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

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Wednesday, February 6, 2013
Session 13099

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SHARE in San Francisco 2013

# Agenda

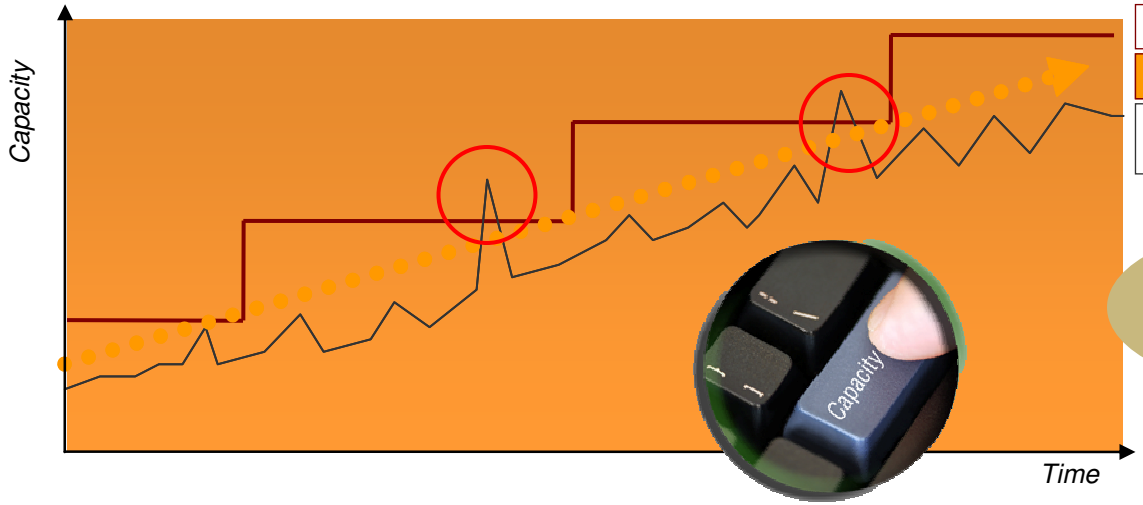

- Capacity Provisioning Overview and Updates
- IBM z/OS Management Facility Capacity Provisioning Task

NEW R13

# Today's challenges to manage capacity

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


Failures, Workload moves




Unexpected Workload spikes

# Manual capacity upgrades
# How it could look like

| | | |
|---|---|---|
| 1. | Workload increases | 0 min |
| 2. | Operator realizes bottleneck | 5-10 min |
| 3. | Operator informs system programmers and manager | 2 min |
| 4. | Discussion | 10 min |
| 5. | Logon to HMC, activate record | 5 min |

***… 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

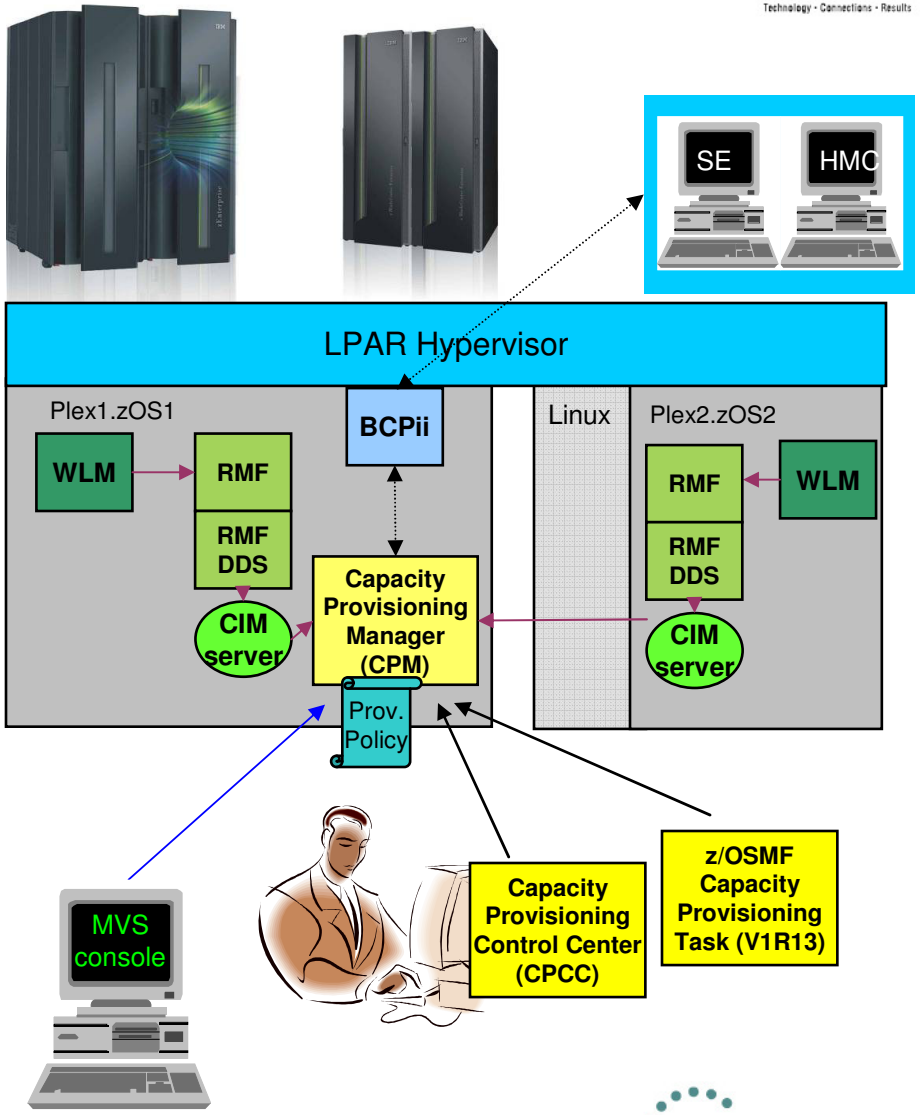
- The Capacity Provisioning Manager (CPM) can control temporary processor resources on IBM zEC12, z196 or z10
  - General purpose capacity
    - In terms of model capacity and MSUs
  - Number of zAAPs or zIIPs
  - Can advise on logical processors
  - Can control one or more IBM zEnterprise or System 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

