

## **SYSTEM OPTIMIZATION BEFORE IT WAS GREEN.**

Without realizing it, I have been 'greening' data centers for 29 years. We knew we were doing good things but the word "GREENING" was not yet in vogue.

The Beginning;

While working for the largest payroll, personnel, and pension software vendor in the United States, with 2,500 mainframe clients a problem arose with one of the clients. The payroll (our product) was being run each week on four different computers in four parts of the country. All of the computer hardware and software was identical and the only thing that was being run on the machines was our payroll software. Each machine was processing approximately 25,000 payroll checks each week. There was a problem with one of the locations. It took 96 hours to process the payroll, while the others were processing in about 6 to 8 hours. This amount of time was unacceptable to process a payroll and left no time to recover in case of a problem or a rerun requirement. Also, it was a union shop and that made management even more concerned. I was given the assignment to visit each data center and determine why the jobs were running so differently and correct the problem.

I discovered that the file configuration and file placement on the slow machine differed vastly from the others. At three of the four locations the system programmers had modified the file parameters and placed the files so as to not have contention on the DASD volumes. The fourth system programmer did not do this. I changed the slow machine's files to match the fast machine's files and the payroll improved and ran in 6 hours.

This assignment gave me the best idea of my life.

Before I go on I want to state something that many, even in the systems area today, are unaware of and that is VSAM is still the heart of your mainframe environment. Most companies don't realize that their operating system is VSAM based. You're Master Catalog and User Catalogs, all of CICS, as well as your DB2 system files, bootstrap and DCAWORK files, as well as TSO, most Online Viewing

systems, and even your page data sets are all VSAM files. IMS is native VSAM under the covers. There are still a great many older vendor software packages as well as home grown applications that are basically VSAM based and a great many ADABAS, IDMS, etc., data bases have VSAM drivers. Now saying all of this many will still say, "We have no VSAM files". My answer is that a very large bank told me that very thing a couple of years ago and an analysis revealed almost 1,000,000 VSAM based files. And, oh by the way, 125,000 of them were found to be improvable.

The perfect tuning tool.

If you could run a file thru a program and capture it's speed, I/O, EXCP's, and CPU, you could compare it to a different definition of the same file and see if this new definition was better or worse than the other. This would require taking a file and running it thru a program and then changing one of the definition parameters and running it again. This would have to be done over and over until every possible combination of parameters had been run. I decided to use a standard IBM Utility program that would always run the same program code so as to have no differences in the processing. I copied the file to a copy of itself and this would test both the input read and output write ability while collecting the statistics. I did this over and over until every combination of definition parameters was tested. This gave me the very best settings for a file with a particular record size, file type, and key length. You could use this definition any where this file was used on any mainframe in any data center and it would always give you the very best performance this file could get. By placing the statistics in an expert data base I could compare the measured speed, I/O, EXCP's, and CPU of a client's file to the best possible example and determine the amount of improvement possible if the improvement was made.

After running and saving a few thousand of these files, a pattern began to emerge so that I was able to fill in the places in the data base where I had no examples of files to run.

I then developed software and began to collect statistics so I could analyze files and recommend improvements that would speed up processing and save CPU, I/O, EXCP's. Each time I ran an analysis I

would get a few new files to add to the data base and that would make the data base more and more complete. I discovered that each file contributed a small percentage, but the overall effect of proactively improving many files gave a very large improvement. Almost always at least 10% and very often 20% to 30% were obtained. Once a job ran so fast that the client thought it had abended. Once a large bank was running 45,000 jobs at month end and they ran for 24 hours each month. After adjusting the file parameters the 45,000 jobs ran in 9 hours, or 62.5% faster with a great reduction in I/O and CPU. I also discovered that the speed of processing changed with the speed of the processor, but that the I/O, CPU, and EXCP's remained constant across mainframes.

Another Savings occurred by identifying over allocated DASD space and empty files and files with FREESPACE that did not need it.

As time went by other parameters had to be introduced into the collected statistics. Things like differences in the data center environment, such as system wide buffering tools, DASD device differences, cache controllers, and file size differences. As IBM introduced new features, the data base had to be enlarged. Things like SMS extended addressing, file compression, striping, etc., had to be integrated into the software.

