CMG Canada Apr 2012

System z Batch Optimization

100+ Years of Innovation

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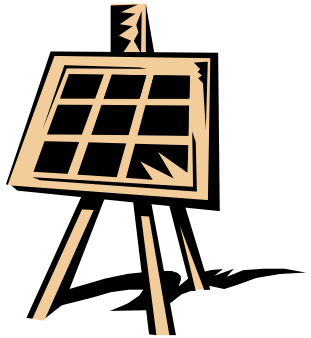
Agenda

- **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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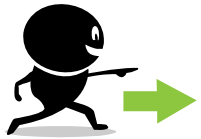

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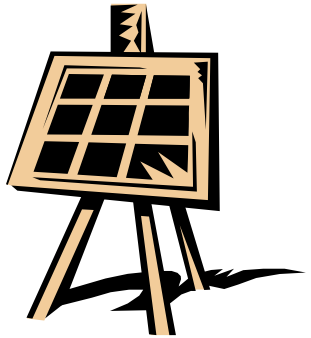

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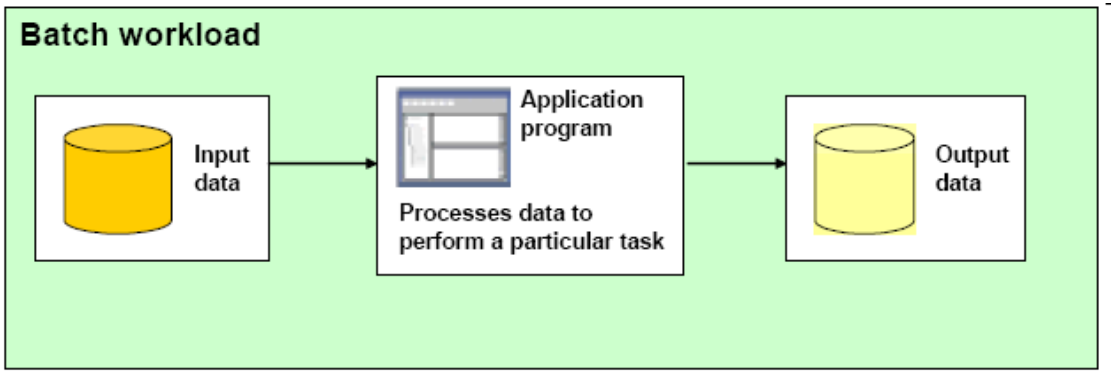
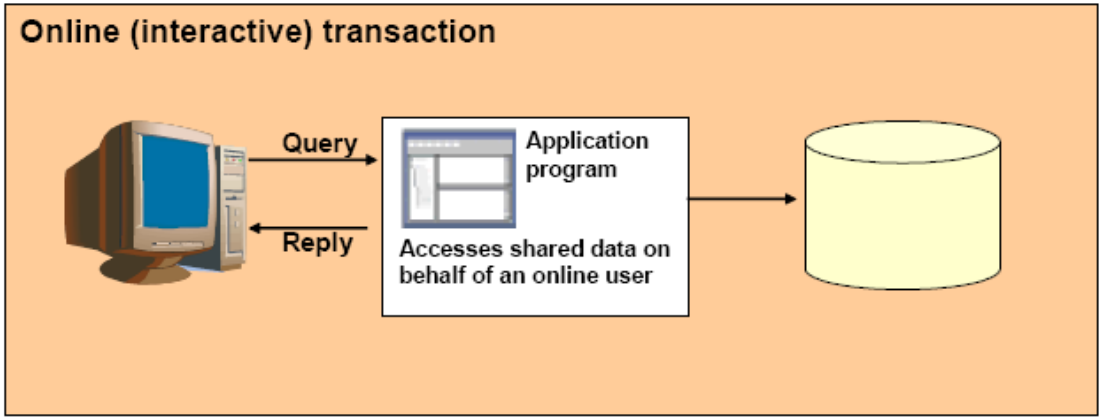
Mainframe Processing Models

- **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 Reponse
  - Wait for Completion
  - Fast → Minimize Locking



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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

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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

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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

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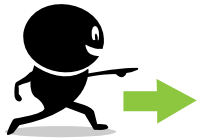

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- Batch study – steps/techniques
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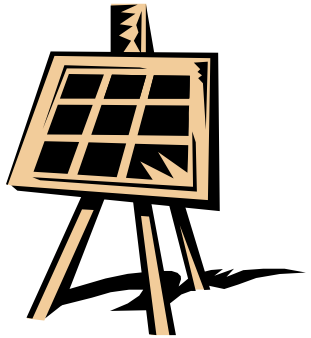

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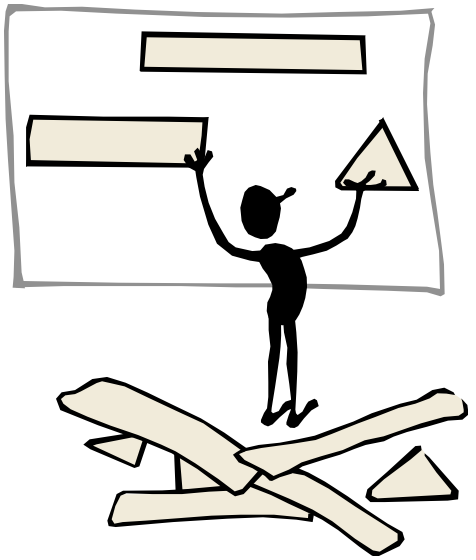
Drivers for Change

- **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



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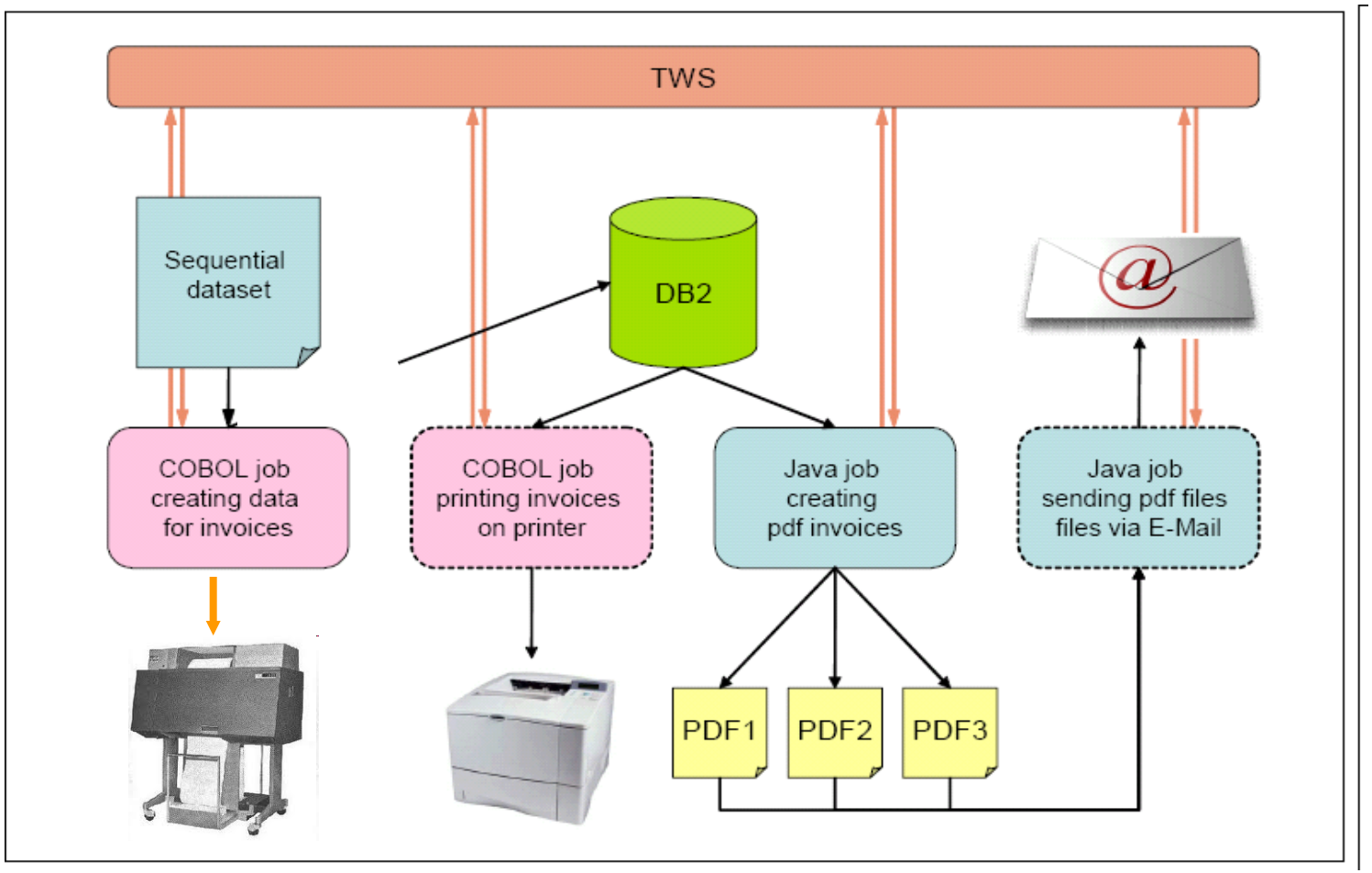
Drivers for Change (Cont'd)



