System z Batch Optimization

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zEnterprise. A New Dimension in Computing.
Agenda

- **Batch today**

- **Technology/Modernization**
  - From Batch Modernization on z/OS – SG24-7779-00

- **Batch study – steps/techniques**
  - From Approaches to Optimize Batch Processing on z/OS - REDP-4816-00

- **z/OS S.O.D.**
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<thead>
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<th>IBM*</th>
<th>FICON*</th>
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Agenda

- Batch today

- Technology/Modernization

- Batch study – steps/techniques

- z/OS S.O.D.
Mainframe Processing Models

**BATCH**
- No User Activity
- Large Amounts of Data
  - Short Period of Time
    - e.g. 1,000,000 records in minutes
- Application Pgm / Utility

**OLTP**
- User Triggered
- Direct Response
- Wait for Completion
- Fast → Minimize Locking

![Diagram of Batch and OLTP models]
Mainframe Batch Strengths

- Designed from the ground up for co-hosting OLTP and Batch
- **Workload Management**
  - Balance & Prioritization
  - Data Access
- **Minimal on-site staff**
- **Relatively low cost**
- **The good “ITY” words**
  - Reliability
  - Availability
  - Scalability
  - Security
  - Manageability
What’s the Problem?

– Batch Not Completing on Time?
  • Can’t Start OLTP Until Batch Completes

– Bad Online Response Time?

– Processor Utilization Too High?

– What Happens if Our Company Buys Company B?

– Our Batch is so Complex We’re Worried about Recovery from Failures
Batch – Still Required?

- **Batch → Bulk processing of OLTP logic… BUT**
  - 10,000 OLTP queries to update one row at a time
  - OR
  - 1 SQL query to update 10,000 rows!!

- **Other Considerations**
  - Timing: Is The Required Data Available yet?
  - Sending data to a Business Partner
    - Efficiency, Reliability of Bulk Transfer vs. 1 at a time
  - Utilities
    - Backups
    - Reorgs
    - Archives
Agenda

- Batch today
- Technology/Modernization
- Batch study – steps/techniques
- z/OS S.O.D.
Drivers for Change

- **Necessary Skills harder to find**
  - JCL, ISPF, TSO, Languages (ASM, PL/I, COBOL)

- **Requirement for 7/24 processing**
  - Global Corporations → Time Zones

- **Output formats**
  - PDF, *.xls *.doc

- **Email**
  - Confirmation of payment processing

- **XML**
  - Stored natively in DB2
  - Extensions to Enterprise PL/I, Enterprise COBOL
  - XML System Services

- **Access to Remote Data**
  - Direct access, RPC
Drivers for Change (Cont’d)
Traditional Programming Model

- **COBOL, PL/I, Assembler**
  - Compiler
  - Linkage Editor/Binder
  - Loader

- **Considerations**
  - Skills available in the shop?
  - Functionality of Traditional Languages
  - Consider Multiple Languages
    - Interoperability, Functionality
  - Must weigh Design Complexity with Ease of Maintenance
Bulk Reference Framework
New Technology

- **XML**
  - New programming models (e.g. SOAP) using XML wrappers
  - z/OS Needed to Efficiently Adapt or Risk Obsolescence

- **Support**
  - Built-in XML Support
    - Enterprise COBOL, Enterprise PL/I
    - Some Offload to zAAP (calls to z/OS XML System Services)
  - XML Toolkit for z/OS
  - z/OS XML System Services
    - Offload to zAAP
  - DB2 V9 and Above
    - PureXML™ technology
    - Exploits z/OS XML System Services
New Technology (cont’d)

- JAVA
  - Platform Independence
  - Skills Readily Available
  - zAAP Eligible
  - Multithreading Support
New Technology (cont’d)

- **JAVA APIs for Batch on z/OS**
  - MVS and VSAM data access
  - Condition Code Processing
  - z/OS Catalog Search
  - z/OS Console Interaction (WTO)
  - DFSORT invocation
  - IDCAMS access
  - RACF APIs
  - Writing of Logstreams
  - Job Submission

- **Java invocation to/from COBOL, PL/I**

- **JZOS Toolkit**
  - Code Samples, Cookbook
New Technology (cont’d)
Unified Batch Architecture

