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Capacity Provisioning Update for z/OS V1.13 and V1.12

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Agenda







- Capacity Provisioning Overview and Updates
- IBM z/OS Management Facility Capacity Provisioning Task







Today's challenges to manage capacity

- Unexpected events and workload spikes can afford higher processing capacity
- Manual capacity management can be timeconsuming and error prone
- Capacity provisioning decisions must be made without sound data





Failures, Workload moves

Manual capacity upgrades How it could look like



... meanwhile, so much workload may have queued up that one additional processor would be insufficient to decrease the queued workload

→ Two processors have to be added

CPM can react faster and reduce cost



Capacity Provisioning Capabilities Overview

- The Capacity Provisioning Manager (CPM) can control temporary processor resources on IBM zEC12, z196 or z10
 - -General purpose capacity
 - In terms of model capacity and MSUs
 - -Number of zAAPs or zIIPs
 - -Can advise on logical processors
 - -Can control one or more IBM zEnterprise or System z10 servers
 - Including multiple Sysplexes
 - -Helps to control static power save mode of IBM zEnterprise systems

CPM allows for different types of provisioning requests:

- Manually at the z/OS console through Capacity Provisioning Manager commands
- Via a user defined policy at specified schedules
- Via a user defined policy by observing workload performance on z/OS



Capacity Provisioning – Infrastructure

- z/OS WLM manages workloads to goals and business importance
- WLM indicators available through monitoring component
 - E.g. z/OS Resource Measurement Facility (RMF)
 - One RMF gatherer per z/OS system
 - One RMF Distributed Data Server (DDS) per Sysplex
- Capacity Provisioning Manager (CPM) retrieves critical metrics through CIM
- CPM communicates to support elements or HMC, via BCPii
- Graphical front end to administer Capacity Provisioning policies and Domain Configurations
 - Capacity Provisioning Control Center (CPCC) for Windows
 - Web based z/OSMF Task (V1R13)

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Main Components of Capacity Provisioning



The Capacity Provisioning Manager (CPM)

– The server program that monitors the defined systems and CPCs and takes actions as appropriate and authorized by the policies.

The Graphical front ends

- Capacity Provisioning Control Center (CPCC) or z/OSMF Capacity Provisioning Task (V1R13)
- The interface through which administrators work with provisioning policies and domain configurations.
- Can be used to transfer provisioning policies and domain configurations files to the CPM, or to query the Capacity Provisioning Manager status.
- -Not required for regular operation of CPM.



Processing Modes



Capacity Provisioning Manager can operate in one of four modes that allow for different degrees of automation

Manual mode

- Server capacities can be controlled via CPM commands
- Command driven mode where no CPM policy is active

Analysis mode

- CPM processes capacity provisioning policy and informs the operator when a provisioning / deprovisioning action would be due according to criteria specified in the policy.
- It is up to the operator either to perform the up-/downgrade manually (using the HMC/SE or the available CPM commands) or to ignore that information.

Confirmation mode

 CPM processes the policy and interrogates the On/Off CoD record to be used for capacity provisioning.

Every provisioning action needs to be authorized (confirmed) by the operator.

Autonomic mode

 Similar to the confirmation mode, except that no human (operator) intervention is required.

Various reports are available with information about workload and provisioning status, and the rationale for provisioning recommendations



CPM Policies and Processing Parameters



- CPM server uses three types of input:
 - Domain configuration defines the topology and connections, such as the CPCs and z/OS systems that are to be managed by the server
 - Contains the ID of the On/OffCoD record to use
 - Policy contains the information as to
 - Workload based activation
 - which work is provisioning eligible,
 - under which conditions and during which timeframes,
 - how much capacity may be activated when the work suffers due to insufficient processing capacity
 - Schedule based activations
 - PARM data set contains setup instructions such as UNIX environment variables, and various processing options that may be set by an installation.