Because MIPS are determined by CPU consumed over time, and we reduced both, we could delay the purchase of additional MIPS and with them the software license agreements that are far more costly. Machines run faster doing more work in less time. Less DASD storage, less electricity, less people needed to do the work, less OT, no Saturdays, etc. The most expensive piece of the data center cost is people costs.

Our tuning not only delayed the next hardware and software upgrade, but all subsequent upgrades as well. Also additional electric power, water, lights, etc. If you tune, all subsequent upgrades are better forever.

How does performance degrade?

Systems get out of whack because people change jobs, what they do in one company may be different in a new environment and may not work in another.

Company's growth of business is a good thing, but files grow causing things to run slower. New hardware devices require changes to be made to file definitions. What is real good for one type is very bad for another. Vendor software must work on all clients' mainframes and therefore must be modified to be compatible with each mainframe environment.

So I guess I have been in the forefront of the Greening of the data center. Having done this for so long, I have seen many of the other benefits of mainframe tuning.

Smoother running systems (much less down time, fewer Abends).  
Faster turn-around time between runs.

Reduced contention between systems running on the same computer.

Improved batch processing (overnight windows, SLA's).

Lower DP costs.

More productive users (Payroll, AP, AR, etc. departments can do more work faster).

Faster and more efficient (accurate) Government reporting.

Because you postpone the purchase of additional hardware because MIPS, CPU, EXCP's, DASD are reduced. You save by delaying or eliminating the purchase of Mainframes, DASD Devices, Control Units, Cables, Insurance, and Maintenance, perhaps additional Operators, Vacation and Benefits for the additional people, etc.

Easier and more efficient programming because debugging is quicker.

Input is quicker. Hit the Enter Key and the data is instantly processed.

Happier users (Payroll dept, AP dept, etc. are not constantly Calling the DP dept and asking, "Why must we wait so long before we get an answer to a query"?)

Happier customers (all computer transactions are very quick).

Faster TSO response time.

Faster on-line response time.

Less overtime for users and programmers (testing and inputting

and verification of data is faster).

Fewer abends and restarts.

CICS comes up sooner (users have more online usage time.)

More research projects because of increased computer resources.

Ad Hoc reports on a timelier basis.

New Development Projects completed faster because of faster test turnaround time.

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## Ralph Bertrum - Bio

A veteran Information Systems professional with more than 40 years in the field, Mr. Bertrum is the founder and principle of Critical Path Software, Inc. Some of his many accomplishments include: The creation, architecture and software development of TurboTune, JCL Analyzer, CICS Contention Analyzer and other Turbo Buffering tools.

During his tenure, Critical Path Software, Inc. has provided expert Database Tuning and Systems Software I/O Subsystem Performance Tuning Services and Analyses for over 600 major Fortune 1000 corporations World Wide. CPSI has grown to the point where it now has a customer base extending from Singapore to Australia, Indonesia, London, Europe and the United States.

Prior to founding Critical Path Software Inc., Mr. Bertrum served as an independent consultant, performing maintenance, installation and performance tuning of mainframe operating systems and many financial packaged systems including but not limited to MSA, M&D and InSci. He was also the managing director of technical installations for a multi-billion dollar software development company, supporting more than 2,500 customers utilizing an extensive array of environmental platforms and operating systems world wide.

Other duties have included, Vice President of Systems and Operations and Programming Manager of Accounting, Budget and Cost Systems – CICS front end programming and support.

Mr. Bertrum is also the author of numerous articles, tips and white

papers on systems performance and tuning and is widely recognized as one of the worlds foremost leading authorities in his field.

He has been a speaker at several user groups including: Millennium Performance Tuning, Speaker at the M&D Tri-State Users Group, May 1988, M&D Fixed Assets under Millennium Performance Tuning, Speaker, M&D Tri-State Users Group, May 1988, Millennium Performance Tuning, Speaker, M&D Northeast Users Group, April 1989, Turbo Tuning Your Data Center, Speaker, Computer Measurement Group (CMG) Reno, Nevada, December 1999

Education: BBA – Accounting – University of Connecticut – 1968  
A Great many IBM classes in Programming, Systems, CICS, etc.