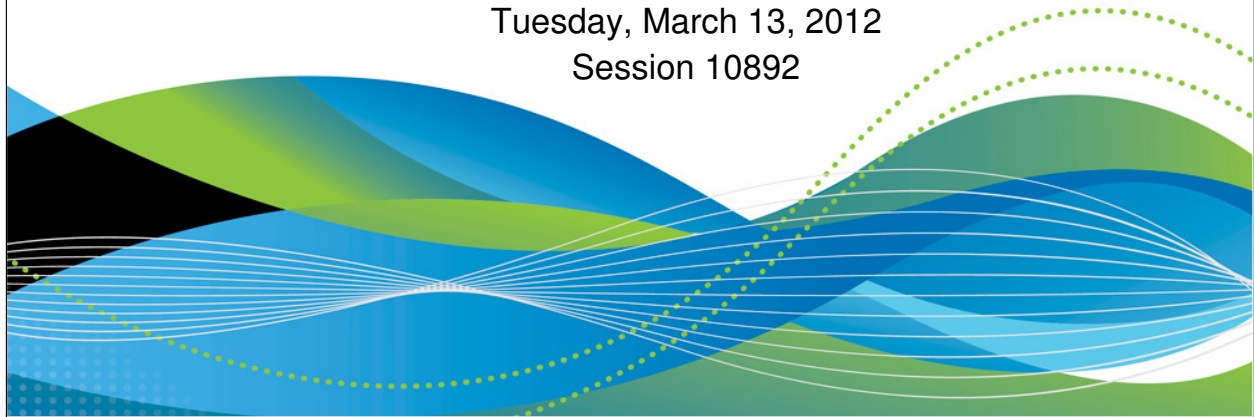


# Cross Platform Performance Monitoring with RMF XP

Robert Kieninger([KIENINGR@de.ibm.com](mailto:KIENINGR@de.ibm.com) )  
IBM Corporation

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Session 10892



# The new Component: RMF XP



What the hell is RMF XP?  
When i think of XP, another  
operating system crosses  
my mind...



# The new Component: RMF XP...



- RMF XP cannot cause Bluescreens!
- RMF XP is the solution for **C**ross **P**latform Performance Monitoring
- RMF XP supports the Operating Systems running on
  - **x** Blades
  - **p** Blades



- In addition RMF XP supports Linux on System z
  - LPAR Mode
  - VM Guest Mode



3

- RMF XP is the new solution to monitor the performance of heterogeneous environments. RMF XP supports the operating systems running on the IBM zEnterprise BladeCenter Extension:
  - AIX on System p
  - Linux on System x
- In addition, Linux on System z is supported as well

# RMF XP – Basic Idea



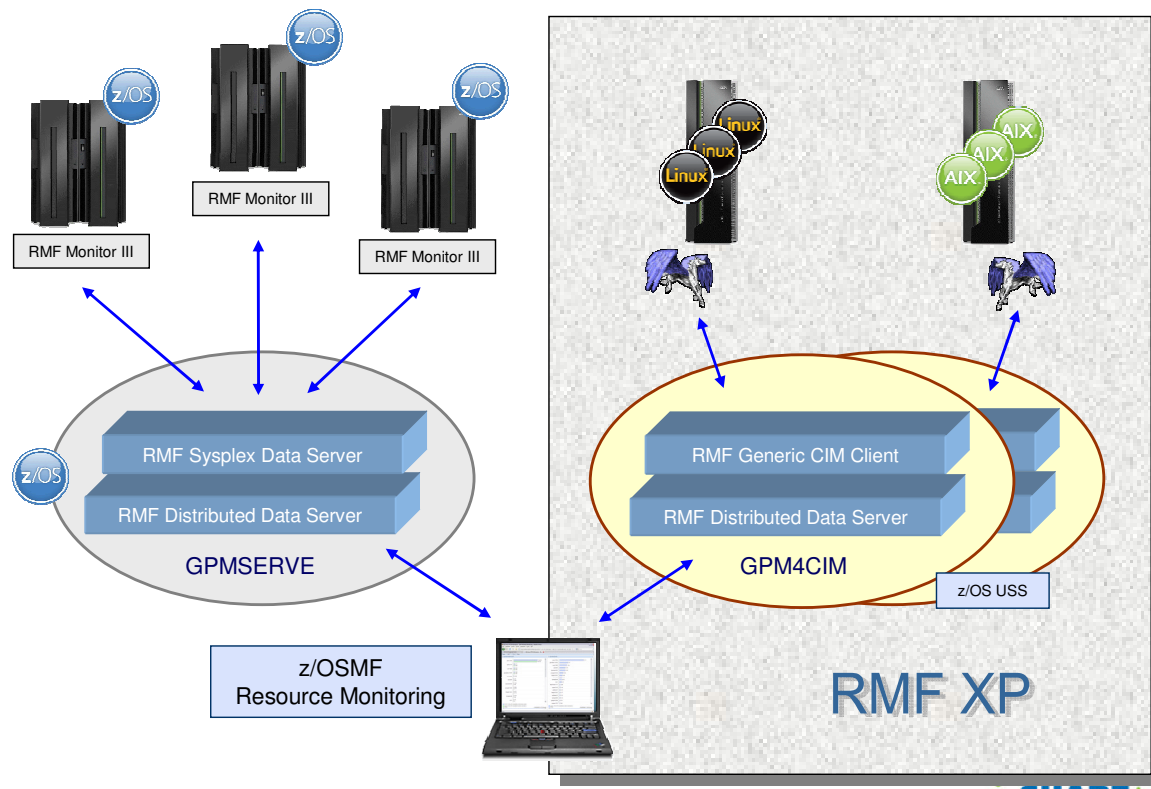
- The Common Information Model (aka CIM) instrumentation is available for almost all operating systems of this planet
- RMF has the infrastructure already in place to
  - combine performance data from multiple systems to a Sysplex wide view
  - display performance data by means of state-of-the-art graphical frontends

💡 Isn't it a good idea to bring those neat things together ?

