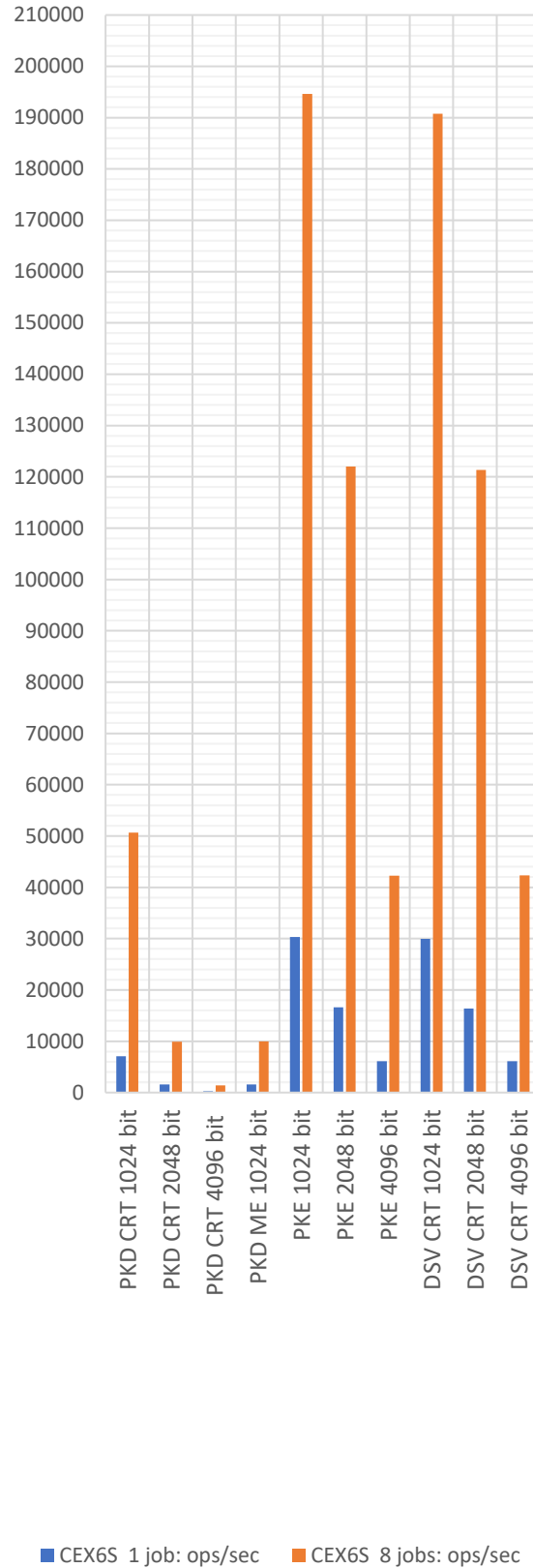


IBM CEX6S Performance Data, Linux on Z		
Random Number Generate operations / second		
Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	1 job: 10KB/sec
Random Number Generate RNG - 8B	15604	125
Random Number Generate Long RNGL - 1B	15884	16
Random Number Generate Long RNGL - 64B	15783	1010
Random Number Generate Long RNGL - 1024B	13275	13594
Random Number Generate Long RNGL - 8192B	6302	51626
Accelerator PKA Ops operations / second		
Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
PKD CRT 1024 bit	7067	50670
PKD CRT 2048 bit	1588	9899
PKD CRT 4096 bit	228	1377
PKD ME 1024 bit	1602	9985
PKE 1024 bit	30341	194636
PKE 2048 bit	16630	122006
PKE 4096 bit	6097	42289
DSV CRT 1024 bit	29942	190790
DSV CRT 2048 bit	16379	121361
DSV CRT 4096 bit	6094	42300

CCA CEX6S Linux on Z RNG Ops



CEX6S Accelerator PKA Ops



IBM CEX6S Performance Data, z/OS

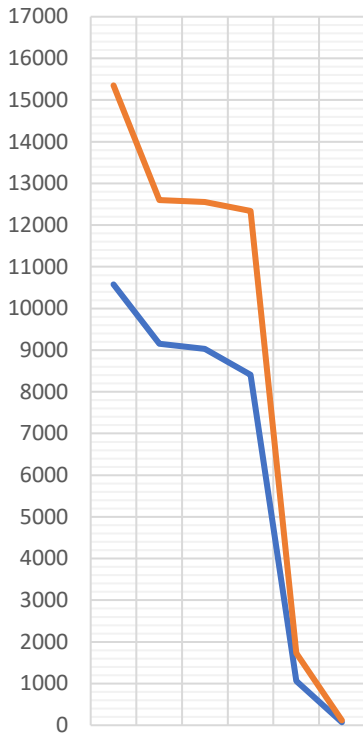
AES 128 bit CBC Encipher
operations / second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
64	AES 128 bit CBC Encipher (CSNBSAE) - 64B	10577	15352
256	AES 128 bit CBC Encipher (CSNBSAE) - 256B	9152	12604
1024	AES 128 bit CBC Encipher (CSNBSAE) - 1024B	9028	12553
4096	AES 128 bit CBC Encipher (CSNBSAE) - 4096B	8406	12342
65536	AES 128 bit CBC Encipher (CSNBSAE) - 64KB	1063	1725
1048576	AES 128 bit CBC Encipher (CSNBSAE) - 1MB	71	117

AES 256 bit CBC Encipher
operations / second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
64	AES 256 bit CBC Encipher (CSNBSAE) - 64B	10569	15348
256	AES 256 bit CBC Encipher (CSNBSAE) - 256B	9126	12593
1024	AES 256 bit CBC Encipher (CSNBSAE) - 1024B	9019	12526
4096	AES 256 bit CBC Encipher (CSNBSAE) - 4096B	8225	12313
65536	AES 256 bit CBC Encipher (CSNBSAE) - 64KB	1017	1727
1048576	AES 256 bit CBC Encipher (CSNBSAE) - 1MB	68	117

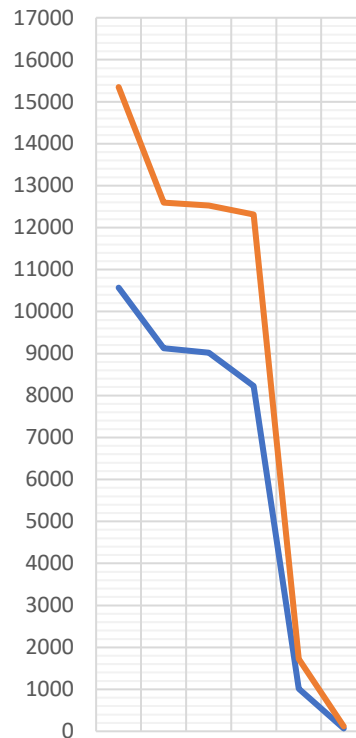
CCA CEX6S z/OS AES 128b CBC Ops



AES 128 bit CBC Encipher (CSNBSAE) - 64B
 AES 128 bit CBC Encipher (CSNBSAE) - 256B
 AES 128 bit CBC Encipher (CSNBSAE) - 1024B
 AES 128 bit CBC Encipher (CSNBSAE) - 4096B
 AES 128 bit CBC Encipher (CSNBSAE) - 64KB
 AES 128 bit CBC Encipher (CSNBSAE) - 1MB

1 job: ops/sec 8 jobs: ops/sec

CCA CEX6S z/OS AES 256b CBC Ops



AES 256 bit CBC Encipher (CSNBSAE) - 64B
 AES 256 bit CBC Encipher (CSNBSAE) - 256B
 AES 256 bit CBC Encipher (CSNBSAE) - 1024B
 AES 256 bit CBC Encipher (CSNBSAE) - 4096B
 AES 256 bit CBC Encipher (CSNBSAE) - 64KB
 AES 256 bit CBC Encipher (CSNBSAE) - 1MB