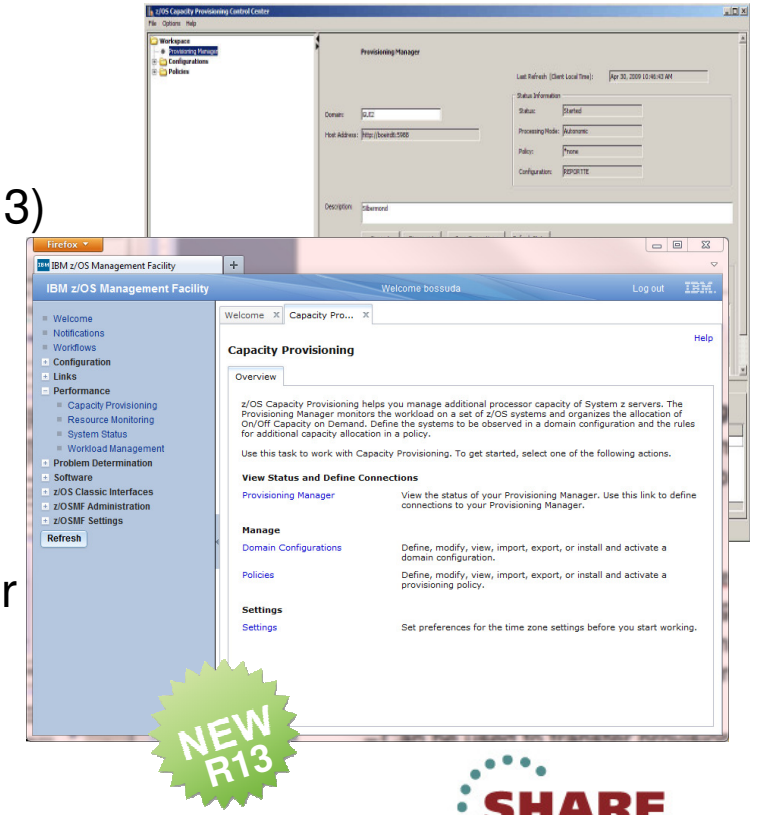
- z/OS WLM manages workloads to goals and business importance
- WLM indicators available through monitoring component
  - E.g. z/OS Resource Measurement Facility (RMF)
  - One RMF gatherer per z/OS system
  - One RMF Distributed Data Server (DDS) per Sysplex
- Capacity Provisioning Manager (CPM) retrieves 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)



# 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.

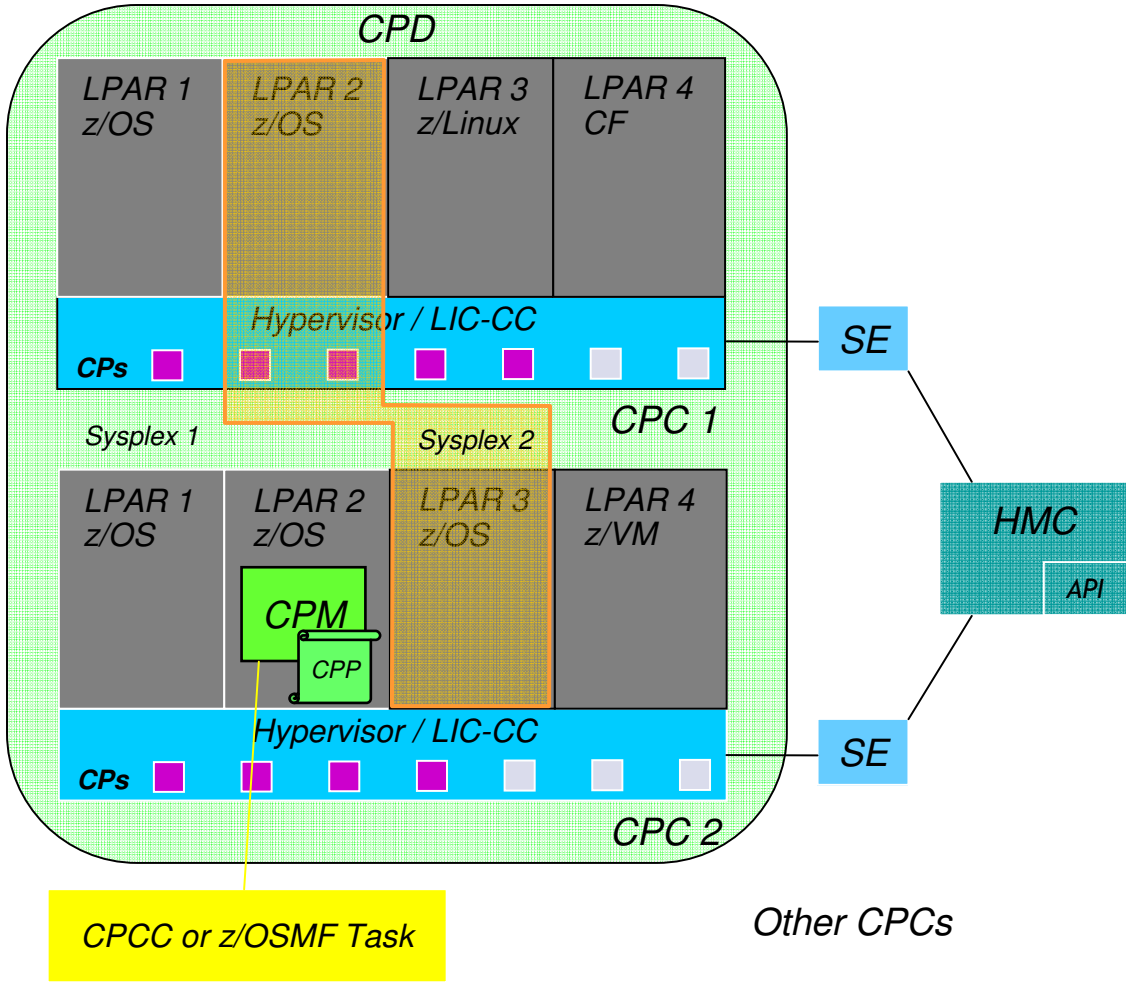
Various reports are available with information about workload and provisioning status, and the rationale for provisioning recommendations

# 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

*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:

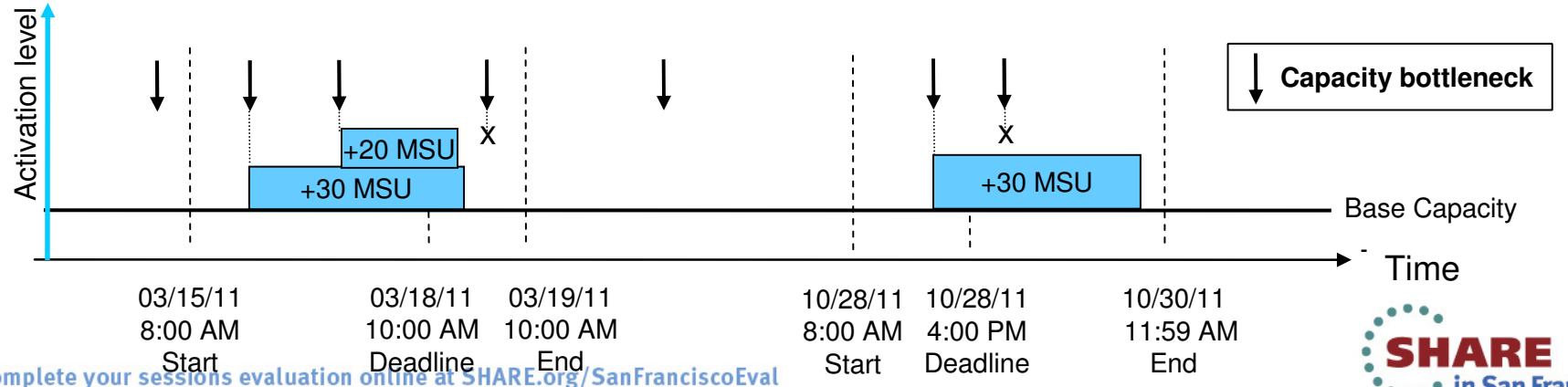
```
If {
    - in the specified time interval
    - the specified work "suffers"
}
Then up to {
    - the defined additional capacity
    may be activated
}
```

