Improve Service Levels with Enhanced Data Analysis

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IBM

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Agenda

• Why do we need IBM zAware?
• What is IBM zAware?
• IBM zAware complements your existing environment
• IBM zAware and Tivoli
  • Event Management
  • Automation
  • Problem Determination and MTTR
• Traditional Performance Monitoring
• Monitoring the IBM zAware environment
IBM zAware: With IBM zEnterprise EC12 (zEC12), IBM introduces a new technology, IBM zAware, based on machine learning developed by IBM Research. IBM zAware is designed to use near real-time continuous learning algorithms, providing a diagnostics capability intended to help you quickly pinpoint problems, which in turn, can help you to more rapidly address service disruptions. IBM zAware uses analytics to intelligently examine z/OS messages to find unusual patterns, inconsistencies, and variations.

Large z/OS operating system environments can sometimes generate more than 25 million messages per day. This can make manual analysis time-consuming and error-prone when exceptional problems occur. IBM zAware uses machine learning to help your organization gain visibility into system behavior, helping you to optimize service, respond to problems quicker, and increase availability.

IBM plans to provide **new capability within the Tivoli Integrated Service Management family of products** designed to leverage analytics information from IBM zAware, and to provide alert and event notification.
IBM zAware …

Systems are more complex and more integrated than ever

• Errors can occur anywhere in a complex system

• Some problems are particularly…

• Difficult to detect
  • Several allowable anomalies can build up over time
  • Symptoms / problems can manifest for hours or days
  • Problem can grow, cascade, snowball

• Difficult to diagnose
  • Sometimes finding the system in error is a challenge
  • Volume of data is not humanly consumable, especially when seconds count

• **Need information and insight**
What is IBM zAware?

- z/OS Log Analytics - Analysis of z/OS operlog
- Firmware appliance that runs ‘out of band’ (not on z/OS)
- Training period determines ‘normal’ message flow, volumes, etc.
- Surfaces anomalies to help detect ‘soft failures’

IBM zAware is a priced feature being offered with IBM zEnterprise EC12 (Available on 9/19/2012)
IBM zAware – Identifies unusual system behavior

IBM zAware contains sophisticated analytics, applies IBM insight, and machine learning to understand your unique system

<table>
<thead>
<tr>
<th>Monitoring</th>
<th>Detection</th>
<th>Frequency</th>
<th>Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supports IBM and non-IBM middleware and applications</td>
<td>Detects anomalies other solutions might miss</td>
<td>Samples every 2 minutes</td>
<td>Near real-time analysis</td>
</tr>
<tr>
<td>Monitors OPERLOG in a sysplex or monoplex</td>
<td>Can find the rare or infrequent message</td>
<td>10-minute interval</td>
<td>Intuitive reporting – both high level and drill down</td>
</tr>
<tr>
<td>Assigns a message anomaly score to help identify potential issues</td>
<td>Can detect an unusual number of normal messages</td>
<td>Uses 90-day rolling baseline; a utility provided to populate baseline; flexibility provided</td>
<td>Color-coded browser display</td>
</tr>
<tr>
<td></td>
<td>Can detect messages issued out of context</td>
<td>History kept for 2 years (default)</td>
<td>XML output can feed ISVs or processes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tivoli provides event notifications and integration with service management capabilities</td>
</tr>
</tbody>
</table>
How can IBM zAware Improve Problem Determination?

- Identify messages indicating a possible z/OS incident is happening
  - Which image is behaving abnormally?
    - Examines unique messages
    - High score generated by unusual messages or message patterns
  - When did this unusual behavior start?
    - For a selected 10 minute interval either the current 10 minute interval or past intervals
      - Which message ids are unusual?
      - How often did the message occur?
      - When did the message start to occur?
  - Were similar messages issued in the past?
    - Similar characteristics, Same pattern?

- After a change has been made
  - Are unusual messages being issued following changes?
    - New software levels (operating system, middleware, applications)
    - Updated system settings / system configurations

- When diagnosing the cause of an intermittent problem
  - Are new unusual messages being issued in advance of the problem?
  - Are more messages issued then expected?
  - Are messages issued out of normal pattern or context?