1 job: ops/sec 8 jobs: ops/sec

IBM CEX6S Performance Data, z/OS

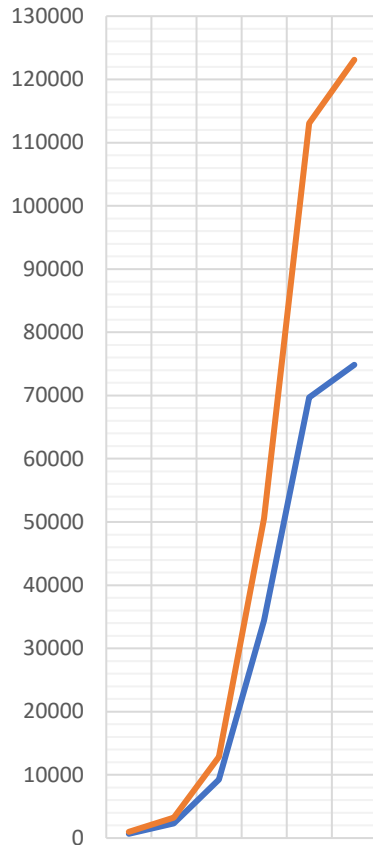
AES 128 bit CBC Encipher
1Kbytes /second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: 1Kbytes/sec	8 jobs: 1Kbytes/sec
64	AES 128 bit CBC Encipher (CSNBSAE) - 64B	677	983
256	AES 128 bit CBC Encipher (CSNBSAE) - 256B	2343	3227
1024	AES 128 bit CBC Encipher (CSNBSAE) - 1024B	9245	12854
4096	AES 128 bit CBC Encipher (CSNBSAE) - 4096B	34431	50553
65536	AES 128 bit CBC Encipher (CSNBSAE) - 64KB	69665	113050
1048576	AES 128 bit CBC Encipher (CSNBSAE) - 1MB	74858	123103

AES 256 bit CBC Encipher
1Kbytes / second

	Op Type - All measurements made using 1 CEX6S	1 job: 1Kbytes/sec	8 jobs: 1Kbytes/sec
64	AES 256 bit CBC Encipher (CSNBSAE) - 64B	676	982
256	AES 256 bit CBC Encipher (CSNBSAE) - 256B	2336	3224
1024	AES 256 bit CBC Encipher (CSNBSAE) - 1024B	9235	12827
4096	AES 256 bit CBC Encipher (CSNBSAE) - 4096B	33690	50434
65536	AES 256 bit CBC Encipher (CSNBSAE) - 64KB	66650	113181
1048576	AES 256 bit CBC Encipher (CSNBSAE) - 1MB	70926	122683

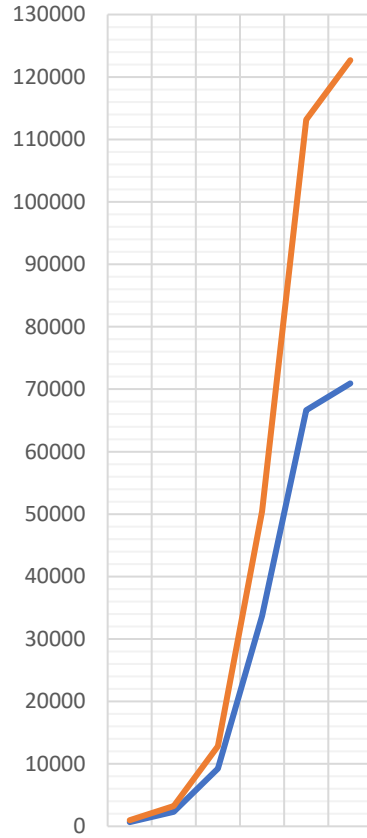
CCA CEX6S z/OS AES 128b CBC
bandwidth



AES 128 bit CBC Encipher (CSNBSAE) - 64B
 AES 128 bit CBC Encipher (CSNBSAE) - 256B
 AES 128 bit CBC Encipher (CSNBSAE) - 1024B
 AES 128 bit CBC Encipher (CSNBSAE) - 4096B
 AES 128 bit CBC Encipher (CSNBSAE) - 64KB
 AES 128 bit CBC Encipher (CSNBSAE) - 1MB

— 1 job: 1Kbytes/sec — 8 jobs: 1Kbytes/sec

CCA CEX6S z/OS AES 256b CBC
Bandwidth



AES 256 bit CBC Encipher (CSNBSAE) - 64B
 AES 256 bit CBC Encipher (CSNBSAE) - 256B
 AES 256 bit CBC Encipher (CSNBSAE) - 1024B
 AES 256 bit CBC Encipher (CSNBSAE) - 4096B
 AES 256 bit CBC Encipher (CSNBSAE) - 64KB
 AES 256 bit CBC Encipher (CSNBSAE) - 1MB

— 1 job: 1Kbytes/sec — 8 jobs: 1Kbytes/sec

IBM CEX6S Performance Data, z/OS

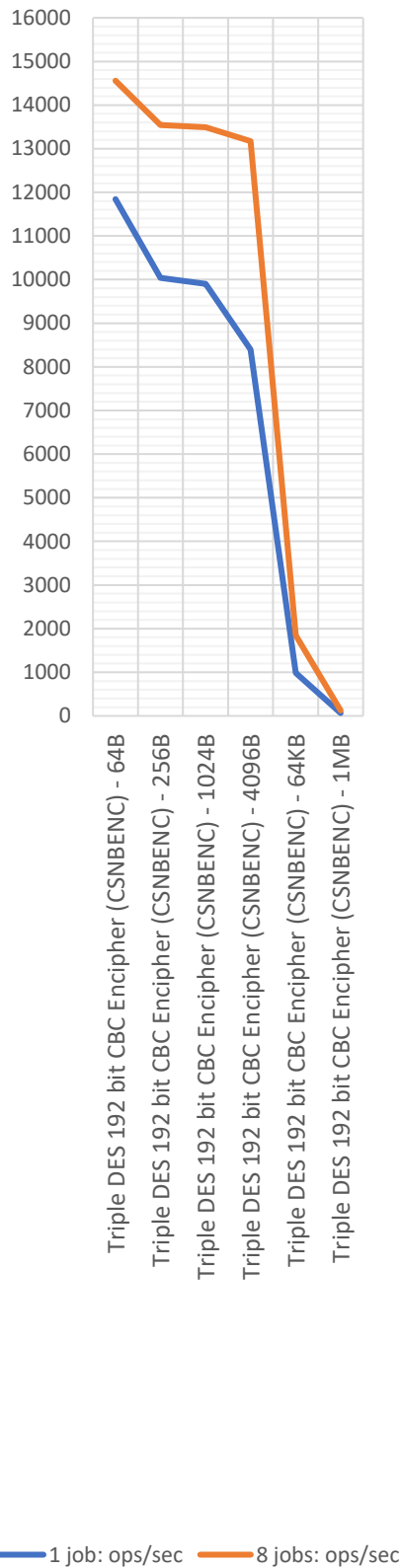
TDES 192 bit CBC Encipher
operations / second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
64	Triple DES 192 bit CBC Encipher (CSNBENC) - 64B	11844	14558
256	Triple DES 192 bit CBC Encipher (CSNBENC) - 256B	10039	13540
1024	Triple DES 192 bit CBC Encipher (CSNBENC) - 1024B	9905	13489
4096	Triple DES 192 bit CBC Encipher (CSNBENC) - 4096B	8400	13177
65536	Triple DES 192 bit CBC Encipher (CSNBENC) - 64KB	988	1846
1048576	Triple DES 192 bit CBC Encipher (CSNBENC) - 1MB	65	125

