Capacity Management Analytics V2.1

November 2015

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European Technical Leader, Capacity Management Analytics
IBM Capacity Management Analytics (CMA)

- Overview
- What is CMA?
- What’s new in CMA 2.1
- Distributed Server Support
- Software Cost Analysis
- Optimization
- Application Analytics
- Real Time Anomaly Detection
The IT Analytics Platform for cost effective, optimal use of IT infrastructure capacity: Today, tomorrow, beyond

**USE CASES**

- Manage capacity of the entire Data Center
- Determine future capacity requirements
- Manage software costs
- Support LOB/application chargeback
- Detect transaction anomalies

**Capacity Management Analytics (CMA)**

**DATA CENTER**

- Z Software Middleware Stack
- Windows
- DB2
- z Systems
- WebSphere
- CICS
- AIX Servers
- Linux Servers

**DISCOVER | FORECAST | OPTIMIZE**

- Capacity Planner
- System Administrator
- IT Manager
Capacity Management Analytics V2.1

CMA Solution
- Systems Management & Optimization
- Software Cost Analysis
- Capacity Planning and Forecasting
- Problem Identification
- Application Analytics

CMA Platform
- Cognos BI
- SPSS
- CPLEX
- DB2
- TDS for z/OS

Multiplatform PIDs:
- D11AYLL (Lic+12m S&S) & D11AZLL (S&S)

z/OS PIDs:
- 5698-CMA (Lic+12m S&S) & 5698-AA7 (S&S)

User Defined

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CMA PIDs – CMA v2.1 for z/OS vs CMA for Distributed

**IBM Capacity Management Analytics on z/OS, V2.1**
Announcement Letter URL: [https://ibm.biz/BdXtfq](https://ibm.biz/BdXtfq)

- ShopZ product
  - Product Identification Number / Program Number: 5698-CMA
  - Subscription and Support PID number: 5698-AA7

- Included products
  - IBM Tivoli® Decision Support for z/OS V1.8.2
  - IBM Cognos® Business Intelligence for z/OS V10.2.2
  - IBM SPSS® Modeler Gold with Scoring Adapter for z Systems™ V17.0
  - Modeler, Collaboration and Deployment Services, Scoring Adapter for DB2 z/OS
  - IBM ILOG® CPLEX® Optimization Studio V12.6.2
  - IBM Capacity Management Analytics Solutions Kit V2.1

**IBM Capacity Management Analytics V2.1**
Announcement Letter URL: [https://ibm.biz/BdXtfq](https://ibm.biz/BdXtfq)

- Passport Advantage product
  - Product Program number: 5725-M72
  - IBM Capacity Management Analytics PVU License + SW Subscription & Support 12 Months: D11AYLL
  - IBM Capacity Management Analytics PVU Annual SW Subscription & Support Renewal: E0IB9LL

- Included products
  - IBM Cognos® Business Intelligence V10.2.2
  - IBM SPSS® Modeler Gold V17.0
  - Modeler, Collaboration and Deployment Services
  - IBM ILOG® CPLEX® Optimization Studio V12.6.2
  - IBM Capacity Management Analytics Solutions Kit V2.1

**Pre reqs:**
- IBM DB2 z/OS V10 or V11 (required w/ IDAA)
- IBM Tivoli® Decision Support for z/OS V1.8.2
Vision: Smarter Data Center Management

**CMA 1.1 & 1.2**
- z Systems
- Distributed Systems Management
  - Linux for System z
  - Linux on x86
  - AIX
  - Windows on x86

**CMA 2.1**
- CPLEX optimized LPAR Policy (Weight) settings
- Over/Under Share Weight
- Dynamic/Selectable Capacity (CPU/MIPS) formulas
- Z13 Framework Mgr Mapping
- Full IDAA Compatibility

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1. **Enterprise Capacity Management, Planning and Optimization**
   - z Systems
   - Distributed Systems Management
     - Linux for System z
     - Linux on x86
     - AIX
     - Windows on x86

2. **Cost Analysis**
   - zEnterprise MLC & IPLA sub-capacity MSU/cost analysis
   - Product cost/MSU forecasting
   - Product cost optimization recommendation
   - Enterprise Summary Dashboard

3. **Anomaly Detection**
   - CICS Transaction Anomaly Detection Models & Batch Scoring

4. **Application Analytics**
   - Cognos Workspace
   - Enterprise/Data Center Monitoring Dashboard
   - Performance

5. **Foundation Ease of Use**
   - Registered Product Summary Workspace
   - Improved modeling for better accuracy
   - Applications Analytics:
     - CPU and MIPS Usage
     - z/OS and Distributed Systems
   - Enhance Installation
   - Improved and consistent UI

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<thead>
<tr>
<th>SMF</th>
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</table>
IBM Capacity Management Analytics

- Executives and managers – level dashboards
- End-to-end view of your enterprise landscape: mainframe AND distributed
- Role-based customized views to analyze, visualize and make informed decisions.