Domain Configuration





- Domain configuration defines the CPCs and z/OS systems that are controlled by an instance of the CPM
- One or more CPCs, sysplexes and z/OS systems can be defined into a domain
- Sysplexes and CPCs do not have to be completely contained in a domain but must not belong to more than one Capacity Provisioning domain
- One active Capacity Provisioning policy per domain
- Multiple Sysplexes and hence multiple WLM service definitions may be involved



Policy Approach



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The Capacity Provisioning policy defines the circumstances under which additional capacity may be provisioned:

- Three "dimensions" of criteria considered:
 - When is provisioning allowed
 - Which work qualifies for provisioning
 - How much additional capacity may be activated
- These criteria are specified as "rules" in the policy:

```
If {
```

- in the specified time interval
- the specified work "suffers"

```
Then up to {
```

- the defined additional capacity

```
may be activated
```

 The specified rules and conditions are named and may be activated or deactivated selectively by operator commands



Rules: Provisioning Conditions – Time



- Time condition defines when temporary capacity may be activated:
 - Start Time: provisioning of additional capacity allowed
 - Deadline: provisioning of additional capacity no longer allowed
 - End Time: deactivation of additional capacity should begin

Name	Start Time	Deadline	End Time
TC1	03/15/11 08:00 AM	03/18/11 10:00 AM	03/19/11 10:00 AM
TC2	10/28/11 08:00 AM	10/28/11 04:00 PM	10/30/11 11:59 AM



Rules: Recurring time conditions





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- Recurring time conditions allow to define recurring time windows without resorting to ENABLE and DISABLE commands
- Starting with z/OS 1.13 CPM supports (weekly) recurring time conditions
 - Defined by start date, end date and day of week
 - Available for z/OS V1.11, V1.12 through APAR OA35284

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Rules: Provisioning Conditions – Workload



- Identifies the work that may trigger the activation of additional capacity,
 - when that work does not achieve its goal due to insufficient capacity and additional capacity would help.
 - expressed as one or more WLM service class periods
- Starting with z/OS V1.12, Capacity Provisioning supports CICS and IMS work which is managed to WLM transaction goals.



The support is available for z/OS V1.10 and V1.11 with APAR OA29641.

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Rules: Provisioning Conditions – Workload



- Parameters:
 - Sysplex/Systems: The z/OS systems that may run eligible work
 - Workload specification:
 - Importance Filter:
 Eligible service class periods, identified by WLM importance
 - Included Service Classes: Eligible service class periods
 - Extends the set of Service Class periods with qualified work (extends the default set of default eligible service classes) and may specify different PI criteria
 - Excluded Service Classes: Identifies service class periods, that should not be considered



Workload Condition Parameters cont.



- PI (Performance Index) criteria:
 - Provisioning PI + Duration: PI of service class periods must exceed the provisioning PI for the specified duration before the work is considered to require help.
 - Deprovisioning PI + Duration: PI of service class periods must fall below the peprovisioning PI for the specified duration the work is considered to no longer require help.

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- If no workload condition is specified a scheduled activation and deactivation will be performed:
 - Full capacity as specified in the rule scope
 - Unconditionally at the start and end times of the time condition



Sample Workload Condition



Sample definition:

Name: PT1 Sysplex: PLEX1 System: SYSA Included Service Class Periods: ONLINE in WLMSD with PI >= 1.8 for 10 min until PI <= 1.2 for 10 min Excluded Service Class Periods: BACKUP in WLMSD

Monitor Service Class Pl's:



Rules: Processor Scope Processor Limits



- CPC within provisioning domain for which activation of resources is allowed
- Max number of additional MSU/zAAPs/zIIPs that may be activated
 - Only the required delta capacity will be activated by the CPM
- Processor scope exists in two flavours:
 - Maximum processor scope defines an upper limit of resources that may be activated in total for all the contained rules at any point in time
 - Processor scope on the "rule" level defines an upper limit of resources that may be activated for the single rule at any point in time
 - Allows for definitions like "I authorize 300 MSU for workload 1 and 200 MSU for workload 2, but at no point in time more than 400 MSU."

