IMS Performance Information
on
Selected Trace Tables

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Introduction

IMS is a complex product and can process large amounts of work efficiently, however, IMS can sometimes experience problems that require diagnosis and correction. The IMS Trace facility table traces can be used to assist in generating information on IMS control blocks, message queue and I/O line buffers, and save area sets to diagnose a wide variety of problems that might occur. This can be done with internally generated trace tables or trace tables that have been generated on external data sets. Activating the IMS Trace facility table traces does have an impact on the IMS complex performance. This document describes some performance measurements and observations that were conducted to demonstrate the performance impact of generating trace tables both to internal memory and to external trace data sets within an IMS complex.

Background

The impact of the IMS Trace facility table traces can vary depending upon how they are used and upon what type of workload environment they are executed in. For this document we chose to evaluate the performance characteristics of generating the trace tables to internal memory and to external trace data sets in both a Fast Path workload environment and a Full Function workload environment. The default for IMS is to generate the trace tables to internal memory, and to have the DL/I and LOCK traces on collecting data. The *IMS V9 Diagnosis Guide and Reference* recommendation is to run with dispatcher, DL/I, lock, and scheduler table traces running at all times to provide the necessary data to accurately diagnose IMS performance problems. For this set of measurements we have altered from the defaults to accurately determine and document the performance characteristics of each of the table traces. For externally generated table trace entries the trace tables can be written to an external device, the online log data set (OLDS), or to a tape volume. The amount of volume of the trace entries that are generated can also be set to High, Medium, or Low, with the default of Medium. For the measurements conducted in this evaluation the default, Medium volume, was used to generate the trace tables on to the defined DASD external data sets DFSTRA01 and DFSTRA02. This evaluation considers the workload specific traces, such as the FPTT table trace for Fast Path specific workloads as well. This document is not a totally inclusive evaluation of all the available IMS Trace facility table traces but it is a set of observations for some of the most widely used. The table trace evaluations for APPC, OTMA, and external subsystem ESS type traces are not included in this document. Please refer to the *IMS V9 Diagnosis Guide and Reference* manual for further information.

Trace Tables Involved

The IMS Trace facility trace tables involved in this study, both to internal memory and to external datasets, are described in Table 1. These traces were evaluated to provide the performance impact of an IMS system when the specific trace tables are activated.

Trace Table	Description
ALL	All the IMS trace facility table traces are activated.
DISP	The DISP table trace traces dispatcher activities.
DL/I	A combined trace consisting of entries from DL/I calls, the DL/I buffer handler, DL/I OPEN/CLOSE, HD space management, lock activity (using either PI or IRLM), OSAM, DFP interface, and ABENDU0427.
DLOG	The DLOG table trace traces DASD log activities.
FPTT	The FPTT table trace traces Fast Path trace modules and their functions.
IDC0	This table trace finds errors in the modules DFSCNXA0 and DFSIDC00, for initialization and termination diagnosis and DC service tasks evaluations.
LATC	This table trace traces events related to its internal serialization services; latch manager, use manager, and system locate control function.
LOCK	The LOCK Table Trace traces lock activities
QMGR	This trace provides information about relevant queue manager functional and exceptional events. Use this trace under the direction of IBM support personnel when problems are suspected in the queue manager area.
SCHD	The SCHD table trace traces scheduler activities.
STRG	The Storage Manager Trace writes a record each time it is called to allocate a pool, get a buffer, or release a buffer. The storage manager traces requests from the following pools: HIOP, CIOP, CESS, SPAP, EMHB, FPWP, LUMP, LUMC.
NO TRACE	No trace tables activated.

Table 1: IMS Trace facility table traces included

Environment

During this evaluation, all of the measurements that are described this document were conducted on configurations of the hardware environment shown in Table 2. The workloads consisted of a Fast Path workload with credit card processing characteristics and DEDB databases, and a Full Function data sharing workload with sample industry transactions (such as hotel and inventory transactions).