- 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

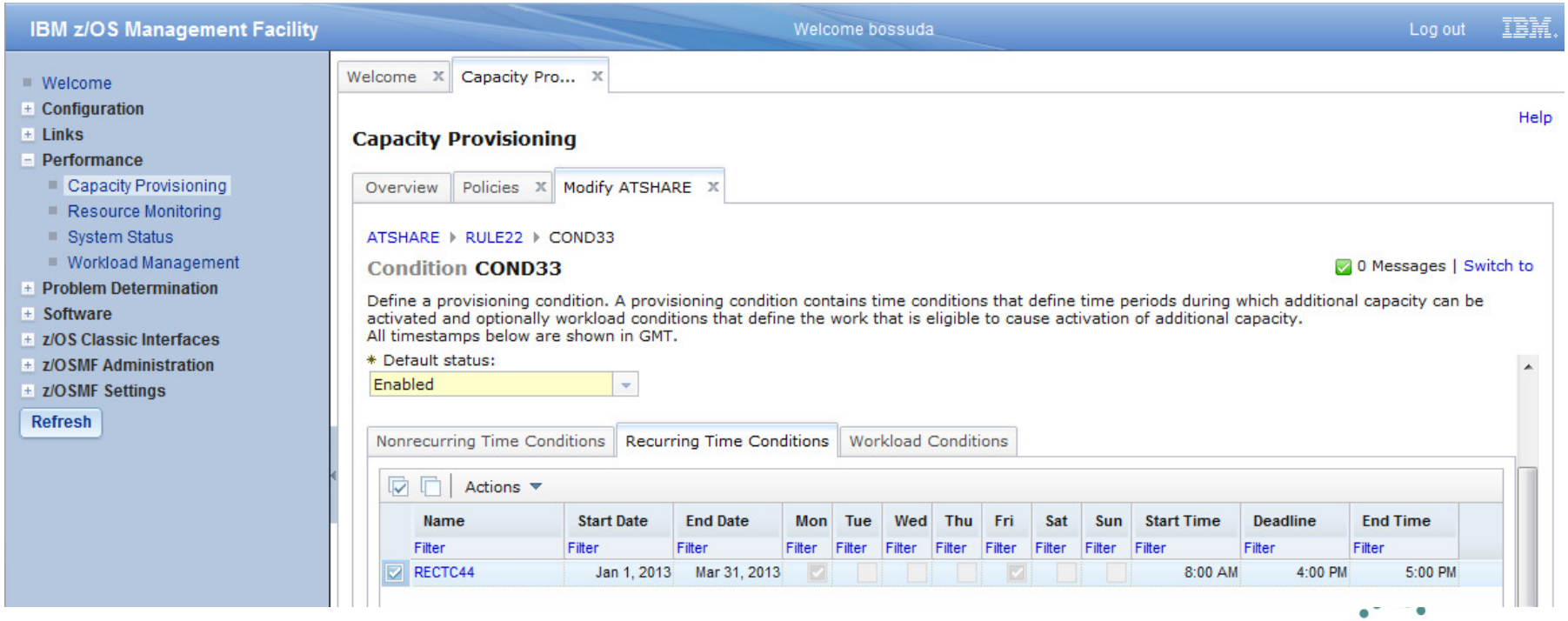
| *Name* | *Start Time* | *Deadline* | *End Time* |
|---|---|---|---|
| TC1 | 03/15/11 08:00 AM | 03/18/11 10:00 AM | 03/19/11 10:00 AM |
| TC2 | 10/28/11 08:00 AM | 10/28/11 04:00 PM | 10/30/11 11:59 AM |



# Rules: Recurring time conditions

NEW R13

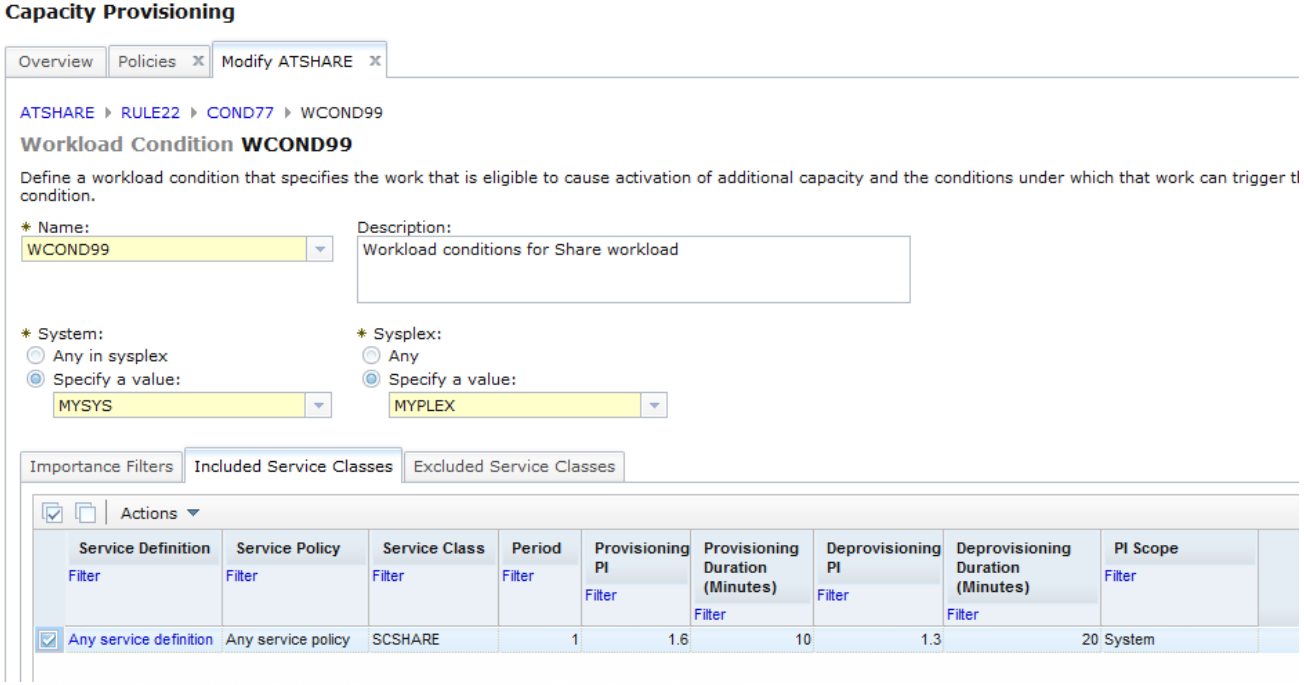
- Recurring time conditions allow to define recurring time windows without resorting to ENABLE and DISABLE commands
- Starting with z/OS 1.13 CPM supports (weekly) recurring time conditions
  - Defined by start date, end date and day of week
  - Available for z/OS V1.11, V1.12 through APAR OA35284



