AMI – Automatic Mainframe Intelligence: a Self-Managing Mainframe

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Worldwide Db2 Z Solutions,
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Pressures Must be Overcome for Business Success

Business & IT Architects

Hybrid Multi-cloud
Customer Experience
Speed & Agility
Regulatory Compliance
Security & Data Protection
Transaction & Data Growth
Cost Efficiency
Skills
New Technology
IoT

BUSINESS PRESSURE

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Mainframe organizations must take a new approach aimed at self-managing IT.

You need:
- Intelligent software with domain expertise
- Proactive early warning
- Degradation analysis
- Problem remediation, with trusted automation
By 2020, **30%** of data centers that fail to apply AI and machine learning effectively in support of enterprise business will cease to be operationally and economically viable.

Gartner Report: [The IT Implications of the 2018 CIO Survey for I&O Leaders](https://www.gartner.com/doc/3891138)

By Dave Russell, Hank Marquis Published: 8 March 2018

**AI will be Pervasive by 2020**
Key Technology – Machine Learning

Machine learning (ML) is a field of computer science that gives computer systems the ability to "learn" (i.e., progressively improve performance on a specific task) with data, without being explicitly programmed.

- Wikipedia

Artificial intelligence (AI) is the intelligence exhibited by machines or software. It is also the name of the academic field of study which studies how to create computers and computer software that are capable of intelligent behavior.

- Wikipedia
Looking Across Other Industries

Financial Services
- “Robo-advisors” in Portfolio Management
- Algorithmic Trading
- Fraud Detection

Manufacturing
- QA using ML is finding 90% more defects
- Reducing supply chain errors by 50%

Logistics
- Lane planning with analytics on weather or traffic
- Natural Language Processing saves data entry time
In data mining, *anomaly detection* (also *outlier detection*) is the identification of items, events or observations which do not conform to an expected pattern or other items in a dataset. ... *Anomalies* are also referred to as outliers, novelties, noise, deviations and exceptions.

- Wikipedia
The Answer is a Self-Managing Mainframe

That Adopts New Key Technologies

- Artificial Intelligence
- Machine Learning
- Intelligent Automation
- Domain Expertise
- Out-of-the-Box value
AMI’s Advantage

• Drive a modern, agile business with AI, machine learning, predictive analytics, and intelligent automation

• Manage, diagnose, heal, and optimize without manual intervention

We Beat the Competition with a Unique Value Proposition

BMC

Multiple Data Sources

Multiple Products

Multivariate Processing

Super Metrics

CLARITY
Components of a Self-Managing Mainframe

Real-Time Automated Mainframe Intelligence

Data Sources
- Storage
- Networks
- Hardware
- Application
- Security
- Transactions
- Databases
- Middleware

Enterprise Connectors

Embedded Domain Expertise

- Data Visualization
  - Data Sensors
- Intelligent Alarms
  - AI Driven Anomaly Detection
- Predictive Analytics
  - Correlation & Pattern Analysis
- Intelligent Automation
  - Protection & Healing
- Prescribed Remediation
  - Applied Domain Expertise
- Problem Determination
  - Root Cause

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That can Enable Business Outcomes

Speeding Application Deployments Safely and Securely

Detecting and Stopping a Security Threats in Real-Time

Seeing Around the Corner, Preventing a Full System Outage

Saving Money with Real-Time Cost Management
“See Around the Corner”
Avoid Full System Outage

- Machine Learning
  - Monitor
  - IMS
  - DB2
  - Network
  - Systems

- Prescribed Remediation
  - Fix index access path

- Problem Determination
  - Automated SQL tuning prior to system outage

- Intelligent Automation

- Predictive Analysis
  - Predicted to impact Production on Monday
  - Access path changes causing increased get pages

- Intelligent Alarms
  - Banking application is changed over weekend – CPU usage increase

- KPIs
  - KPI1
  - KPI2
  - KPI3
  - KPI4
  - ✓
  - ✓
  - ✓
  - ✓
Business Agility

Meet Best Practice Standards?

