Autonomics for Your IMS Databases

Nick R. Griffin
IMS Product Manager
"Civilization advances by extending the number of important operations which we can perform without thinking about them."

- Alfred North Whitehead

This quote made by the preeminent mathematician Alfred Whitehead holds both the lock and the key to the next era of computing. It implies a threshold moment surpassed only after humans have been able to automate increasingly complex tasks in order to achieve forward momentum.
Definition of “Autonomic”

› “Autonomic” according to Merriam-Webster:
  • au·to·nom·ic
    1: acting or occurring involuntarily <autonomic reflexes>
    2: relating to, affecting, or controlled by the autonomic nervous system or its effects or activity
    <autonomic drugs>

› A better word is “autonomous” (according to Merriam-Webster) :
  • au·ton·o·mous
    1: of, relating to, or marked by autonomy
    2 a: having the right or power of self-government  b: undertaken or carried on without outside control : SELF-CONTAINED <an autonomous school system>
    3 a: existing or capable of existing independently <an autonomous zooid>  b: responding, reacting, or developing independently of the whole <an autonomous growth>
    4 : controlled by the autonomic nervous system

› Autonomic Computing - is an initiative started by IBM in 2001. Its ultimate aim is to develop computer systems capable of self-management, to overcome the rapidly growing complexity of computing systems management, and to reduce the barrier that that complexity poses to further growth. (From Wikipedia)
In a self-managing system Autonomic System, the human operator takes on a new role: He does not control the system directly. Instead, he defines general policies and rules that serve as an input for the self-management process. This process is defined by the following four functional areas:

- Self-Configuration
- Self-Healing
- Self-Optimization
- Self-Protection
Self-contained Software

How does software become self-contained?

- **Self-configuring - Automatic configuration of components**
  - able to discover the environment around it
  - able to adapt to changes in the environment

- **Self-healing - Automatic discovery, and correction of faults**
  - able to recover from mistakes
  - able to make adjustments to settings if expected results aren’t achieved
  - able to seek alternative routes to accomplish goal

- **Self-optimizing - Automatic monitoring and control of resources to ensure the optimal functioning with respect to the defined requirements**
  - able to improve performance
    - by making adjustments to environment (reactive)
    - by making adjustments to itself (adaptive)

- **Self-protecting - Proactive identification and protection from arbitrary attacks**
  - able to anticipate and cure intrusions/problems
### Evolving to Autonomic Computing

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Basic Level 1</th>
<th>Managed Level 2</th>
<th>Predictive Level 3</th>
<th>Adaptive Level 4</th>
<th>Autonomic Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple sources of system generated data</td>
<td>Requires extensive, highly skilled IT staff</td>
<td>IT staff analyzes and takes actions</td>
<td>IT staff approves and initiates actions</td>
<td>IT staff manages performance against SLAs</td>
<td>Integrated components dynamically managed by business rules/policies</td>
</tr>
<tr>
<td>Source: IBM IMS teleconference Dec ’03</td>
<td>Greater system awareness, Improved productivity</td>
<td>Reduced dependency on deep skills, Faster/better decision making</td>
<td>Balanced human/system interaction, IT agility and resiliency</td>
<td>Business policy drives IT management, Business agility and resiliency</td>
<td></td>
</tr>
</tbody>
</table>

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How do we get there?

1. Monitor
2. Analyze
3. Feedback
4. Exploit

Scheduled Process
Execution
Statistical Repository
Problems
DELTA Change
Optimizations
Adjustments
Autonomics: Our Hopes and Dreams

› High-Level
  – Junior DBA able to handle open-ended tasks
  – Let humans stay at the policy level
  – Programming language for systems
  – Just enough (and not too much) detail in reports
  – Natural language processing for instructions and reports

› Low-Level
  – Have it learn to automate what I do repeatedly (high-tech macro recorder/player)
  – Build and share best practices
  – No downtime!
Benefits of Automation

› Reduces the amount of time, error, and human effort required to implement and maintain efficient database systems

› Gives expert DBAs more time to concentrate on aligning databases with the business, new technology, planning and strategy

› Provides a means to train novice DBAs through learning what has been automated
Database Performance for IMS

- MAXM Database Advisor for IMS - What is it??

  MAXM Database Advisor is a new IMS solution that provides **proactive and intelligent** automated management of the database maintenance/reorganization process.