✓ We thought it is and we created the RMF XP

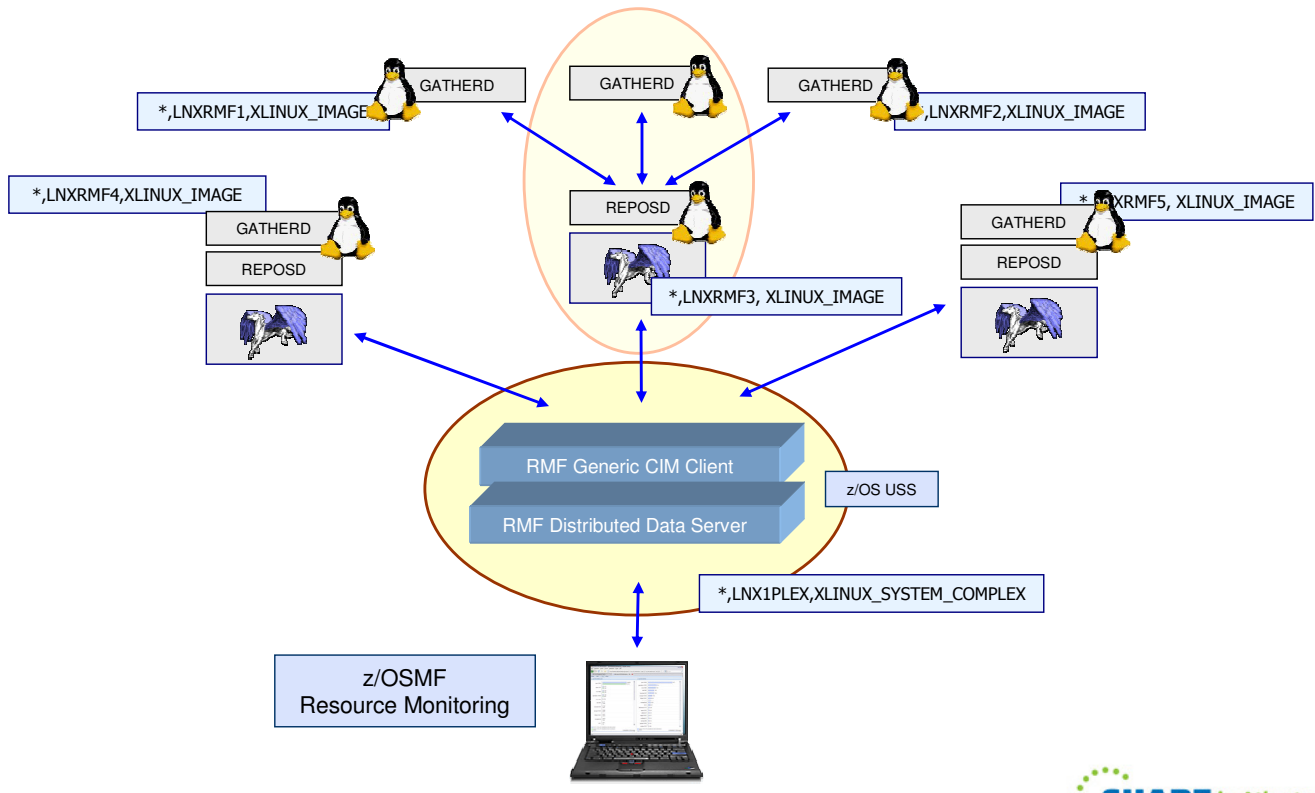


# RMF XP – Component Overview



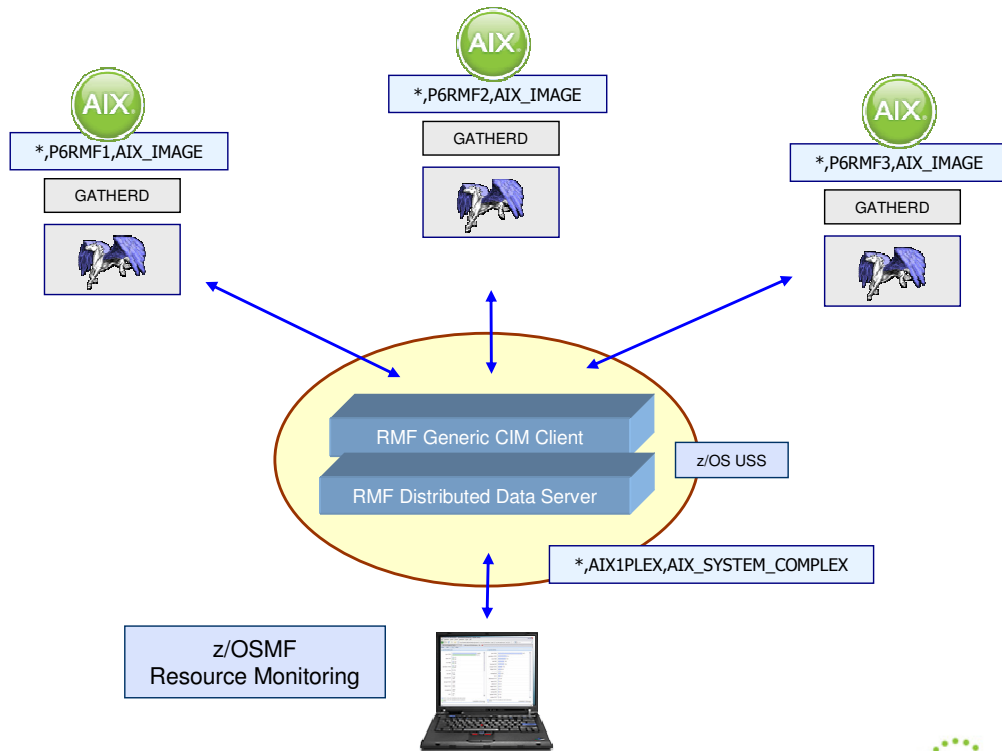
- What are the components of the new RMF XP function?
- The RMF Distributed Data Server (aka DDS) consists of two main functional entities:
  - The communication layer to the client
  - The interface layer to the data collection backend
- For RMF XP, the existing DDS communication layer remains unchanged
- In contrast to the z/OS data collection which exploits the RMF Sysplex Data Server API's, RMF XP uses the standard CIM API's to collect the performance data from the remote Linux and AIX systems