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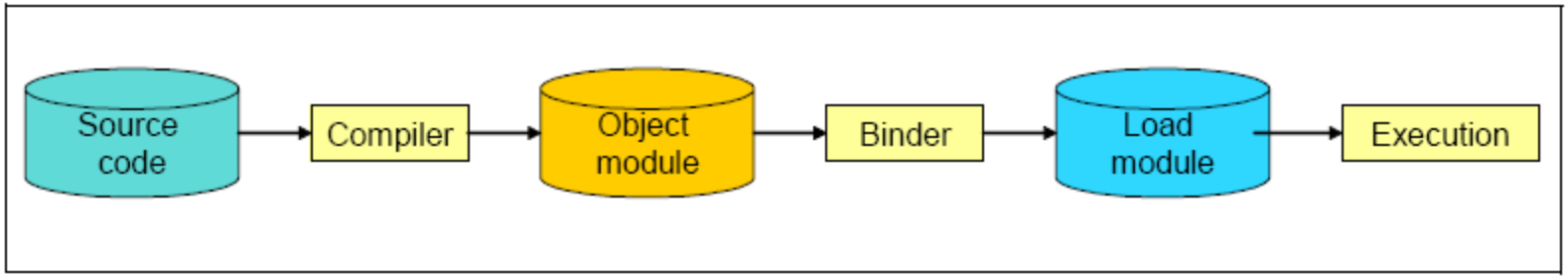
Traditional Programming Model



- **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

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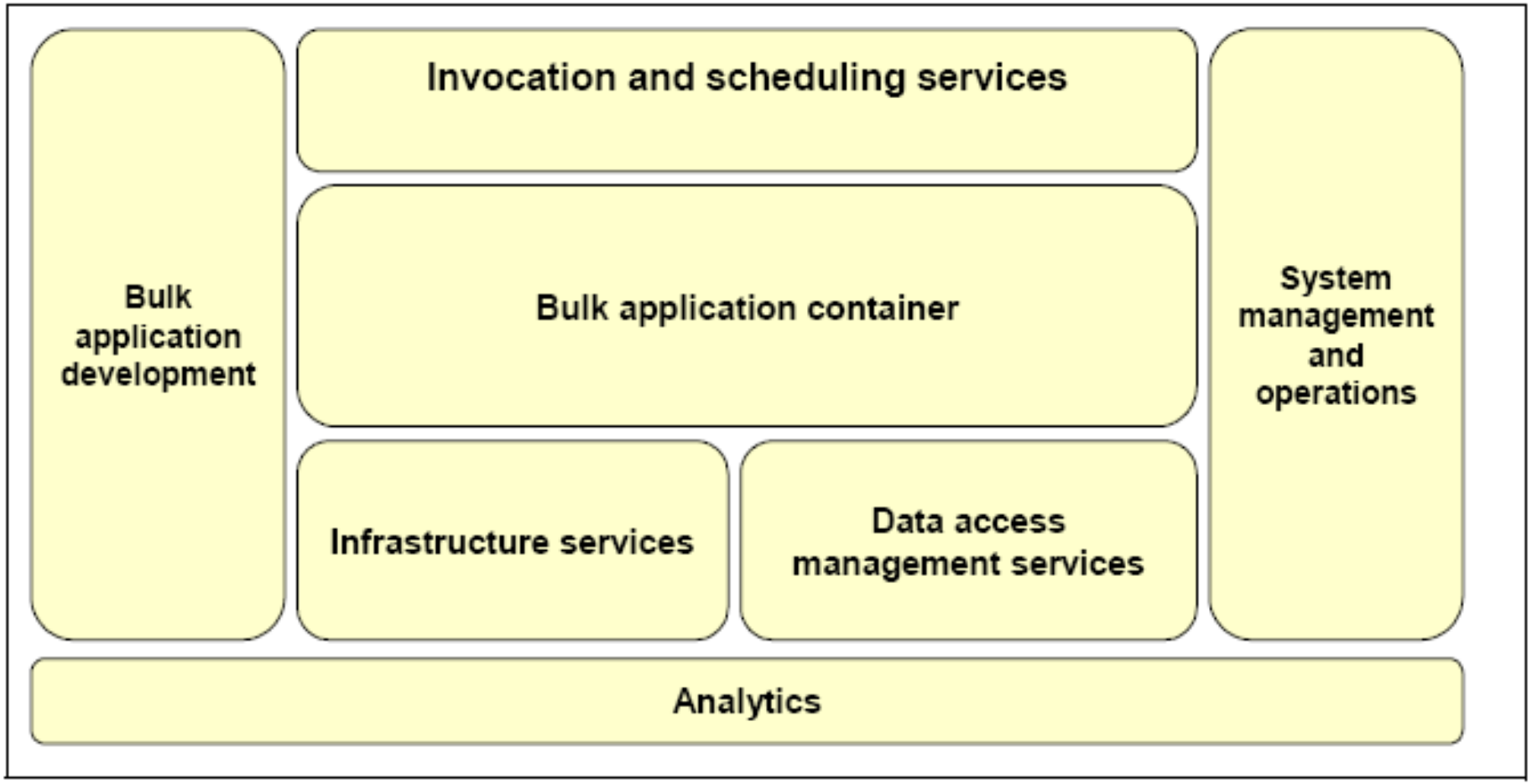
Bulk Reference Framework