Processor:	IBM eServer zSeries 2084 Model 322 (zSeries 990 C24) 12 GB storage, 2 CPUs for IMS 3 CPUs for TPNS
Disk storage:	IBM TotalStorage Enterprise Storage Server (ESS) 2105 Model M800: 4 FICON channels, 8 LSS, 16 Ranks, Volume configuration = 3390-9, 7 PAVs per real volume
Operating systems:	z/OS V1R6 & z/OS V1R7, IMS V9.1, TPNS V3R5

Table 2: Hardware and software environment

Results

Trace Tables in Memory (Fast Path)

The results of this study indicate that the performance impact, Internal Throughput Rate (ITR), of trace tables in memory range from -0.4 to -4.3 and -8.6 percent when individual trace table and all trace tables were activated respectively. The results are tabulated in Table 3 with Chart 1 depicting the performance impact of generating the trace tables in memory.

	External Throughput Rate (ETR) (tx /sec)	% CPU Busy	Internal Throughput Rate (ITR) (tx /sec)	Perform. Impact (%)
- No Trace	**7,111**	**83.6**	**8,505**	
- ALL	7,272	93.5	7,778	-8.6%
- DISP	6,784	83.3	8,144	-4.3%
- LATC	7,408	89.6	8,268	-2.8%
- LOCK	7,429	89.8	8,273	-2.7%
- DLOG	7,462	90.1	8,282	-2.6%
- STRG	7,385	88.4	8,354	-1.8%
- DL/I	7,303	87.2	8,375	-1.5%
- FPTT	7,352	87.4	8,412	-1.1%
- QMGR	7,292	86.3	8,450	-0.7%
- SCHD	7,004	82.7	8,469	-0.4%

Table 3: IMS Fast Path ETR, ITR, & CPU % Busy performance characteristics of trace tables in memory

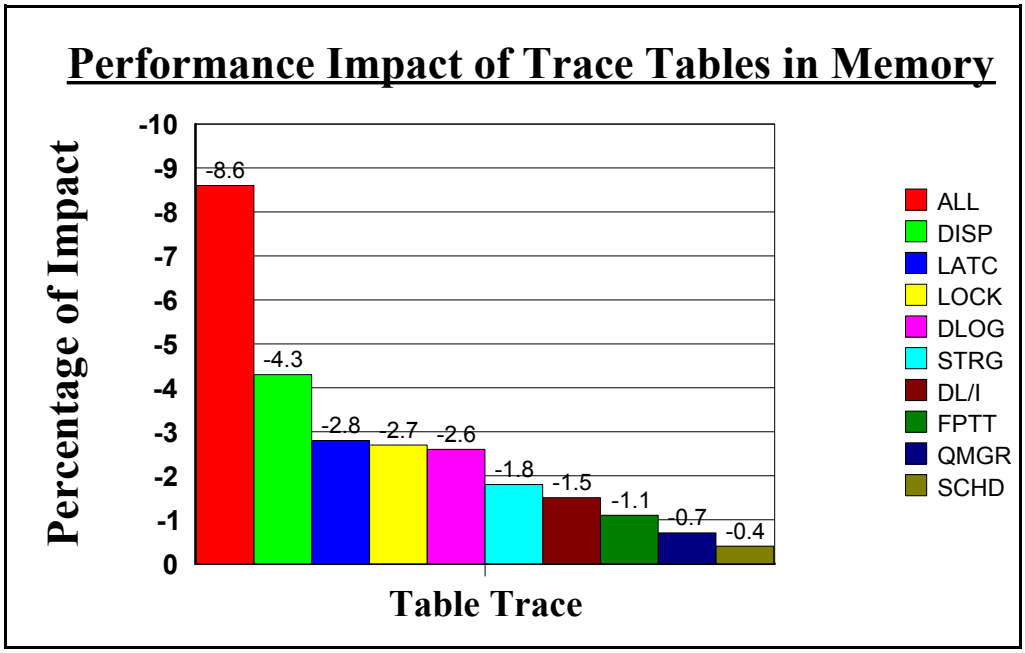

Chart 1: IMS Fast Path ETR, ITR, & CPU performance impact of trace tables in memory

Trace Tables in Memory (Full Function)

The results for the Full Function trace evaluation demonstrate similar results as for the Fast Path evaluation. Table 4 demonstrates the most significant impact occurred during measurements with all the traces turned on, with the LATC trace being the most significant individual trace. Chart 2 is a bar chart representation of the data.