- Traditional Silo Approach
  - Duplication
  - Lacks Agility (Time to Market)
Unified Batch Architecture (cont’d)

- Unified Approach
  - Standardized
  - Eliminates Redundancies
New Technology

WebSphere XD (Extended Deployment) Compute Grid

- 24x7 batch processing, where batch can be executed concurrently with online transaction processing (OLTP)
- Sharing business services across batch and OLTP, where a service can be executed in multiple execution environments without sacrificing efficiencies, such as bulk-data processing
- Parallel-processing and caching features, where large problems can be partitioned, governed, and processed in parallel across a collection of server resources while hiding the complexities of multi-threading and management
- Container-managed batch qualities-of-service, such as checkpoint algorithms, restart mechanisms, multi-threading, and threshold policies, so the developer can focus on business logic
- Leverage application design patterns for building agile applications, where object-oriented design and service-orientation allow emerging middleware technologies, such as persistence and caching, to be adopted easily.
- Leverage the qualities-of-service of IBM WebSphere Application Server, such as security, thread-pooling, connection-pooling, scalability and z/OS integration.
New Technology (cont’d)

Traditional Batch and OLTP in WAS
New Technology (cont’d)

Batch and OLTP with WebSphere XD Compute Grid
Beyond Sorting - DFSORT

- More than just Sort/Merge
  - ICEGENER
    • Automatic Replace for IEBGENER
  - ICETOOL
    • Verify data, e.g. Packed Decimal, Zoned Decimal
  - Record Manipulation
    • Selection
    • Reformatting
    • Parsing
    • CSV Creation
    • Report Writing
    • IF-THEN-ELSE Processing

- References
  - Beyond Sorting
  - Smart DFSORT Tricks
Agenda

- Batch today
- Technology/Modernization
- Batch study – steps/techniques
- z/OS S.O.D.
Undertaking a Batch Study

- What’s the Problem?
  - Bad Online Response Time?
  - Batch Not Completing on Time?
  - Processor Utilization Too High?
  - What Happens if Our Company Buys Company B?
  - Our Batch is so Complex We’re Worried about Recovery from Failures

→ Clear, Concise Problem Statement
Analysis Methodology

- Similar to Performance Studies on All Platforms

- 3 Basic Steps

  1. Initialization
     - Standard Project Management “kick off”
     - Complexity of Batch Analysis

  2. Analysis
     - Where the Fun Begins 😊

  3. Implementation
     - Standard Project Management
     - Focus on Implementation/Measurement
Batch Study Analysis

- The Big Picture
Undertaking a Batch Study (Cont’d)

- Create the Business Case
  - Batch Study → SIMPLE INEXPENSIVE
  - Legislated Change
  - SLA penalties avoided

- Lowered Costs
  - Less People Time for Maintenance, Troubleshooting
  - Lower Hardware costs
    - Disk, Network

- Costs May Increase!
  - Additional Software
  - Incremental Hardware
    - Memory, Processor Cycles
Undertaking a Batch Study (Cont’d)

- Project Initialization
  - Objectives
  - Investigate Problem
  - Governance
  - Project Setup
  - Identify Participants
  - Measurement
  - Data Collection
Undertaking a Batch Study (Cont’d)

- Setting the Strategy
  1. System Configuration
  2. Implementing Data In Memory
  3. Optimizing I/O
  4. Increasing Parallelism
  5. Reducing the Impact of Failures
  6. Increase Operational Effectiveness
  7. Improve Application Efficiency
Setting the Strategy – *System Configuration*

- **LPAR Setup**
  - Access to Processor Cycles
  - Watch for “Short” CPs
  - Sufficient Memory
  - WLM Setup
    - Multiple Periods of Batch (?)
  - JESx Setup
    - Over-Initiation?
Setting the Strategy – *D.I.M, I/O*

- **Data In Memory**
  - Buffering
    - DB2/IMS Buffers
    - VSAM Index Buffers, Data Buffers
    - Batch LSR
    - In-Storage Tables, Databases

- **I/O Processing** *(The 4 Golden Rules)*
  1. Don’t Do Any I/O  ➔ D.I.M.
  2. Do I/Os in Parallel
  3. Do I/Os Faster
  4. See Rule #1
Setting the Strategy – Parallelism, Failure Impact

- **Parallelism**
  - Understand the Critical Path
  - Reduce/Eliminate Dataset Contention
  - BatchPipes/MVS
  - Backups

- **Failure Impact Reduction**
  - “Bad” Data
  - “Bad” Programs
  - Swift & Effective Recovery Procedures
Setting the Strategy – *Ops Effectiveness, Application Efficiency*

- **Operational Effectiveness**
  - Workload Scheduling Software
    - IBM → Tivoli Workload Scheduler
  - Tape Mounts?