Yes

No

Build Change File

Notify of non-compliance

Change Manager

Compare to Production

DBA Review / Approve

Application Development Orchestration

JIRA, ISPW, Jenkins, BMC RLM

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Foundation of a Self-Managing Mainframe

Out of the Box Intelligence

Deep and Broad Data Sources

Built-in Domain Expertise

Multivariate Analysis
Out-of-the-Box Value or

Taking the Burden Off of You and Your Teams
Deep and Broad Data Sources

Depth & Breadth of Data

• Different products
  • Db2
  • CICS
  • z/OS
  • IMS
  • MQ
  • Network
  • Etc ...
• Different types
  • MainView
  • SMF
  • Recovery logs
  • Console logs
  • Logrec

Drives ML and AI effectiveness

• Baselining
• Predictive analysis
• Root cause analysis
• Model training

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The Advantage of Domain Expertise

- Machine learning is not magic
- Data science can lead to unintended correlations that are **believable**
- You need Domain Expertise
Multivariate statistics is a subdivision of statistics encompassing the simultaneous observation and analysis of more than one outcome variable.

Multivariate statistics concerns understanding the different aims and background of each of the different forms of multivariate analysis, and how they relate to each other.

The ability to watch many different metrics from many different data sources
Rules vs. Machine Learning

Rules

- Learned one outage at a time
- Too little too late
- Too much to watch - Excessive amount of KPIs mean data overload and inability to reduce data input
- Root cause still unclear

Machine Learning

- Ability to monitor the systems/transactions in a more efficient way
- More sensitivity to data characteristics
- Unearth hidden patterns from the data
- Build in domain expertise up front relieves lack of domain expertise on staff
- Intelligent models that self assess and allow automatic retraining to find a new “normal”
Training, Deployment, Scoring

1. Historical Data
2. Feature Engineering
3. Train
4. Evaluate
5. Deploy

6. New data
7. Score
8. Feedback
9. Reevaluate
10. New Historical data
Creating & Using Baseline Models

• Gathers historical data to understand normal - baseline
• Learns special time series data (weekday, weekend, month end, quarter end, “black Friday”).
• Defines the red, yellow and green range for metrics
• With the baseline, models can now detect anomalies
Real Life Scenario Today

App rebound
- Access path changed
- Tablespace scan

Application Problems
- Uses extra GetPages
- No extra I/O

Extra CPU
- High priority workload
- ALL applications are effected

Peak Production Workload Arrives
- No CPU available

More Threads Allocated
- Cause MORE Contention
- More CPU & Storage

System Runs out of Storage
- Complete system outage
- $$M

Completely Avoidable Complete System Outage
Same Scenario Tomorrow

Application Rebound at weekend
• Access path changes
• Tablespace scan

Pages Loaded Correctly
• No extra I/O

Application Corrected
• Hours in Advance
• Saves $$$M

All the pain is gone!

100% Detectable & Avoidable
DevOps Drives your Digital Business

Improving Speed is a High Priority

- 76% of IT leaders say speed of application/product delivery is a critically or very important KPI.

- 67% of IT leaders say improving the speed of development cycles is a critical or high priority.

Velocity Gap Slowing Customers Down

- 67% of IT leaders say improving the speed of development cycles is a critical or high priority.
Today’s Velocity Gap is Inefficient

App Dev Orchestration
- JIRA
- ISPW
- JENKINS
- BMC RLM

Change Manager

Compare to Production

CHG FILE

DBA

Discuss Changes After Testing

Start over if not compliant

Review Changes for Compliance

Start over if performance issue

SQL Performance

PROD

Database changes

Application Developer

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Automate Database Changes in DevOps

- Notify of non-compliance
- Change Manager
- Compare to Production
- Build Change File
- DBA Review / Approve
- Meet Best Practice Standards?
  - Yes
  - No
**External: What is AMI?**

**Advanced Solutions and Capabilities in the BMC Z Portfolio that Incorporate Automation, Machine Learning, Analytics, and Artificial Intelligence**

**BMC AMI Enterprise Connectors**
- Getting your Z information connected to the rest of your enterprise
  - AMI Data Extractor for IMS available now
  - More AMI Data Extractors coming in 1H 2019

**BMC AMI Autonomous Solutions***
- Intelligent, policy driven, integrated solutions to power self-managing mainframes
  - AMI Security management
  - AMI DevOps
  - AMI Performance and Availability management
  - AMI Cost and Capacity management
  - *Multiple products releasing over the next five quarters*
Current Capabilities

✓ Intrusion detection
✓ Automatic tracing
✓ Threshold analytics
✓ Smart Alarms
✓ Performance predictions
✓ SQL workbench
✓ One-button IPL
✓ Secure HMC management
✓ Dynamic capping
✓ IMS scheduling wizard

✓ Transaction details
✓ MainView - IMS log integration
✓ Automated reorg
✓ Online reorg
✓ MLC peak reporting
✓ MLC predictions
✓ Automatic restart
✓ Subsystem redundancy
✓ NGT SmartSwitch
THANK YOU