CPC	Max MSU	Max zAAPs	Max zIIPs
CPC1	400	3	5
CPC2	800	0	0



Primary and secondary capacity quantum



- Provisioning increments allow for faster or more aggressive provisioning
- Starting with z/OS 1.13 CPM supports primary and secondary activation quantum
 - Primary quantum added for first activation on a given CPC
 - Secondary added on subsequent activations
 - Defined on "Maximum Processor Scope" panels
 - Only general purpose capacity supports primary and secondary quantum
 - Available for z/OS V1.11, V1.12 through APAR OA35284

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Capacity Provisioning

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Additional CPM Processing and Directives



- For workload-based provisioning it is a necessary condition that the performance index exceeds the specified provisioning PI
 - However, that is not at a sufficient condition
 - The underlying CPM processing examines many metrics and parameter to ensure that:
 - The observed performance bottleneck is actually caused by a capacity bottleneck
 - That additional capacity could actually be consumed by the workload incurring the capacity demand
- Deprovisioning is under control of additional parameters
 - The "minimum activation time" specifies for how long any added capacity must remain active at a minimum.
 - It is specified in the PARM member
- For many aspects of the CPM processing additional directives may be specified in the PARM member
 - Refer to documentation for full list



Reports, Logs, Audit Trails



- History of actual workload and system activity available with CPM reports
 - Especially REPORT ACTIVITY, REPORT WORKLOAD
 - Reports can be directed to files and archived
- History of capacity changes available via CPM logging
 - Metrics, decisions and other data can be logged to file system
 - Binary format
- Other information available:
 - RMF Mon III data sets
 - Model and capacity changes recorded outside CPM
 - SMF22
 - RMF 70.1, 72
 - Current capacity information also available via STSI instruction, and related MVS programming interfaces



zEnterprise Static Power Save Mode (requires APAR OA30433)



Syntax



 Existing reports are extended to report on power-save capability, and whether power-save mode can currently be enabled

```
CPC R35 with record * is enabled (default enabled)
CPC is matched with serial 000020089F25 since 07/23/2010 13:32:13
Hardware is of type 2817 with model M49
Current model is 722 with 2119 MSU, 1 zAAPs, and 1 zIIPs
No usable 00CoD record available
Power save mode is enabled
```

- If power-save mode cannot be re-enabled in current period: "Power save mode is disabled and not allowed"
- For CPCs supporting static power save mode the Provisioning Manager will not consider adding capacity based on the active policy while in power save mode
 - Already activated temporary capacity may be deactivated
 - ACTIVATE RESOURCE and DEACTIVATE RESOURCE commands are not affected by power save mode.



Capacity Provisioning Summary

- Capacity Provisioning allows for faster reaction to workload fluctuations
 - -Replacing manual analysis with policy based monitoring of workloads
 - -Customer defined criteria and objectives
 - -Supports general purpose, zAAP, and zIIP capacity
 - -Can be used to control z196 static power save mode



Can be configured to different levels of automation

- –z/OS system commands for capacity changes
 - -Eliminates need to access HMC
- -Scheduled capacity changes
- -Provide capacity recommendations to staff
- -Optionally, full automation, eliminating human intervention

z/OS base component

- -z/OS Release 9 and above
- -Utilizes z/OS Resource Measurement Facility (RMF) or equivalent
- -Uses open standards protocol
 - -Common Information Model (CIM)
- -Mostly zAAP eligible

Hardware Pre-requisites

- -IBM zEC12, z196 or z10
- Based on System z On/Off Capacity on Demand



Agenda





- Capacity Provisioning Overview and Updates
- IBM z/OS Management Facility Capacity Provisioning Task







IBM z/OS Management Facility Capacity Provisioning Task





- View the domain status, active configuration and active policy
- Full editing capability for Policies and Domain Configurations
- Import/Export functionality
- Install and Activate functionality
- Copy/Paste support
 - Whole policies or domain configurations
 - Single elements
- No installation on local workstation required
- Multi User support

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	Policies	Define, modify, view, import, export, or install and activate a provisioning policy.	
	Settings		
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Provision Manager Reports in z/OSMF



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Domain Configuration Editing in z/OSMF

IBM z/OS Management Facility



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Policy Editing in z/OSMF

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Policy Editing Guided by Messages



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Navigation between Edit Elements







Import and Installation

Capacity Provisioning

Overview Policies X

Policies

Provisioning policies contain a set of time and workload co The list of policies stored in the z/OSMF repository (all time