# 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.

R12 NEW



# 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

Importance Filters | Included Service Classes | Excluded Service Classes

Actions

| Service Definition | Service Policy | Service Class | Period | Provisioning PI | Provisioning Duration (Minutes) | Deprovisioning PI | Deprovisioning Duration (Minutes) | PI Scope |
|---|---|---|---|---|---|---|---|---|
| Filter | Filter | Filter | Filter | Filter | Filter | Filter | Filter | Filter |
| Any service definition | Any service policy | SCSHARE | 1 | 1.6 | 10 | 1.3 | 20 | System |

# 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.

Importance Filters | Included Service Classes | Excluded Service Classes

Actions

| Service Definition | Service Policy | Service Class | Period | Provisioning PI | Provisioning Duration (Minutes) | Deprovisioning PI | Deprovisioning Duration (Minutes) | PI Scope |
|---|---|---|---|---|---|---|---|---|
| Filter | Filter | Filter | Filter | Filter | Filter | Filter | Filter | Filter |
| Any service definition | Any service policy | SCSHARE | 1 | 1.6 | 10 | 1.3 | 20 | System |

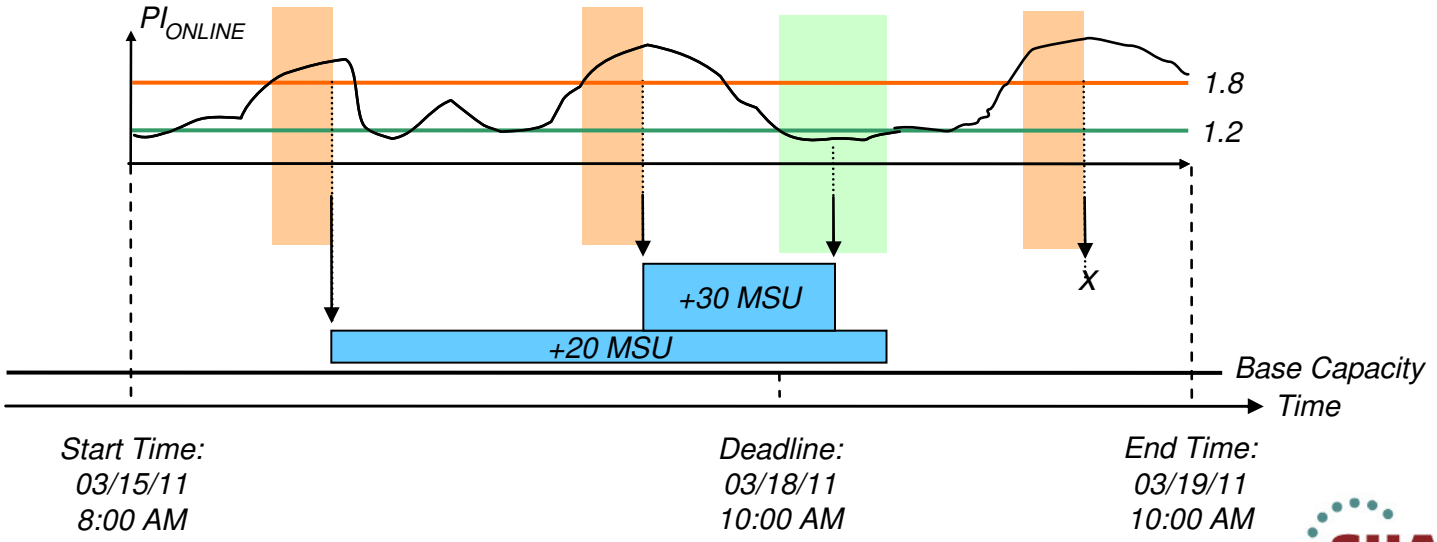
- If no workload condition is specified a scheduled activation and deactivation will be performed:
  - Full capacity as specified in the rule scope
  - Unconditionally at the start and end times of the time condition

# 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 PI's:*



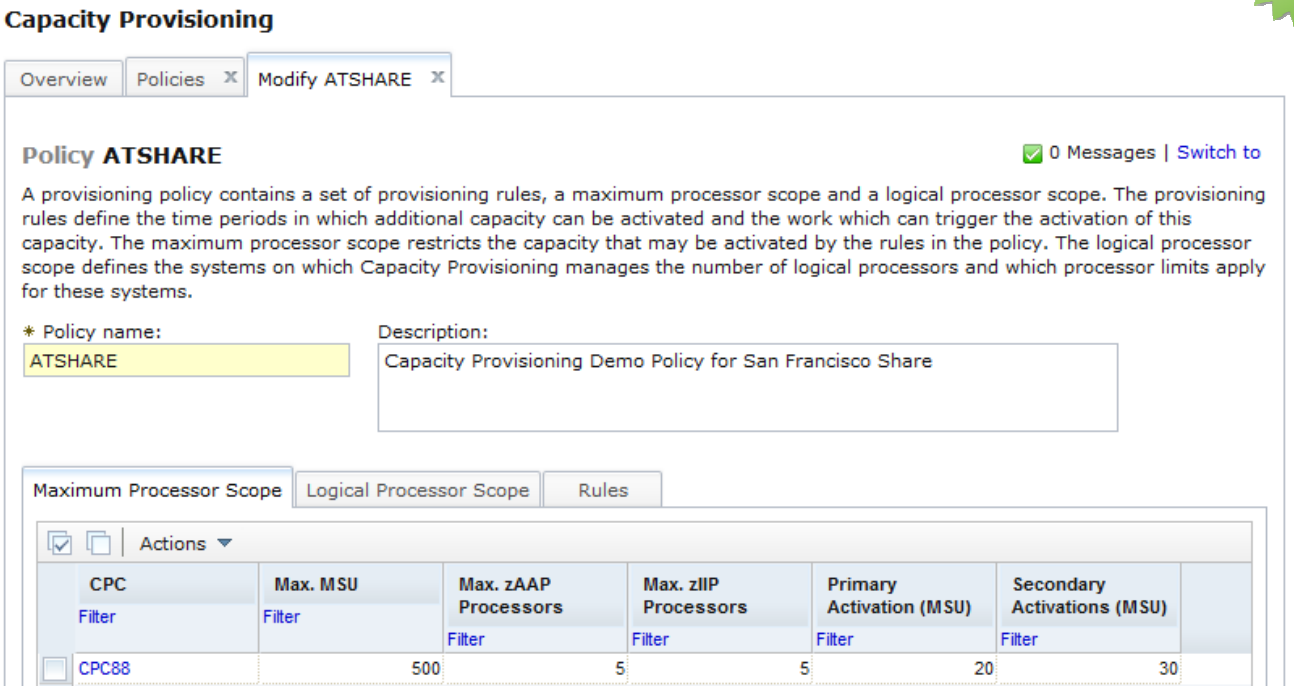
# Rules: Processor Scope Processor Limits