**Key Features**

- Auto-Discovery
- Proactive Notification
- Conditional Reorg
- Statistics / History
- Database Management Console
Current IMS Environment

- IMS Databases and systems spread across the globe.
- Small DBA workforce maintaining the databases.
- Always in a reactive mode.
Proactive database management

› Looming database problems show up on “Radar Screen”

› Users have time to react and avoid disasters
  Poor performance
  Out of space
  Database outage

› Increase productivity
› Meet SLAs
› Save time and $$$
Proactive database management
MAXM Database Advisor for IMS

- MAXM Database Advisor for IMS – How it works
  - Stand-Alone Solution for ANY IMS Customer
  - Solution covers the entire database maintenance cycle
    - Gather data, analyze data, report on analysis, schedule work based on analysis
  - Interrogates data collected by BMC Utilities or Advisor Collector and makes recommendations to correct any problems identified
  - Does not require ANY other BMC Solutions – but provides move value if you have a MAXM REORG Solution

Auto-Discover

Recommend & Execute Solutions

MAXM REORG SOLUTIONS

Database Repository

Data Collector

INTELLIGENCE
FULL FUNCTION - Database State – I/O Performance
Integrated with database Utilities

- Statistics collected from database utility runs
- Automatic data collection when necessary

- **Conditional Reorg - Full Function Feature - Prevents unnecessary maintenance saving time, resources, and $$$**
  - You tell Advisor that you want to use the Conditional Reorganization feature
  - Your normal reorganization schedule starts executing
  - As each unload step starts, Advisor looks at the database to determine if maintenance is necessary
  - If Advisor determines that a reorganization is required, then it allows the unload to continue
  - If Advisor determines that a reorganization is not required, then the step is terminated with your choice of a Return Code or User Abend
Conditional Reorg - How it works!

- Job consults with Advisor to determine if Database **NEEDS** to be reorg’ed
- Requires **NO** changes to Scheduler or JCL
- **Saves valuable time, resources, and $$$**

Reorgs only the databases that need to be reorg’ed
Conditional Reorg – Set Up Panel
Conditional Reorg – Simulation Mode

SESSION1 - EXTRA for Windows 98 / Windows NT

Display Filter View Print Options Help

SDSF OUTPUT DISPLAY DEMOCR0 J0055973 DS10 182 LINE 0 COLUMNS 82-133
COMMAND INPUT ==> - SCROLL ==> CSR

*******************************************************************************
*************** TOP OF DATA *********************************************************

01/17/2005 BMC MESSAGE LOG PAGE 1

17:19:20.52 LOG START
17:19:21.15 BMC90022I BMC UTILITY DRIVER STARTED
17:19:21.26 LISTING OF 'PLUSIN ' CONTROL STATEMENTS:
17:19:21.26 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 REC CMD
17:19:21.26 UNLOAD DESURGQ1 (LONG)
17:19:21.26 DATA SET CONTAINS 0001 RECORDS
17:19:21.52 BMC900261 IMS 7.1.0
17:19:24.23 BMC902201 UNLOAD FUNCTION STARTED
17:19:24.23 BMC1803751 COMMAND UNLOAD (1) STARTED
17:19:24.44 BMC1803941 PRODUCT (MX0) MAINTENANCE LEVEL (1.2.01) MAINTENANCE DATE (02/20/02) LOADLIB (DBU.SNPE.DBLLIB)
17:19:25.11 BMC902251 DDB (HIVFM05) PARTITION () - CONDITIONAL REORG BYPASSED, SIMULATE MODE
17:19:25.11 BMC902251 DDB (HIVFF05) PARTITION () - CONDITIONAL REORG BYPASSED, SIMULATE MODE
17:19:25.20 BMC900941 NUMBER OF UNLOAD FUNCTION TASKS IS 1
17:19:35.29 BMC901911 MAXIM HISTORY DATA WAS SENT TO MXAD FOR UNLOAD FUNCTION
17:19:35.31 BMC902211 UNLOAD FUNCTION ENDED
17:19:35.32 BMC1803751 COMMAND UNLOAD (1) ENDED
17:19:35.47 BMC900231 BMC UTILITY DRIVER ENDED, RETURN CODE IS 0000
17:19:35.55 LOG END

*******************************************************************************
*************** BOTTOM OF DATA *********************************************************

Connected to host sysc [172.19.19.231]
Data Management Console

MAXM Database Advisor for IMS
MAXM Utilities and Fast Path Utilities

System Administration for IMS
Energizer for IMS Connect

Backup & Recovery Solutions for IMS Advisor

BSM

MAINVIEW

IMS DM Console
Single Console for all IMS

- MAINVIEW
- IMS Database Reorganization
- Backup & Recovery
- IMS Subsystems
- Energizer for IMS Connect
Easy to install and customize

Customize at multiple levels
Proactive database Notification

E-Mail

WTO
Multiple levels of Security

**Access Control using SAF rules:**
- Edit
- Browse
- No Access
- Access limited to specific functions
- Access limited to specific RECON datasets

**Limit Connections using Enterprise List**
Generate JCL to fix Exceptions

Generate JCL with Recommended Solution to fix Database Exceptions
Generate JCL for all utilities

Generate JCL with most recent enhancements for all utilities
One Place To Browse All the JES Queues

Job Output based on userid

Job Output based on Job Name

Job Output across multiple MVS systems
Dataset Management Services

The user can enter a full or partial DSN (as in ISPF 3.4)

Dataset attributes (as in ISPF 3.2) are shown in table columns

Members can be edited, browsed, renamed, deleted, printed, downloaded to PC, uploaded to z/OS, submitted for execution

User can find/replace text, submit, or print from the screen

User can allocate sequential, PDS, and PDSE “Allocate Like” from DS list populates fields from an existing dataset