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New Technology

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

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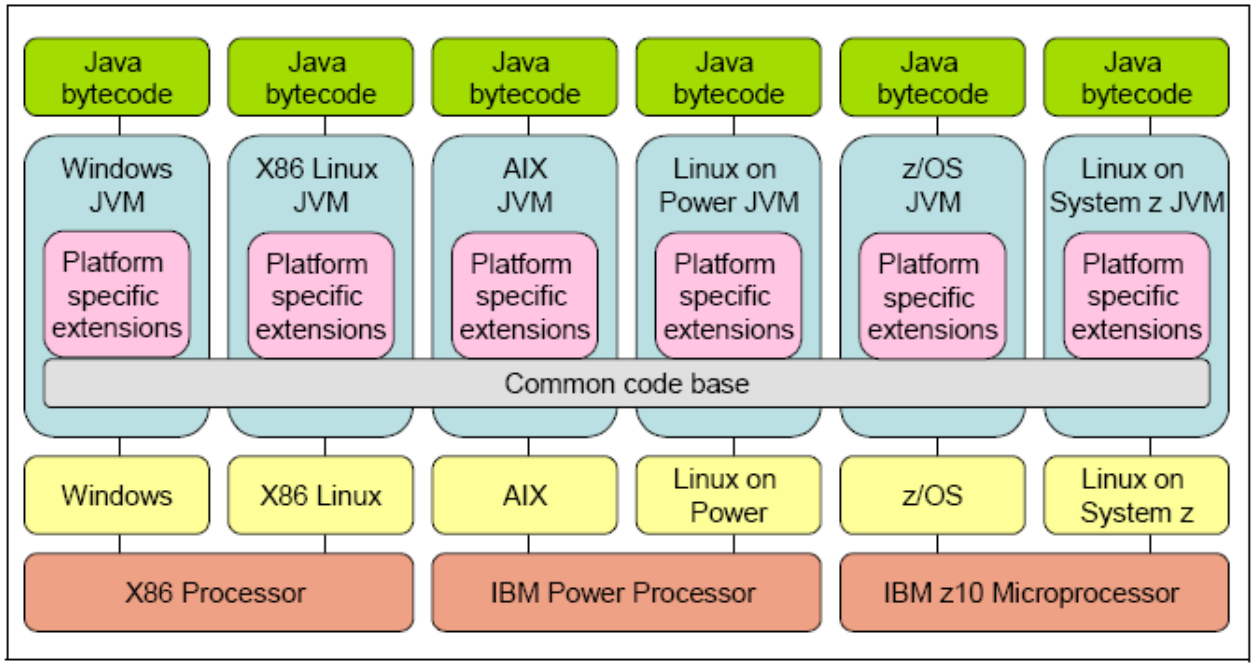
New Technology (cont'd)

- **JAVA**
  - Platform Independence
  - Skills Readily Available
  - zAAP Eligible
  - Multithreading Support



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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
  - http://www.alphaworks.ibm.com/tech/zosjavabatchtk/download
    http://www.ibm.com/servers/eserver/zseries/software/java/products/jzos/jzossamp.html

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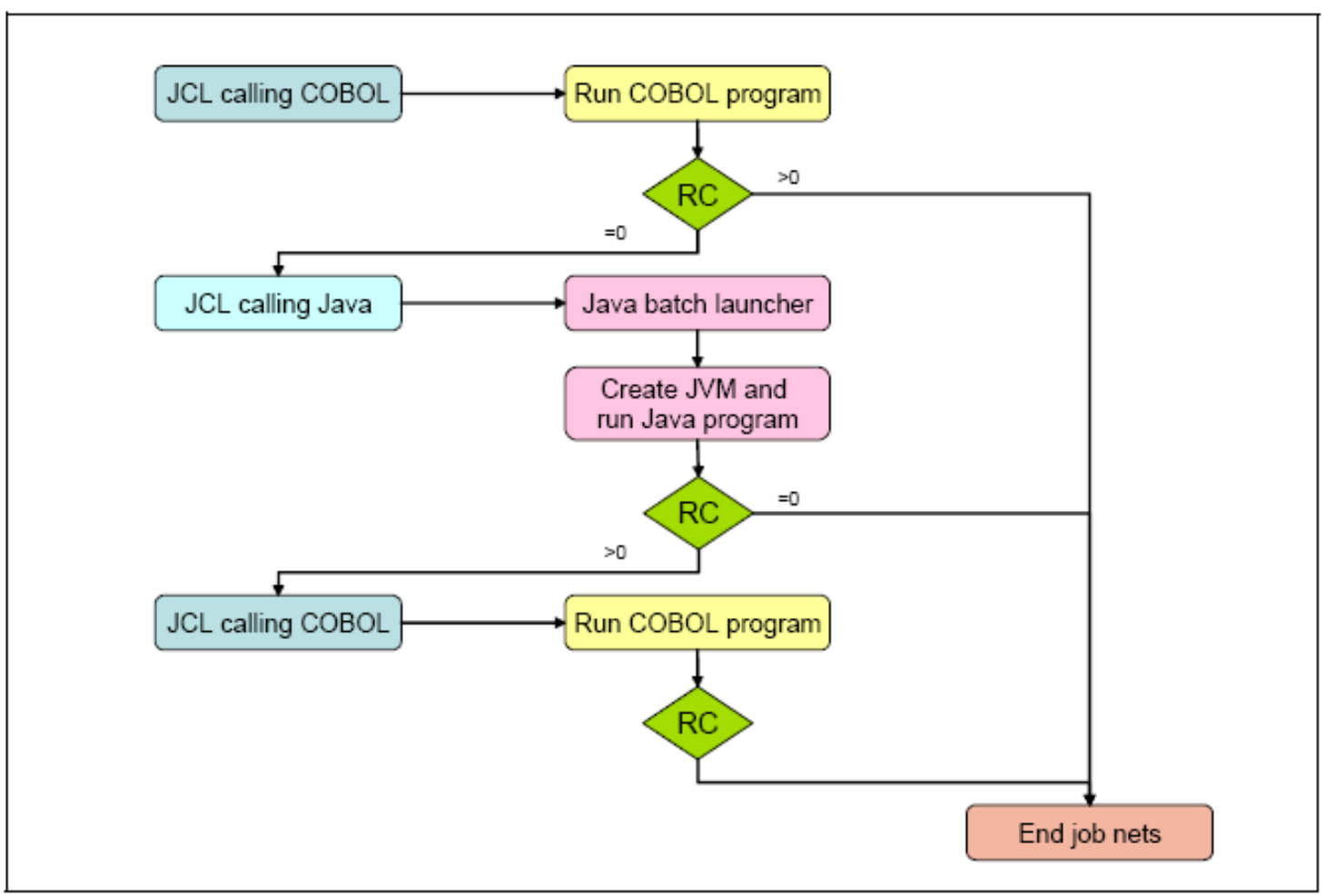
New Technology (cont'd)



