z/OS Performance: Stand-Alone Dump Performance

Introduction

Recently a series of Stand-Alone Dump measurements were conducted by the zSeries performance organization using the LSPR (Large Systems Performance Reference) TSO workload.   The purpose of the measurements was to establish a baseline for Stand-Alone Dump performance in terms of real storage dump time, virtual storage dump time, and IPCS initialization time at the latest software levels.

Measurement variables were:
- Placement of the dump output data sets on an IBM Enterprise Storage Subsystem (ESS) vs. on a non-ESS DASD (IBM 3390 mod 3)
- Use of 2, 4, or 8 spanned ("striped") volumes
- The Real Storage size.

The LSPR TSO workload was run on a zSeries 116 using z/OS V1.2 in z/Architecture mode at approximately 90% CPU busy (1376 TSO users), and approximately 50% CPU busy (688 TSO users), to establish the dump environments. When all of the users were logged on and the desired CPU utilization was reached, a Stand-Alone Dump was taken.

There seemed to be some inherent variability in the timings for these tests, and any particular number could easily change by +/- 10%, and possibly more. Therefore, absolute timings should be read within the context of the rest of the test points. General trends are probably more valid than any individual measured time.
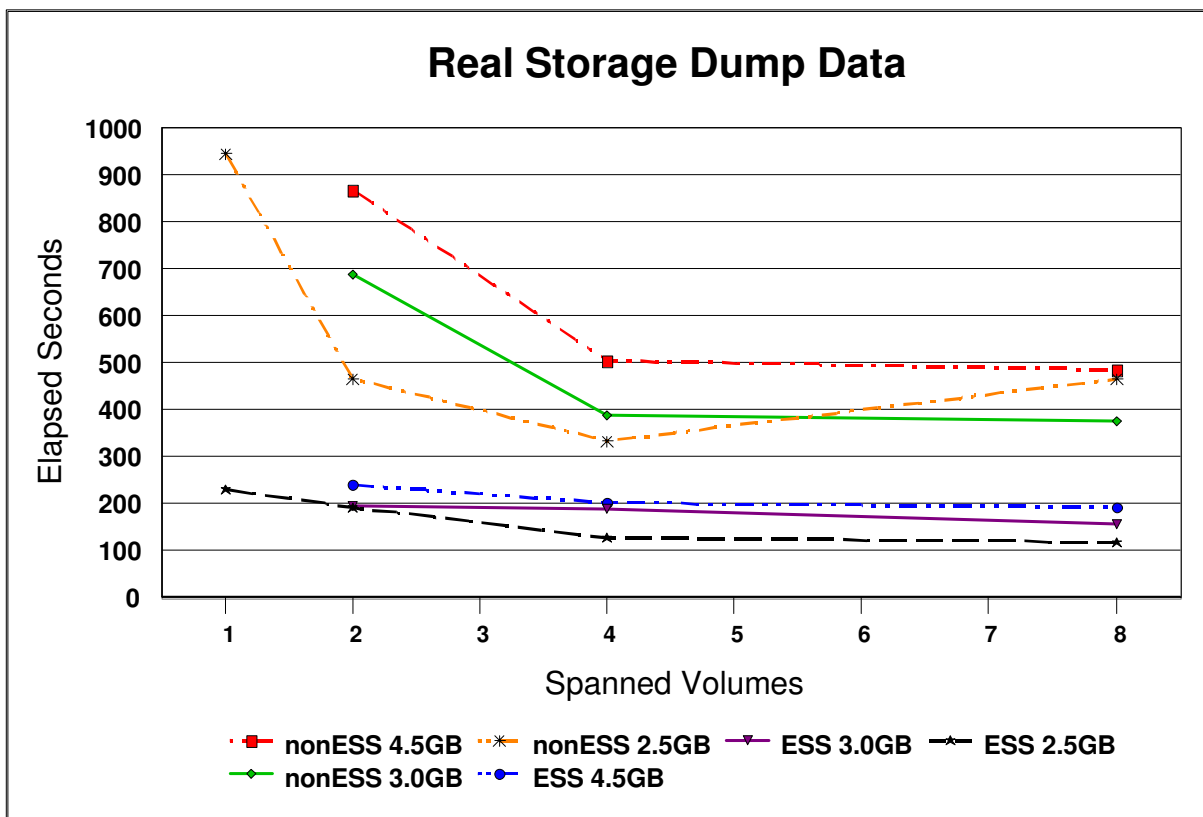
Real Storage Dump Time

For Real Storage dumping the use of ESS DASD and spanned volumes showed significant reductions in dump time.