- 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



# 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)


- Commands to enable or disable static power save mode:

**Syntax**



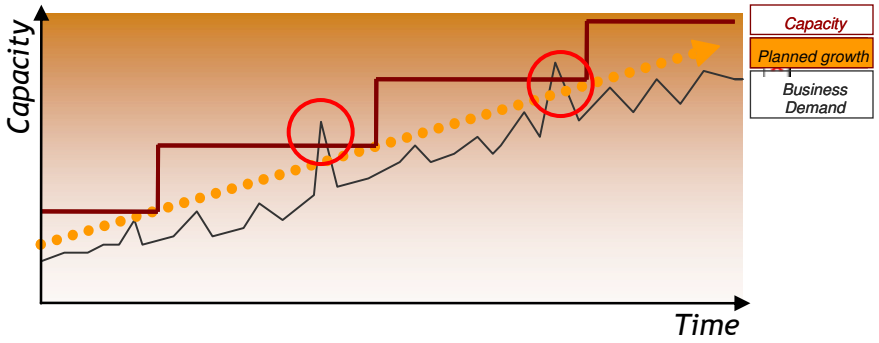
- Existing reports are extended to report on power-save capability, and whether power-save mode can currently be enabled

```
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 OOCoD 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*

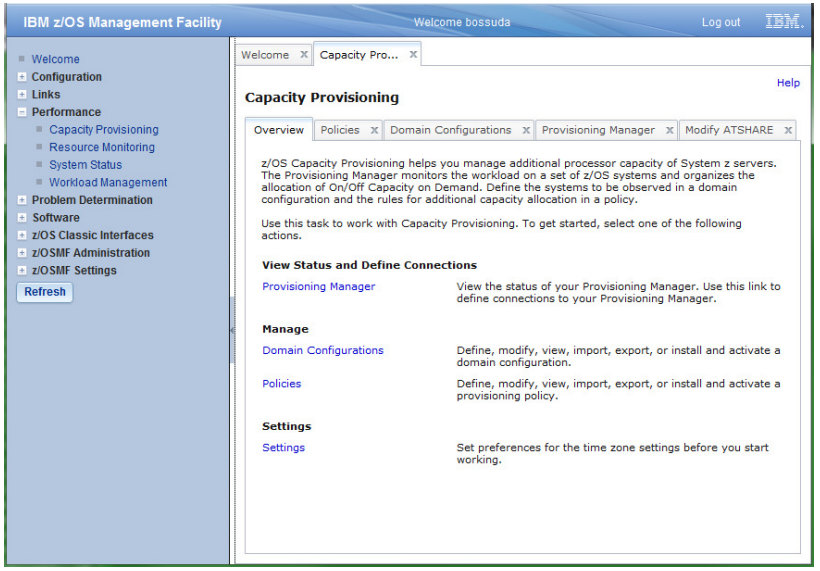