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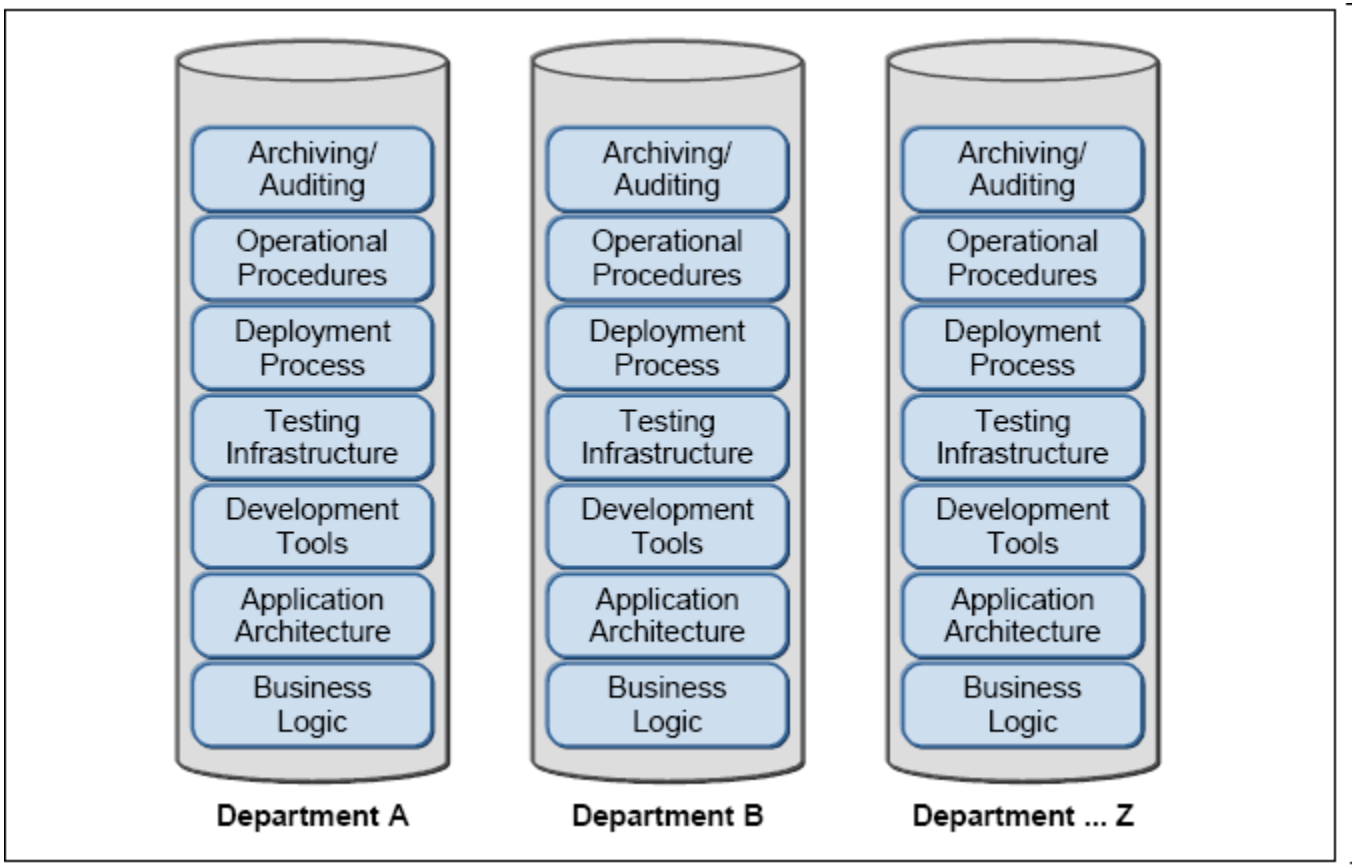
Unified Batch Architecture

- **Traditional Silo Approach**
  - Duplication
  - Lacks Agility (Time to Market)



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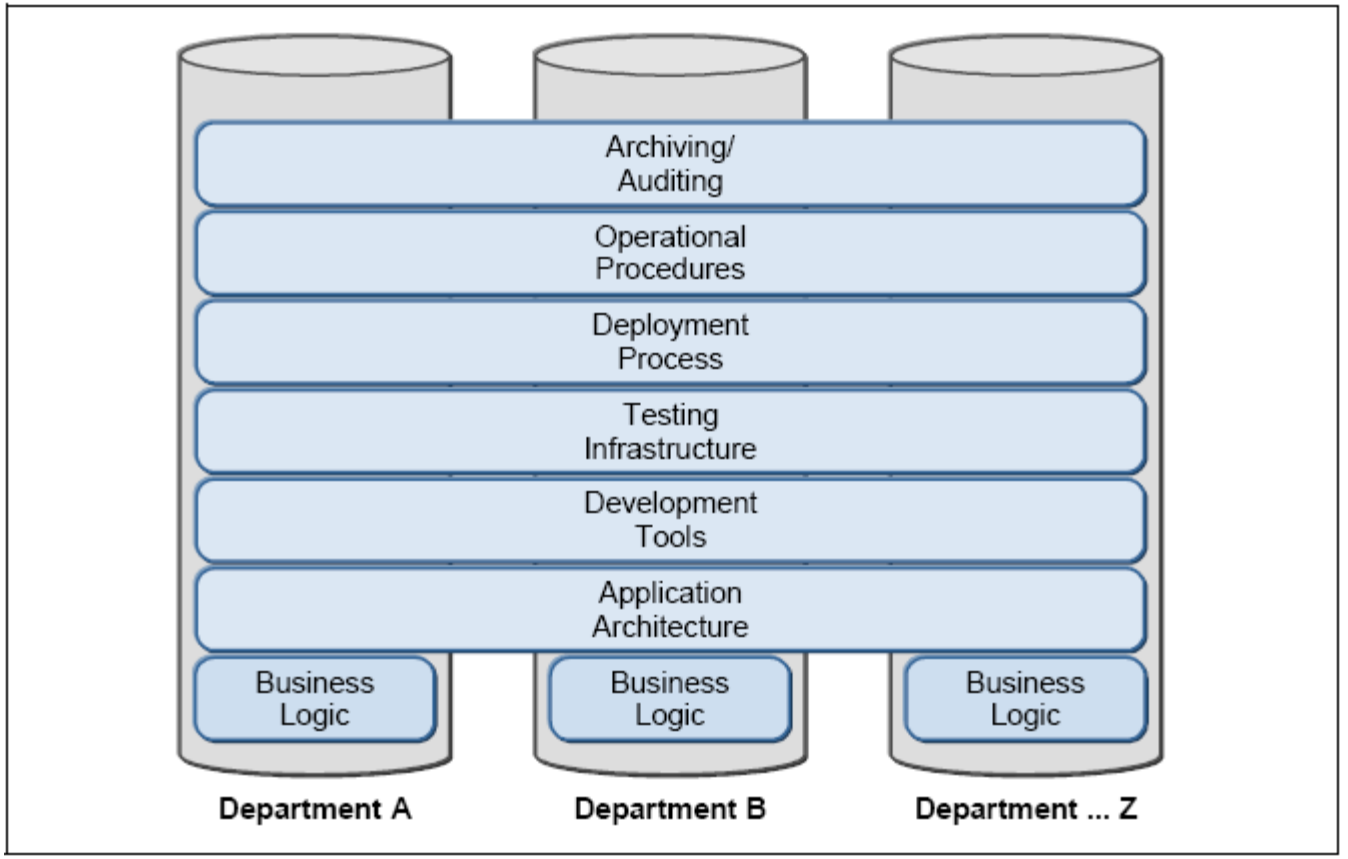
Unified Batch Architecture (cont'd)

- **Unified Approach**
  - Standardized
  - Eliminates Redundancies



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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.