The use of spanned volumes always reduced dump time, though there did not appear to be much performance benefit beyond 4 spanned volumes, at least in these measurements. Additional volumes, however, can be of value in reducing operator intervention for large dumps. Other hardware configurations may produce different results.

ESS DASD dump times were always the best, though the gap between ESS and non-ESS DASD tended to narrow going from 2 to 4 spanned volumes. It would appear the striping benefits in Stand Alone Dump have compensated somewhat for the slower access speed on non-ESS DASD.

Real Storage dump time is related to the size of real storage, but the rate of increase was less than linear as storage was increased from 2.5GB to 4.5GB.

Virtual Dump Time

For virtual dump processing there were no clear trends in these tests. This is because the amount of paged out data on the system to be dumped was minimal and much more variable than the real storage configuration. Virtual dumping time is primarily constrained by the amount of paged out data and the page data set service times to read in the data, and not the dump output data set.

There was no benefit to anything more than 4 spanned volumes in these tests (the elapsed times for more than 4 volumes actually increased).

Having the dump data set on ESS DASD did not seem to exhibit any advantages in either the 3 GB or 4.5GB dump cases, on average, working out to be a wash.
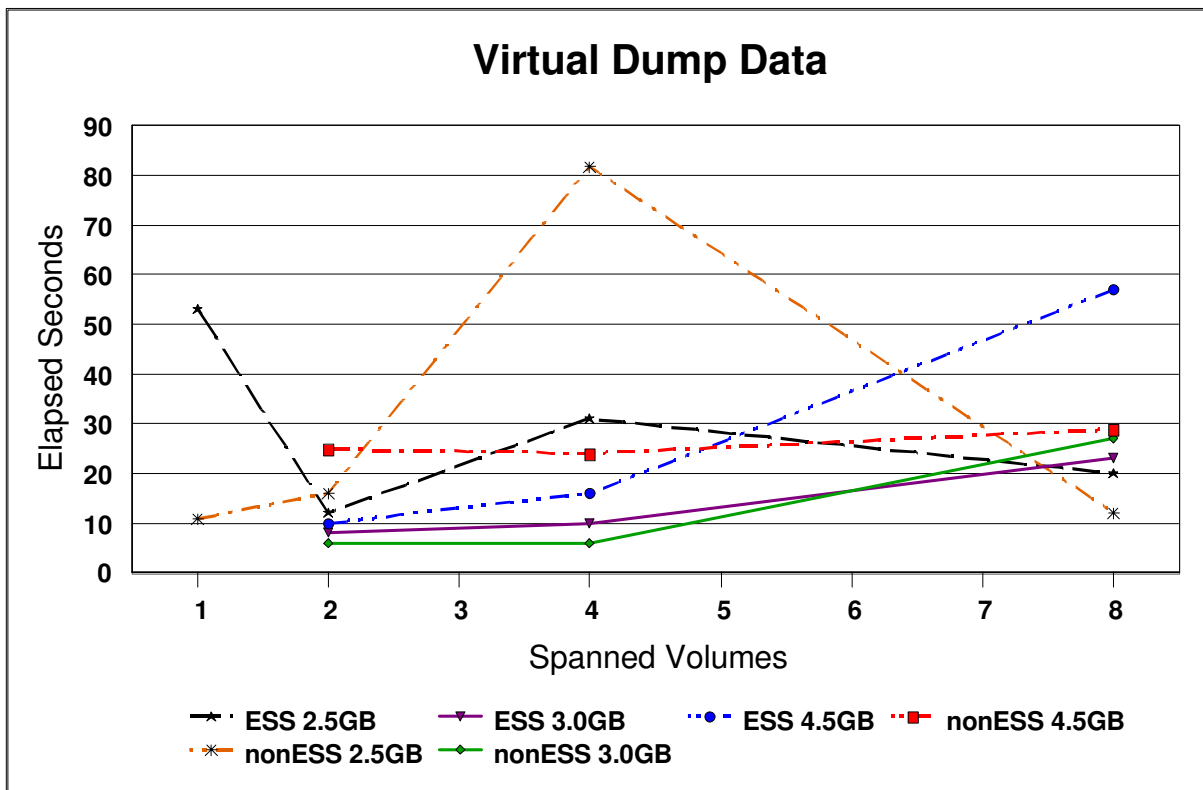
IPCS Initialization Time

The IPCS initialization time for the dumps showed clear trends.