Finds Anomalies that would be Hard to Detect

Vertical bar shows the number of unique messages in a 10 minute interval
Scoring of messages color coded from common (blue) to rare (orange)
IBM zAware – User Interface

IBM System z Advanced Workload Analysis Reporter

- Monitors z/OS OPERLOG including all messages written to z/OS console, including ISV and application generated messages
- Detects things typical monitoring systems miss due to:
  - Message suppression (message may be too common)
    - Useful for long-term health issues
  - Uniqueness (message not common enough)
    - Useful for real-time event diagnostics
- Color-coded, easy-to-use web browser GUI
- XML Output can feed other products

Ability to drill down for details on anomalies
Sample Output - Interval View

Drill down to see JES2 resource shortage

<table>
<thead>
<tr>
<th>Anomaly Score</th>
<th>Interval Contribution Score</th>
<th>Message Context</th>
<th>Rules Status</th>
<th>Appearance Count</th>
<th>Time Line</th>
<th>Message ID</th>
<th>Message Example</th>
<th>Rarity Score</th>
<th>Component</th>
<th>Cluster ID</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>0.229</td>
<td>new</td>
<td>None</td>
<td>1</td>
<td></td>
<td>EYUXS1004W</td>
<td>M88CM88 Interval Timing queue element shortage detected</td>
<td>101</td>
<td>EYUXS</td>
<td>-1</td>
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<tr>
<td>1</td>
<td>0.229</td>
<td>new</td>
<td>None</td>
<td>1</td>
<td></td>
<td>EYUXS1005F</td>
<td>M88CM88 Interval Timing queue element shortage relieved</td>
<td>101</td>
<td>EYUXS</td>
<td>-1</td>
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<tr>
<td>1</td>
<td>0</td>
<td>in_context</td>
<td>IMPORTANT</td>
<td>16</td>
<td></td>
<td>HASP050</td>
<td>JES2 RESOURCE SHORTAGE OF TGS - 100% UTILIZATION REACHED</td>
<td>50</td>
<td>HASP</td>
<td>102</td>
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<tr>
<td>0.999</td>
<td>10.974</td>
<td>unclustered</td>
<td>None</td>
<td>57</td>
<td></td>
<td>IEE043I</td>
<td>A SYSTEM LOG DATA SET HAS BEEN QUEUED TO SYSOUT CLASS M</td>
<td>2</td>
<td>IEE</td>
<td>-1</td>
</tr>
<tr>
<td>0.998</td>
<td>6.706</td>
<td>unclustered</td>
<td>None</td>
<td>7</td>
<td></td>
<td>EYUCI0016I</td>
<td>M88CM88 Send Link Task terminated for MRO Network connection with CMAS MRAICMA.</td>
<td>74</td>
<td>EYUCI</td>
<td>-1</td>
</tr>
<tr>
<td>0.998</td>
<td>6.519</td>
<td>unclustered</td>
<td>None</td>
<td>4999</td>
<td></td>
<td>ITP138I</td>
<td>ADSWCB GZAPA001 GZLUU001.1 LU IS NOW INACTIVE 00.02.50.86</td>
<td>27</td>
<td>ITP</td>
<td>-1</td>
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<tr>
<td>0.987</td>
<td>4.427</td>
<td>unclustered</td>
<td>None</td>
<td>40</td>
<td></td>
<td>IEC070I</td>
<td>209-220,NETVIEW,NETVIEW.DSLOGS,6836,NE</td>
<td>12</td>
<td>IEC</td>
<td>-1</td>
</tr>
</tbody>
</table>
IBM zAware Operating Requirements

- zEC12 to host IBM zAware Server
  - IBM zAware requires it’s own LPAR and runs it’s own self-contained firmware stack.
    - This will reduce the number of LPARs available for customer use
  - IBM zAware processor resources can be IFL or General Purpose CP
  - Memory and DASD resources are dependent on the number of monitored clients, amount of message traffic, length of time data retained
    - Memory - Min 6GB + 256 MB
    - DASD ~ 500GB (ECKD or FC)
  - Network: HiperSockets or OSA ports – for both gathering of instrumentation data, and outbound alerting/communications
    - Need dedicated IP address for partition