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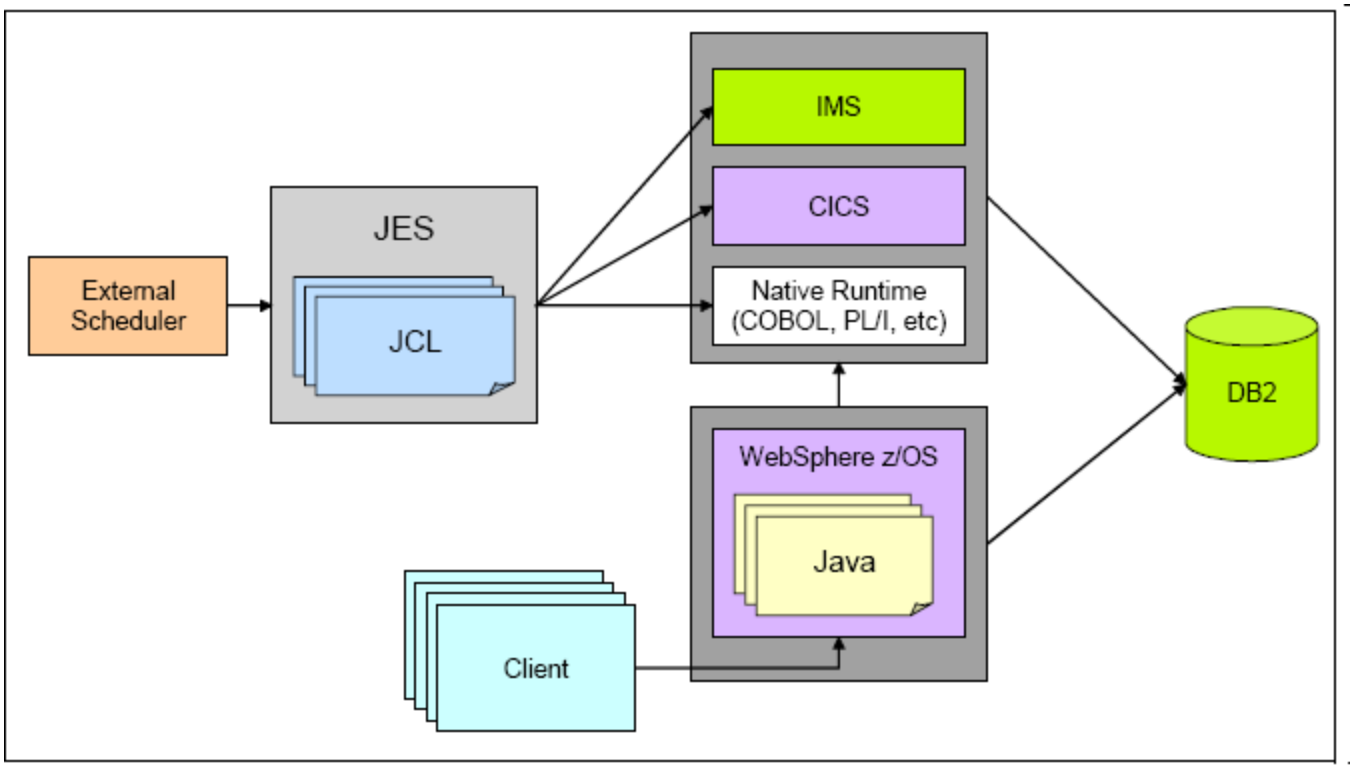
New Technology (cont'd)

Traditional Batch and OLTP in WAS



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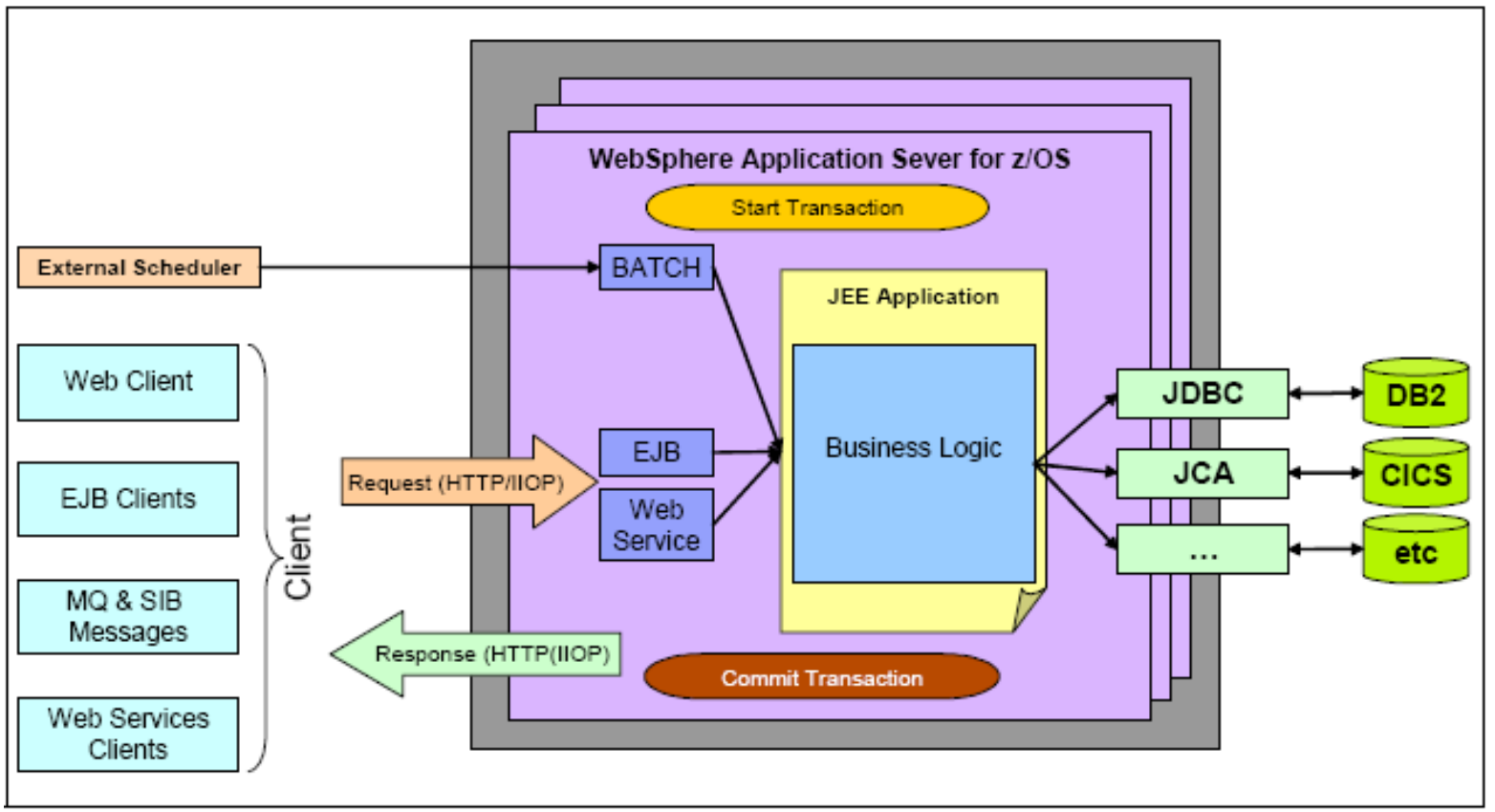
New Technology (cont'd)

Batch and OLTP with WebSphere XD Compute Grid



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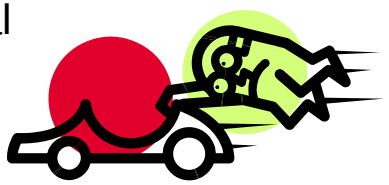
Beyond Sorting - DFSORT

- **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
    - http://www.ibm.com/support/docview.wss?rs=114&uid=isg3T7000091
  - Smart DFSORT Tricks
    - http://www.ibm.com/support/docview.wss?rs=114&uid=isg3T7000094

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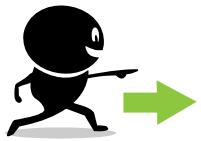

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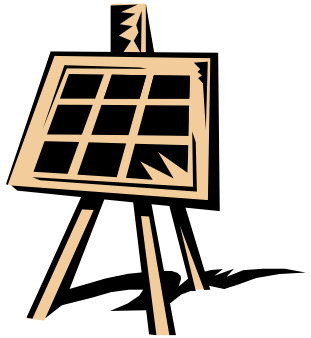

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Undertaking a Batch Study

- **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**

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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

