System z DASD I/O Subsystem Observations

Historically there was a very simple synergy between the IBM S/370 Mainframe and its supporting disk I/O (DASD) subsystem, allowing for Mainframe host to physical and logical disk device (I.E. 3390) connectivity. The analysis and tuning of this I/O subsystem has always been and continues to be supported by the SMF Type 7n records via IBM RMF and the BMC CMF alternative. However, over the years, major advances in DASD subsystems and the System z Mainframe server have delivered many layers of technology resources (E.g. Cache, Memory, FICON Channels, RAID Storage, Proprietary Microcode, et al) and this has introduced complexities into highlighting DASD I/O subsystem performance problems.

The focus of technology based metrics (E.g. I/O Rate Response Time, I/O MB/S Bandwidth, et al) have also been complemented with more meaningful business focussed Service Level Agreements (SLA). Therefore today's System z I/O Performance Analyst must gather and act upon proactive meaningful information from the ever-increasing amounts of performance data available. Put another way, too much data can deliver not enough information! As previously stated, it was forever thus, RMF and CMF have always collected the requisite performance data available and arguably no other data source is required (E.g. OMEGAMON/TMON/SYSVIEW Performance Monitor, SAS/MXG/MICS/WPS Performance Database). RMF/CMF is the ideal data source for thorough and timely System z I/O performance management, where intelligent analytics and expert knowledge are required to present this *"Golden Record"* or *"Statement of Truth"*.

From a DASD subsystem technology viewpoint, there is no longer an obvious one-one direct connection between the Mainframe host and DASD device. An increasing number of technological advances, both microcode and hardware (E.g. Memory, Fibre Channel, Function Assist Processing, et al) have diminished the requirement for data access directly from the physical device. Put another way, in today's world of System z servers with multiple cache level CPU chips (I.E. Relative Nest Intensity), massive and multiple processor memory resources (I.E. z13 @ 10 TB Memory), high bandwidth Fibre Channel (I.E. FICON, zHPF) subsystem and a hierarchy of DASD memory (I.E. SSD/Flash, Cache), it's not uncommon to consider an I/O that requires physical device access as a problem! Finally and most importantly, from a DASD subsystem viewpoint, each of the recognized System z DASD providers, EMC (Symmetrix VMAX), HDS (VSP G1000) and IBM (DS8870) have highly proprietary DASD subsystems that provide z/OS plug compatibility, but deliver overall I/O performance using their own unique architecture and internal algorithms.

Technical Storage: Company Introduction

Founded in 1997, Technical Storage has 30+ years of expertise with IBM Mainframe storage solutions, combined with deep knowledge gained from collaborating with System z storage IHV companies, namely EMC, HDS, IBM and Oracle (StorageTek). Technical Storage is an IBM Business Partner and ISV whose solutions have been deployed in major global data centres for over 10 years. Customers include Global 500 companies in Aerospace, Banking, Government, Insurance, Retail and IBM System z supplier sectors. For ease of global support coverage, Technical Storage has offices located in France (HQ), United States of America, China and Luxembourg. As an active member of the IBM PartnerWorld community, Technical Storage has access to the latest System z hardware and software resources, safeguarding customers never have to worry about compatibility, as and when new product versions are released (E.g. CMF, RMF, z/OS, et al). Technical Storage has one simple objective; to make life easier for z/OS storage professionals. Technical Storage also actively participate in CMG, GSE and SHARE User Group communities, sharing their Storage Management knowledge with System z Mainframe users globally.

Easy Analyze DASD Mainframe (EADM) Preview

Built for z/OS Mainframe Storage Managers, Systems Engineers, Service Managers and Capacity/Performance Managers who wish to deliver optimal service, EADM is an automated Storage Performance Management tool with three main objectives:

➢ System z DASD I/O Subsystem Analysis Optimization (reduce time in highlighting performance issues)
➢ System z DASD I/O Subsystem Performance Optimization (safeguard business SLA metrics)
➢ Simplified & Internal System z Skills Consolidation (deliver fact based information to internal staff)
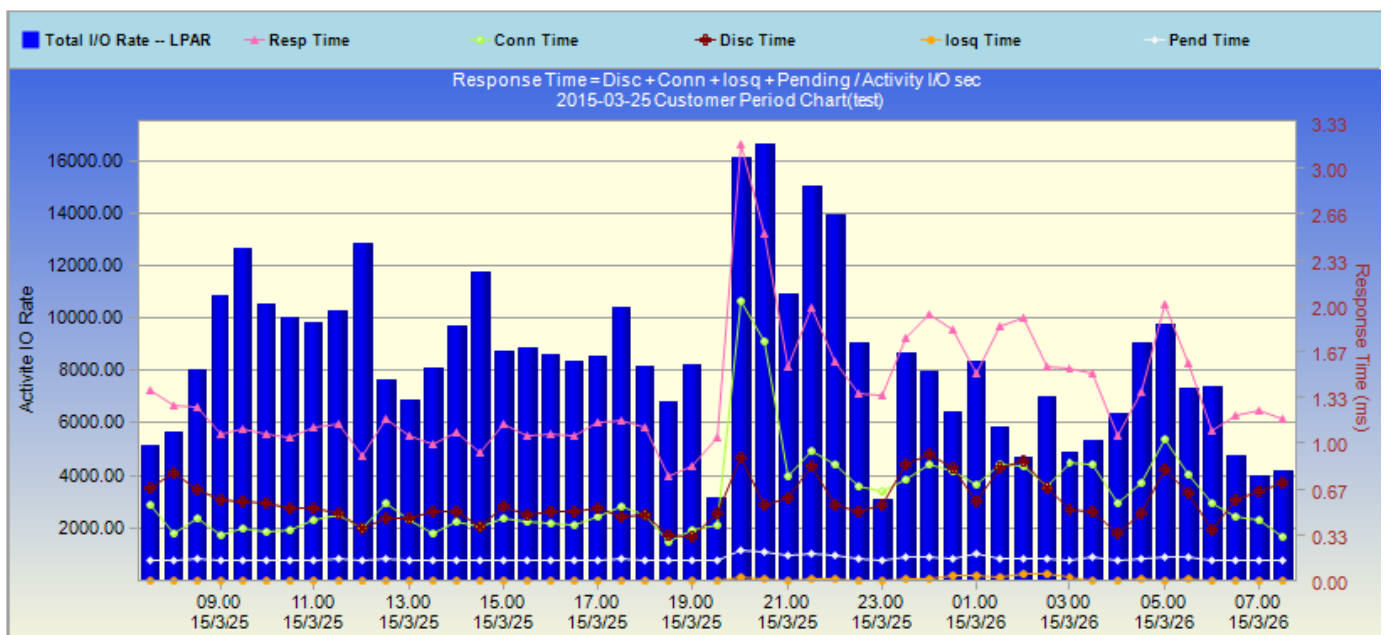
EADM Performance Trending & Hot Spot Issue Escalation

Real time monitoring alone does not allow for in-depth detection of bottlenecks and system imbalances or malfunctions that impact performance. In general, when the alarm sounds, System z Mainframe availability has already been disrupted, with consequential impact for the associated business SLA. Traditional storage performance tools exist, but they are no longer adequate to provide the enterprise with a pertinent and inexpensive predictive analytics system, especially when dealing with large complex LPAR configurations.

EADM delivers an automated and intelligent daily health check of the entire System z disk I/O subsystem resource. EADM works around the clock for the enterprise, delivering customized and automatic user friendly reports via internal Email. Operations and performance teams are alerted as soon as performance variances occur, typically in minutes, assisting in the identification of underlying root problems, causing changes in system behaviour. Incorporating intelligent and meaningful I/O performance indicators, with drill-down and zoom-in ability, storage technicians can determine if the problem is temporary, permanent, local or global. By simplifying the data reduction process (E.g. RMF/CMF data from numerous LPAR/Sysplex environments), EADM safeguards that the internal technical team can efficiently manage their ever increasingly complex and large DASD environment, for intelligent and timely communications with internal business teams and external suppliers alike.

EADM GUI Examples

EADM incorporates a number of meaningful reports, both real time and historic, allowing the System z technician to effectively manage their organizations DASD I/O subsystem, while maintaining business service (I.E. SLA):
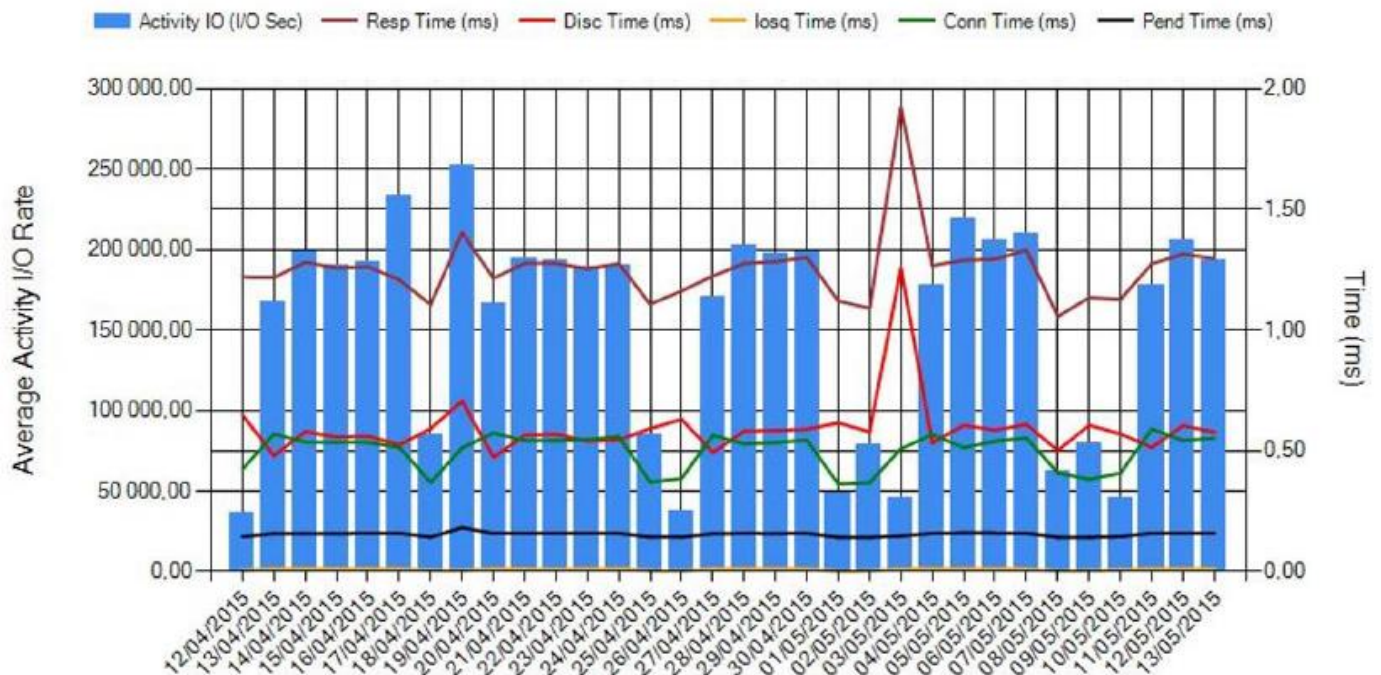