- zAware Monitored Clients
  - IBM zAware monitored clients can be on any System z Server running z/OS 1.13 + PTFs
    - IBM zEnterprise 196 (z196), IBM zEnterprise 114 (z114), etc., and can share log files via IP network with IBM zAware server

- 90 days historical syslog or OPERLOG data to initially prime IBM zAware
IBM zAware Complements Your Existing Environment

IBM zAware provides a RESTful API to retrieve XML data to support alternative views generated by higher level managers.

**Customer controlled scope**
- Sysplex views
- z/OS Image views

Programmatic calls
- Launch (UI)

Management of z/OS and Sysplex

z/OSMF

Operator, SME

IBM zAware UI

Service Management Software

IBM zAware

zOS

ICF

z/VM®

zLinux

zLinux

zLinux

EC12

z CPU, Memory and IO

SE

z CPU, Memory and IO

SE

z/VM™

PR/SM™

PR/SM

z/OS

z/OS

z/OS

z/OS

zLinux

zLinux

zLinux

zLinux

IBM zAware Complements Your Existing Environment
IBM zAware and Tivoli Service Management - A powerful Combination

Get the more from the zAware feature by integrating with Tivoli Service Management. Tivoli will utilize the zAware API to integrate log analysis with existing service management capabilities.

- Provide visibility into IBM zAware anomalies via Event Management
- Improve MTTR through integration with existing problem determination and performance monitoring tools
- Identify system errors and eliminate subsequent occurrences thru automation and more sophisticated analysis

**IBM zAware is NOT a replacement for traditional performance and availability monitoring tools. It’s just the opposite. When used in conjunction with existing service management tools, it can provide a VERY powerful combination to help achieve 24/7 uptime, improve MTTR when problems occur and help avoid subsequent problems.**
Why incorporate insights from zAware with NetView?

NetView already provides a complete set of Service Management functions to enable customers to surface Events, perform Problem Determination, reduce Mean Time to Recovery and automate.

• Network Availability (SNA, TCP/IP, FTP, OSA, EE/HPR, etc)
• Automation (Messages, EIF Events, SNMP Traps, etc)
• HA/DR (SA, GDPS, Active/Active, etc)
• REXX and High-Level Language support
• Problem Determination tools (Command Support, IP Trace, CANZLOG, etc)
• …
IBM zAware, Automation, Event Management and PD Tools

NetView processing …
- Query zAware (10 minute interval)
- If anomaly detected
  - Generate ‘anomaly’ message
  - Generate Event
- SME - Browse NetView CANZLOG to perform problem determination

- NetView samples provided to generate anomaly message and event(s)
  - Available for download from Service Management Connect
- NetView integration referenced from IBM zAware Redbook
- IBM Services (optional) available to install and configure zAware and NetView
NetView for z/OS: Expanded Log Browse