	External Throughput Rate (ETR) (tx /sec)	% CPU Busy	Internal Throughput Rate (ITR) (tx /sec)	Perform. Impact (%)
- No Trace	**335.32**	**77.98%**	**430.01**	
- ALL	326.88	80.27%	407.23	-5.30%
- LATC	331.45	79.06%	419.24	-2.50%
- DL/I	340.15	80.30%	423.60	-1.49%
- DISP	342.57	80.84%	423.76	-1.45%
- DLOG	335.51	78.98%	424.80	-1.21%
- IDC0	338.74	79.31%	427.11	-0.67%
- STRG	337.66	78.98%	427.53	-0.58%
- SCHD	334.86	78.09%	428.81	-0.28%
- QMGR	340.77	79.39%	429.24	-0.18%
- LOCK	348.98	81.29%	429.30	-0.16%

Table 4: IMS Full Function ETR, ITR, & CPU Busy performance characteristics of trace tables in memory

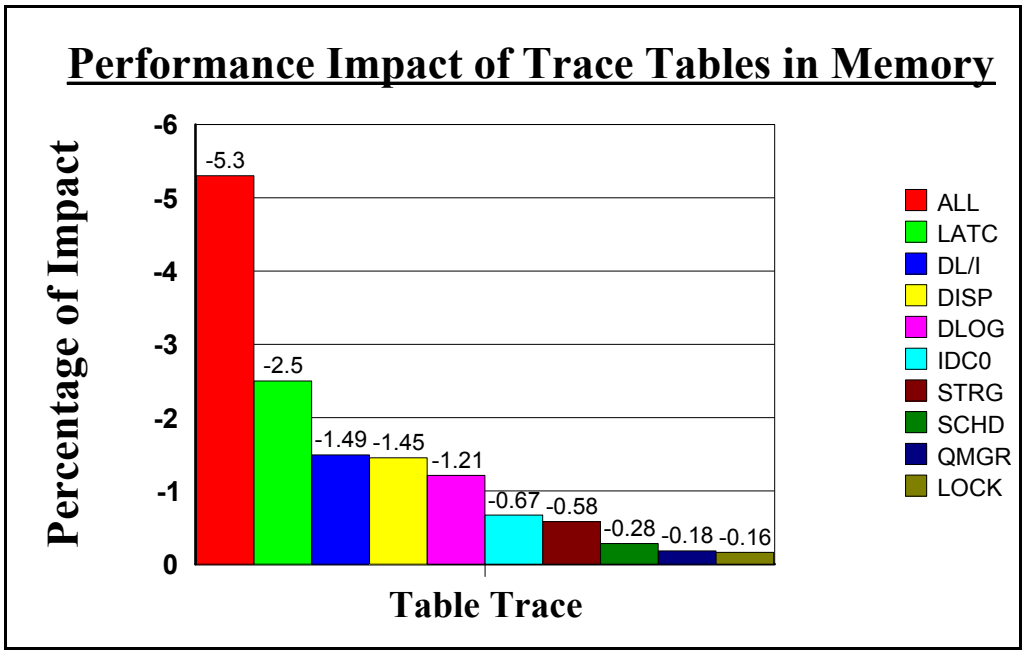

Chart 2: IMS Full Function ETR, ITR, & CPU % Busy performance impact of trace tables in memory

Trace Tables to External Datasets (Fast Path)

The results of this study also indicate that the performance impact, ITR performance, of running the trace tables differ when the tables are generated to external data sets. The results ranged from -0.6 to -14.1 and -20.4 percent when individual trace table and all trace tables were activated respectively. The results are tabulated in Table 5 with Chart 3 demonstrating the impact in bar chart.