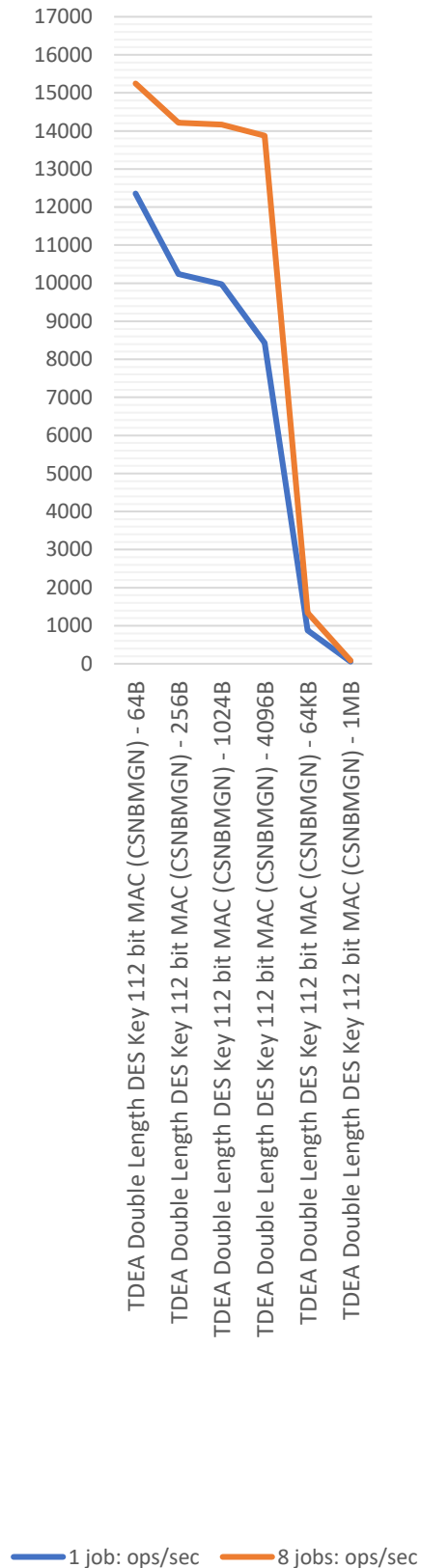
TDEA Double Length DES Key 112 bit MAC
operations / second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
64	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 64B	12355	15247
256	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 256B	10242	14219
1024	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 1024B	9970	14168
4096	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 4096B	8431	13878
65536	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 64KB	876	1340
1048576	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 1MB	57	85

CCA CEX6S z/OS TDES 192b
CBC Ops



CCA CEX6S z/OS Double Length
TDES 112b MAC Ops



IBM CEX6S Performance Data, z/OS

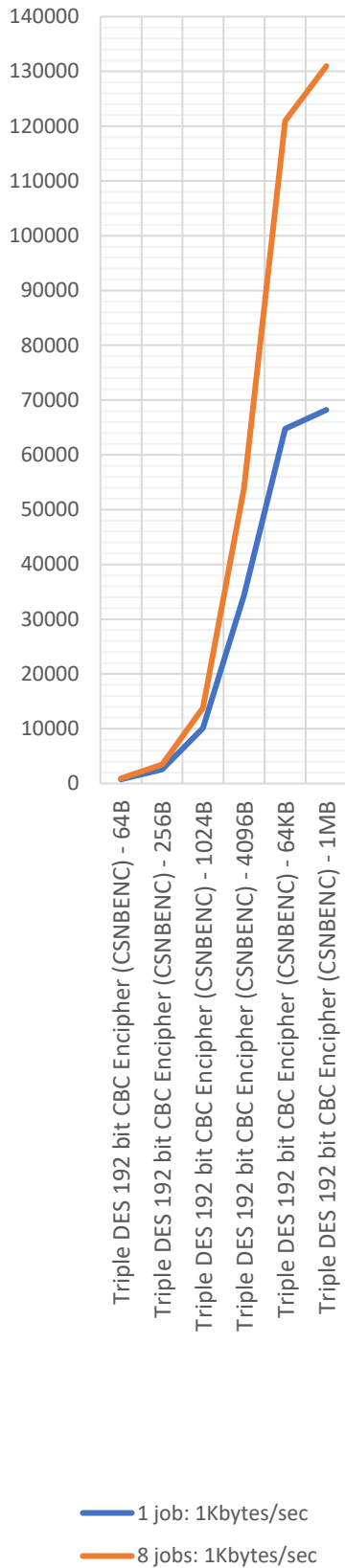
Triple DES 192 bit CBC Encipher
1Kbytes / second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: 1Kbytes/sec	8 jobs: 1Kbytes/sec
64	Triple DES 192 bit CBC Encipher (CSNBENC) - 64B	758	932
256	Triple DES 192 bit CBC Encipher (CSNBENC) - 256B	2570	3466
1024	Triple DES 192 bit CBC Encipher (CSNBENC) - 1024B	10143	13813
4096	Triple DES 192 bit CBC Encipher (CSNBENC) - 4096B	34406	53973
65536	Triple DES 192 bit CBC Encipher (CSNBENC) - 64KB	64756	120979
1048576	Triple DES 192 bit CBC Encipher (CSNBENC) - 1MB	68199	130967

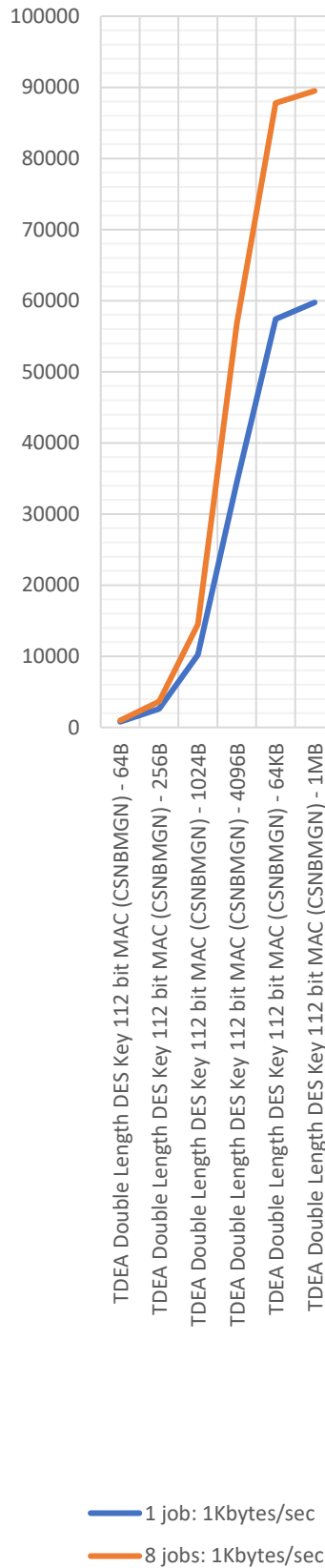
Double Length TDES Key 112 bit MAC
1Kbytes / second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: 1Kbytes/sec	8 jobs: 1Kbytes/sec
64	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 64B	791	976
256	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 256B	2622	3640
1024	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 1024B	10209	14508
4096	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 4096B	34533	56844
65536	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 64KB	57396	87818
1048576	TDEA Double Length DES Key 112 bit MAC (CSNBMGN) - 1MB	59748	89496

CCA CEX6S z/OS TDES 192b CBC
Bandwidth



CCA CEX6S z/OS Double Length
TDES 112b MAC Bandwidth



IBM CEX6S Performance Data, z/OS

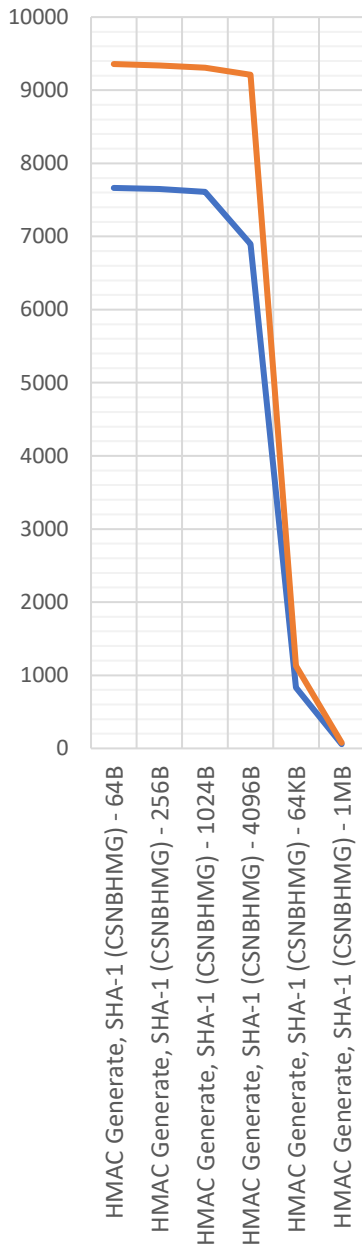
HMAC Generate with SHA-1
operations / second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
64	HMAC Generate, SHA-1 (CSNBHMG) - 64B	7664	9358
256	HMAC Generate, SHA-1 (CSNBHMG) - 256B	7648	9339
1024	HMAC Generate, SHA-1 (CSNBHMG) - 1024B	7609	9307
4096	HMAC Generate, SHA-1 (CSNBHMG) - 4096B	6898	9211
65536	HMAC Generate, SHA-1 (CSNBHMG) - 64KB	834	1128
1048576	HMAC Generate, SHA-1 (CSNBHMG) - 1MB	58	77