# RMF XP – Linux Data Collection



- The topology for the Linux data collection slightly differs from the AIX topology:
- On each individual endpoint, a performance data collector is needed in terms of a component called GATHERD
- The collector stores his data to a central repository which is managed by the REPOSD component.
- RMF XP can interact with this component by means of a CIM provider interface.
- Result: just one connection to a CIM server is needed to retrieve performance data from multiple Linux images

# RMF XP – AIX Data Collection



- In contrast to Linux, the concept of a repository node does not exist for the AIX operating system
- Hence, RMF XP builds up a separate connection to each individual endpoint

# RMF XP – Invocation



- Started Task: SYS1.PROCLIB(GPM4CIM)
- Runs in USS Environment via BPXBATCH
- Multiple instances can run in parallel: one STC per platform
  - S GPM4CIM.GPM4A,OS=A
  - S GPM4CIM.GPM4X,OS=X
  - S GPM4CIM.GPM4Z,OS=Z

```
//GPM4CIM PROC OS=A
//STEP1 EXEC PGM=BPXBATCH,TIME=NOLIMIT,REGION=0M,
// PARM='PGM /usr/lpp/gpm/bin/gpm4cim cfg=/etc/gpm/gpm4&OS..cfg'
//STDENV DD PATH='/etc/gpm/gpm4cim.env'
//STDOUT DD PATH='/var/gpm/logs/gpm4cim&OS..out',
// PATHOPTS=(OWRONLY,OCREAT,OTRUNC),
// PATHMODE=(SIRUSR,SIWUSR,SIRGRP)
//STDERR DD PATH='/var/gpm/logs/gpm4cim&OS..trc',
// PATHOPTS=(OWRONLY,OCREAT,OTRUNC),
// PATHMODE=(SIRUSR,SIWUSR,SIRGRP)
//SYSPRINT DD SYSOUT=*
//SYSOUT DD SYSOUT=*
// PEND
```




- To start RMF XP, use the new proclib member GPM4CIM
- The gpm4cim executable runs in the Unix System Services environment and receives control from the BPXBATCH utility
- One GPM4CIM instance is needed per platform type



# RMF XP – Configuration

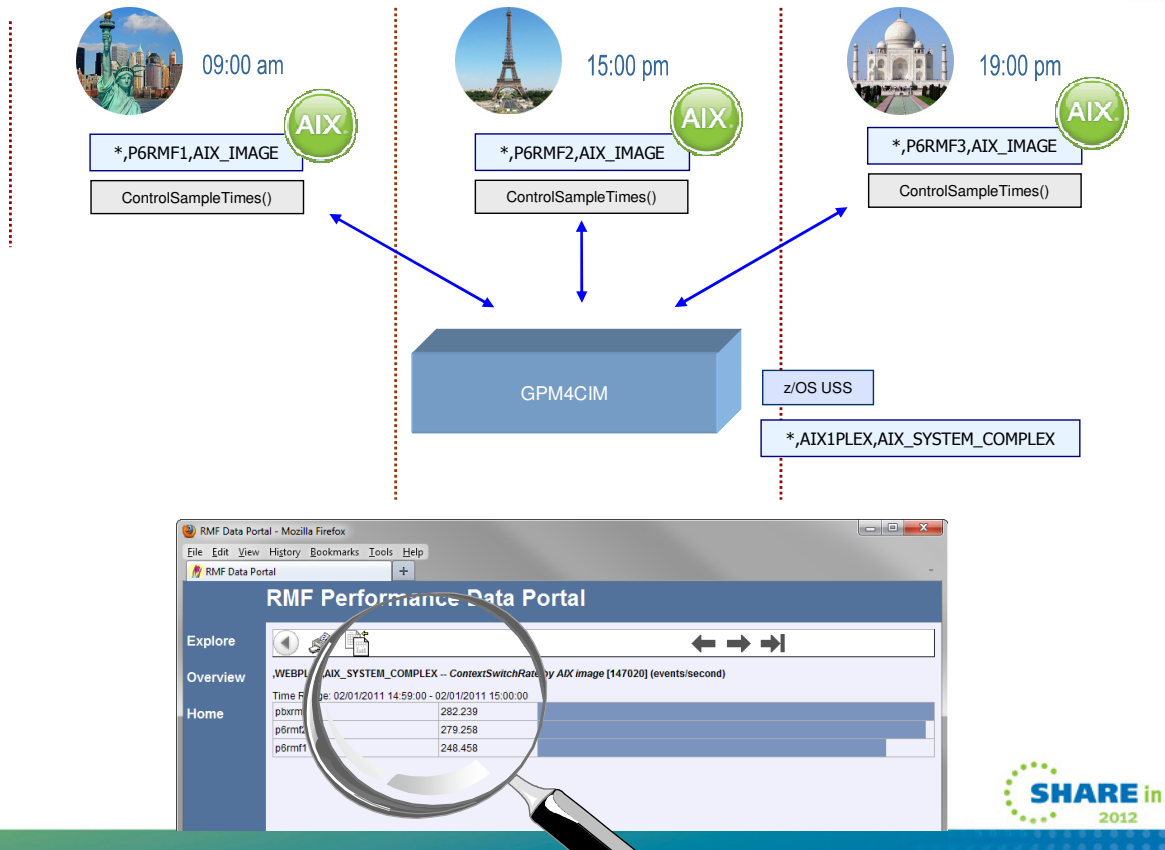
```
//GPM4CIM PROC OS=A
//STEP1 EXEC PGM=BPXBATCH,TIME=NOLIMIT,REGION=0M,
// PARM='PGM /usr/lpp/gpm/bin/gpm4cim cfg=/etc/gp /gpm4&OS..cfg'
//STDENV DD PATH='/etc/gpm/gpm4cim.env'
//STDOUT DD PATH='/var/gpm/logs/gpm4cim&OS..out',
// PATHOPTS=(OWRONLY,OCREAT,OTRUNC),
// PATHMODE=(SIRUSR,SIWUSR,SIRGRP)
//STDERR DD PATH='/var/gpm/logs/gpm4cim&OS..trc',
// PATHOPTS=(OWRONLY,OCREAT,OTRUNC),
// PATHMODE=(SIRUSR,SIWUSR,SIRGRP)
//SYSPRINT DD SYSOUT=*
//SYSOUT DD SYSOUT=*
// PEND
```



```
MAXSESSIONS_HTTP(20) /* MaxNo of concurrent HTTP requests */
HTTP_PORT(8805) /* Port number for HTTP requests */
HTTP_ALLOW(*) /* Mask for hosts that are allowed */
HTTP_NOAUTH(*) /* No server can access without auth.*/
INTERVAL(300) /* Length of the monitoring interval */
AIX_COMPLEX(WEBPLEX) /* Name of system complex */
AIX_IMAGE(p6rmf1.boeblingen.de.ibm.com:5988) /* Hostname of member */
AIX_IMAGE(p6rmf2.boeblingen.de.ibm.com:5988)
```