	External Throughput Rate (ETR) (tx /sec)	% CPU Busy	Internal Throughput Rate (ITR) (tx /sec)	Perform. Impact (%)
- No Trace	**7,331**	**74**	**9,907**	
- ALL	7,200	91.3	7,886	-20.4%
- DISP	7,283	85.6	8,508	-14.1%
- LATC	7,216	79.8	9,043	-8.7%
- LOCK	7,112	73.6	9,663	-2.5%
- DLOG	7,365	77.5	9,501	-4.1%
- STRG	7,503	76.5	9,808	-1.0%
- DL/I	7,380	75.7	9,749	-1.6%
- FPTT	7,498	76.3	9,827	-0.8%
- QMGR	7,288	74	9,848	-0.6%
- SCHD	7,337	74.5	9,848	-0.6%

Table 5: IMS Fast Path ETR, ITR, & CPU % Busy performance characteristics of trace tables, external DS

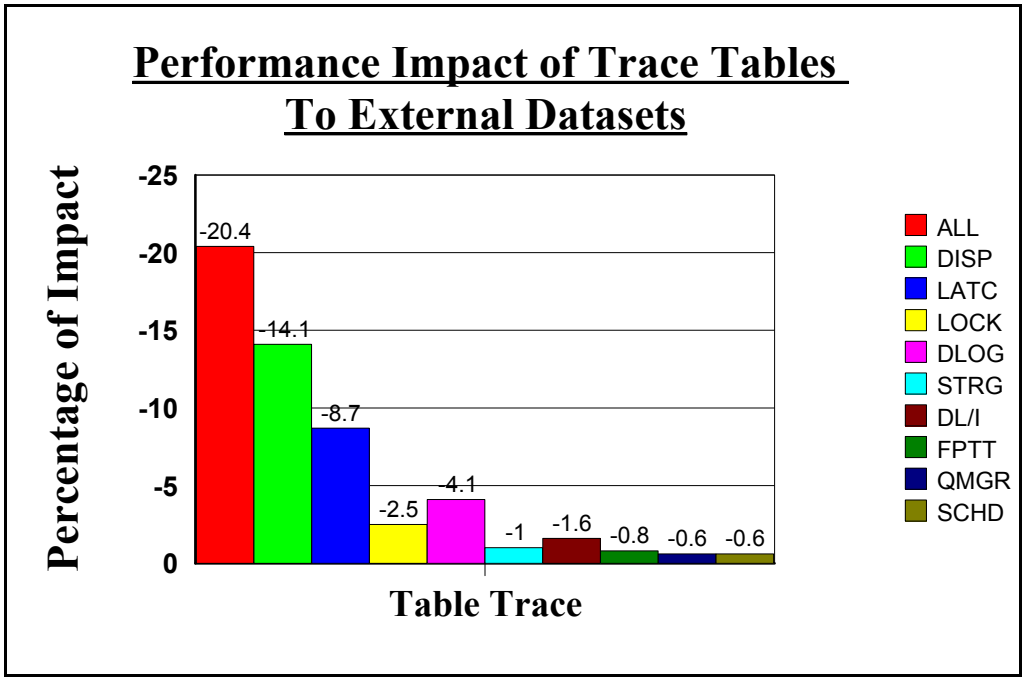

Chart 3: IMS Fast Path ETR, ITR, & CPU % Busy performance impact of trace tables, external DS

Trace Tables to External Datasets (Full Function)

With the Full Function workload, the results of generating the trace tables on external data sets demonstrated a significant overall performance impact increase. As demonstrated in Table 6 as much as an 8.33% degradation was observed. Chart 4 depicts the performance impact of the trace tables to external dataset in Bar Chart.