HMAC Generate with SHA-256
operations / second

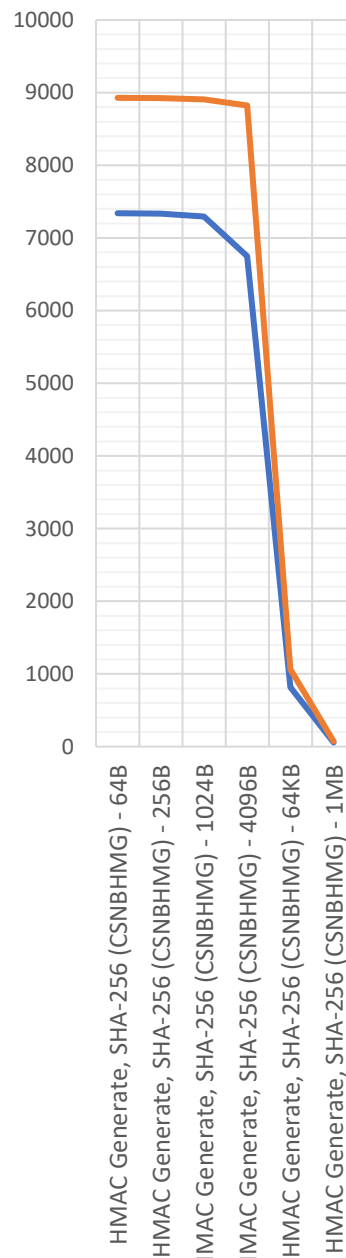
Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
64	HMAC Generate, SHA-256 (CSNBHMG) - 64B	7340	8928
256	HMAC Generate, SHA-256 (CSNBHMG) - 256B	7335	8926
1024	HMAC Generate, SHA-256 (CSNBHMG) - 1024B	7294	8908
4096	HMAC Generate, SHA-256 (CSNBHMG) - 4096B	6751	8822
65536	HMAC Generate, SHA-256 (CSNBHMG) - 64KB	818	1065
1048576	HMAC Generate, SHA-256 (CSNBHMG) - 1MB	57	74

CCA CEX6S z/OS HMAC SHA-1
Generate Ops



1 job: ops/sec 8 jobs: ops/sec

CCA CEX6S z/OS HMAC SHA-256
Generate Ops



1 job: ops/sec 8 jobs: ops/sec

IBM CEX6S Performance Data, z/OS

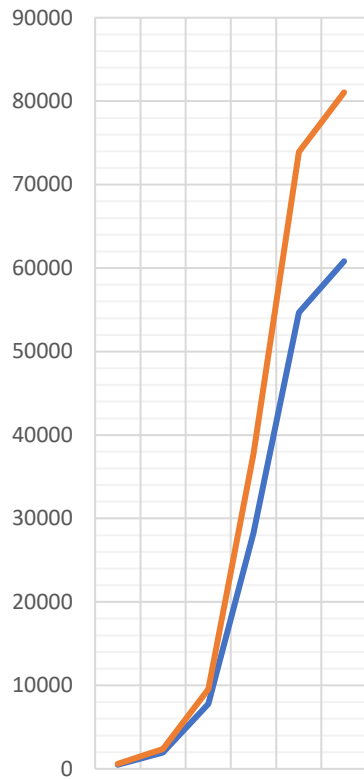
HMAC Generate with SHA-1
1Kbytes / second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: 1Kbytes/sec	8 jobs: 1Kbytes/sec
64	HMAC Generate, SHA-1 (CSNBHMG) - 64B	490	599
256	HMAC Generate, SHA-1 (CSNBHMG) - 256B	1958	2391
1024	HMAC Generate, SHA-1 (CSNBHMG) - 1024B	7792	9530
4096	HMAC Generate, SHA-1 (CSNBHMG) - 4096B	28254	37728
65536	HMAC Generate, SHA-1 (CSNBHMG) - 64KB	54657	73925
1048576	HMAC Generate, SHA-1 (CSNBHMG) - 1MB	60817	81055

HMAC Generate with SHA-256
1Kbytes / second

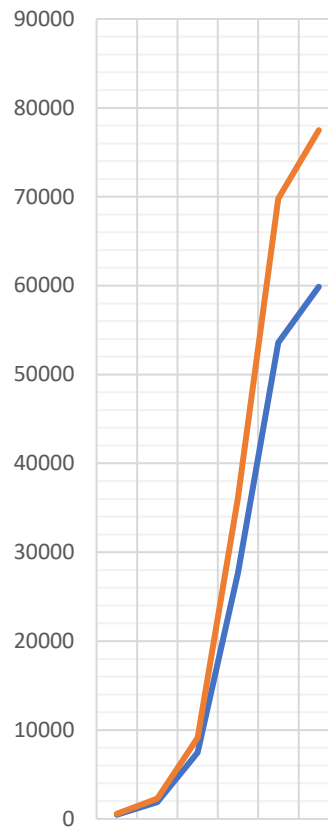
Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: 1Kbytes/sec	8 jobs: 1Kbytes/sec
64	HMAC Generate, SHA-256 (CSNBHMG) - 64B	470	571
256	HMAC Generate, SHA-256 (CSNBHMG) - 256B	1878	2285
1024	HMAC Generate, SHA-256 (CSNBHMG) - 1024B	7469	9122
4096	HMAC Generate, SHA-256 (CSNBHMG) - 4096B	27652	36135
65536	HMAC Generate, SHA-256 (CSNBHMG) - 64KB	53608	69796
1048576	HMAC Generate, SHA-256 (CSNBHMG) - 1MB	59874	77490

CCA CEX6S z/OS HMAC SHA-1
Generate Bandwidth



1 job: 1Kbytes/sec 8 jobs: 1Kbytes/sec

CCA CEX6S z/OS HMAC SHA-256
Generate Bandwidth



1 job: 1Kbytes/sec
8 jobs: 1Kbytes/sec

IBM CEX6S Performance Data, z/OS

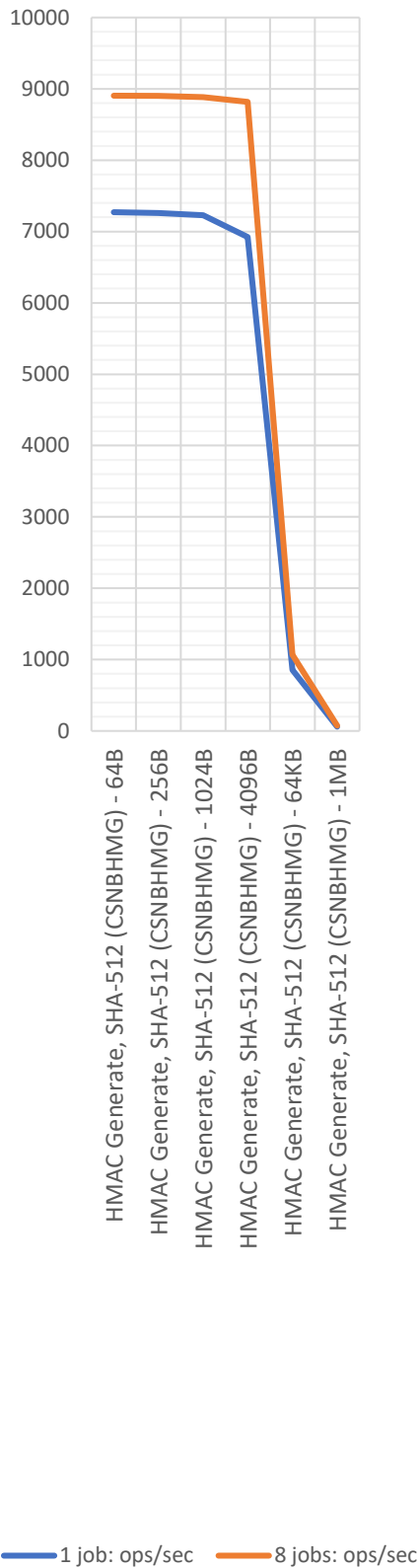
HMAC Generate with SHA-512
operations / second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
64	HMAC Generate, SHA-512 (CSNBHMG) - 64B	7271	8904
256	HMAC Generate, SHA-512 (CSNBHMG) - 256B	7261	8901
1024	HMAC Generate, SHA-512 (CSNBHMG) - 1024B	7228	8883
4096	HMAC Generate, SHA-512 (CSNBHMG) - 4096B	6921	8818
65536	HMAC Generate, SHA-512 (CSNBHMG) - 64KB	856	1068
1048576	HMAC Generate, SHA-512 (CSNBHMG) - 1MB	60	75