**CANZLOG** = Consolidated Audit, NetView and z/OS Log

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**Canzlog**

<table>
<thead>
<tr>
<th>Time</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>15:20:07</td>
<td>IST1411I INOP GENERATED FOR EEO001</td>
</tr>
<tr>
<td>15:20:07</td>
<td>IST1430I REASON FOR INOP IS XID OR LDLC COMMAND TIMEOUT</td>
</tr>
<tr>
<td>15:21:09</td>
<td>IST1411I INOP GENERATED FOR EEO02</td>
</tr>
<tr>
<td>15:21:09</td>
<td>IST1430I REASON FOR INOP IS XID OR LDLC COMMAND TIMEOUT</td>
</tr>
<tr>
<td>15:20:07</td>
<td>IST259I INOP RECEIVED FOR NMP181 CODE = 01</td>
</tr>
<tr>
<td>15:20:07</td>
<td>IST423I VARY DIAL FOR ID = NMP181 OVERRIDDEN BY SOFT INOP</td>
</tr>
<tr>
<td>15:20:07</td>
<td>IST619I ID = NMP181 FAILED - RECOVERY IN PROGRESS</td>
</tr>
<tr>
<td>15:20:07</td>
<td>IST1411I INOP GENERATED FOR EEO001</td>
</tr>
<tr>
<td>15:21:09</td>
<td>IST1430I REASON FOR INOP IS XID OR LDLC COMMAND TIMEOUT</td>
</tr>
<tr>
<td>15:21:09</td>
<td>IST259I INOP RECEIVED FOR NMP130 CODE = 01</td>
</tr>
<tr>
<td>15:21:09</td>
<td>IST439I SOFT INOP FOR ID = NMP130 OVERRIDDEN BY SOFT INOP</td>
</tr>
<tr>
<td>15:21:09</td>
<td>IST619I ID = NMP130 FAILED - RECOVERY IN PROGRESS</td>
</tr>
<tr>
<td>15:21:09</td>
<td>IST590I CONNECTOUT FAILED FOR PU NMP130 ON LINE EEO02</td>
</tr>
<tr>
<td>15:21:09</td>
<td>IST621I RECOVERY SUCCESSFUL FOR NETWORK RESOURCE NMP130</td>
</tr>
<tr>
<td>15:21:09</td>
<td>IST1411I INOP GENERATED FOR EEO001</td>
</tr>
<tr>
<td>15:21:09</td>
<td>IST1430I REASON FOR INOP IS XID OR LDLC COMMAND TIMEOUT</td>
</tr>
<tr>
<td>15:21:09</td>
<td>IST259I INOP RECEIVED FOR NMP181 CODE = 01</td>
</tr>
<tr>
<td>15:21:09</td>
<td>IST439I SOFT INOP FOR ID = NMP181 OVERRIDDEN BY SOFT INOP</td>
</tr>
<tr>
<td>15:21:09</td>
<td>IST619I ID = NMP181 FAILED - RECOVERY IN PROGRESS</td>
</tr>
<tr>
<td>15:21:09</td>
<td>IST590I CONNECTOUT FAILED FOR PU NMP181 ON LINE EEO00</td>
</tr>
<tr>
<td>15:21:09</td>
<td>IST621I RECOVERY SUCCESSFUL FOR NETWORK RESOURCE NMP181</td>
</tr>
<tr>
<td>15:28:29</td>
<td>BNM067I SYSPLEX MASTER SET TO NTV7E. PREVIOUS MASTER</td>
</tr>
<tr>
<td>15:28:29</td>
<td>DSI047E CNMEERSC failed: DISCOVERY not enabled</td>
</tr>
<tr>
<td>15:28:29</td>
<td>DSI201I TIMER REQUEST SCHEDULED FOR EXECUTION 'ID=XCFTRMR$2'</td>
</tr>
<tr>
<td>15:37:41</td>
<td>GO</td>
</tr>
<tr>
<td>15:37:41</td>
<td>GO</td>
</tr>
<tr>
<td>15:37:41</td>
<td>DSI016I NOT IN PAUSE OR WAIT STATUS</td>
</tr>
<tr>
<td>15:37:48</td>
<td>br log</td>
</tr>
</tbody>
</table>

DW0672I Message * was issued at 06/28/11 15:21:09.845 by NTV7EPPT

CMD=>

---

Complete your sessions evaluation online at SHARE.org/SFEval
NetView CANZLOG – Browse in zAware context

- Browse NetView CANZLOG in context of zAware anomaly
- Set filter and timeframe to view related messages in CANZLOG (consolidated log)
- Perform problem determination in context of timeframe of the anomaly
Why incorporate insights from zAware with OMEGAMON?

OMEGAMON already provides a complete set of Performance Monitoring capabilities for z/OS, z/OS middleware, applications, etc.