	External Throughput Rate (ETR) (tx /sec)	% CPU Busy	Internal Throughput Rate (ITR) (tx /sec)	Perform. Impact (%)
- No Trace	**338.81**	**77.74%**	**435.82**	
- ALL	334.57	83.74%	399.53	-8.33%
- LATC	334.13	79.59%	419.81	-3.67%
- DL/I	345.95	80.88%	427.73	-1.86%
- DISP	336.50	81.26%	414.10	-4.98%
- DLOG	342.85	80.22%	427.39	-1.93%
- IDC0	348.90	80.60%	432.88	-0.67%
- STRG	343.17	79.76%	430.25	-1.28%
- SCHD	347.82	80.62%	431.43	-1.01%
- QMGR	346.78	80.56%	430.46	-1.23%
- LOCK	340.37	79.13%	430.14	-1.30%

Table 6: IMS Full Function ETR, ITR, & CPU % performance characteristics of trace tables, external DS

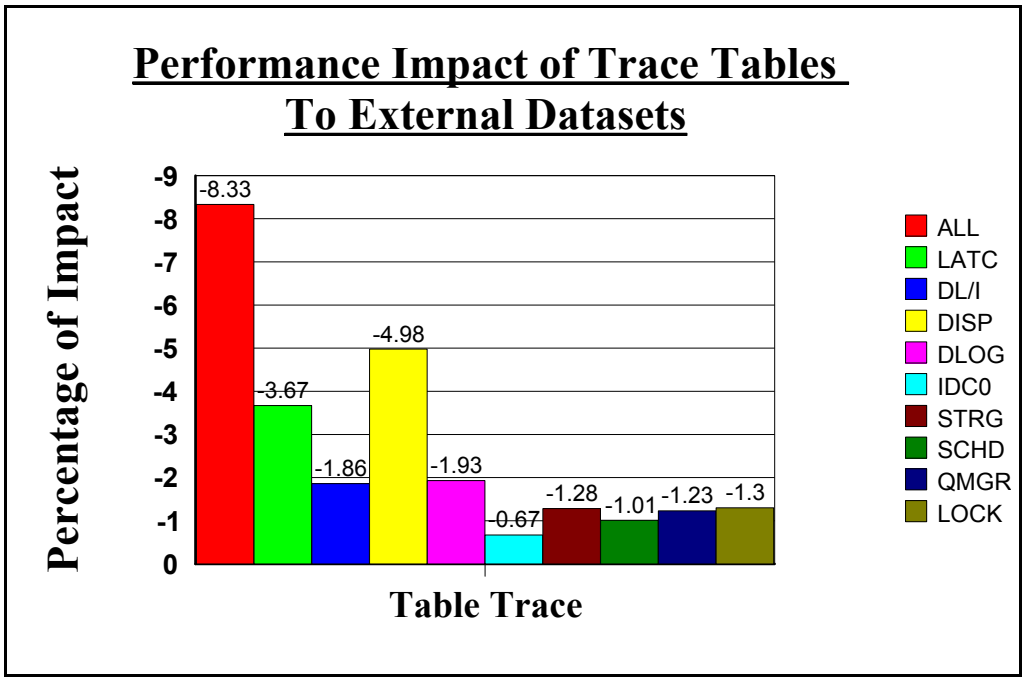

Chart 4: IMS Full Function ETR, ITR, & CPU % Busy performance impact of trace tables, external DS

Impact of Trace Tables In Memory Vs. External Datasets (Fast Path)

Table 7 demonstrates a comparison of the adjusted ITR values derived from measurements of the trace tables generated in memory compared with the ITRs of trace tables generated on external data sets. The results indicate that the performance impact, ITR improvement and degradation, of trace tables in memory range from -0.1 to 12.9 percent when compared to trace tables generated on external data sets. Positive percentage indicates a higher ITR performance for the internal memory measurement and negative percentage indicates an ITR degradation for the internal memory case. Chart 5 depicts this in bar chart form.

	Internal Throughput Rate (ITR) (tx/sec)* - Trace Tables in Memory	**Internal Throughput Rate (ITR) (tx /sec) - Trace Tables to External Dataset**	**Perform. Impact (%)**
ALL	9,058	7,886	12.9%
DISP	9,485	8,508	10.4%
LATC	9,629	9,043	6.1%
LOCK	9,635	9,663	-0.3%
DLOG	9,646	9,501	1.5%
STRG	9,730	9,808	-0.8%
DL/I	9,754	9,749	0.1%
FPTT	9,797	9,827	-0.3%
QMGR	9,841	9,849	-0.1%
SCHD	9,865	9,848	0.2%