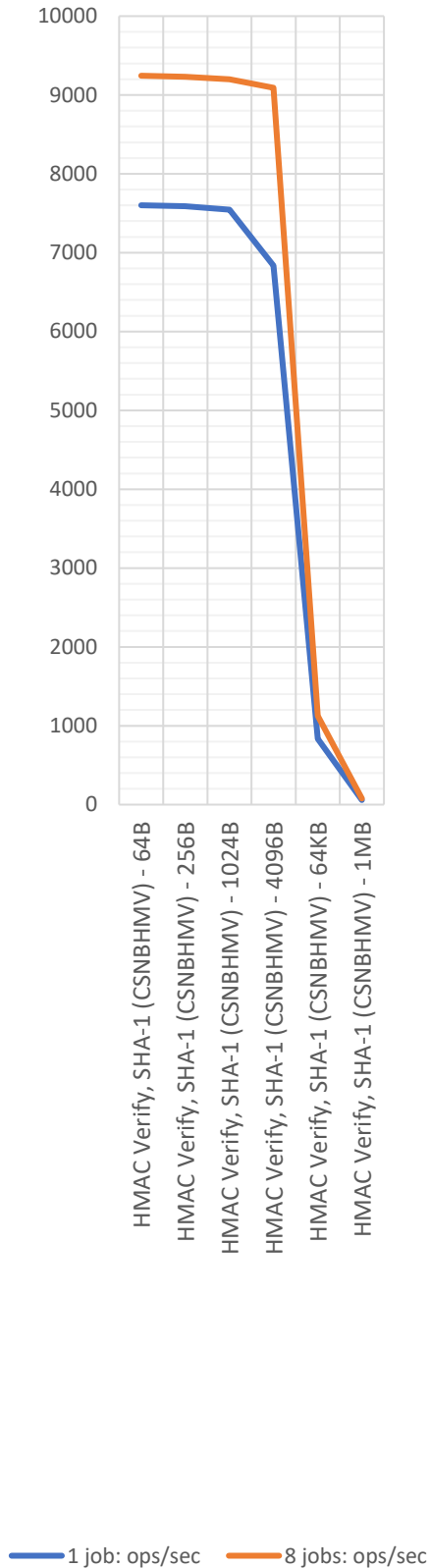
HMAC Verify with SHA-1
operations / second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
64	HMAC Verify, SHA-1 (CSNBHMOV) - 64B	7601	9244
256	HMAC Verify, SHA-1 (CSNBHMOV) - 256B	7591	9230
1024	HMAC Verify, SHA-1 (CSNBHMOV) - 1024B	7547	9198
4096	HMAC Verify, SHA-1 (CSNBHMOV) - 4096B	6835	9092
65536	HMAC Verify, SHA-1 (CSNBHMOV) - 64KB	835	1125
1048576	HMAC Verify, SHA-1 (CSNBHMOV) - 1MB	58	77

CCA CEX6S z/OS HMAC SHA-512
Generate Ops



CCA CEX6S z/OS HMAC SHA-1
Verify Ops



IBM CEX6S Performance Data, z/OS

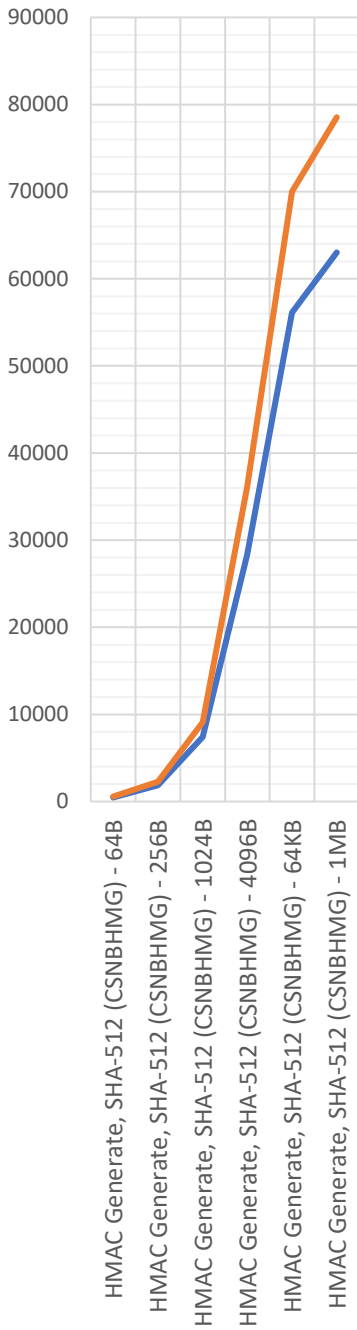
HMAC Generate with SHA-512
1Kbytes / second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: 1Kbytes/sec	8 jobs: 1Kbytes/sec
64	HMAC Generate, SHA-512 (CSNBHMG) - 64B	465	570
256	HMAC Generate, SHA-512 (CSNBHMG) - 256B	1859	2279
1024	HMAC Generate, SHA-512 (CSNBHMG) - 1024B	7401	9096
4096	HMAC Generate, SHA-512 (CSNBHMG) - 4096B	28348	36119
65536	HMAC Generate, SHA-512 (CSNBHMG) - 64KB	56099	69992
1048576	HMAC Generate, SHA-512 (CSNBHMG) - 1MB	63019	78538

HMAC Verify with SHA-1
1Kbytes / second

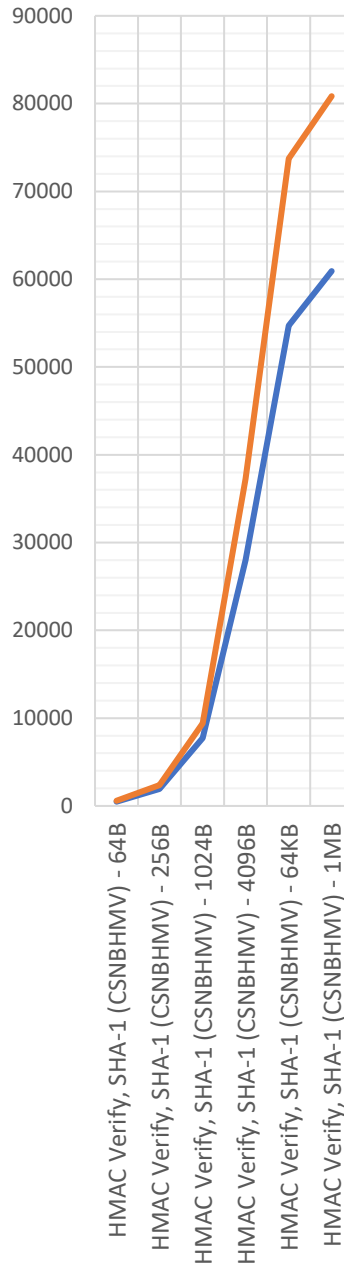
Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: 1Kbytes/sec	8 jobs: 1Kbytes/sec
64	HMAC Verify, SHA-1 (CSNBHMV) - 64B	486	592
256	HMAC Verify, SHA-1 (CSNBHMV) - 256B	1943	2363
1024	HMAC Verify, SHA-1 (CSNBHMV) - 1024B	7728	9419
4096	HMAC Verify, SHA-1 (CSNBHMV) - 4096B	27996	37241
65536	HMAC Verify, SHA-1 (CSNBHMV) - 64KB	54723	73728
1048576	HMAC Verify, SHA-1 (CSNBHMV) - 1MB	60922	80845