Question: Do you have 24x7 visibility on your enterprise capacity?
Distributed Components

- Linux for System z
  - CPU Usage report
  - Memory Usage report
- Linux for System X
  - CPU Usage report
  - Memory Usage report
- AIX
  - CPU Usage report
  - Memory Usage report
- Windows
  - CPU Usage report
  - Memory Usage report
- Enterprise Dashboard workspace
  - Shows high level information for all the supported servers across the enterprise.
Common Information Model (CIM)

• Defined and published by the Distributed Management Task Force (DMTF)
  • CIM Infrastructure Specification
    • defines the architecture and concepts of CIM
    • managed elements represented by CIM classes
    • object oriented based on UML
  • CIM Schema
    • defines the objects and relationships to be managed
    • computer systems, operating systems, networks etc.
    • CIM-XML over HTTP for data exchange
• Latest version is 2.43.0 published 27 January 2015
• Designed to unify the management of distributed systems
  • incorporates CIM
• Implemented by many vendors
• RMX XP communicates with / IBM has tested
  • Open Pegasus (tog-Pegasus) for RHEL
  • Pegasus 2.9.0 for AIX
  • Small Footprint CIM Broker (SFCB) for Novell SLES
    • replaces OpenWBEM
  • IBM Systems Director Platform Agent for Windows
RMF XP & SMF Record Processing

Control SMF Recording on Subtype Level via SMFPRMxx Parmlib Member

Control SMF Buffering on Subtype Level via RMF and SMFBUF Parameter
### RMF XP & SMF 104 Records

#### One Subtype per Metric Category

<table>
<thead>
<tr>
<th>AIX on System p</th>
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<th>Linux on System x</th>
<th>ST</th>
<th>Linux on System z</th>
<th>ST</th>
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</table>
Example: Linux on z Systems

Linux on System z CPU Utilisation

Linux on System z Memory Utilisation

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Example: Windows
- System z Integrated Information Processor (zIIP) & System z Application Assist Processor (zAAP)

- Specialty processors have lower hardware acquisition costs and zIIP’s & zAAP’s don’t impact software pricing based on capacity

**Question:** Are you getting the most out of your zIIP engines?

**Question:** Are you getting the most out of your mainframe?

- Prescriptive recommendation of LPAR Policy.

- Monitor how well the specified LPAR Policy is working
LPAR Weight Optimization: Scope and Restrictions

• Overview
  • Prescribe more effective LPAR policy (weight values) optimized for the “demand” workload - work that must run on the LPAR based on priority (importance levels)

• Scope
  • Input data can be 2-5 days (does not need to be continuous) which best represent the peak and competing “demand” workloads among LPARs
  • Supports optimization of multiple date periods (one size does not fit all)
  • Results shown in report (CPU:LPAR Weight Optimization Run Result).
  • Use other CMA reports to determine the input information to do the optimization
    ▪ (CPU:MIPS Used –Service Class Period Level, CPU:MIPS Used –LPAR Level by WLM Importance, CPU:Over/Under Share Weight – CPC by LPAR)

• Restrictions
  • Only support certain process type (CP, zIIP, zAAP, IFL)
  • Importance level used for LPAR with z/OS only – customer supplied % “demand” workload used for all other LPARs
  • The total weight percentage of LPARs is 100% - must look at all defined LPARs
## Systems Management and Optimization

### LPAR Weight Optimization Run Result

**CPU: LPAR Weight Optimization Run Result**

- **CPUs:**
  - Dev: 2 (31%)
  - Test: 2 (31%)
  - Dev, Dual: 2 (31%)

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<td>Optimization Run:</td>
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### Optimization MetaData

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<td>OPTIMIZATION MODEL:</td>
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<td>OPTIMIZATION RUN:</td>
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<td>OBJECTIVE:</td>
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### LPAR Weight Optimization Run – LPAR Information

