# Saving CPU time with IMS database administration
## Optimize Workload Performance with IBM IMS Tools

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# Managing IMS Systems: Performance

IMS is a core platform for daily business

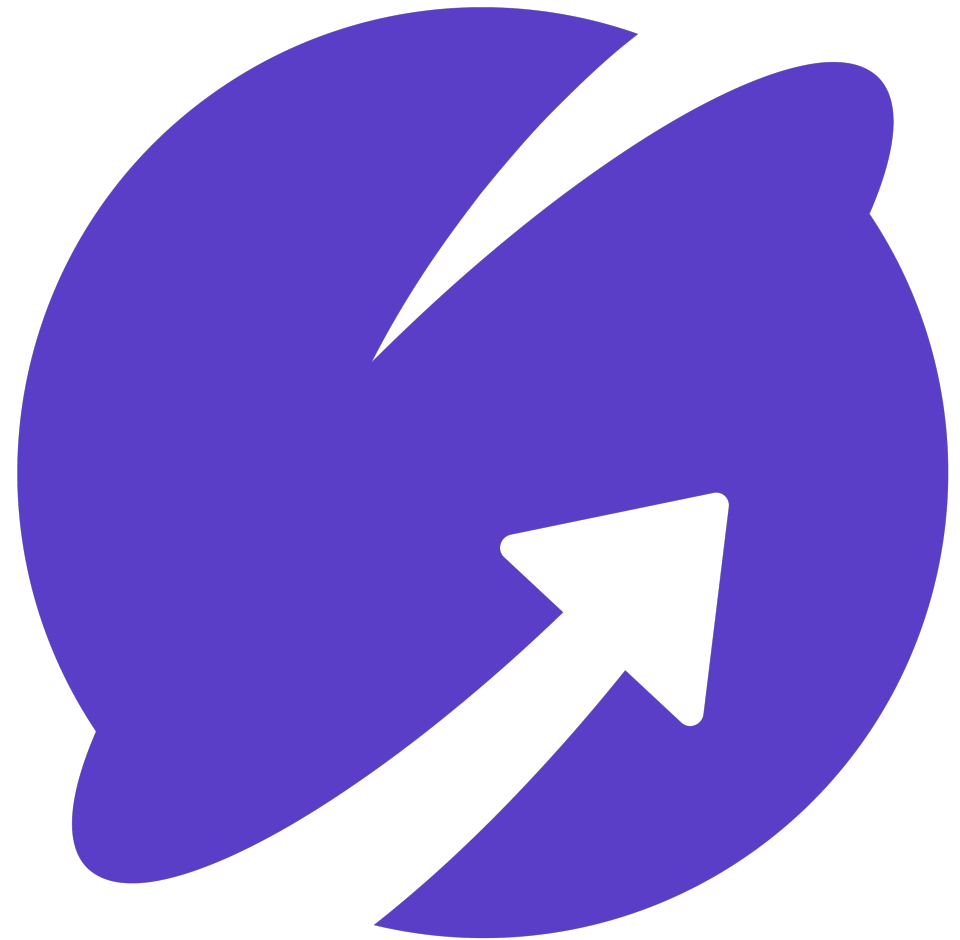*Healthy IMS systems and data are mission critical*

- *IMS DB*

- *IMS TM*

- *IMS ETO*

Managing today's IMS systems requires modernization focused on:

- **Performance / Efficiency**

- Autonomics and automation

- Analytics

- Ease of use

Efficient processing

# Efficiency of Tools versus Utilities provided by IMS

- **Reduced MSUs** for database maintenance tasks
  - Database unload
    - Database reorgs to improve database performance
    - Export data for use in other applications or analytics
  - Database load
    - Database reorgs to improve database performance
  - Database image copy
    - Backup and recovery
  - Index building
    - Improve efficiency of IMS by rebuilding indexes and fast path secondary indexes
    - Marks indexes non-recoverable
      - » IMS can skip logging them
- In addition, some **zIIP offload**

**IMS High Performance Database Tools**

Available:

- ➢ Standalone products
  - o IBM IMS High Performance Unload for z/OS
  - o IBM IMS High Performance Load for z/OS
  - o IBM IMS High Performance Image Copy for z/OS
  - o IMS Index Builder for z/OS
- ➢ IMS Database Utility Solution for z/OS
  - o For offline reorgs
- ➢ IMS Database Solution Pack for z/OS
  - o For online reorgs
- ➢ IMS Fast Path Solution Pack for z/OS
  - o For fast path databases (DEDBs)