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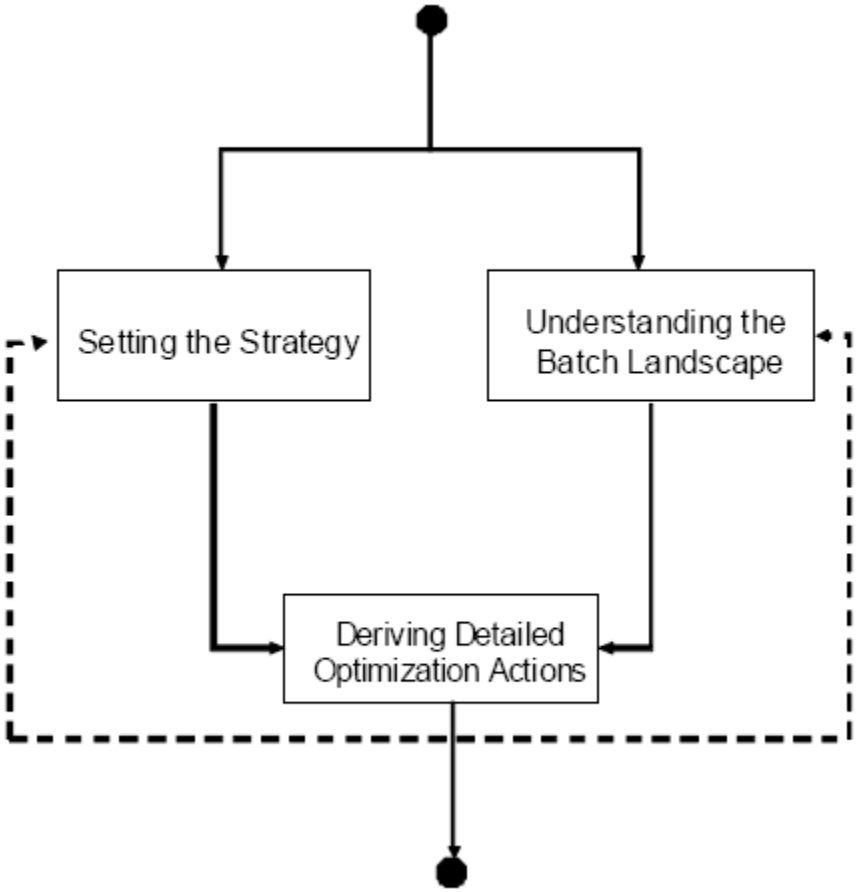
Batch Study Analysis

- **The Big Picture**



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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

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Undertaking a Batch Study (Cont'd)

- **Project Initialization**
  - Objectives
  - Investigate Problem
  - Governance
  - Project Setup
  - Identify Participants
  - Measurement
  - Data Collection

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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

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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?

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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**

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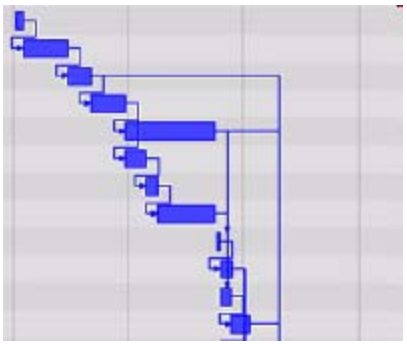
Setting the Strategy – *Parallelism, Failure Impact*

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



- ***Failure Impact Reduction***
  - "Bad" Data
  - "Bad" Programs
  - Swift & Effective Recovery Procedures

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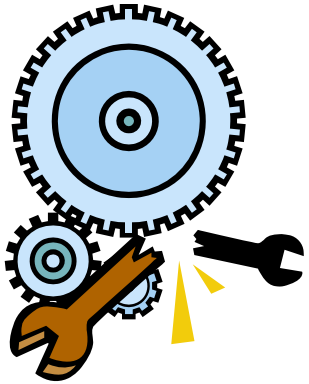
Setting the Strategy – *Ops Effectiveness, Application Efficiency*

- ***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?

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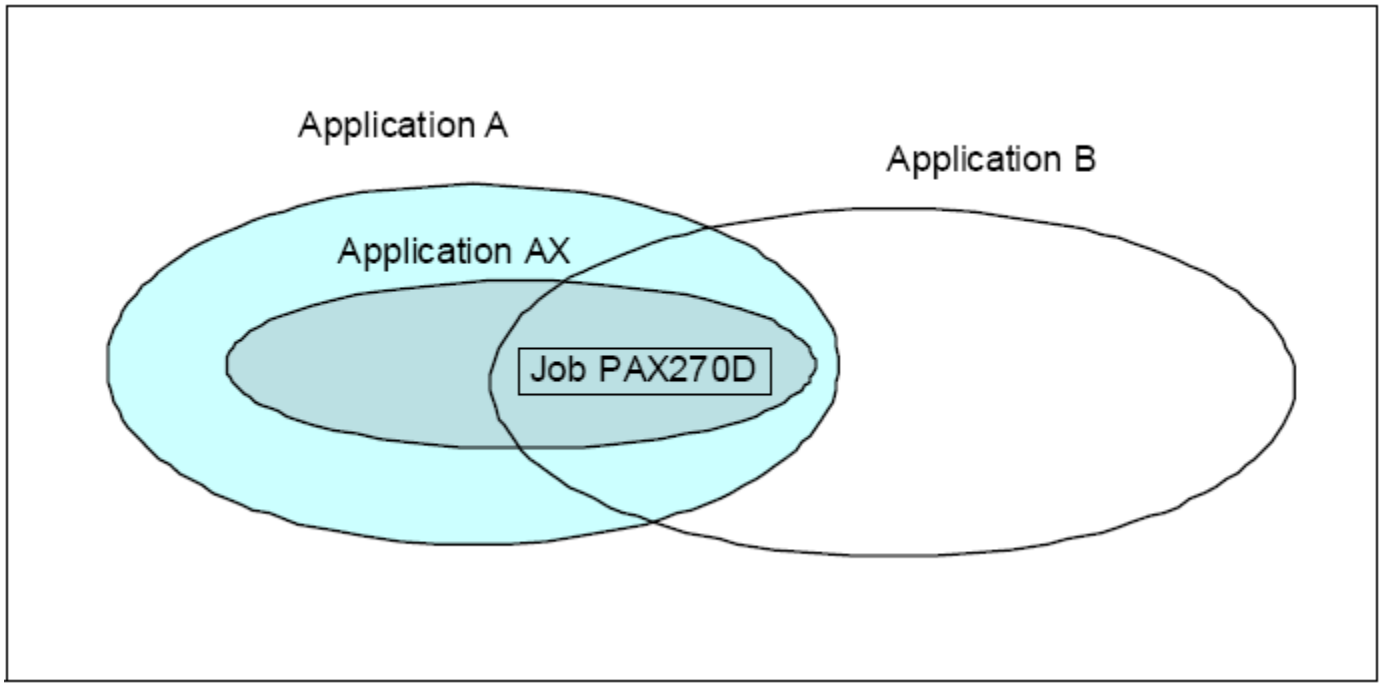
Understanding the Batch Landscape

- ***Complexity***
  - Many, Many Jobs
  - Job Functions
  - Application Ownership/Boundaries



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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

Character Position	Number Of Characters	Meaning
1	1	P for Production D for Development Q for Quality Assurance
2	3	A three-character application name.
5	3	Individual job identifier, typically a number
8	1	D for Daily, W for Weekly, M for Monthly, Q for Quarterly, Y for Yearly, A for Ad Hoc

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Selecting Jobs to Tune

- **Potential Criteria**
  - On Critical Path
  - CPU Intensive
  - Long Running
  - Part of Important Application
  - Prone to Failure