CCA CEX6S z/OS HMAC-512
Generate Bandwidth



1 job: 1Kbytes/sec 8 jobs: 1Kbytes/sec

CCA CEX6S z/OS HMAC SHA-1
Verify Bandwidth



1 job: 1Kbytes/sec
8 jobs: 1Kbytes/sec

IBM CEX6S Performance Data, z/OS

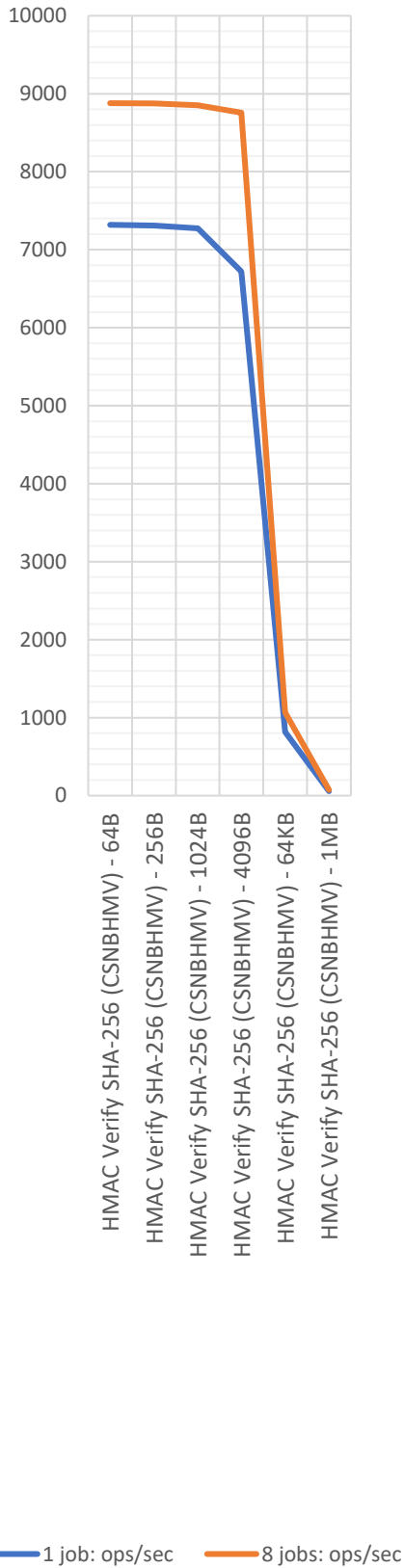
HMAC Verify with SHA-256
operations / second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
64	HMAC Verify SHA-256 (CSNBHBMV) - 64B	7319	8879
256	HMAC Verify SHA-256 (CSNBHBMV) - 256B	7311	8875
1024	HMAC Verify SHA-256 (CSNBHBMV) - 1024B	7274	8851
4096	HMAC Verify SHA-256 (CSNBHBMV) - 4096B	6722	8759
65536	HMAC Verify SHA-256 (CSNBHBMV) - 64KB	818	1064
1048576	HMAC Verify SHA-256 (CSNBHBMV) - 1MB	57	74

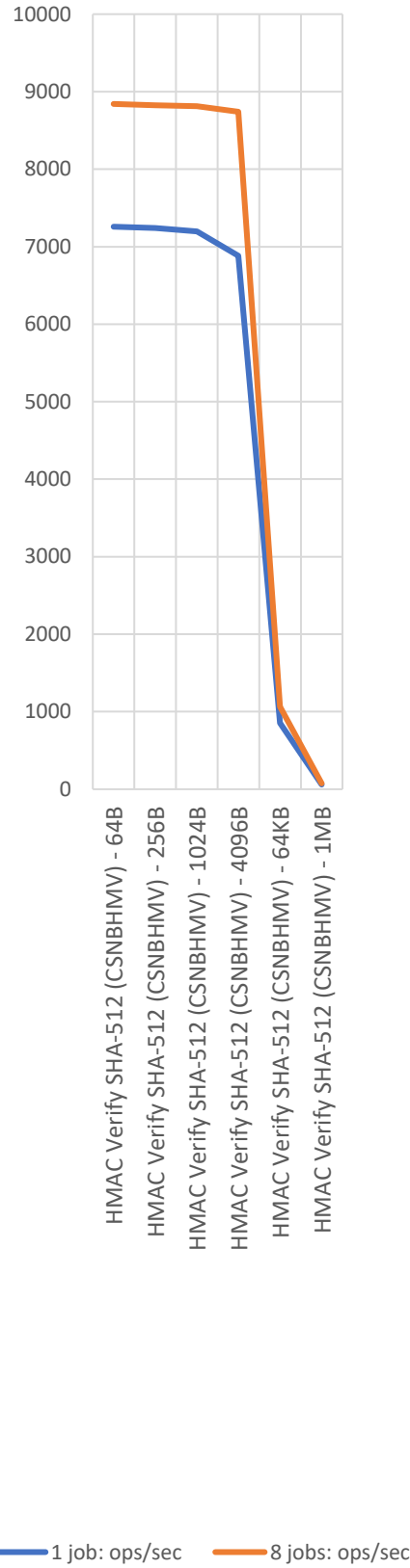
HMAC Verify with SHA-512
operations / second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
64	HMAC Verify SHA-512 (CSNBHBMV) - 64B	7258	8842
256	HMAC Verify SHA-512 (CSNBHBMV) - 256B	7241	8825
1024	HMAC Verify SHA-512 (CSNBHBMV) - 1024B	7199	8814
4096	HMAC Verify SHA-512 (CSNBHBMV) - 4096B	6881	8740
65536	HMAC Verify SHA-512 (CSNBHBMV) - 64KB	854	1066
1048576	HMAC Verify SHA-512 (CSNBHBMV) - 1MB	60	75

CCA CEX6S z/OS HMAC SHA-256
Verify Ops



CCA CEX6S z/OS HMAC SHA-512 Verify
Ops



IBM CEX6S Performance Data, z/OS

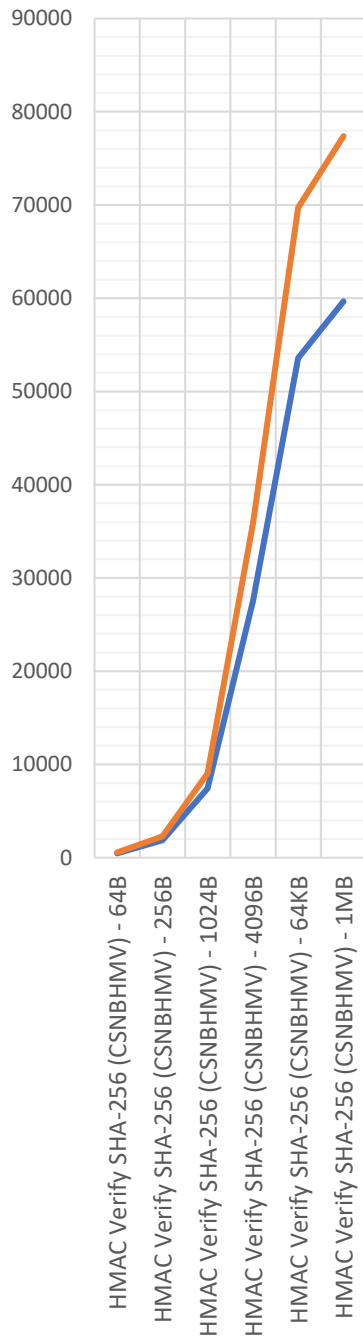
HMAC Verify with SHA-256
1Kbytes / second

Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: 1Kbytes/sec	8 jobs: 1Kbytes/sec
64	HMAC Verify SHA-256 (CSNBHBMV) - 64B	468	568
256	HMAC Verify SHA-256 (CSNBHBMV) - 256B	1872	2272
1024	HMAC Verify SHA-256 (CSNBHBMV) - 1024B	7449	9063
4096	HMAC Verify SHA-256 (CSNBHBMV) - 4096B	27533	35877
65536	HMAC Verify SHA-256 (CSNBHBMV) - 64KB	53608	69730
1048576	HMAC Verify SHA-256 (CSNBHBMV) - 1MB	59664	77385