# Single step IMS database reorganization

## Unique value

– IMS DBAs **improve productivity** with single job step

– **Reduced MSU consumption** with single job step

  • Avoid file I/O by each standalone utility

    – Data is passed in memory between each step

  • Avoid startup and shutdown of each job step

– Some **zIIP offload**

**IBM IMS Database Reorganization Expert**

Available:

➢ Standalone product

➢ IMS Database Utility Solution for z/OS

  ○ For offline reorgs

➢ IMS Database Solution Pack for z/OS

  ○ For online reorgs

# Buffer pool analysis and tuning

**IBM IMS Buffer Pool Analyzer for z/OS**

Available as standalone product

## Unique value

– Improves **operational efficiency** of databases

- Helps DBAs easily understand (in)efficiency of current settings

- **Recommends** new settings to improve operational efficiency of each database

- Simple enough to use often

  – **Continue tuning** as database characteristics change over time
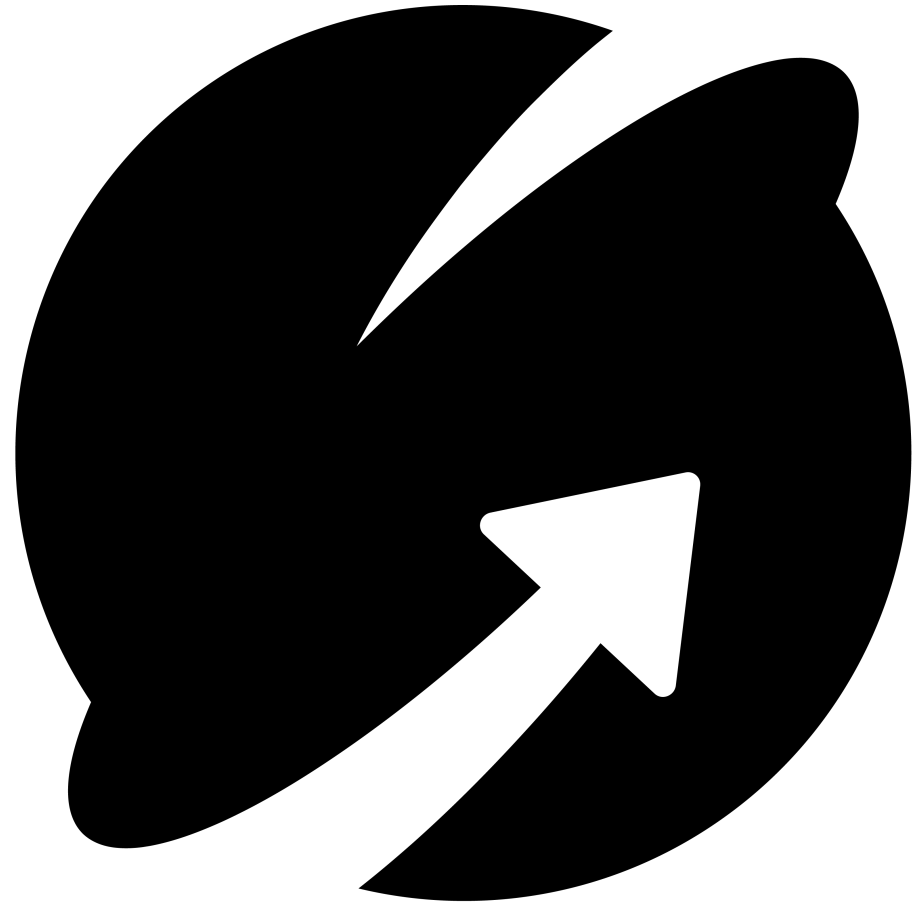
# Cloning IMS databases

## Unique value

– **Quickly** refresh or **create test databases**

- Create consistent copies of databases with **no database outage**
- **Mask data** during cloning process

– **Fast replication** technologies supported

- **Reduced MSUs**
- Offload processing to storage devices

– **More efficient** over traditional methods

- Image copy
- Recovery
- Index rebuild

**IBM IMS Cloning Tool for z/OS**

Available as standalone product

Task reduction or avoidance

# Index building vs image copies

- **Eliminate MSU consumption** for backing up database indexes
  - Avoid image copies of:
    - Index data sets for full function databases
    - Fast path secondary index (FPSI) data sets for fast path databases (DEDBs)
- Instead
  - During recovery
    - Rebuild indexes for full function databases
    - Rebuild FPSI for DEDBs if recover to previous point in time
  - Database reorg
    - Avoid pointer healing for HALDBs
      » Pointer healing consumes MSUs and prolongs DL/I call
    - Clean up FPSI for DEDBs if purging records, etc.