- Pro-Active Performance Monitoring (z/OS, CICS, IMS, DB2, Mainframe Networks, Storage, etc)
- Generate EIF Events (OMNIbus, etc)
- Automation
IBM zAware, Event Management & Traditional Performance Monitoring

View event in Active Event List
Generate trouble ticket

Perform PD for with correlation to traditional monitoring KPIs

Proposed Future Capability

Processing ...
- Query zAware (10 minute interval)
- If anomaly detected
  - Trigger situation to Generate Event when anomaly is surfaced
  - Include zAware insights in performance monitoring views

- Performance monitoring scenarios currently being developed per Tivoli’s statement of direction
- Customer input welcome

z/OS Logger

Tivoli Performance Monitoring

- zAware
- zICF
- z/zOS
- z/Linux
- z/Linux
- z/Linux
- z/VM
- PR/SM
- z CPU, Memory and IO

SE

EC12
Performance monitoring view including IBM zAware anomalies

- Proposed Future Capability
- Anomaly scores for the last hour
- zAware server info
- Trigger situations to generate events based on anomaly score
- Reduce MTTR
Monitor the Components of the IBM zAware environment

**Tivoli Performance Monitoring**
- IBM zAware Server
- Network (HiperSockets & OSA)
- z/OS Logger
- Storage

IBM zAware GUI

Persistent Storage

File System

IBM zAware Server
Web Server

Analyses
Results
Models

Data Retrieval

Logger Data Transport

Operlog

zEC12

LPAR

HiperSockets

OSA (for data from other servers)

Operlog

Logger Data Transport

z/OS

z/OS

Operlog

Operlog

Operlog

zEC12/z196/z114

LPAR

HiperSockets

OSA (for data from other servers)
IXGLOGR Address Space Details

Monitor the health of the Logger Address space
zEnterprise Ensemble Summary workspace

Monitor the IBM zAware partition Running in the EC12
IBM zAware Share Presentations

Session # 13063:
IBM zAware - Using Analytics to Improve System z Availability
Speaker: Garth Godfrey

Session # 13066:
Setting up IBM zAware - Step by Step
Speakers: Garth Godfrey and Thomas B. Mathias
IBM zAware and Tivoli – more Information

**IBM zAware Publications:**
System z Advanced Workload Analysis Reporter (IBM zAware) Guide - SC27-2623-00
https://www-304.ibm.com/support/docview.wss?uid=isg24f9114255d7d1f3285257a6a0077c2ca&aid=1

**IBM zAware Demo:**

**IBM zAware Redbook:**
Extending z/OS System Management Functions with IBM zAware

**Service Management Connect:**
NetView wiki page to download zAware integration samples and documentation

IBM zAware and Tivoli – Service Management Myth Buster #199
https://www.ibm.com/developerworks/mydeveloperworks/blogs/5e65990a-9690-42e2-93b1-c2267be7620c/entry/service_management_myth_busters1?lang=en
System z Social Media Channels

- Top Facebook pages related to System z:
  - IBM System z
  - IBM Academic Initiative System z
  - IBM Master the Mainframe Contest
  - IBM Destination z
  - Millennial Mainframer
  - IBM Smarter Computing

- Top LinkedIn groups related to System z:
  - System z Advocates
  - SAP on System z
  - IBM Mainframe- Unofficial Group
  - IBM System z Events
  - Mainframe Experts Network
  - System z Linux
  - Enterprise Systems
  - Mainframe Security Gurus

- Twitter profiles related to System z:
  - IBM System z
  - IBM System z Events
  - IBM DB2 on System z
  - Millennial Mainframer
  - Destination z
  - IBM Smarter Computing

- YouTube accounts related to System z:
  - IBM System z
  - Destination z
  - IBM Smarter Computing

- Top System z blogs to check out:
  - Mainframe Insights
  - Smarter Computing
  - Millennial Mainframer
  - Mainframe & Hybrid Computing
  - The Mainframe Blog
  - Mainframe Watch Belgium
  - Mainframe Update
  - Enterprise Systems Media Blog
  - Dancing Dinosaur
  - DB2 for z/OS
  - IBM Destination z
  - DB2utor
Questions