# Agenda


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

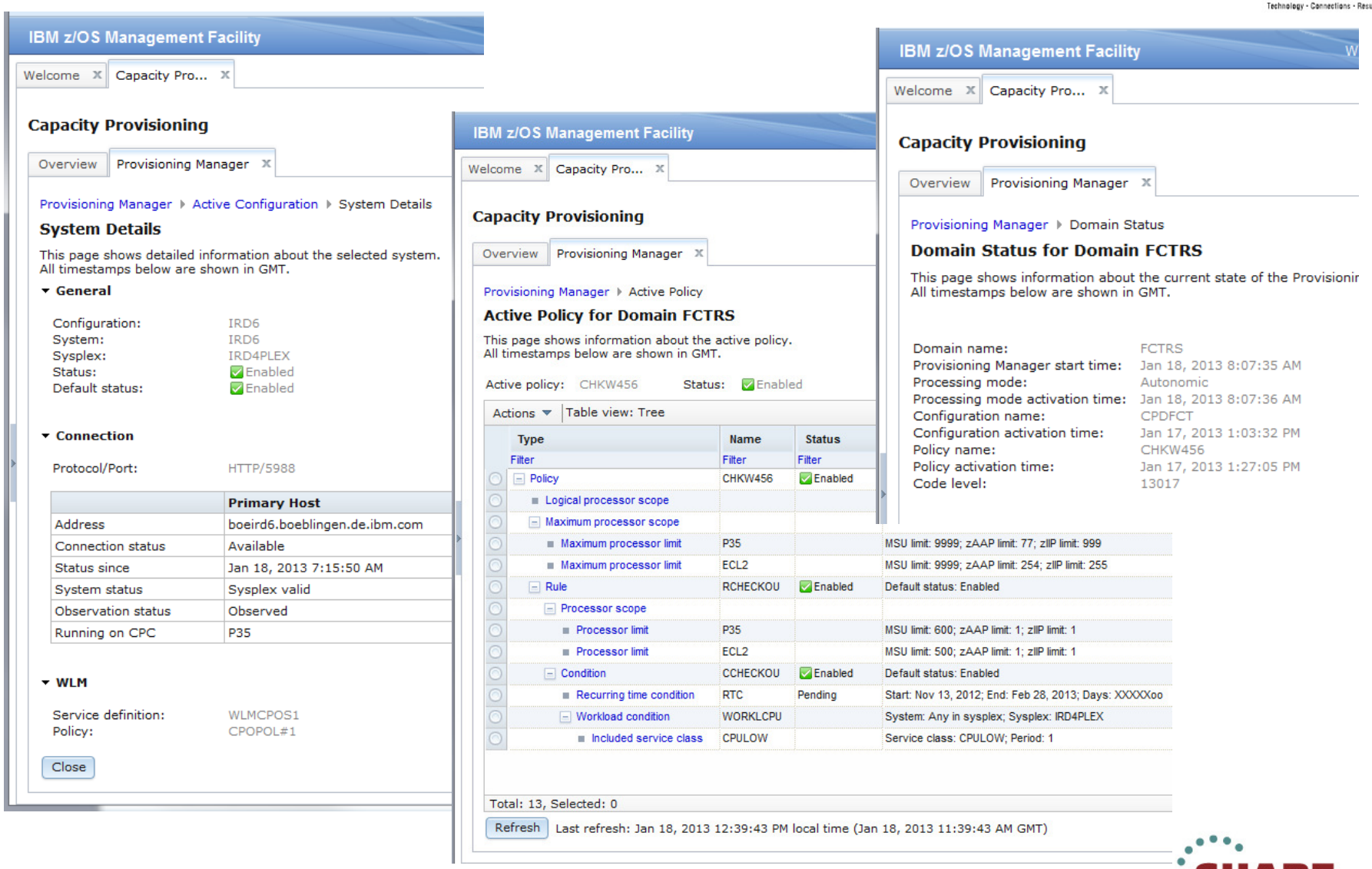
NEW R13

# IBM z/OS Management Facility Capacity Provisioning Task

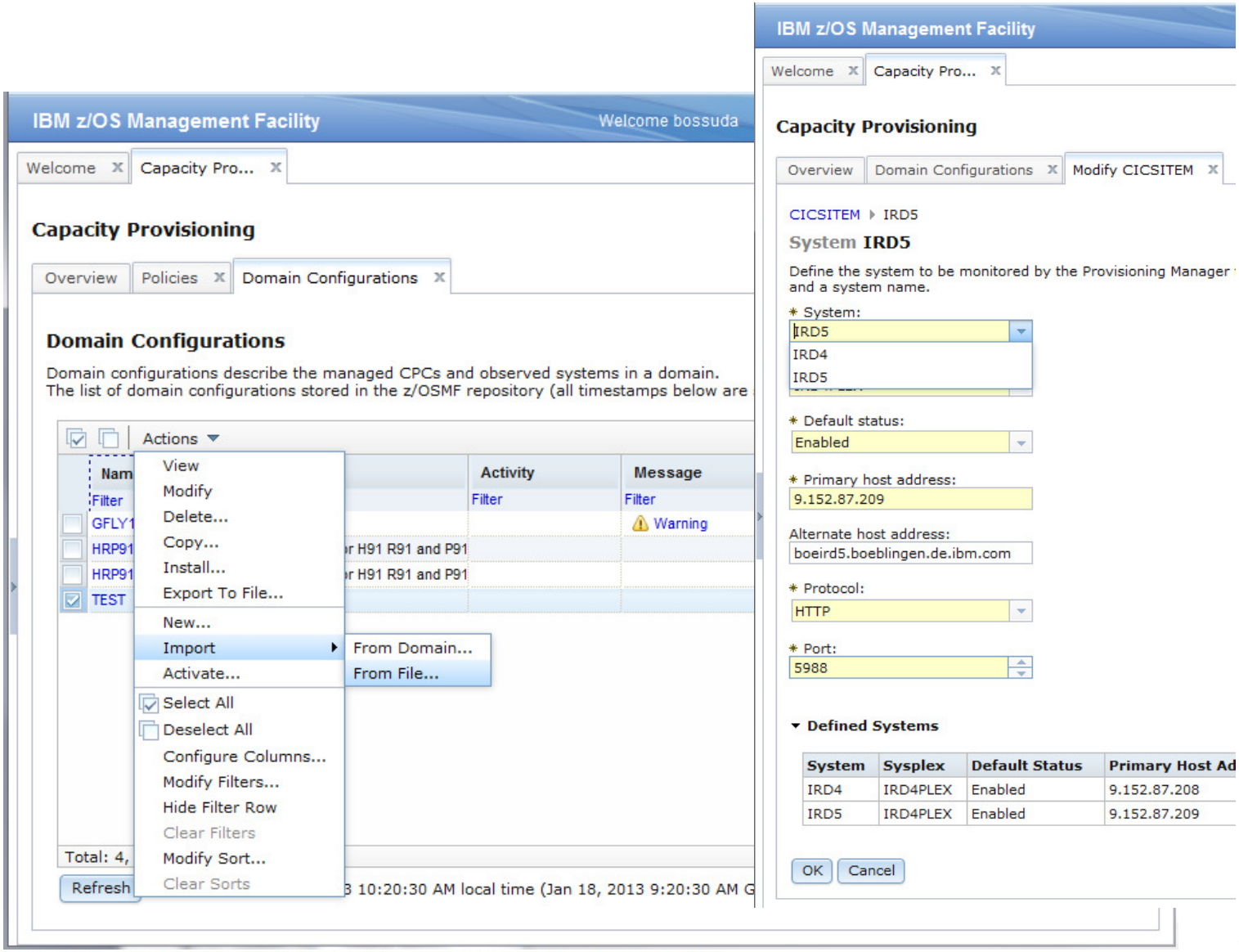

- With z/OSMF R13 APAR PM74519 the Capacity Provisioning Task can be used as a replacement of the Capacity Provisioning Control Center.
  - View the domain status, active configuration and active policy
  - Full editing capability for Policies and Domain Configurations
  - Import/Export functionality