**IMS Index Builder for z/OS**

Available:

➤ Standalone products

➤ IMS Database Utility Solution for z/OS
   o For offline reorgs

➤ IMS Database Solution Pack for z/OS
   o For online reorgs

➤ IMS Fast Path Solution Pack for z/OS
   o For fast path databases (DEDBs)

# Conditional database reorganizations

– **Eliminate MSU consumption** for database reorganizations that will not add value

- Ad-hoc scheduling
  – DBAs schedule database reorgs based on reports provided by Tools

- Recurring schedule
  – Each database reorg remains in or is added to schedule
  – Tools gather characteristics and metrics about each database
  – When reorg scheduled, data points analyzed to determine if reorg will add value
    » Skip and report if no added value
    or
    » Continue with reorg and report if value-add

**IBM IMS Database Reorganization Expert**

Available:

➤ Standalone product

➤ IMS Database Utility Solution for z/OS
  o For offline reorgs

**IBM IMS Online Reorganization Facility**

Available:

➤ IMS Database Solution Pack for z/OS
  o For online reorgs

**IBM IMS Online Expert Reorganization**

Available:

➤ IMS Fast Path Solution Pack for z/OS
  o For fast path databases (DEDBs)

*Customer experienced **85%** reduction in IMS database reorganizations using default criteria provided with the product*

# Backup and recovery methodology

- Traditional image copies for backup processing (with Tools)
  - **Fast replication** technologies
    - **Reduced MSU** consumption
    - Offload processing to storage devices
  - Some zIIP offload
- More efficient *System Level Backup*
  - Reduced frequency of image copies for each database
  - Full IMS system or data only
  - Multiple IMS systems
  - **Fast replication** technologies
    - **Reduced MSU** consumption
    - Offload processing to storage devices

**IBM IMS Image Copy for z/OS**

Available:

➢ Standalone

➢ IMS Recovery Solution Pack for z/OS

➢ All database-related solution packs

**IBM IMS Recovery Expert for z/OS**

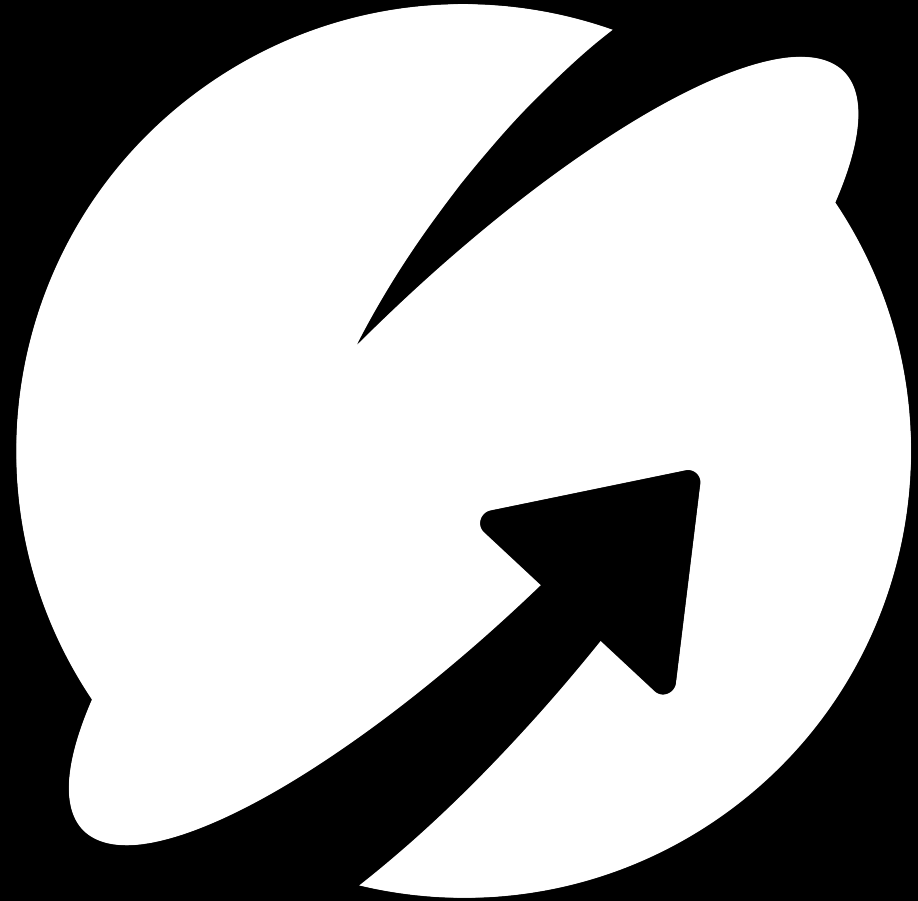Available:

➢ IMS Recovery Solution Pack for z/OS

# Checkpoint processing

– **Eliminate MSU consumption** for **unnecessary** application driven checkpoints

- Customer applications written when Z processors were much slower

- With faster processors, **checkpoints** often taken too frequently, **consuming system resources**

- Tools **reduce checkpoint processing** based on customer-specified options

  – Settings easily updated as Z processors continue to improve

  – <u>No application changes</u>

**IBM IMS Program Restart Facility for z/OS**

Available as standalone product

# Report and Model

# IMS performance reporting and diagnosis

– **Understand MSU consumption**

- IMS and IMS Connect

- Summary and detailed reporting

- Highly customizable

- Samples included to get started

– **Deep dive analysis** by transaction to reveal hot spots or problem areas

– Based on IMS log and IMS Connect Extensions journal

- Minimal SMF data for IMS

**IBM IMS Performance Analyzer for z/OS**

**IBM IMS Problem Investigator for z/OS**

**IBM IMS Connect Extensions for z/OS**

Available:

➢ Standalone products

➢ IMS Performance Solution Pack for z/OS

# Model and test IMS workloads

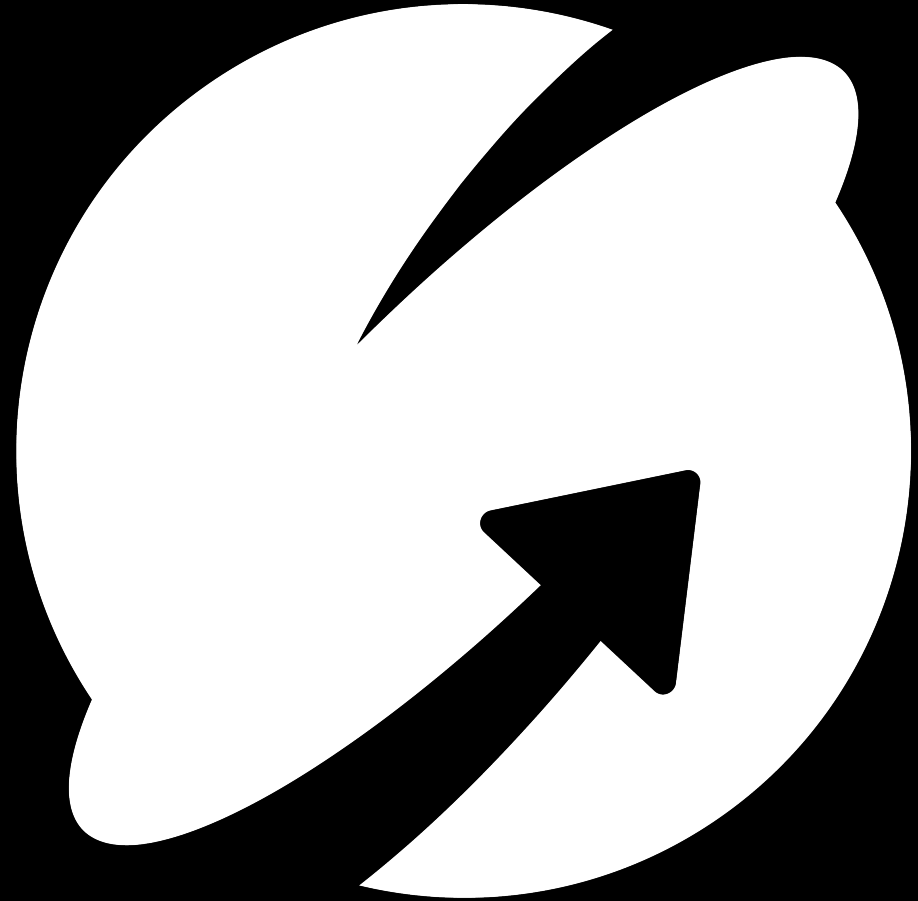– **Understand MSU consumption**

- **Replay production workloads** in performance test environment

  – Configured differently

  – Planning application changes

- Modify rate of transactions through pacing

- **Measure results** with performance reporting

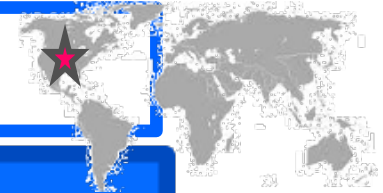**IBM IMS Queue Control Facility for z/OS**