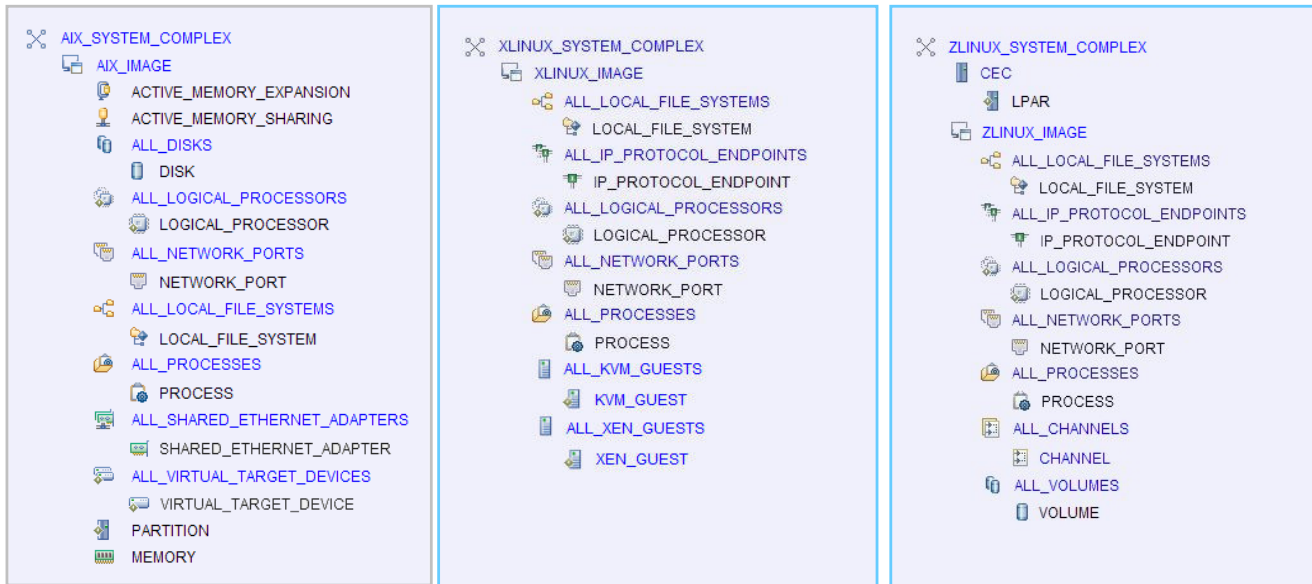
- RMF XP is almost an out-of-the-box function
- Just supply the following parameters:
  - Complex name (can be any string)
  - Image names (must be valid host names or ip addresses)
  - Interval length (optional parameter, default = 300 sec)
- Even though the minimum interval length can be set to 60 seconds, it is recommended to choose longer intervals in order to prevent too much resource consumption

# RMF XP – Interval Synchronization



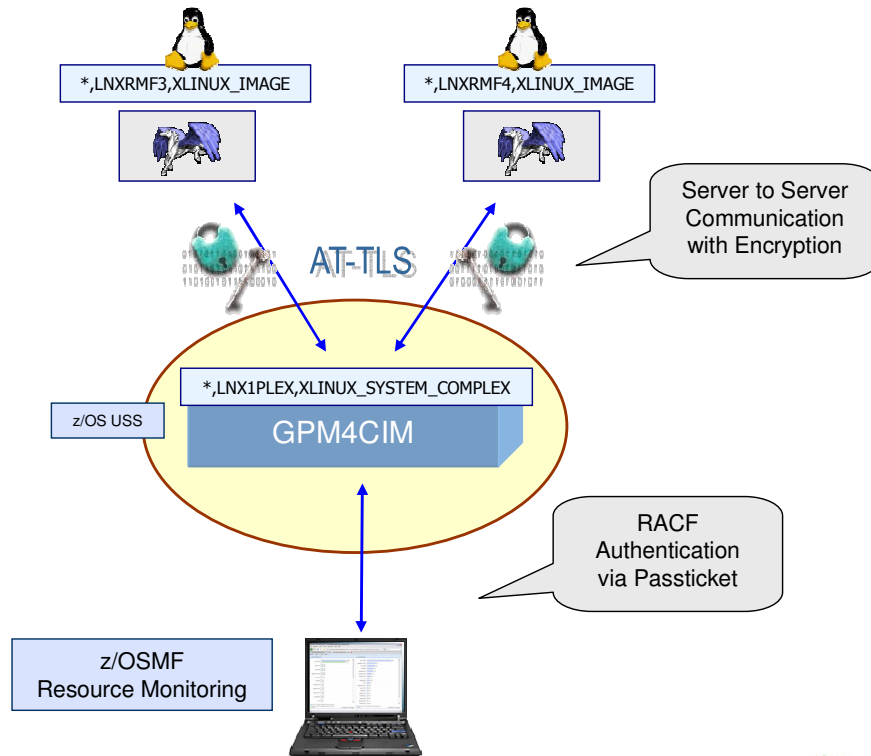
- For the AIX operating system the remote CIM API allows to
  - Start the data collection at a certain point in time
  - Set a common collection interval for all monitored endpoints
- RMF XP synchronizes the interval
  - On a one minute boundary if the interval is < 5 minutes
  - On a five minute boundary if the interval is > 5 minutes
- For the Linux operating system it is the responsibility of the system administrator to
  - Start the data collection on the monitored endpoints synchronously
  - Set the data collection interval on all endpoints accordingly to the RMF XP interval length