- **Application Efficiency**
  - DB2 for z/OS SQL Tuning
  - I/O Bound or CPU Bound?
  - Sequential or Hash Searches?
  - Self-written Sort Routines?
Understanding the Batch Landscape

- **Complexity**
  - Many, Many Jobs
  - Job Functions
  - Application Ownership/Boundaries
Understanding the Batch Landscape

- **Complexity (Cont’d)**
  - Job Naming Convention
  - Importance, Frequency, Application, Job Identifier
  - e.g. PLEG250D
    - Production, Daily, General Ledger, Job 250 (follows 240?)
  - Convention extended to Datasets, Steps, Programs

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<td>2</td>
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<td>A three-character application name.</td>
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<td>5</td>
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<td>Individual job identifier, typically a number</td>
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<td>D for Daily, W for Weekly, M for Monthly, Q for Quarterly, Y for Yearly, A for Ad Hoc</td>
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Selecting Jobs to Tune

- Potential Criteria
  - On Critical Path
  - CPU Intensive
  - Long Running
  - Part of Important Application
  - Prone to Failure
## Selecting Jobs to Tune (cont’d)

### Gantt Chart

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Governance

“The formal process and policies for controlling, directing and making batch decisions”

- **Empowers:**
  - Consistent Management
  - Cohesive Policies
  - Decision Rights for Actions & Solutions

- **Batch Design Authority**

- **Creating Governance**
  - Revise Standards / Guidelines
  - Communicate Standards/Guidelines
  - Setup Baseline and Monitor
  - Introduce Improvements
  - Control and Perform Quality Assurance
Anti-Patterns

**Pattern**
- A named solution to a recurring problem *(DO)*
- Describes How to Solve a Problem
  - Doesn’t advocate implementing a particular solution

**Anti-Pattern**
- Similar to a pattern, but with negative consequences *(DON’T)*
- Describes What Must be Avoided
- Some Examples:
  - Incorrect Usage of a Special Resource
  - Incorrect Usage of a Start Time
  - Actual Start Time not equal to Last Predecessor’s End Time
  - Redundant Copies of Files
  - Batch Prevented from Usage of Sysplex-Wide Resources
TOOLS

- **Batch Workload Scheduling Tools (like TWS)**
  - Monitoring (Status/Errors/Delays/Extended Running)

- **SMF Record Analysis**
  - RMF, Address Space, Dataset, DB2, DFSORT, zFS

- **One Vendor Tool (From the Redbook…)**
  - **Source2VALUE™**
    - Source2VALUE™ is a Product of Omnext BV
    - Analysis of Source Code, Workflow Definitions, Menu Structures and Batch-Job Definitions
    - White Space Analysis, Timeline Comparison

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New programmatic interface for z/OS batch

Function delivered with z/OSMF R13

- A new REST (Representational state transfer) API (HTTP(s)-based) interface to z/OS
- Easy programmatic access to the power of z/OS batch capabilities
  - REST API web services can be used by: web applications (javascript/AJAX, Flex(Flash), etc) and other web service clients, such as Java, PHP, Perl, etc
  - The REST API web service will connect to both JES2 and JES3, as well as select secondary subsystems

Today:
- Complex programming
  - Allocate and open internal reader
  - TSO/ISPF submit,
  - FTP “interface-level2”
  - Java z/OS submit interface
- Security protocol limitations

New option today
- Any web-based, Java, PHP, Perl application, etc. supporting HTTP
- New RESTful HTTPs based API
- Highly secure, firewall friendly,
- Simplified text-like programming

Break the barriers of batch
Submit JCL, get status, retrieve output files, change jobclass, cancel job, purge job

- z/OS JES2 and z/OS JES3
z/OS R13 - The foundation for modern batch

- About 90% of customers consider batch mission critical*
- **Challenge:** Greater volumes of data and larger batch and on-line processing windows.
- **Solution:** Need to make batch more efficient.