Available:

➤ Standalone product

➤ IMS Transaction Manager Solution Pack for z/OS

Customer experiences

# Performance Issue on Busy Database

**The Situation:**
- Single database with <u>millions</u> of accesses per day
- When database down, revenue lost
- Response time critical but increasing
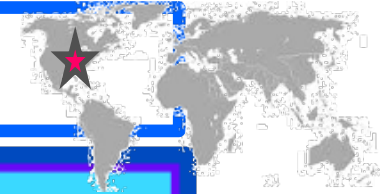- Requested health check

**IMS Buffer Pool Analyzer**

## Initial request
- **Health check indicated database not tuned properly**
- **Size of database dramatically increased since originally configured**

## Final solution
- **Analyzed buffer pools and implemented recommended changes**
- **Improved response time**
- **Reduced I/O**
- **Continued monitoring/tuning as database changes**

# Unnecessary Reorgs and DB Growth

**The Situation:**

- Growing IMS usage due to client growth
  - Increased transaction volume, database contention, batch processing times
- Architectural limits reached on existing partitioned databases
- 24x7 becoming a requirement

**IMS Database Solution Pack**

## Initial environment

- Only 5 most critical databases reorganized each day
- Reorgs done regardless of need
- 30 mins downtime per month in production

## Final solution

- **Conditional reorg**
  - Automatically gather DB info
  - Reorgs scheduled as usual
  - Reorg only executed if meets criteria
    - 85% reduction in reorgs
    - Using IBM default criteria

# Test Workload in Various Environments

## The Situation:
- IMS Transaction Manager with IMS & Db2 databases
- Planning move from non-Sysplex to Sysplex environment
- Need to understand impact of workload in new environment
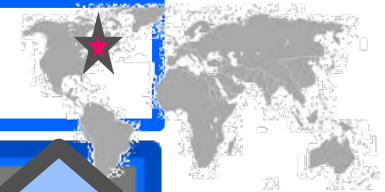
**IMS Queue Control Facility**

### Initial request
- Test workload in future Sysplex environment
- Workload during tests must reflect real (production) environment

### Final solution
- Replay the IMS log from a non-Sysplex Production environment to a Test Sysplex environment
- Split and pace playback of transactions across test Sysplex

# Database Reorganizations

**The Situation:**
- Offline reorgs using base utilities in IMS
- Database sizes continued to grow
- Batch window reduced due to business demand
- Reorgs taking longer than batch window allowed
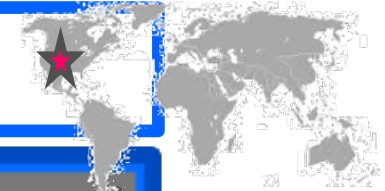
**IMS HP Unload
IMS HP Load**

## Initial request

- **Reduce offline reorg processing time**

## Final solution

- **HP Tools for Unload and Load**
- **Results consistent with lab benchmarks**
  - **3.5x faster**
  - **70% less CPU time**