# RMF XP – Platform specific Resource Models



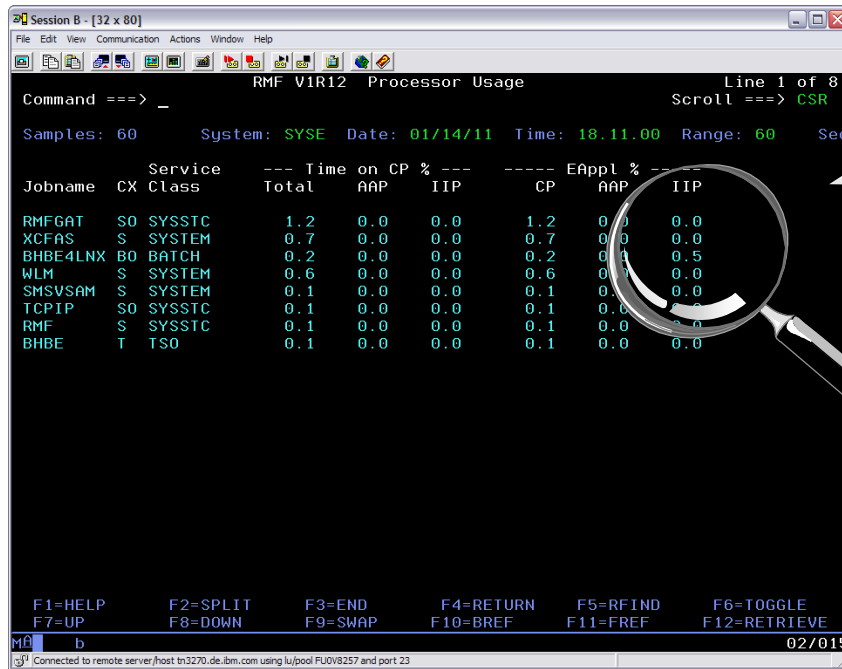
- If we could follow the pure nature of CIM, resources and metrics are common in a computing environment, regardless of the operating system.
- However, the reality looks a bit different. We have to deal with lots of platform specific extensions of the resource model.
- That's why we decided to supply one GPM4CIM instance per operating system type.

# RMF XP – Security



- Encryption for the communication between GPM4CIM and the endpoints can be configured via AT-TLS on the z/OS outbound side
- For the communication between the client and GPM4CIM authentication can be configured via userid and password or passtickets

# RMF XP – zIIP Exploitation



Command ==> \_

System: SYSE Date: 01/14/11 Time: 18.11.00 Range: 60 Sec

Jobname	CX	Service Class	Time Total	on CP AAP	% IIP	CP	EAppl AAP	% IIP
RMFGAT	S0	SYSSTC	1.2	0.0	0.0	1.2	0.0	0.0
XCFAS	S	SYSTEM	0.7	0.0	0.0	0.7	0.0	0.0
BHBE4LNX	B0	BATCH	0.2	0.0	0.0	0.2	0.1	0.5
WLM	S	SYSTEM	0.6	0.0	0.0	0.6	0.0	0.0
SMSVSAM	S	SYSTEM	0.1	0.0	0.0	0.1	0.0	0.0
TCPIP	S0	SYSSTC	0.1	0.0	0.0	0.1	0.0	0.0
RMF	S	SYSSTC	0.1	0.0	0.0	0.1	0.0	0.0
BHBE	T	TSO	0.1	0.0	0.0	0.1	0.0	0.0

F1=HELP F2=SPLIT F3=END F4=RETURN F5=RFIND F6=TOGGLE  
F7=UP F8=DOWN F9=SWAP F10=BREF F11=FREF F12=RETRIEVE

02/015

Up to 70% CPU utilization can be offloaded to zIIPs !

- Talking to lots of images and collect lots of performance metrics is not for free. It can become costly!
- However, RMF XP can exploit zIIP specialty engines for the CIM based data collection
- In our test environment, we have observed that approximately 70% of the CPU consumption can be offloaded to zIIP engines

# RMF XP – Performance Considerations

```
//GPM4CIM PROC OS=A
//STEP1 EXEC PGM=BPXBATCH,TIME=NOLIMIT,REGION=0M,
// PARM='PGM /usr/lpp/gpm/bin/gpm4cim cfg=/etc/gpm/gpm4&OS..cfg'
//STDENV DD PATH='/etc/gpm/gpm4cim.env'
//STDOUT DD PATH='/var/gpm/logs/gpm4cim&OS..out',
// PATHOPTS=(OWRONLY,OCREAT,OTRUNC),
// PATHMODE=(SIRUSR,SIRGRP,SIRXCP)
//STDERR DD PATH='/var/gpm/logs/gpm4cim.trc',
// PATHOPTS=(OWRONLY,OCREAT,OTRUNC),
// PATHMODE=(SIRUSR,SIWUSR,SIRGRP)
//SYSPRINT DD SYSOUT=*
//SYSOUT DD SYSOUT=*
// PEND
```

```
GPM_HOME=/u/bhbe/gpm/
ICLUI_TRACETO=STDERR
_BPX_SHAREAS=NO
_BPXK_AUTOCVT=ON
LIBPATH=/u/bhbe/gpm:/usr/lpp/wbem/lib
GPM_NETWORK_PORT=1
GPM_LOCAL_FILE_SYSTEM=1
GPM_PROCESS=0
GPM_LOGICAL_PROCESSOR=1
GPM_DISK=1
GPM_IP_PROTOCOL_ENDPOINT=1
```

Deactivation of metrics  
on process level can save  
up to 90% CPU utilization



Exclude individual metric categories from the data collection

- Most variables within the GPM environment file are common for all platforms and should not be changed
- However, individual metric categories can be included in – or excluded from – the data collection by means of environment variables
- This feature is only applicable for metric categories which have multiple instances per system
- Specifically for metrics on process level, the deactivation can save up to 90% CPU utilization
- The remote deactivation of metrics categories depends on the CIM server implementation resp. the `ControlMetricsByClass()` method
- This method is currently only valid together with the AIX CIM server
- Anyway, for the Linux platforms it is possible to exclude individual metric categories as well. But this cannot be achieved by means of a remote API
- It is the responsibility of the administrator to deactivate specific provider modules on the endpoints manually by means of the `unload` command