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<tr>
<th>LPAR Name</th>
<th>LPAR Type</th>
<th>LPAR Weight</th>
<th>Fixed Workload</th>
<th>Target Workload</th>
<th>Workload Importance</th>
<th>Desired Weight</th>
<th>Optimized Weight</th>
<th>Max Over Target Workload</th>
<th>SLA Over Target Workload</th>
<th>SLA Over Total Workload</th>
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<td>100.00%</td>
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</table>

### LPAR Weight Optimization Run – Date Information

**Date:** 2013-04-27

### LPAR Weight Optimization Run – Sub-Objectives Information

**SubObjective Name:**
- Max Over Target Weight
- Max Over Total Weight
- SLA Over Target Weight
- SLA Over Total Weight

**SubObjective Weight:**
- 1.000000
- 1.000000
- 0.800000
- 0.200000

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**Note:**
- The report was generated on 2013-04-27 at 20:14.
- The system is running on an i386 processor.
- The optimization run was performed on Dev, Dual, and Test environments.
- The system achieved an objective of 0.80.
- The LPARs have different weights and importances, affecting the overall optimization.

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**New Feature:**
- Enhanced reporting for LPAR weight optimization.
- Improved visualization for better understanding of optimization outcomes.

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**Contact:**
- For further inquiries, please contact systemsmanagement@company.com.
Determine available white space by comparing target “demand” workload against total workload.
IBM Capacity Management Analytics

Problem Identification

Solution Kit – CPU Reports

Answers the questions

• Which partitions drive usage on the platform?
• Drilling down to that partition, what workload types are responsible for that load?
• Are delays impacting throughput?
IBM Capacity Management Analytics

**Question: Would I have enough capacity to handle my business growth in the next three months?**

- **CMA uses **predictive analytics** to help organizations use their data to make better decisions by drawing reliable, data-driven conclusions based on past and current events.**

- **Future capacity requirements** can be forecasted to help ensure that sufficient capacity is available when the business needs it.

- **Dynamically select** your standard **formula** for capacity planning or compare between formulas to find the one that best fits your requirements.
Forecasting – SPSS Time Series Modelling
Software Cost Analysis – Three Scenarios

**Observed:** Track product MSU usage and costs at LPAR and Server level, identifying peak intervals and tracking 4 hour rolling average (4HRA).

**Forecasted:** Predict future MSU and cost usage based on forward utilization model.

**Optimized:** Suggest alternative LPAR / product configurations to take advantage of white space and reduce billable MSU where possible.
• Moving Workloads is not so simple…
  • There are often application dependencies hidden from products like CMA
  • e.g. CICS transaction affinities
• CMA allows users to specify which products must be kept on same LPAR
• Traditional methods for reducing MIPS are still important
  • e.g. application tuning, SQL optimization
• Does NOT replace SCRT
• Uses the same data & same rules
• Needs the SCRT NO89 listings
• Pricing Structures Supported
  • MLC
  • IPLA: Execution Based, Reference Based, zOS Based
  • IWP
  • GSSP
• License Charges Supported
  • AWLC, AEWLC, MWLC, VWLC, EWLC, zNALC,
  • VUE001, VUE007, VUE020,
• Monetary Value
• Forecasting MSUs at the LPAR & Product level
Application Analytics

Overview
• Provides the ability to track, predict and improve utilization of existing server resources (CPU) by defined applications or lines of business.
  ✓ May help with developing a charge back process

Scope
• Hierarchical and Flexible mapping to either Report Classes or Jobnames
  ▪ Functions of Application that run in an environment
• Mapping occurs during report execution, not hardened in the data
• Utility (stream) provided to determine transaction capture ratio for CICS and IMS

Restrictions
• Assumes distributed server runs a single application
• Does not show application spread across distributed and mainframe
• Forecasting available only at application function level
Application Analytics

**Answers questions such as:**

- How much MIPS do your applications consume?
- How do they compare month to month?
- Which applications are growing? How much should I charge back?
Application Analytics
MIPS Used by Applications in an LPAR by day

CPU SERIAL NO = BAA4, LPAR_SYSTEM_ID = J90, J90, PROCESSOR_TYPE = CP

HOUR(AM) |
---|
05.06.2014 | 06.06.2014 | 07.06.2014 | 08.06.2014

APPLICATION |
---|
Database Sharing | NISTCICS | Retail | WhizBang | zWAS Systems