As the number of spanned volumes increased, IPCS initialization time increased. This is because IPCS treats "striped" dumpset volumes as a conventional multi-volume data set, which IPCS reads 1 volume at a time. The volume switching involved in this reading results in the increasing overhead as the number of volumes increases. IPCS caching of dump data is, as a result, also less effective.

ESS DASD resulted in initialization times almost 3 times faster than non-ESS DASD due to increased response times, though this gap narrowed somewhat as the number of spanned volumes increased. Possibly the same factors which caused the general increase in time with more spanned volumes also caused some of the ESS DASD speed benefits to be reduced relative to non-ESS DASD.

In all cases it seemed initialization time grew fairly linearly with the size of the dump data.
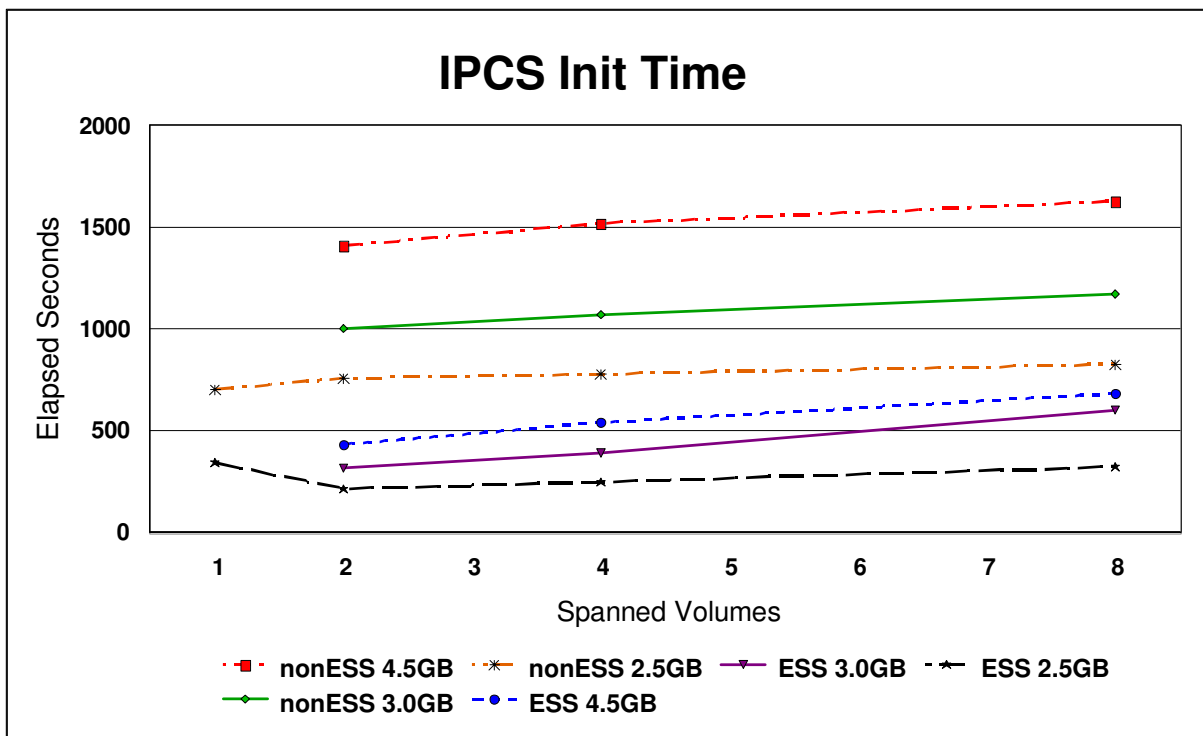
Conclusions:

Based on this data it is strongly recommended installation consider using ESS DASD to hold the stand-alone Dump output data sets. There were clear advantages to using ESS DASD in all but a few of the virtual storage dump cases. The virtual dump timings tended to be a smaller component in terms of overall Stand-Alone Dump time anyway. It is likewise recommended striping or spanned volumes be used for Stand-Alone Dump. Four volumes would seem to be a reasonable number, though this might vary in other dump environments.

Special Notices

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