# RMF XP – Resource Tree



**RMF Performance Data Portal**

Explore: [←](#) [👤](#)

Overview: Welcome, you are connected to: ,WEBPLEX,AIX\_SYST

My View

Icon	Resource	Metrics
	,WEBPLEX,AIX_SYSTEM_COMPLEX	Metrics

Home: RMF-DDS-Server GPM4CIM - 1 [↗](#) Availability Level: 3000

---

**RMF Performance Data Portal**

Explore: [←](#) [👤](#)

Overview: Children of: ,WEBPLEX,AIX\_SYSTEM\_COMPLEX

My View

Icon	Resource	Metrics	Attributes	Res-Type
	,tmcc-123-131,AIX_IMAGE	Metrics	N/A	AIX_IMAGE
	,tmcc-123-133,AIX_IMAGE	Metrics	N/A	AIX_IMAGE
	,tmcc-123-139,AIX_IMAGE	Metrics	N/A	AIX_IMAGE
	,tmcc-123-140,AIX_IMAGE	Metrics	N/A	AIX_IMAGE
	,tmcc-123-141,AIX_IMAGE	Metrics	N/A	AIX_IMAGE

Home

---

**RMF Performance Data Portal**

Explore: [←](#) [👤](#)

Overview: Children of: ,tmcc-123-141,\*ALL\_NETWORK\_PORTS

My View

Icon	Resource	Metrics
	,tmcc-123-141.en0.NETWORK_PORT	Metrics
	,tmcc-123-141.en1.NETWORK_PORT	Metrics
	,tmcc-123-141.lo0.NETWORK_PORT	Metrics
	,tmcc-123-141.sit0.NETWORK_PORT	Metrics

Home

---

**RMF Performance Data Portal**

Explore: [←](#) [👤](#)

Overview: Children of: ,tmcc-123-141,\*ALL\_NETWORK\_PORTS

My View

Icon	Resource	Metrics	Attributes	Res-Type
	,tmcc-123-141,*ACTIVE_MEMORY_EXPANSION	Metrics	N/A	ACTIVE_MEMORY_EXPANSION
	,tmcc-123-141,*ACTIVE_MEMORY_SHARING	Metrics	N/A	ACTIVE_MEMORY_SHARING
	,tmcc-123-141,*ALL_DISKS	Metrics	N/A	ALL_DISKS
	,tmcc-123-141,*ALL_LOGICAL_PROCESSORS	Metrics	N/A	ALL_LOGICAL_PROCESSORS
	,tmcc-123-141,*ALL_NETWORK_PORTS	Metrics	N/A	ALL_NETWORK_PORTS
	,tmcc-123-141,*ALL_LOCAL_FILE_SYSTEMS	Metrics	N/A	ALL_LOCAL_FILE_SYSTEMS
	,tmcc-123-141,*ALL_PROCS	Metrics	N/A	ALL_PROCESSES
	,tmcc-123-141,*ALL_SHARED_ETHERNET_ADAPTERS	Metrics	N/A	ALL_SHARED_ETHERNET_ADAPTERS
	,tmcc-123-141,*ALL_VIRTUAL_TARGET_DEVICES	Metrics	N/A	ALL_VIRTUAL_TARGET_DEVICES
	,tmcc-123-141,*PARTITION	Metrics	N/A	PARTITION
	,tmcc-123-141,*MEMORY	Metrics	N/A	MEMORY

Home



# RMF XP – Metrics



The screenshot displays the RMF Performance Data Portal interface in a Mozilla Firefox browser window. The page is divided into several sections:

- Navigation:** Includes 'Explore', 'Overview', 'My View', and 'Home' links.
- Overview:** Shows the user is connected to the resource `,WEBPLEX,AIX_SYSTEM_COMPLEX`.
- My View:** A table listing resources and their metrics. A hand cursor is pointing at the 'Metrics' link for the selected resource.
- Home:** Displays a table of metrics for the selected resource, categorized by type (e.g., by shared ethernet adapter, by disk, by local file system, by AIX image).

Icon	Resource	Metrics	Actions
	<code>,WEBPLEX,AIX_SYSTEM_COMPLEX</code>	Metrics	...

Metric description	Help	Id
<b>by shared ethernet adapter</b>		
ByteInRate by shared ethernet adapter	Explanation	049010
ByteOutRate by shared ethernet adapter	Explanation	049020
PacketInRate by shared ethernet adapter	Explanation	049030
PacketOutRate by shared ethernet adapter	Explanation	049040
TransferredRate by shared ethernet adapter	Explanation	049050
<b>by disk</b>		
ActiveTimePercentage by disk	Explanation	043010
AvailableSpace by disk	Explanation	043020
AverageDeviceUtilization by disk	Explanation	043030
Capacity by disk	Explanation	043040
IOIntensity by disk	Explanation	043050
QueueDepth by disk	Explanation	043060
ReadOperations by disk	Explanation	043070
ReadThroughput by disk	Explanation	043080
RequestRate by disk	Explanation	043090
ResponseTime by disk	Explanation	043100
TransferredOperations by disk	Explanation	043110
TransferredThroughput by disk	Explanation	043120
WaitTime by disk	Explanation	043130
WriteOperations by disk	Explanation	043140
WriteThroughput by disk	Explanation	043150
<b>by local file system</b>		
AvailableSpace by local file system	Explanation	045010
TotalSpace by local file system	Explanation	045020
UsedSpace by local file system	Explanation	045030
<b>by AIX image</b>		
ActiveMemorySharingEnabled by AIX image	Explanation	050010
ActiveVirtualMemory by AIX image	Explanation	046010
ActiveVirtualProcessors by AIX image	Explanation	042010





# RMF XP – Metric Values



The image displays three screenshots of the RMF Performance Data Portal interface, showing different views of system metrics.