Select all | Deselect all
### Application Summary CPU usage

#### Count of Servers with Peak Utilization (90%+):

<table>
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<th>RANGE</th>
<th>Count</th>
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<tbody>
<tr>
<td>Above 90%</td>
<td>30</td>
</tr>
<tr>
<td>79 - 89%</td>
<td>22</td>
</tr>
<tr>
<td>Below 70%</td>
<td>6</td>
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</table>

#### Count of Servers with Peak Utilization (80%+) within Each Range:

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<th>ENVIRONMENT</th>
<th>RANGE 1</th>
<th>RANGE 2</th>
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<th>RANGE 4</th>
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<td>2</td>
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**Legend:**
- **Complex Integrated Online, Prod:** Green
- **Complex Integrated Online, QA:** Green
- **Other Application:** Yellow

**Time Range:**
- Date range: Jul 1, 2014 to Jul 30, 2014
- Time range: 12:00 AM to 11:59 PM
- Interval: Daily
Near real-time Anomaly Detection

- Based on transaction CPU utilization and elapsed time
- Find out which CICS transaction is anomalous.
- Use the result to tune or fix problem of the production environment.
IBM Capacity Management Analytics

Anomaly Detection Snapshots –
CPU anomaly detection building stream
Multi-Platform Installer – Feature based

Component Selection

Which components do you want to install or upgrade?

- Capacity Management Analytics Base [Selected]
- Software Cost Analysis [Selected]
- Anomaly Detection [Selected]
- Application Analytics [Selected]

Description:
Installs the Application Analytics feature to help map and track application usage in the data center.

Disk Space:
Total required: 50.62 MB
Multi-Platform Installer – Automatic Configuration

IBM Cognos Business Intelligence Server and Java

Enter the Following Information.

Cognos BI Hostname: `abc123host`

Cognos BI Installation Directory: `/opt/ibm/cognos/c10_64`

Cognos BI Dispatch URL: `http://localhost:9300/p2pd/servlet/dispatch`

Java Installation Directory: `C:\Program Files\Java\jre1.7.0_75`

Cognos BI Application Server Type: `WebSphere Application server`

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Recommended CMAplex deployment

Clustering

Cognos: Active/Active
- z13
- z/OS
- TDSz v1.8.2 (Active)
- DB2 V11
- CMA DW
- Content Manager
- DQM Engine
- Cognos 10.2.2
- Dispatcher
- LPAR Configuration:
  - Engines: 2CPs, 2zIIPs
  - Memory: 32GIG
  - Cognos – 16G
  - DB2 – 8G
  - TDSz – 2G (~10 concurrent jobs)
  - Safety buffer – 6G

SPSS: Active/Standby
- z/OS
- TDSz v1.8.2 (standby)
- DB2 V11
- CMA DW
- Content Manager
- DQM Engine
- Content store
- LPAR Configuration:
  - Engines: 2CPs, 2zIIPs
  - Memory: 32GIG
  - Cognos – 16G
  - DB2 – 8G
  - TDSz – 2G (~10 concurrent jobs)
  - Safety buffer – 6G

TDSz: Active/Standby
- z13
- z/OS
- TDSz v1.8.2 (standby)
- DB2 V11
- CMA DW
- Content Manager
- DQM Engine
- Content store
- LPAR Configuration:
  - Engines: 2CPs, 2zIIPs
  - Memory: 32GIG
  - Cognos – 16G
  - DB2 – 8G
  - TDSz – 2G (~10 concurrent jobs)
  - Safety buffer – 6G

CMA DW
- Cognos Content Manager (ACTIVE)
- Content store
- Cognos 10.2.2
- Dispatcher
- Cognos Configuration:
  - Cognos 64bit
  - DQM JVM: 2048MB
  - Report Processes: 8
  - Thread High/Low Affinity: 2-8
  - Tomcat: 
    - maxThreads="150"
    - minSpareThreads="4"

zLinux
- CPLEX
- Modeler Server
- Configuration:
  - Buffer Size: 200M – 600M
  - Commit After 25000 records
  - Tables Partitioned by Range
  - MVS_SYSTEM_ID
  - Row Level Locking:
    - DRLSYS.DRLLOGDATASETS
  - Tablespaces: Non-logged, Locking: ANY

Cognos Framework Manager
- Modeler Client
- zLinux
- CPLEX
- Cognos 10.2.
- DQM
- Dispatcher
Tack så mycket!

Mange tak!

Kiitos!