Documentation

- z/OS MVS Capacity Provisioning User's Guide, SC33–8299 http://publibz.boulder.ibm.com/epubs/pdf/iea2u141.pdf
- Website under the Capacity Provisioning homepage http://www-03.ibm.com/systems/z/os/zos/features/cpm/
- IBM z/OS Management Facility Website http://www-03.ibm.com/systems/z/os/zos/zosmf/
- zEnterprise System Capacity on Demand User's Guide, SC28-2605 http://www-01.ibm.com/support/docview.wss?uid=isg296907662ee3456d1852577690056367e
- ITSO Redbook:
 - System z10 Enterprise Class Capacity on Demand, SG24-7504 http://www.redbooks.ibm.com/abstracts/sg247504.html?Open



• in San Francisco

2013



 Capacity on Demand advancements on the IBM System z10, IBM J. RES. & DEV. VOL. 53 NO. 1 PAPER 15 2009 <u>http://www.research.ibm.com/journal/abstracts/rd/531/axnix.html</u>





WLM, RMF, CPM Sessions

- 12792: Remote RMF Report Access Hands-on Lab
 - Juergen Baumann

Monday 02/04, 3:00-4:00 PM, Union Square 23-24, Fourth Floor

13088: Workload Management Update for z/OS V1.13 and V1.12

Brad D. Snyder Tuesday 02/05, 4:30-5:30 PM, Yosemite C, Ballroom Level

13099: Capacity Provisioning Update for z/OS V1.13 and V1.12

Juergen Baumann,

Wednesday 02/06, 6:00-7:00 PM, Yosemite C, Ballroom Level

- 13089: RMF: The Latest and Greatest
 - Brad D. Snyder

Thursday 02/07, 8:00-9:00 AM, Yosemite C, Ballroom Level

• 13090: z/OS Workload Manager: What Are You Thinking

Brad D. Snyder Thursday 02/07, 4:30-5:30 PM, Yosemite B, Ballroom Level



z/OSMF SHARE Sessions – San Francisco



ID	Day	Time	Title	Presenters	Location
13059	2/5	9:30 – 10:30	z/OSMF What is it? And why would I want it?	Anuja Deedwaniya	Franciscan B, Ballroom Level
13052	2/5	12:15 – 1:15	Engaging Users and Reducing Complexity: z/OSMF Project Usability Discussion	Toshiba Burns-Johnson	Franciscan B, Ballroom Level
13061	2/6	1:30 – 2:30	z/OSMF Advanced Functionality	Anuja Deedwaniya	Franciscan B, Ballroom Level
13048	2/6	6:00 – 7:00	z/OSMF Roundtable	Anuja Deedwaniya	Franciscan B, Ballroom Level
13099	2/6	6:00 – 7:00	Capacity Provisioning Update for z/OS 1.13 and 1.12	Juergen Baumann	Yosemite C, Ballroom Level
13082	2/7	8:00 – 9:00	New z/OSMF Software Management Capabilities	Greg Daynes	Franciscan B, Ballroom Level
13089	2/7	8:00 – 9:00	RMF: The Latest and Greatest	Brad Snyder	Yosemite C, Ballroom Level
13100	2/7	9:30 – 10:30	Manage your Workloads and Performance with z/OSMF	Juergen Baumann	Yosemite C, Ballroom Level
12752	2/7	11:00 – 12:00	z/OSMF Hands-On Lab	Anuja Deedwaniya	Union Square 23- 24, Fourth Floor
13040	2/7	4:30 – 5:30	z/OSMF User Experience	Doug Henry (US Bank) Mary_Anne Matyaz (U.S. Customs) Anuja Deedwaniya(IBM)	Imperial A, Ballroom Level
12753	2/8	8:00 - 9:00	z/OSMF Software Deployment Hands- on Lab	Marna Walle Greg Daynes	Union Square 23- 24, Fourth Floor
13070	2/8	8:00 – 9:00	z/OSMF Software Management Hands-on Lab	Greg Daynes	Union Square 23- 24, Fourth Floor

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Closing Slide – Capacity Provisioning Update for z/OS V1.13 and V1.12

Juergen Baumann IBM Corporation

Wednesday, February 6, 2013 Session 13099

baumannj@de.ibm.com