Syntax highlighting for Assembler and JCL

ISPF member statistics are updated when members are edited
Cross Interface Linking – Mainview Explorer

› Mainview Explorer Launch in context
  – Select from appropriate views for the current object
Recovery Advisor

Thresholds

Check for:
- Backout needed
- Image Copy needed
- Recovery needed
- No valid IC within nn days
- Assets not catalogued
- No SECLOG entry
- No CA run exists
- DB is not in any CAGRP

... and many more

Exceptions

- No IC in nn days
- IC/Backout/Recovery Needed
- PRILOG not catalogued
- No SECLOG
- Change Accum not available
- DB not in CAGRP
- HALDB Not Initialized
- No ADS defined/available

... and many more

Solutions

- Image Copy
- Change Accum
- Recover
- CHANGE.CAGRP ADD

... and many more
Recovery Advisor Thresholds

› Are all my recovery assets available and catalogued?
› Am I making enough Image Copies?
› Am I keeping enough Change Accum?
› Are all my databases in a Change Accum Group?
› Are all my databases available?
› Can I exclude some databases?
› Do my RECONs have enough space?
DB Available?

Recovery Thresholds / Recovery Conditions

Check for the following conditions:
- Backup is needed
- REO(s) are detected
- Recovery is needed
- Image copy is needed
- Image copy is recommended
- HALDB partition is not initialized
- Object is in read-only status
- Object is in prohibit authorization status

For Fast Path area, check for conditions:
- No area data set is available
- No area data set is defined

Last updated at 12/7/07 3:57 PM by BMCDFLT
DB in CAGRP?
Exclude group?
### RECON Thresholds

<table>
<thead>
<tr>
<th>Condition</th>
<th>CI %</th>
<th>CA %</th>
<th>ASM %</th>
<th>Extents</th>
<th>Volumes</th>
<th>Data Set Size (tracks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI Splits%</td>
<td>20</td>
<td></td>
<td></td>
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<tr>
<td>CA Splits%</td>
<td>20</td>
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<td>ASM Free Space %</td>
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</table>

Last updated at 12/7/07 3:57 PM by BMCDFLT

**RECON full?**
Recovery Collect

› How do I collect Recovery information?
› Can I run Recovery Advisor on demand?
› Can I run Recovery Advisor for a single group?
› Can I use my own Scheduler?
› Can I execute against a RECON backup?
Collect recovery info?
Exceptions and Email/WTO

› How do I know I have a problem?
› How can I get notified when I have a problem?
› Can I reduce the number of emails that I am getting, but still hear about the severe situations?
Do I have problems?

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<th>IMSPLEX</th>
<th>Object Type</th>
<th>Name</th>
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<td>DDB / PART</td>
<td>IRMEP4X / EP4X1</td>
</tr>
<tr>
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<td>DDB / PART</td>
<td>IRMEP4Y / EP4Y1</td>
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<tr>
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<td>DDB / PART</td>
<td>IRMEP4Y / EP4Y2</td>
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<td>DDB / AREA</td>
<td>IRME81P / IRME81A1</td>
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<tr>
<th>Threshold</th>
<th>Description</th>
<th>Dataset</th>
<th>Warning Date</th>
<th>Critical Date</th>
<th>Dead Date</th>
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<tr>
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<td>N/A</td>
<td>2007/08/21</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Receive notification?
Fewer Emails?
Severe problems?
Conditional Image Copy

› Am I making too many batch Image Copies?
› Can I save money on Image Copies without changing my scheduler?
Conditional Image Copy

DBRC

DB=PAY001  DSG=PAY001

IMAGE COPY  2008.055
IMAGE COPY  2008.056
ALLOC       2008.056
DEALLOC    2008.057
IMAGE COPY  2008.057
IMAGE COPY  2008.058

Start IMAGE COPY PLUS

Any updates since last image copy?

Yes

Has it been too long since last image Copy?

Yes

Create Image Copy

No

Bypass Image Copy

No
Maintain Parameters

Conditional IC

Skip IC for no updates

Perform IC if "nn" days since last IC

Last updated at 8/9/07 4:06 PM by RRS
//ICP  EXEC  PGM=ICPUMAIN
   . . .
//SYSIN DD *
   GLBL  DBRC(Y)  DBALLOC(Y)  SMARTIC(Y)
   AIC  DBD(PAY001)  IC((*,SMSMODL))
<table>
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<th>DBD/PART</th>
<th>DDN/AREA</th>
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<th>ORG</th>
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<td>VSAM</td>
<td>ESDS</td>
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</tr>
</tbody>
</table>
Summary
The BMC Software Difference

› Experience
  – Developing IMS tools for over 20 years
  – Solutions developed in-house
  – Development, QA, & Support all on the same team

› Technology
  – Hold many IMS patents
  – The proven leader in delivering innovation for un-matched performance and availability
  – We provide integrated ONLINE Solutions to solve your business issues

› Quality
  – Certified QA experts on staff
  – Industrial Strength code – run by the world’s largest companies
  – Extensive library of customer data for regression testing

› Support
  – Live World Class Support available 24 x 7
  – Products supported by IMS experts
Questions?