- Expand existing COBOL applications with Java!
  - More choice for application development skills
  - Leverage specialty engines!

- Simplified programming!
  - Enhancements in z/OS simplify the development and maintenance of existing batch applications.
  - Enable distributed applications to access the power of z/OS batch

- Shorter batch windows!
  - New function in z/OS helps make batch processing more efficient
  - “Pipe” data between two batch jobs to enable these jobs to perform concurrent reads and writes

- Real time batch!
  - WebSphere® Compute Grid delivers a batch environment capable of supporting 24x7 batch and OLTP processing, and parallel computing

"Interactive is manual. Batch is automatic." - Gary Puchkoff, IBM Senior Technical Staff Member

* IBM Market Research
Agenda

- Batch today
- Technology/Modernization
- Batch study – steps/techniques
- z/OS S.O.D.
Clients find it difficult to keep pace with our annual releases

**z/OS® Client Migration Patterns**

- Every Release: 5%
- Every Other Release: 38%
- Irregular: 20%
- Unchanged: 18%
- Inconclusive: 15%
- Other: 4%

*Estimated from several sources including: IBM Inventory, Order, Fulfillment, and Service Call (PMR) data over a 4 year period 2008 - 2011*

Only 5% of our customers migrate annually, almost 60% migrate every 2-4 years
### Annual cycles split functions over multiple releases

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Implementing functions over several releases makes it more difficult to see value in each step.
Summary

- Version 2 of z/OS targeted to Availability 2H2013
- A Version 2 release is the next z/OS release, no “V1.14”
- Release delivery cycle is planned to be every two years, in the second half of that calendar year.
- z/OSMF will be on the same cycle as z/OS
- N+1 or N+2 release migrations support two or four year migration cycle
- New five Year Support with optional fee based service extension
- IBM plans to deliver hardware support updates between releases (PTFs, web deliverables)
- Minimum supported hardware levels

Changes to Current Releases:

- R12 Support extended to four years,
- R13 Support extended to five years to bridge customers to Version 2 migrations
- R13 orderable until Version 2 becomes available

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Support and Service Changes

- **Transition Timing (to 5+3)**
  - Release 11 has three Years Support +2 LCE
  - Release 12 has four Years Support +3 years service
  - Release 13 has five Years Support +3 years service
  - 5 + 3 Model transitions at R13 and continues with Version 2 going forward.

- **Migration and Support**
  - Longer support lifecycles align with delivery cycles
  - Maintaining “N+2” migration paths, now becomes every two or four years
  - Bridge migration from currently supported releases
IBM Lifecycle Extension for z/OS V1.11

What’s new:
- The IBM Lifecycle Extension for z/OS service offer is now available for z/OS V1.11. It provides fee-based corrective service (a fix, bypass, or restriction to a problem) for up to two years starting with October 1, 2012, the earliest offering start date, up through September 30, 2014.

Features / Business Value:
- Offered through IBM System z, the Lifecycle Extension provides only corrective service for z/OS.
- Flexible terms and conditions:
  - Purchase services for any number of machines, aggregate pricing available
  - Add and delete machines as you migrate to newer releases
  - Option to add additional months
  - Keeps billing active for uninterrupted support; cancel when you are done with migration

Client Benefits:
- For z/OS V1.11 customers needing additional time to complete their migration to the next release, the Lifecycle Extension for z/OS V1.11 provides defect support after the end of program services.

References

- **IBM Redbooks**
  - Approaches to Optimize Batch Processing on z/OS - REDP-4816-00
  - Batch Modernization on z/OS – SG24-7779-00
  - Batch Processing in a Parallel Sysplex - SG24-5329-00
  - Batch Processing with WebSphere Compute Grid – REDP-4566-00
  - VSAM Demystified, SG24-6105

- **z/OS**
  - IBM z/OS Version 2 SOD Announcement

- **z/OS home page**
  http://www-03.ibm.com/systems/z/os/zos/
ZEND!

Thank You

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