HMAC Verify with SHA-512
1Kbytes / second

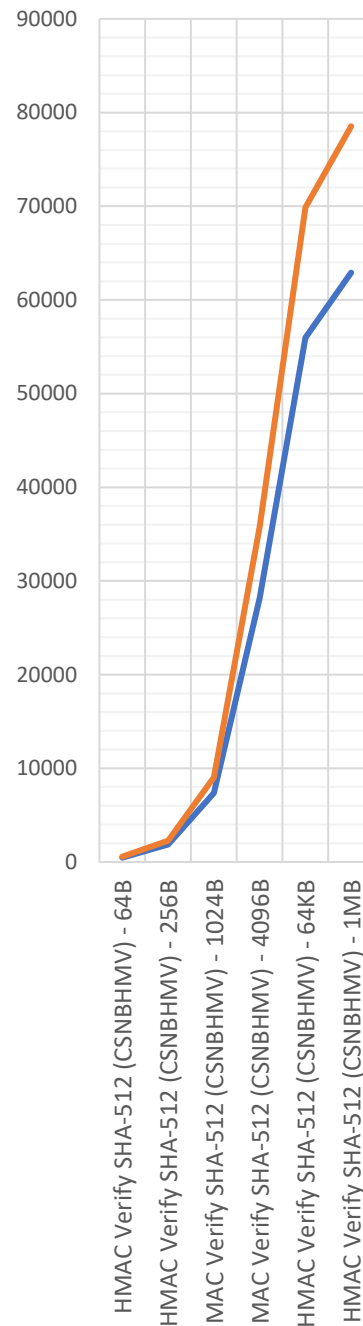
Data size	Op Type - All measurements made using 1 CEX6S adapter	1 job: 1Kbytes/sec	8 jobs: 1Kbytes/sec
64	HMAC Verify SHA-512 (CSNBHBMV) - 64B	465	566
256	HMAC Verify SHA-512 (CSNBHBMV) - 256B	1854	2259
1024	HMAC Verify SHA-512 (CSNBHBMV) - 1024B	7372	9026
4096	HMAC Verify SHA-512 (CSNBHBMV) - 4096B	28185	35799
65536	HMAC Verify SHA-512 (CSNBHBMV) - 64KB	55968	69861
1048576	HMAC Verify SHA-512 (CSNBHBMV) - 1MB	62915	78538

CCA CEX6S z/OS HMAC SHA-256
Verify Bandwidth



1 job: 1Kbytes/sec 8 jobs: 1Kbytes/sec

CCA CEX6S z/OS HMAC SHA-512
Verify Bandwidth



1 job: 1Kbytes/sec 8 jobs: 1Kbytes/sec

IBM CEX6S Performance Data, z/OS

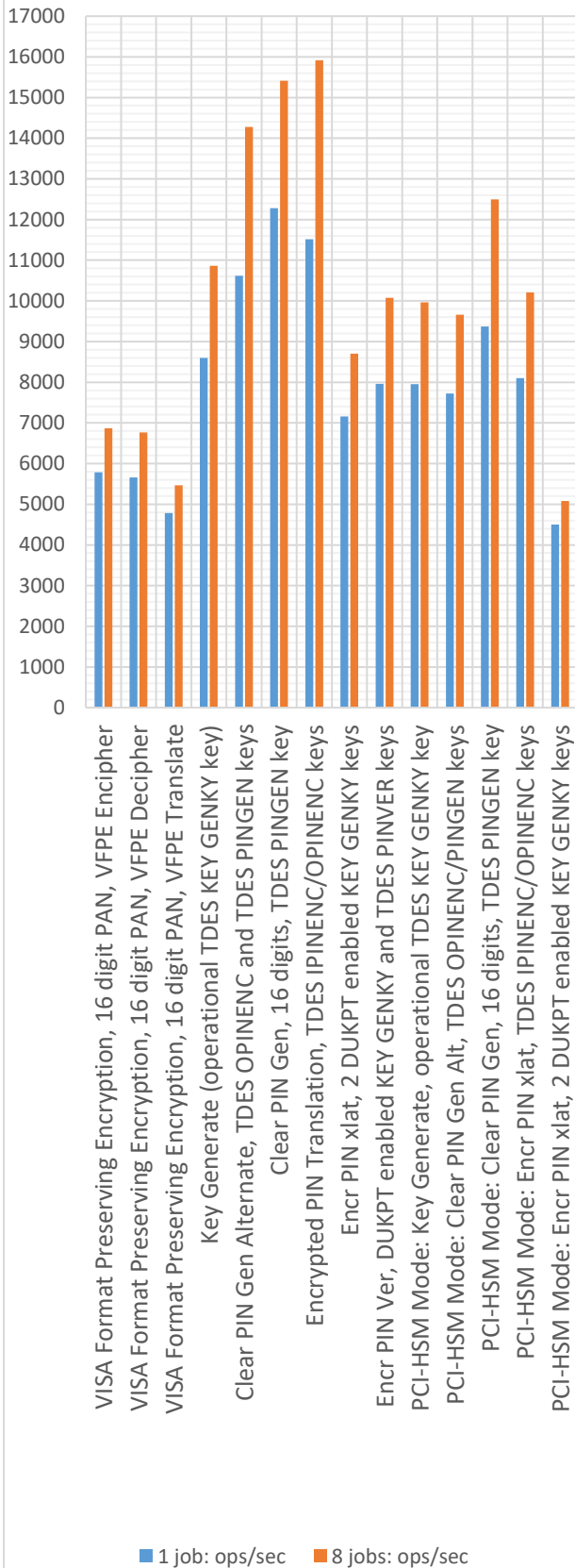
PIN / VFPE operations / second

Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
VISA Format Preserving Encryption, 16 digit PAN, VFPE Encipher	5784	6868
VISA Format Preserving Encryption, 16 digit PAN, VFPE Decipher	5661	6762
VISA Format Preserving Encryption, 16 digit PAN, VFPE Translate	4787	5464
Key Generate (operational TDES KEY GENKY key)	8600	10860
Clear PIN Gen Alternate, TDES OPINENC and TDES PINGEN keys	10614	14277
Clear PIN Gen, 16 digits, TDES PINGEN key	12281	15409
Encrypted PIN Translation, TDES IPINENC/OPINENC keys	11518	15914
Encr PIN xlat, 2 DUKPT enabled KEY GENKY keys	7155	8702
Encr PIN Ver, DUKPT enabled KEY GENKY and TDES PINVER keys	7959	10077
PCI-HSM Mode: Key Generate, operational TDES KEY GENKY key	7950	9964
PCI-HSM Mode: Clear PIN Gen Alt, TDES OPINENC/PINGEN keys	7719	9657
PCI-HSM Mode: Clear PIN Gen, 16 digits, TDES PINGEN key	9374	12495
PCI-HSM Mode: Encr PIN xlat, TDES IPINENC/OPINENC keys	8102	10209
PCI-HSM Mode: Encr PIN xlat, 2 DUKPT enabled KEY GENKY keys	4499	5077