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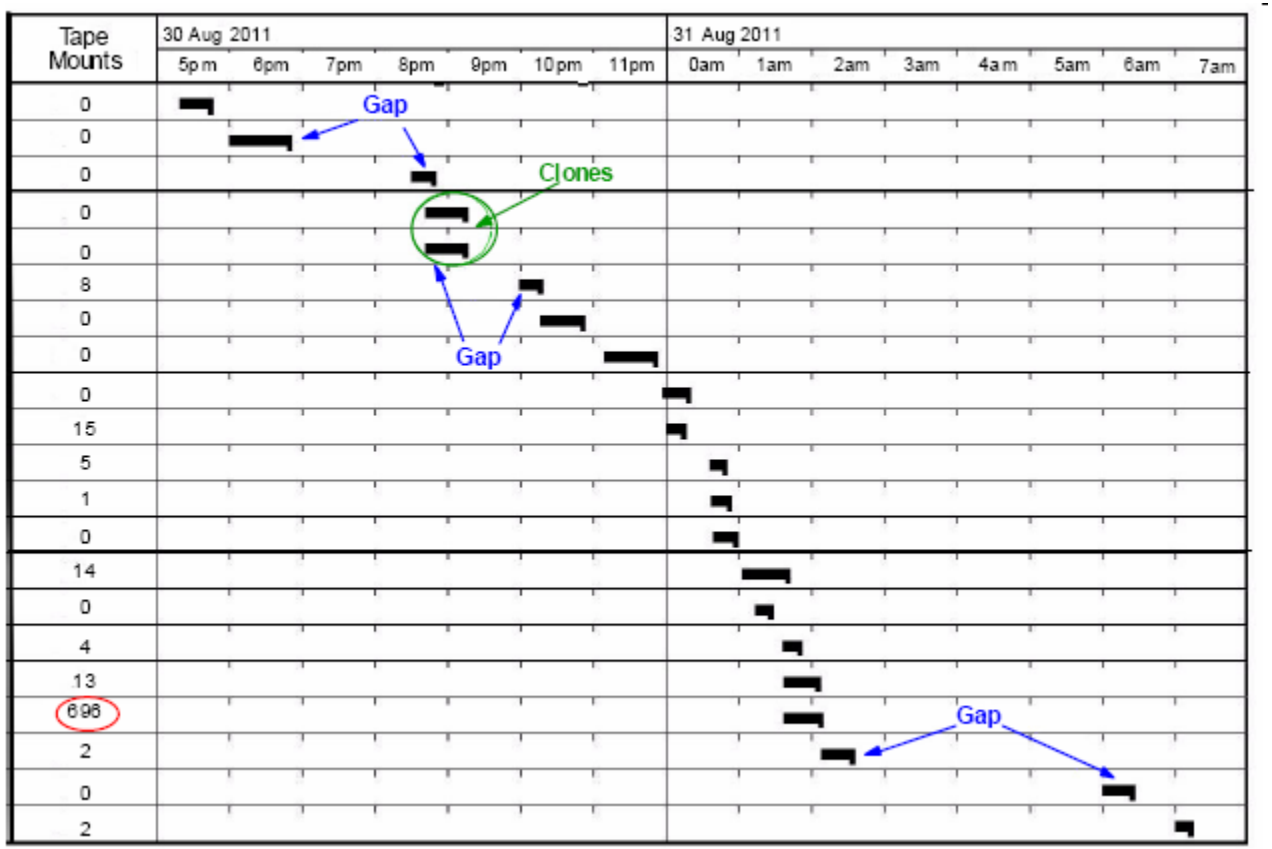
Selecting Jobs to Tune (cont'd)

Gantt Chart



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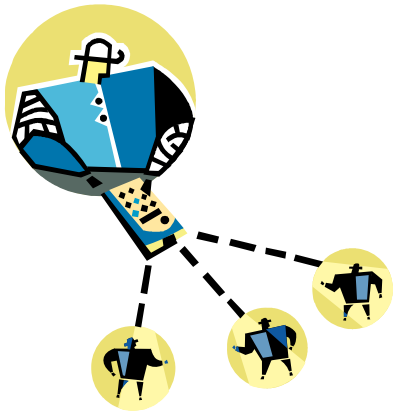
Governance

"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



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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

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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

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

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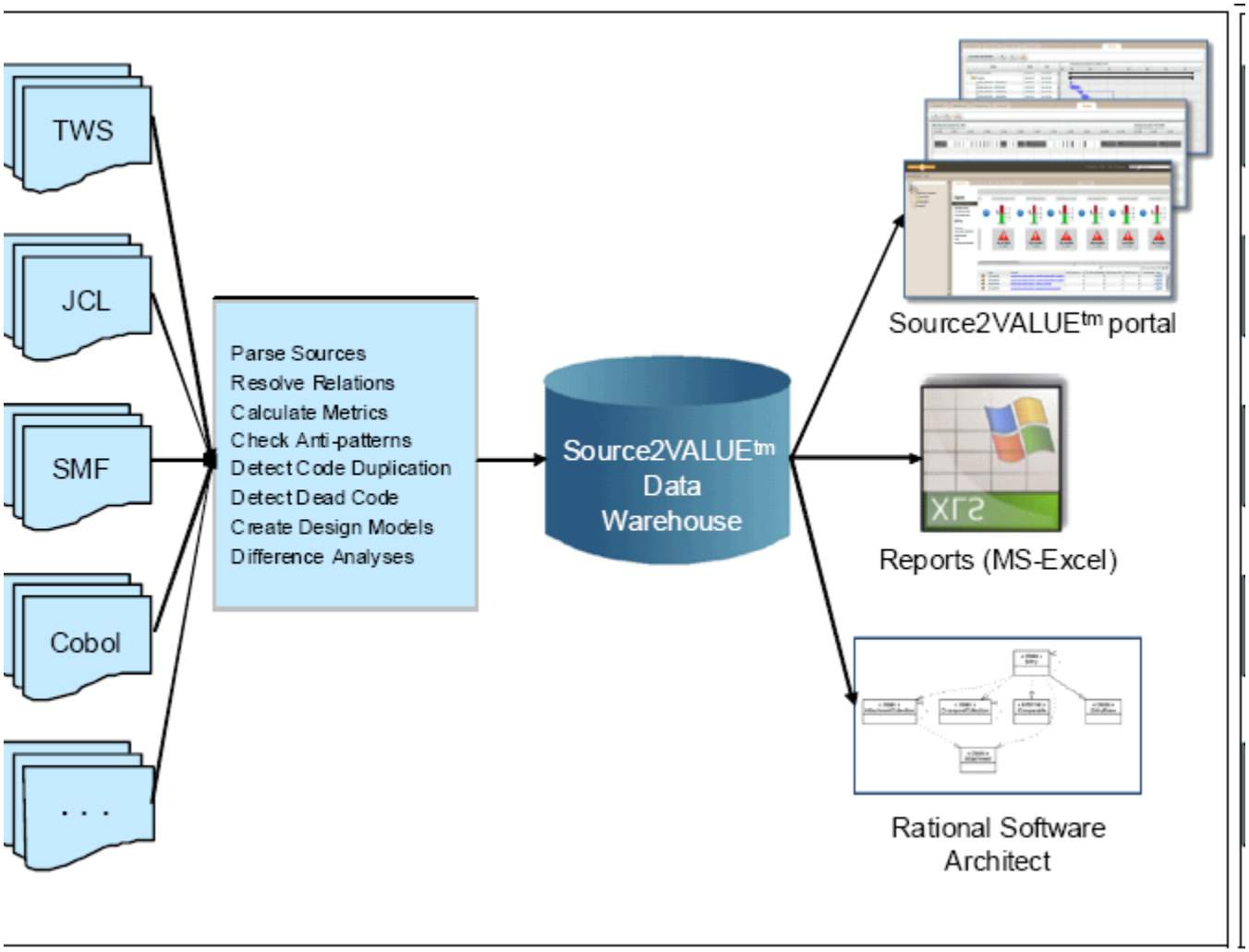
TOOLS



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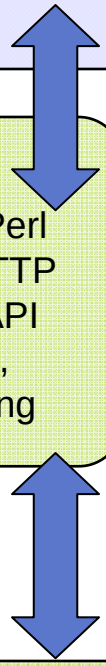
New programmatic interface for z/OS batch

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

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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