**Top Screenshot: Children of: tmcc-123-131,\*ALL\_LOGICAL\_PROCESSORS**

Icon	Resource	Metrics
	tmcc-123-131.cpu0.LOGICAL_PROCESSOR	Metrics
	tmcc-123-131.cpu1.LOGICAL_PROCESSOR	Metrics
	tmcc-123-131.cpu2.LOGICAL_PROCESSOR	Metrics
	tmcc-123-131.cpu3.LOGICAL_PROCESSOR	Metrics

**Middle Screenshot: Overview of tmcc-123-131.cpu0.LOGICAL\_PROCESSOR**

Overview: tmcc-123-131.cpu0.LOGICAL\_PROCESSOR -- TotalCPUTimePercentage [001010] (percent)  
 Time Range: 02/01/2011 14:59:00 - 02/01/2011 15:00:00

My View	91.8112
---------	---------

**Bottom Screenshot: Overview of tmcc-123-131,\*ALL\_LOGICAL\_PROCESSORS**

Overview: tmcc-123-131,\*ALL\_LOGICAL\_PROCESSORS -- TotalCPUTimePercentage by logical processor [021010] (percent)  
 Time Range: 02/01/2011 14:59:00 - 02/01/2011 15:00:00

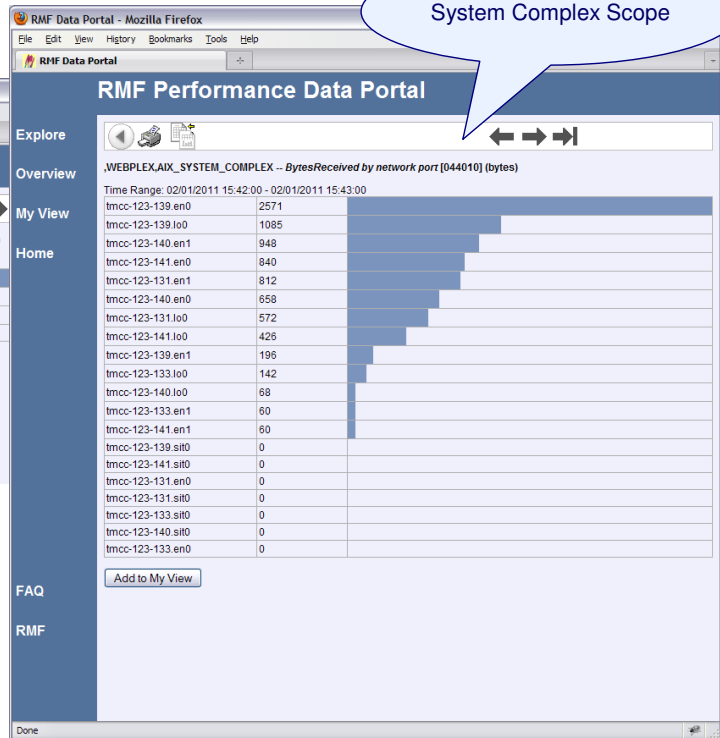
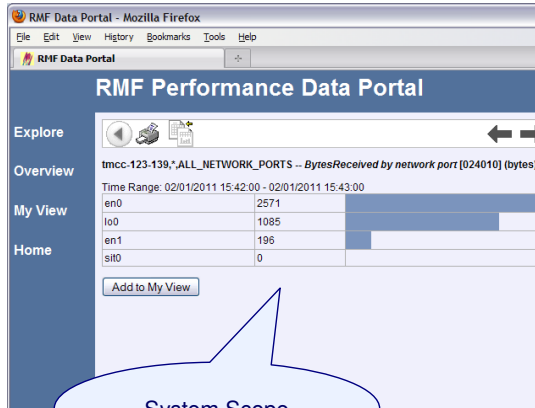
Resource	Value
cpu0	91.8112
cpu1	49.1353
cpu3	2.18854
cpu2	1.35127

**Bottom Screenshot: Children of: ,tmcc-123-131,AIX\_IMAGE**

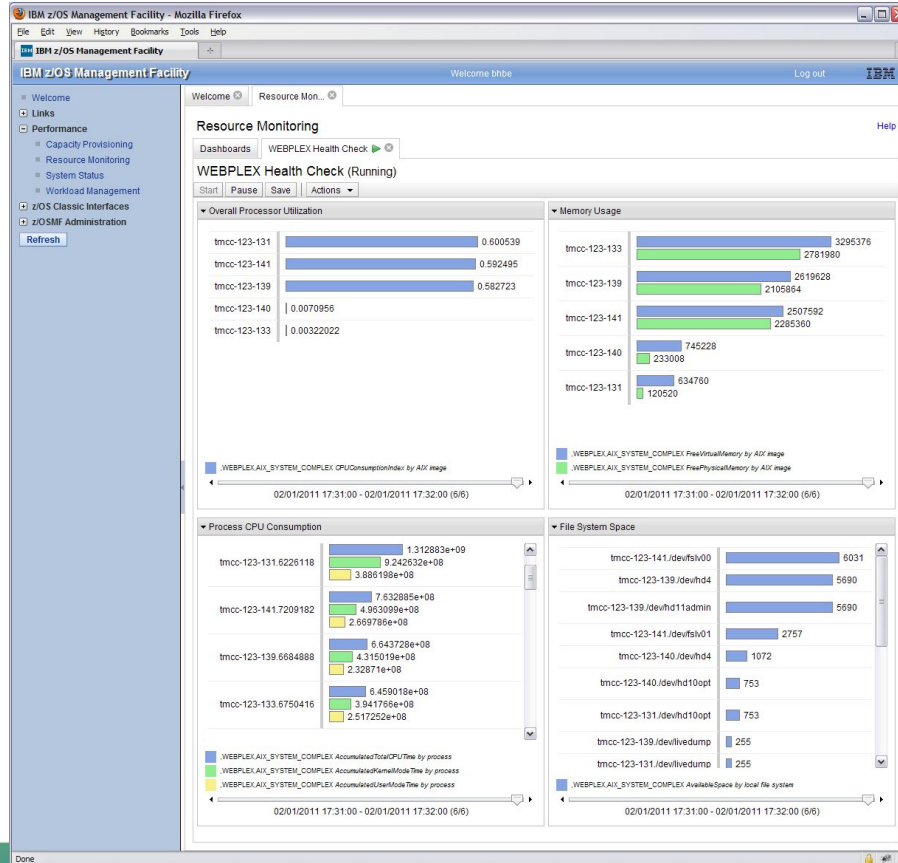
Icon	Resource	Metrics	Attributes
	tmcc-123-131,*ACTIVE_MEMORY_EXPANSION	Metrics	N/A
	tmcc-123-131,*ACTIVE_MEMORY_SHARING	Metrics	N/A
	tmcc-123-131,*ALL_DISKS	Metrics	N/A
	tmcc-123-131,*ALL_LOGICAL_PROCESSORS	Metrics	N/A
	tmcc-123-131,*ALL_NETWORK_PORTS	Metrics	N/A
	tmcc-123-131,*ALL_LOCAL_FILE_SYSTEMS	Metrics	N/A
	tmcc-123-131,*ALL_PROCESSES	Metrics	N/A