Table 7: ITR and Performance impact of trace tables in memory Vs. to external datasets

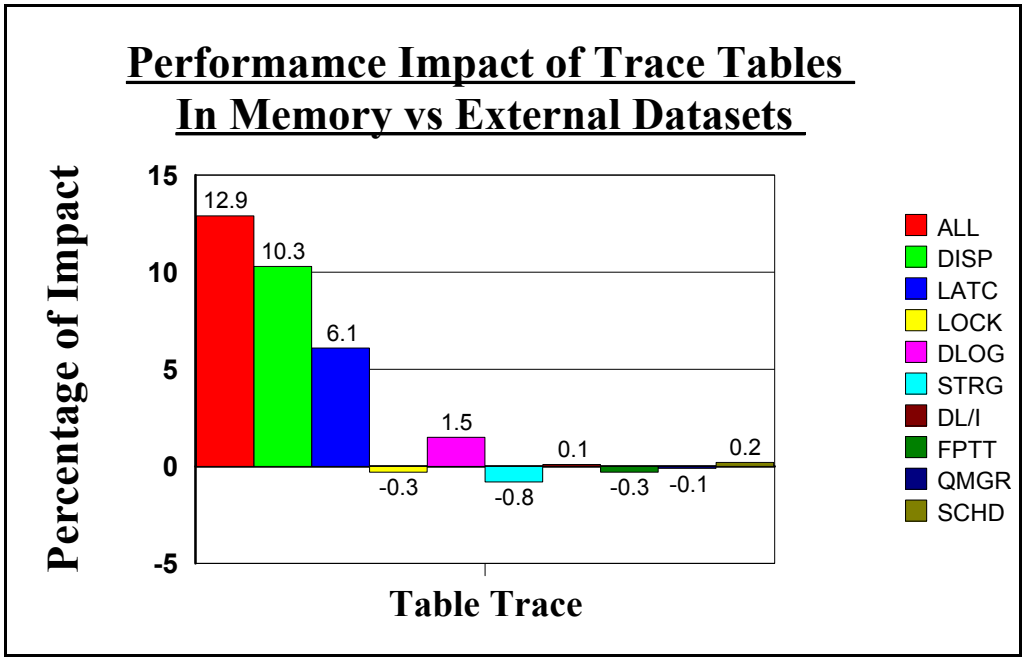

Chart 5: Performance comparison of trace tables in memory Vs. to external datasets

Impact of Trace Tables In Memory Vs. External Datasets (Full Function)

As with the Fast Path measurements, Table 8 demonstrates a comparison of the adjusted ITR values derived from measurements of the trace tables generated in memory compared with the ITRs of trace tables generated on external data sets for the Full Function workload. Chart 6 depicts this in bar chart form.

	Internal Throughput Rate (ITR) (tx/sec)* - Trace Tables in Memory	Internal Throughput Rate (ITR) (tx /sec) - Trace Tables to External Dataset	Perform. Impact (%)
- ALL	407.23	399.54	1.89%
- LATC	419.24	419.82	-0.14%
- DL/I	424.84	427.73	-0.68%
- DISP	423.77	414.10	2.28%
- DLOG	424.80	427.39	-0.61%
- IDC0	427.11	432.88	-1.35%
- STRG	427.52	430.25	-0.64%
- SCHD	428.81	431.44	-0.61%
- QMGR	429.24	430.47	-0.29%
- LOCK	429.30	430.14	-0.20%

Table 8: ITR and Performance impact of trace tables in memory Vs. to external datasets