  - Install and Activate functionality
  - Copy/Paste support
    - Whole policies or domain configurations
    - Single elements
  - No installation on local workstation required
  - Multi User support



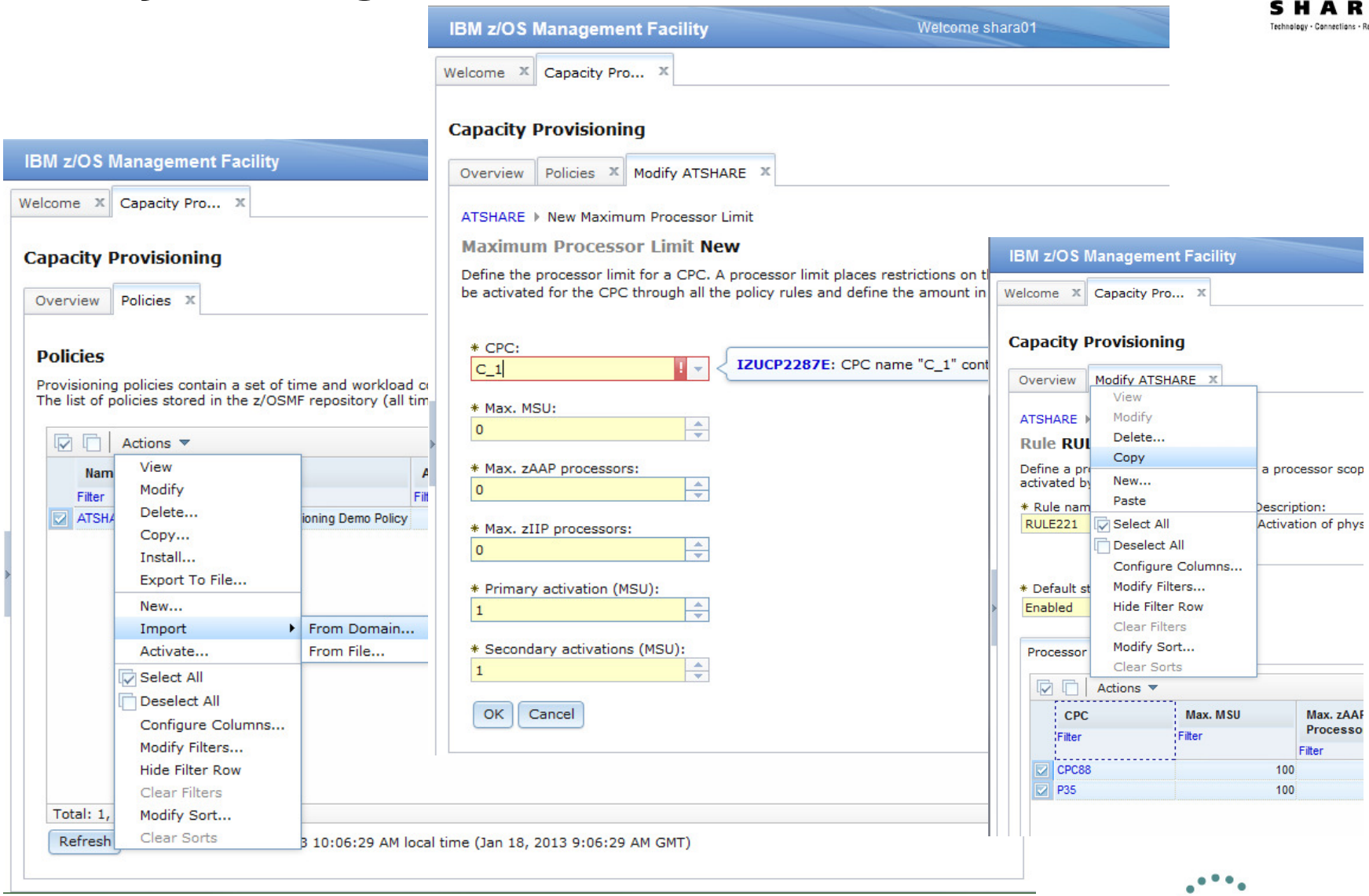
# Provision Manager Reports in z/OSMF



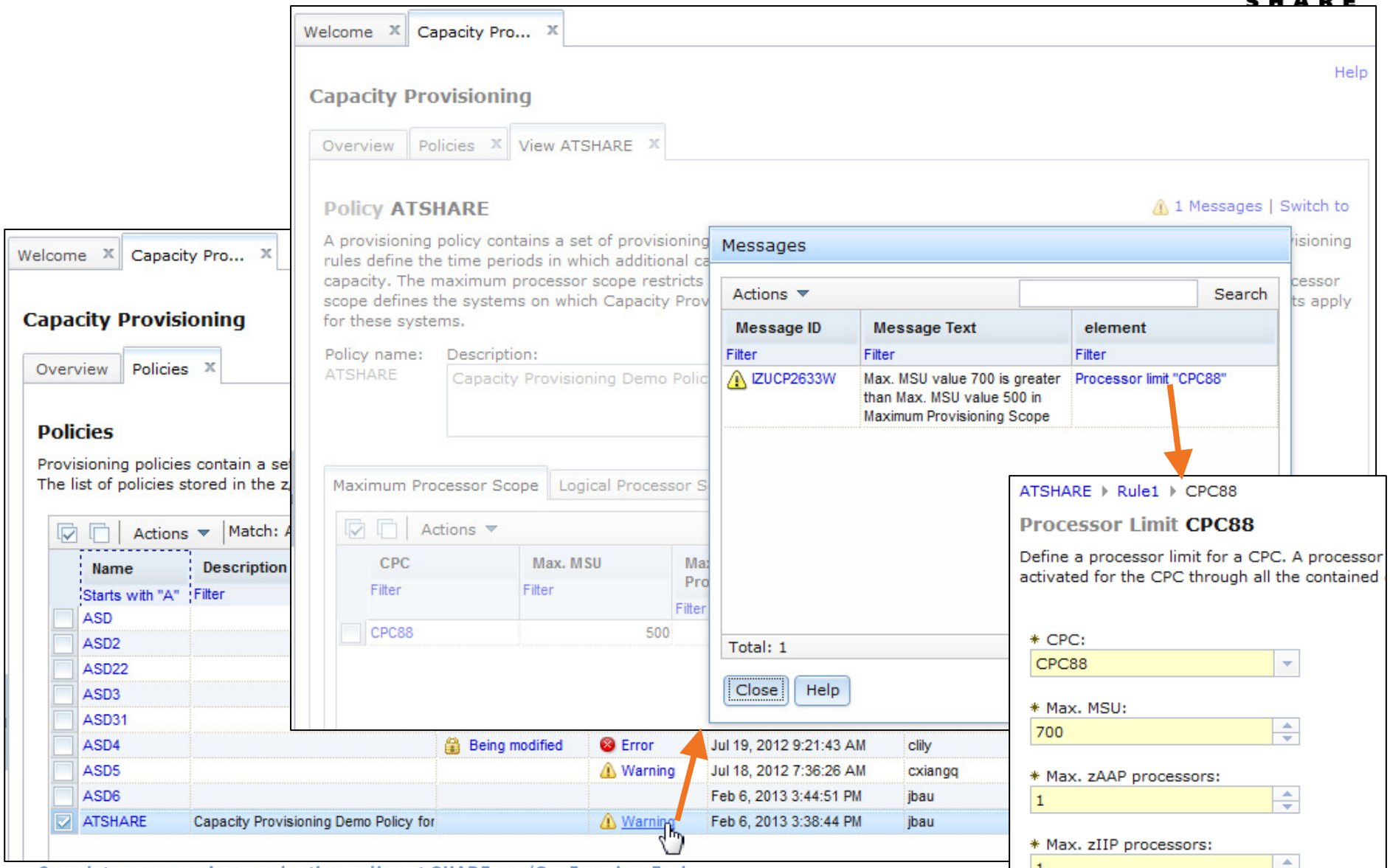
# Domain Configuration Editing in z/OSMF



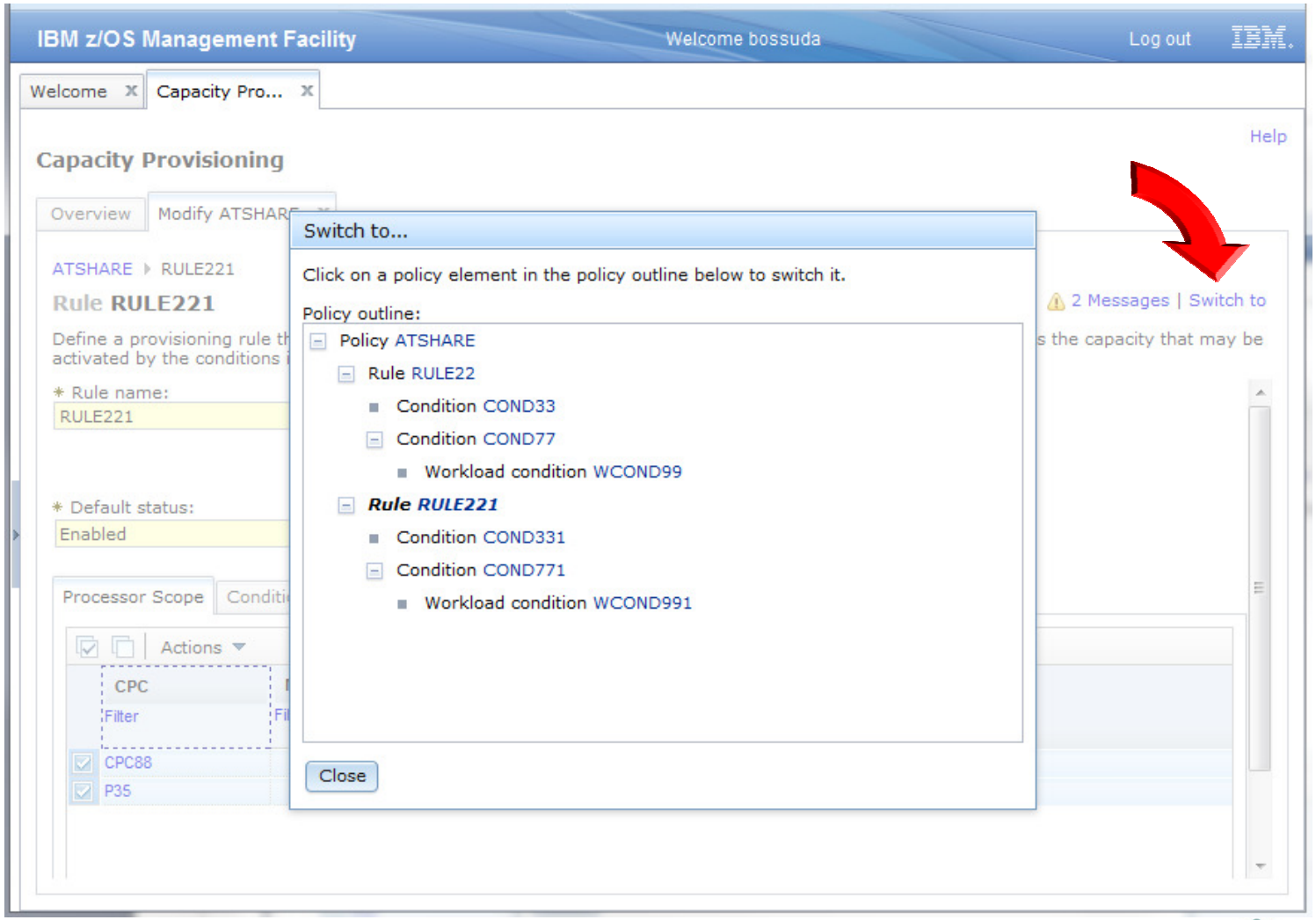
# Policy Editing in z/OSMF



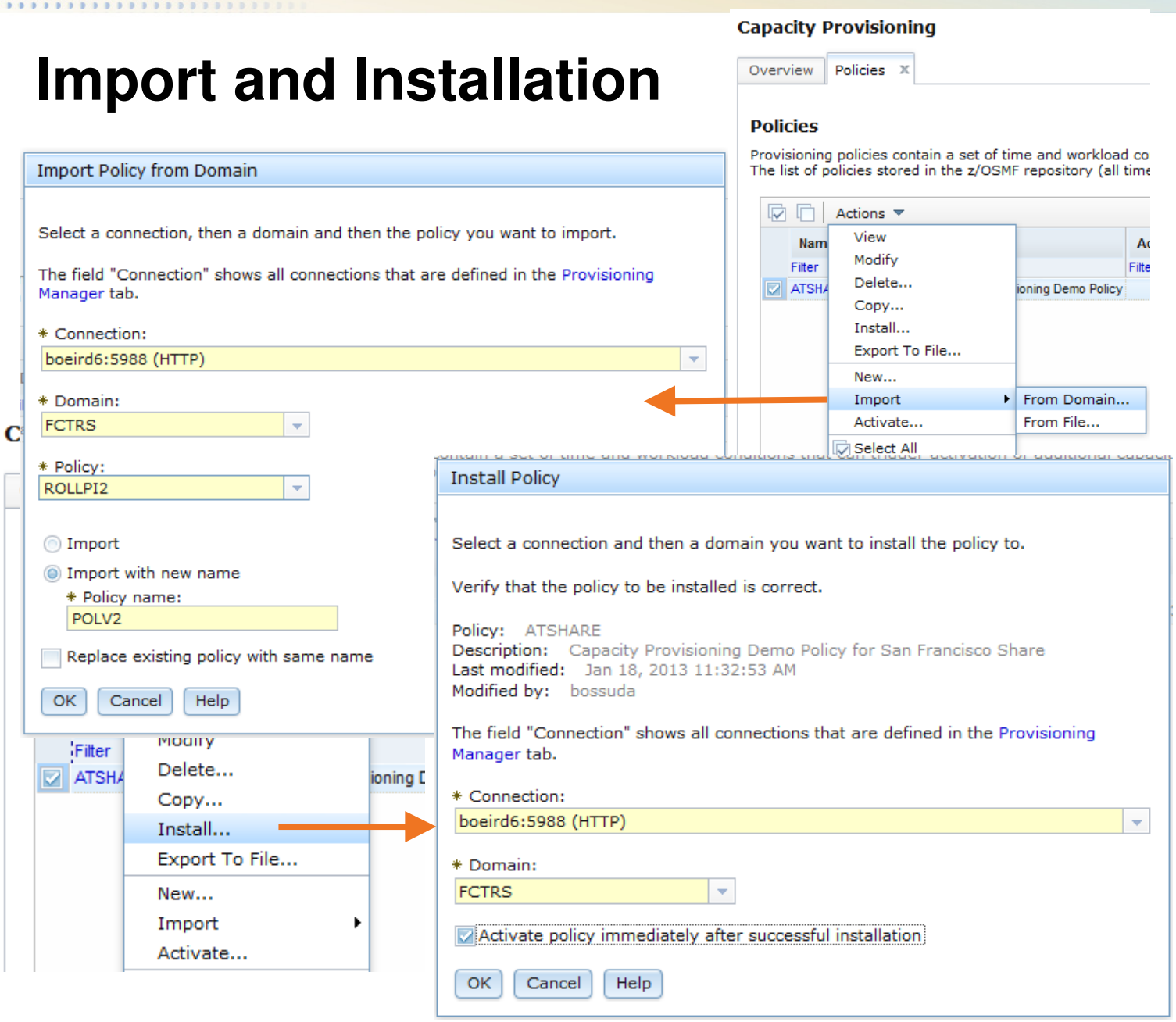
# Policy Editing Guided by Messages



# Navigation between Edit Elements



# Import and Installation



# 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*



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

# 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)<br>Mary Anne Matyaz (U.S. Customs)<br>Anuja Deedwaniya(IBM) | Imperial A, Ballroom Level |
| 12753 | 2/8 | 8:00 – 9:00 | **z/OSMF Software Deployment Hands-on Lab** | Marna Walle<br>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

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