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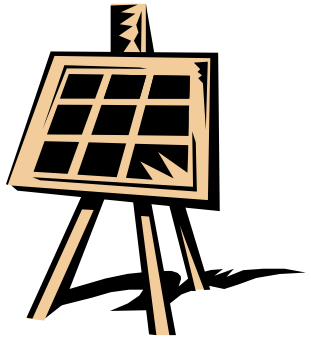
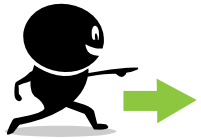
Agenda

- Batch today
- Technology/Modernization
- Batch study – steps/techniques





- **z/OS S.O.D.**

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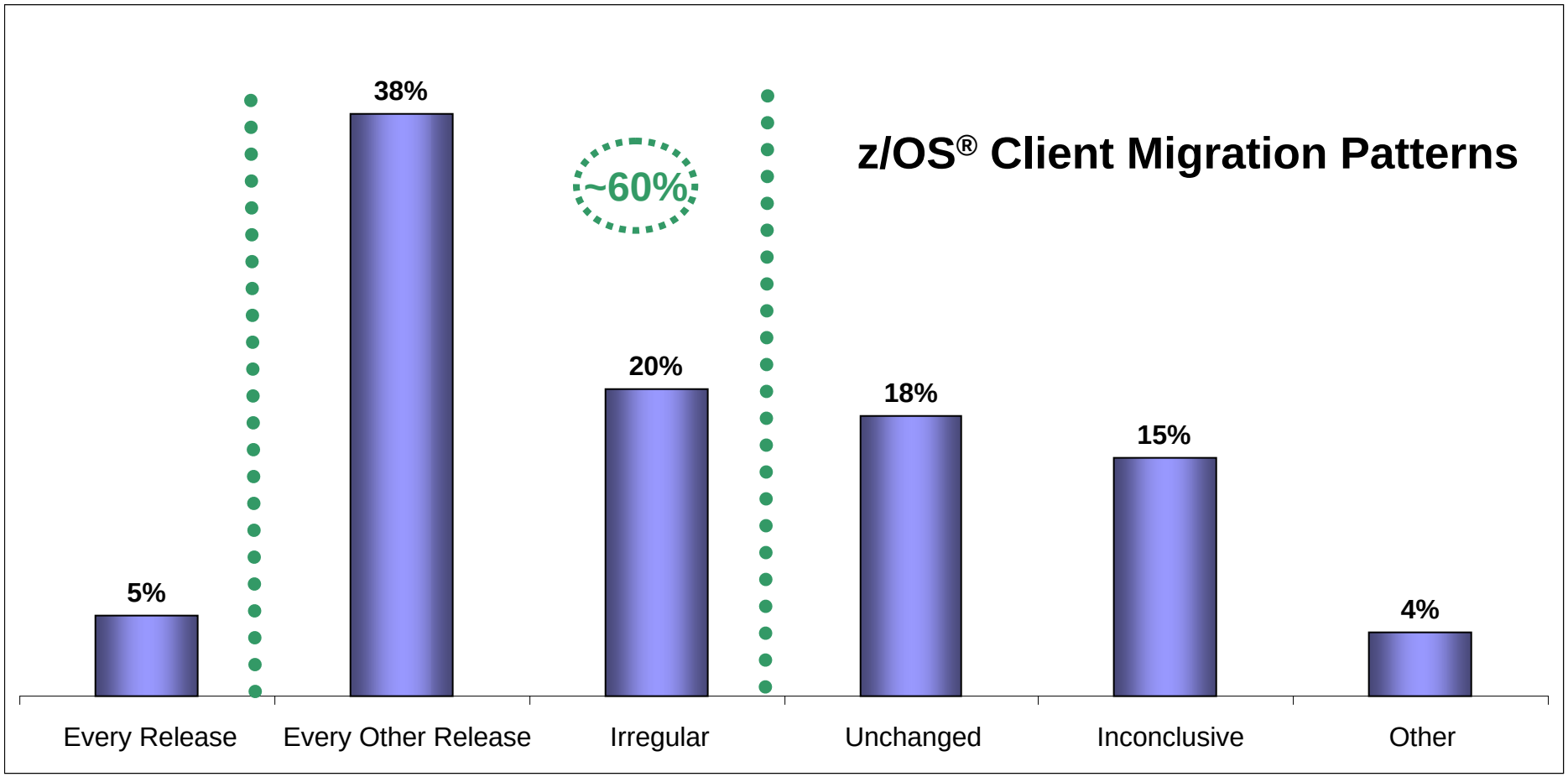
Clients find it difficult to keep pace with our annual releases



*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

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Annual cycles split functions over multiple releases

Functions	z/OS V1.7	z/OS V1.8	z/OS V1.9	z/OS V1.10	z/OS V1.11	z/OS V1.12	z/OS V1.13
Consoles restructuring	X	X		X			
Parallel VARY processing	X	X					
Password phrases		X	X	X			
SMF data to System Logger			X		X	X	X
NFS V4				X	X		
Message Flooding Automation			X	X			X
System REXX™ (SYSREXX)			X		X		
Large (1 MB) pages				X	X	X	
Extended Address Volumes (EAVs)				X	X	X	X
zHPF					X		X
Catalog constraints						X	X

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

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z/OS Version 2 Statement of Direction April 11, 2012

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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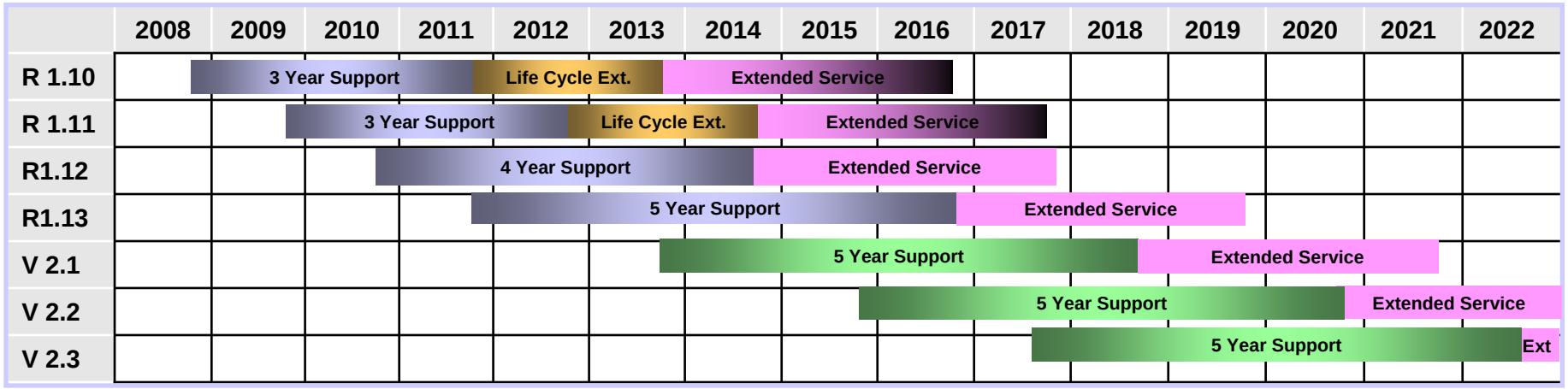
Support and Service Changes

- 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



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IBM Lifecycle Extension for z/OS V1.11

IBM Lifecycle Extension for z/OS V1.11 offers an optional fee-based corrective service for users who have not completed migration from z/OS V1.11 to z/OS V1.12 or z/OS V1.13

- 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.

Learn More: http://www.**ibm.com**/systems/z/os/zos/

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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
    http://www-01.ibm.com/common/ssi/rep_ca/6/897/ENUS212-086/ENUS212-086.PDF

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

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