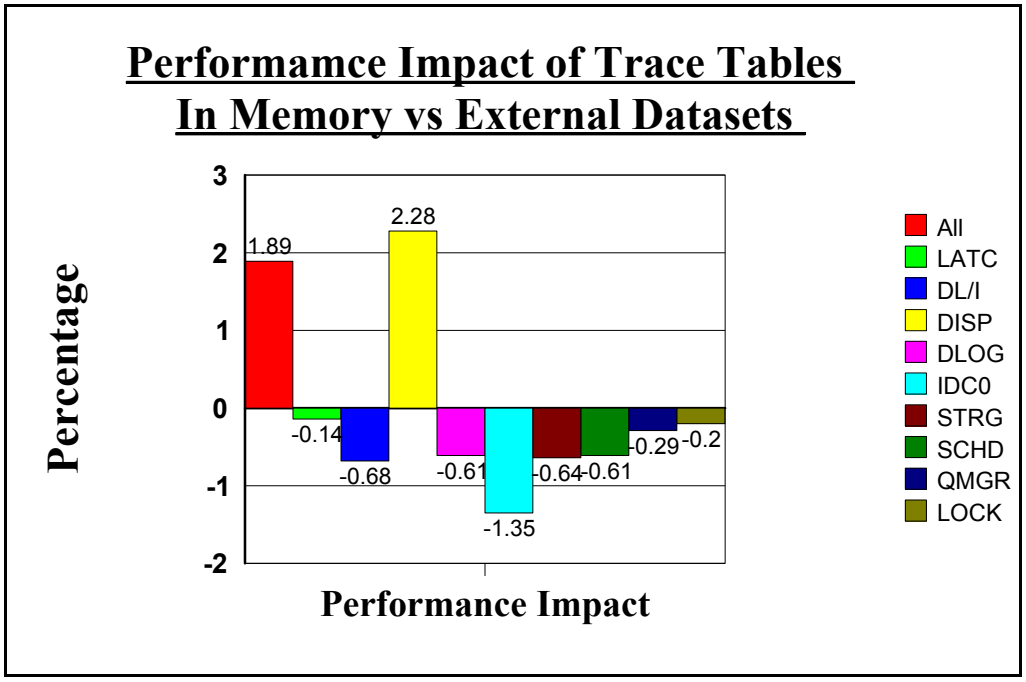

Chart 6: Performance comparison of trace tables in memory Vs. to external datasets

Charts 7 and 8 depict in bar chart for comparisons of the performance impacts between the trace tables generated in memory compared to the impacts of the trace table measurements generated on external data sets. Chart 7 demonstrates the comparison for the Fast Path workload with Chart 8 depicting the Full Function workload comparisons.

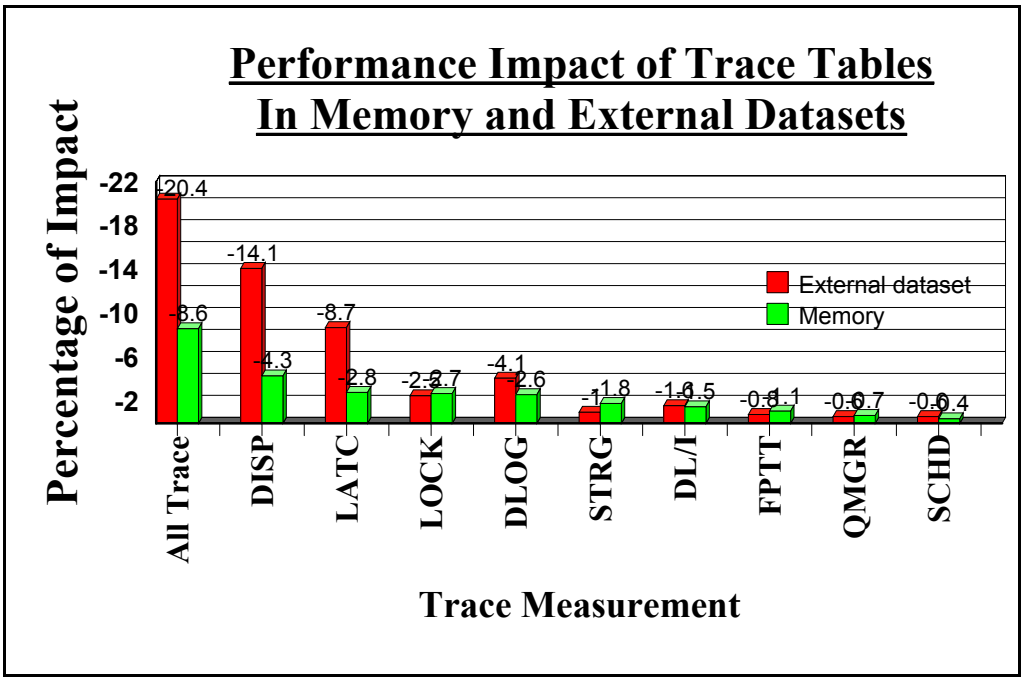

Chart 7: Comparisons of the Fast Path trace table measurements (in memory Vs. external DS)