# Production-like Test Environments

**The Situation:**
- Merger of two large companies
- Need to merge workload into a single environment
- Application changes required
- Minimal existing procedures to create test environments
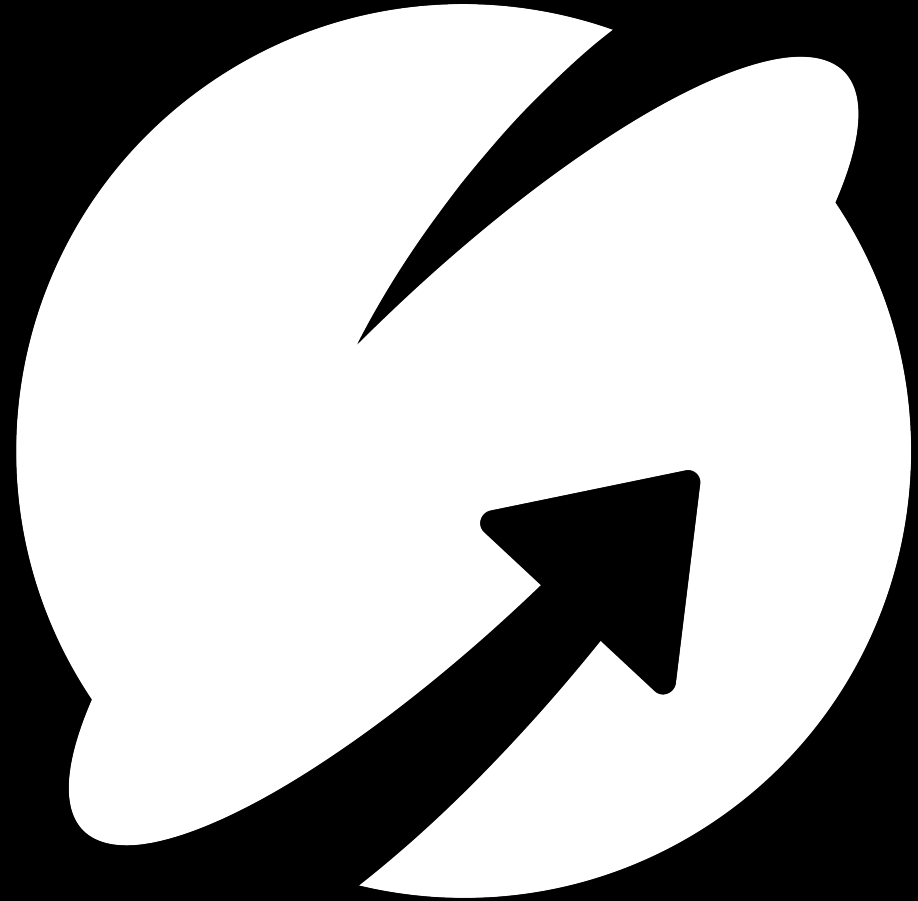
**IMS Cloning Tool**

### Initial request

- Develop and optimize test environment and data creation
- <u>No impact</u> to production environment
- Keep test environment up to date

### Final solution

- Copy all production DBs and indexes
  - Point in time 'fuzzy copy'
  - No production DB outage
- Bring test up to date with production via log updates
- Refresh test environment in minutes
- Include masking of data

Resources

# Related hands-on labs available

- IMS Performance Analyzer: *Customized (form-based) reporting*

- IMS Problem Investigator: *Analyzing and IMS/Db2 transaction problem*

- IMS Connect Extensions: *Splunk dashboards*

- IMS Database Reorganization Expert: *Conditional reorg*

# Resources: IBM IMS and IMS Tools

IMS Tools website
www.ibm.com/it-infrastructure/z/ims/tools

IMS Fundamentals videos:
https://mediacenter.ibm.com/playlist/dedicated/139456202/0_o46903ao/0_beoagp8k

IMS Tools Product Documentation
www.ibm.com/support/docview.wss?uid=swg27020942

IMS newsletter
Sign up: ibm.biz/IMS_eNews

**IMS Tools new functions**
**www.ibm.com/support/docview.wss?uid=swg22015506**

**IMS Tools support for IMS V15**
**www.ibm.com/support/docview.wss?uid=swg22009341**

**IMS Tools support for Managed ACBs**
**www.ibm.com/support/docview.wss?uid=ibm10731745**

**IMS Tools support for Data Set Encryption**
**www.ibm.com/support/docview.wss?uid=ibm107333513**

**Article in Enterprise Executive: The Modern IMS Ecosystem**
**ourdigitalmags.com/publication/?i=644521**

**IMS Tools Videos on IBM MediaCenter** (no new videos on Youtube)
**https://mediacenter.ibm.com/esearch/search?fields=all&sortBy=updatedAtDesc&keyword=%22IMS%20tools%22**

**IMS new functions**
**www.ibm.com/support/knowledgecenter/en/SSEPH2_15.1.0/com.ibm.ims15.doc.rpg/ims_cd_functions.htm**

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धन्यवाद
Hindi

감사합니다
Korean

多謝
Traditional Chinese

Спасибо
Russian

*Thank You*
English

Gracias
Spanish

**Ndzi khense ngopfu**
Tsonga

Grazie
Italian

Obrigado
Brazilian Portuguese

Hvala Lijepa
Croatian

شكراً
Arabic

Danke
German

多谢
Simplified Chinese

ขอบคุณ
Thai

**Ke a leboha**
Tswana

Merci
French

நன்றி
Tamil

ありがとうございました
Japanese

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