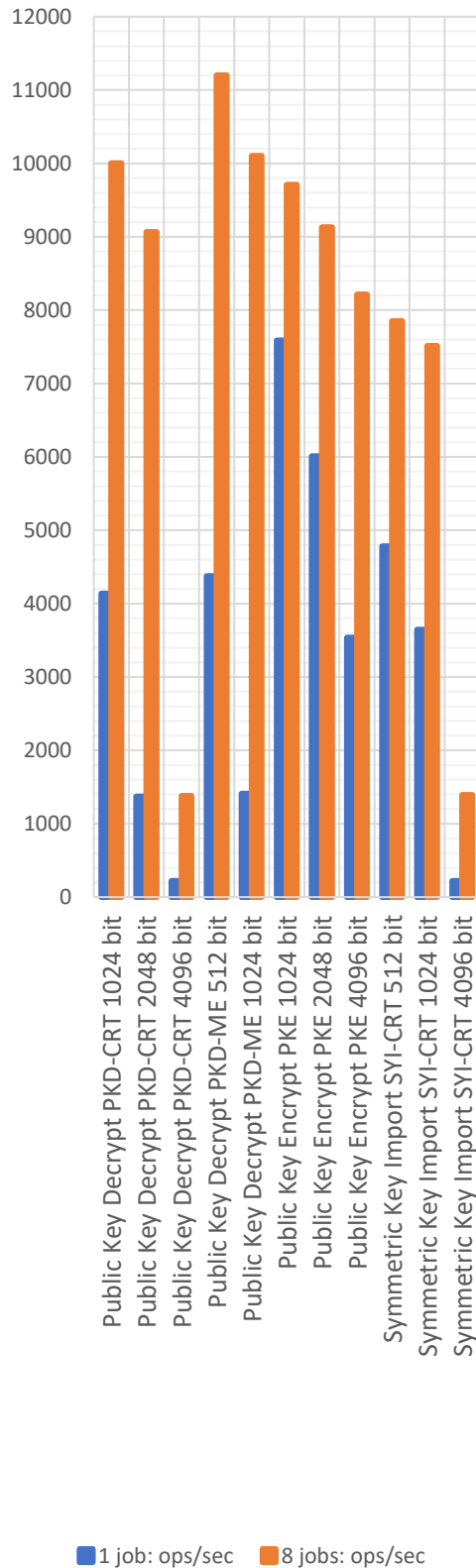
Public Key Decrypt / Encrypt and Secure Key Import operations / second

Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
Public Key Decrypt PKD-CRT 1024 bit	4136	10004
Public Key Decrypt PKD-CRT 2048 bit	1372	9065
Public Key Decrypt PKD-CRT 4096 bit	222	1381
Public Key Decrypt PKD-ME 512 bit	4375	11200
Public Key Decrypt PKD-ME 1024 bit	1411	10101
Public Key Encrypt PKE 1024 bit	7585	9708
Public Key Encrypt PKE 2048 bit	6010	9130
Public Key Encrypt PKE 4096 bit	3536	8214
Symmetric Key Import SYI-CRT 512 bit	4781	7852
Symmetric Key Import SYI-CRT 1024 bit	3645	7515
Symmetric Key Import SYI-CRT 4096 bit	222	1393

CCA CEX6S z/OS PIN / VFPE Ops



CCA CEX6S z/OS PKD/PKE/SYI Ops



IBM CEX6S Performance Data, z/OS

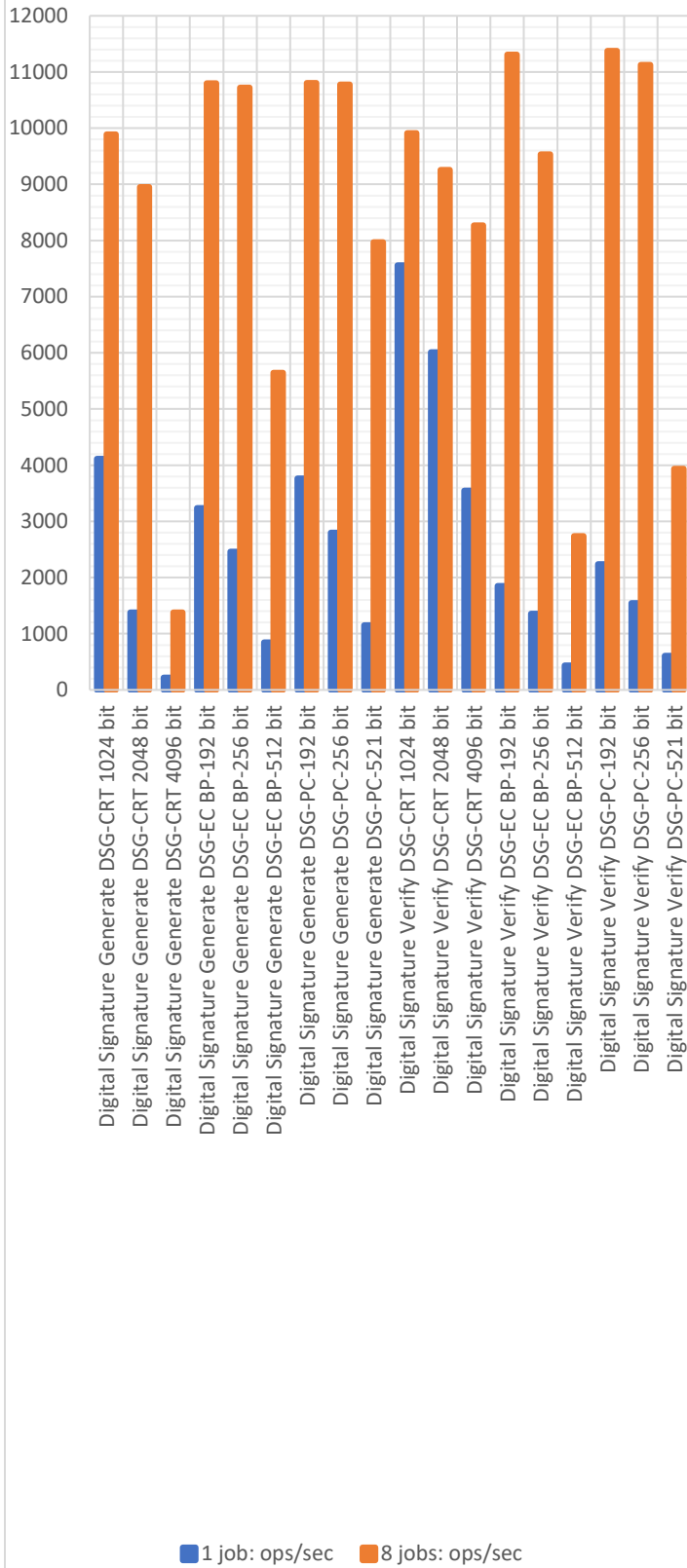
Digital Signature Generate / Verify PIN
operations / second

Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	8 jobs: ops/sec
Digital Signature Generate DSG-CRT 1024 bit	4113	9893
Digital Signature Generate DSG-CRT 2048 bit	1380	8952
Digital Signature Generate DSG-CRT 4096 bit	222	1381
Digital Signature Generate DSG-EC BP-192 bit	3237	10800
Digital Signature Generate DSG-EC BP-256 bit	2463	10725
Digital Signature Generate DSG-EC BP-512 bit	847	5644
Digital Signature Generate DSG-PC-192 bit	3763	10808
Digital Signature Generate DSG-PC-256 bit	2800	10780
Digital Signature Generate DSG-PC-521 bit	1152	7968
Digital Signature Verify DSG-CRT 1024 bit	7558	9910
Digital Signature Verify DSG-CRT 2048 bit	6015	9259
Digital Signature Verify DSG-CRT 4096 bit	3551	8269
Digital Signature Verify DSG-EC BP-192 bit	1854	11312
Digital Signature Verify DSG-EC BP-256 bit	1357	9537
Digital Signature Verify DSG-EC BP-512 bit	434	2741
Digital Signature Verify DSG-PC-192 bit	2241	11377
Digital Signature Verify DSG-PC-256 bit	1549	11129
Digital Signature Verify DSG-PC-521 bit	611	3937

PKA Key Generate
operations / second

Op Type - All measurements made using 1 CEX6S adapter	1 job: ops/sec	
PKA Key Generate RSA CRT 512 bit	106	
PKA Key Generate RSA CRT 1024 bit	79	
PKA Key Generate RSA CRT 2048 bit	21	
PKA Key Generate RSA CRT 4096 bit	2	
PKA Key Generate RSA ME 512 bit	105	
PKA Key Generate RSA ME 1024 bit	75	
PKA Key Generate EC BP-192 bit	959	
PKA Key Generate EC BP-256 bit	699	
PKA Key Generate EC BP-512 bit	220	
PKA Key Generate EC PC-192 bit	1158	
PKA Key Generate EC PC-256 bit	809	
PKA Key Generate EC PC-521 bit	307	

CCA CEX6S z/OS DSG/DSV Ops



CCA CEX6S z/OS PKA Key Gen Ops