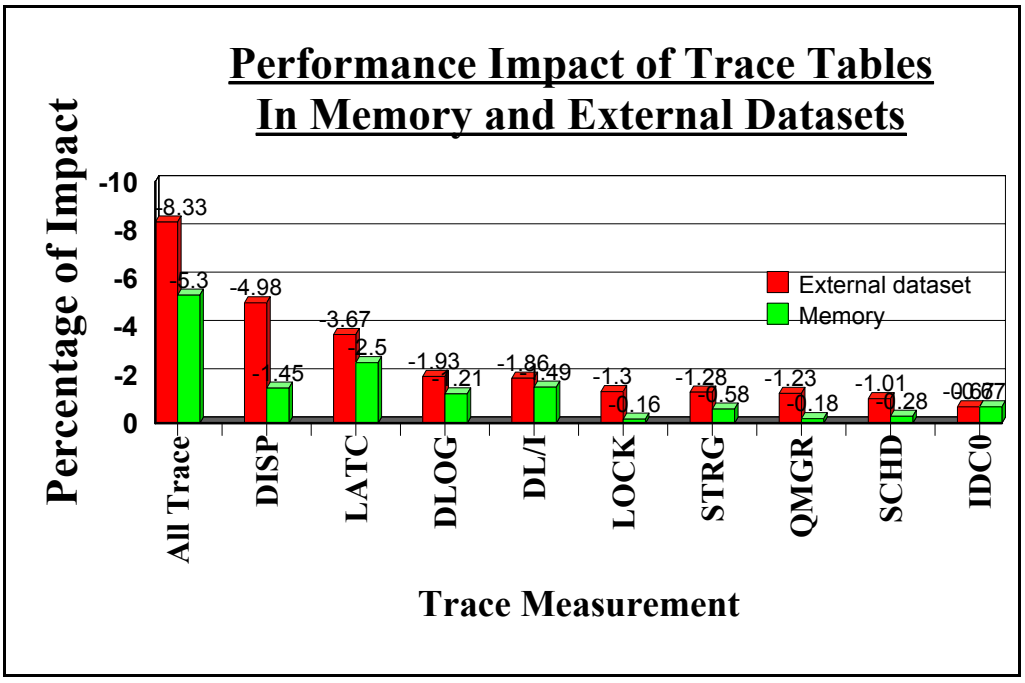

Chart 8: Comparisons of the Full Function trace table measurements (in memory Vs external DS)

Summary

The performance information of the specific trace tables in this study was obtained under a controlled environment based on the use of specific data - IBM Server zSeries 2084 Model 322 (zSeries 990) processor, IBM TotalStorage Enterprise Storage Server (ESS) 2105 Model 800 DASD, z/OS V1R6 operating systems, IMS V9.1, TPNS V3R5 and Fast Path 2 workload.

The specific trace tables in memory and trace tables to external datasets study were carried out separately. For the Fast Path workload evaluation the following information was derived:

- ITR degradation for the specific trace tables in memory was measured between -0.4 to -8.6 percent.
- ITR degradation for trace tables to external datasets was measured between -0.1 to -20.4 percent.

Similarly, the results for the Full Function workload evaluation demonstrated:

- ITR degradation for the specific trace tables generated in memory was measured between -0.16 to -5.3 percent.
- ITR degradation for trace tables to external datasets was measured between -0.67 to -8.33 percent.

Generally for both of the workloads, Fast Path and Full Function, generating the specific trace tables in memory incurred less of a performance overhead than generating the trace tables to external data sets.