The Daily I/O Profile Summary shows component I/O operations, allowing for easy identification of performance issues.

TP Analysis from Sunday, 4/12/2015 to Wednesday, 5/13/2015

Legend: Activity IO (I/O Sec) — Resp Time (ms) — Disc Time (ms) — Iosq Time (ms) — Conn Time (ms) — Pend Time (ms)

LPARs Analyzed: LPAR1 ; LPAR2 ; LPAR3

The Monthly I/O Workload (TP or Batch) Summary shows I/O activity & response time for an LPAR group.

EADM Usage

Over time IBM RMF and BMC CMF generate even more detailed information about z/OS subsystems and performance. EADM automatically analyses SMF, RMF and CMF data, retaining pertinent data to create an intelligent repository of I/O and storage behaviour, delivering optimal performance and capacity planning. EADM is a smart and automated tool that interprets Big Data from RMF and CMF, allowing System z Mainframe users to make the right decisions, take proactive action, reduce service outage risks and optimize TCO. EADM incorporates the following features:

➢ Automatic daily (24 Hour) analysis of Sysplex wide workload (On-Line TP & Batch) I/O response times
➢ Systematic intelligent alerts of early performance variances with exact occurrence time indicators
➢ Identification of I/O performance hot-spots with DASD volume and data set level granularity
➢ Performance trending at DFSMS Storage Group, Subsystem LCU and DASD volume level
➢ DR (E.g. PPRC) simulations to prevent data loss and forecast Data Centre failover scenarios
➢ I/O subsystem WLM indicators to determine exactly what impacts performance objectives
➢ Full FICON channels and zHPF analysis, incorporating typical I/O throughput indicators
➢ HyperPAV and associated LCU indicators to easily balance volumes, optimizing PAV alias allocation
➢ Performance monitoring and balancing via intelligent LCU, SSID and I/O analytics
➢ DASD capacity usage via DCOLLECT data, comparing assigned vs. allocated vs. actual disk utilization
➢ EADM supports entry-level several LPAR and complex multiple CPC/LPAR System z configurations

EADM Benefits

A well provisioned and performing System z I/O subsystem is of vital importance for safeguarding today's ever increasing storage requirements of mission critical business applications. A poorly performing I/O subsystem will generate unnecessary and extra CPU overhead, with potential and tangible TCO impact, in conjunction with potential business impact. Although the advances of the System z server and underlying DASD I/O subsystem can compensate for many application code or data placement issues, the fundamental concepts of analysing and tuning the I/O subsystem remain. EADM delivers the following benefits:

➢ Eradication of I/O bottlenecks, increasing application Quality of Service (I.E. response time)
➢ Maintain Mission-Critical business application SLA's
➢ System z DASD TCO optimization, combined with a short-term EADM ROI, typically within 3 months
➢ System z technician productivity gains (E.g. less time analysing I/O subsystem issues)
➢ Centralization of DASD I/O subsystem performance and capacity data, with associated alerts
➢ Safeguard Production service performance (E.g. DB2, On-Line) is not impacted by disk response time
➢ Seamless System z interoperability (E.g. plug-and-play compatibility)
➢ Intelligent analytics based capacity forecasting for optimal TCO
➢ Intelligent, smarter and efficient reporting, for better communications with IT divisions, suppliers and partners
➢ No dedicated team required to maintain software and manage System z DASD I/O subsystem
➢ System z TCO optimization, reducing CPU overhead of poor I/O and resource overhead of over allocated capacity

For more information please visit the <u>*EADM Portal*</u> *or Email our* <u>*Sales Team*</u> *or call us on +44 (0) 845 0579386.*

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