# RMF XP – Metric Scope



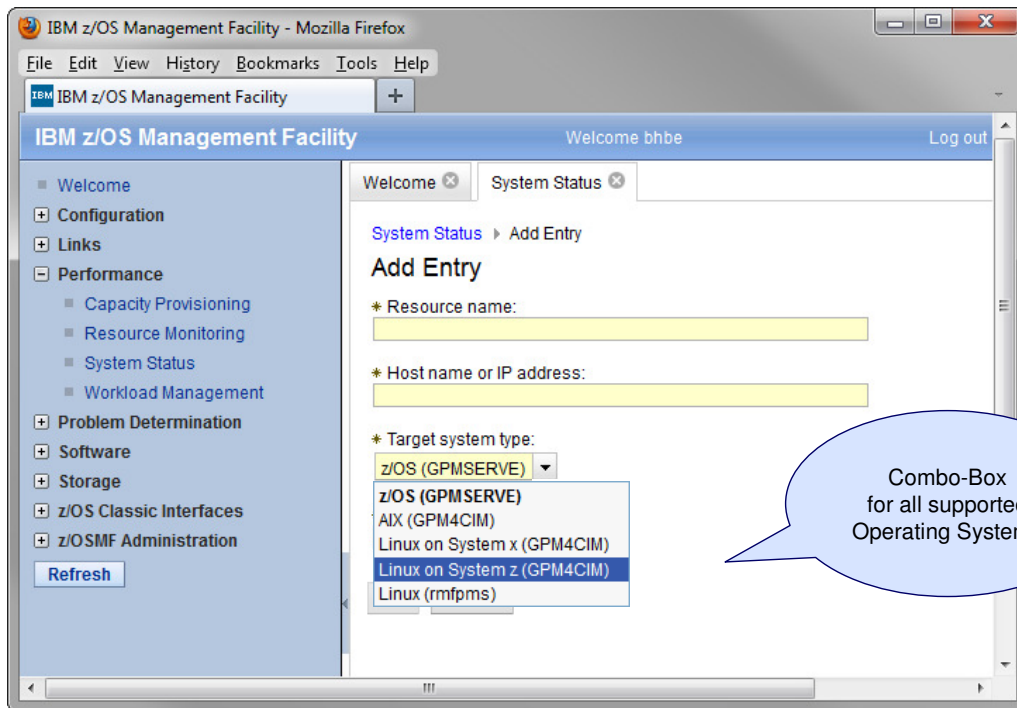
# RMF XP – z/OSMF Integration



IARE in Atlanta  
2012

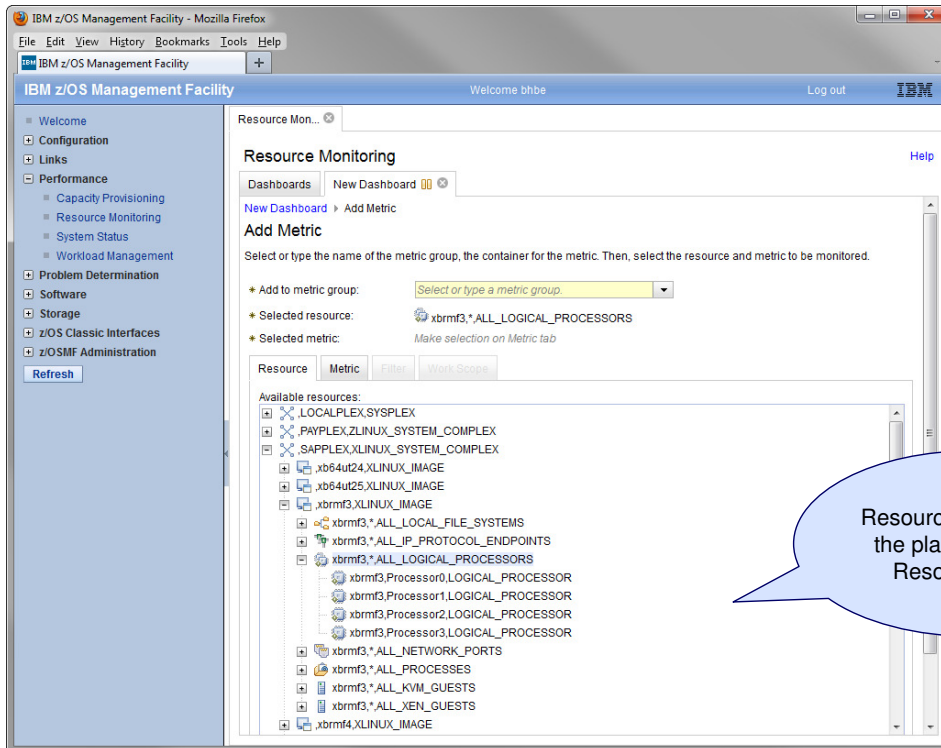
- The new RMF XP capabilities are completely applicable in the z/OSMF Resource Monitoring plugin
- Hence, you are able to monitor seamlessly all the systems within your enterprise, independent of the operating system type
- In a short time frame you can take advantage of the various capabilities of z/OSMF Resource Monitoring:
  - One workstation as single point of control
  - Dashboards with state-of-the-art graphical views
  - Maximum flexibility with user defined dashboards
  - Powerful data reduction and filtering

# RMF XP – z/OSMF System Status Task



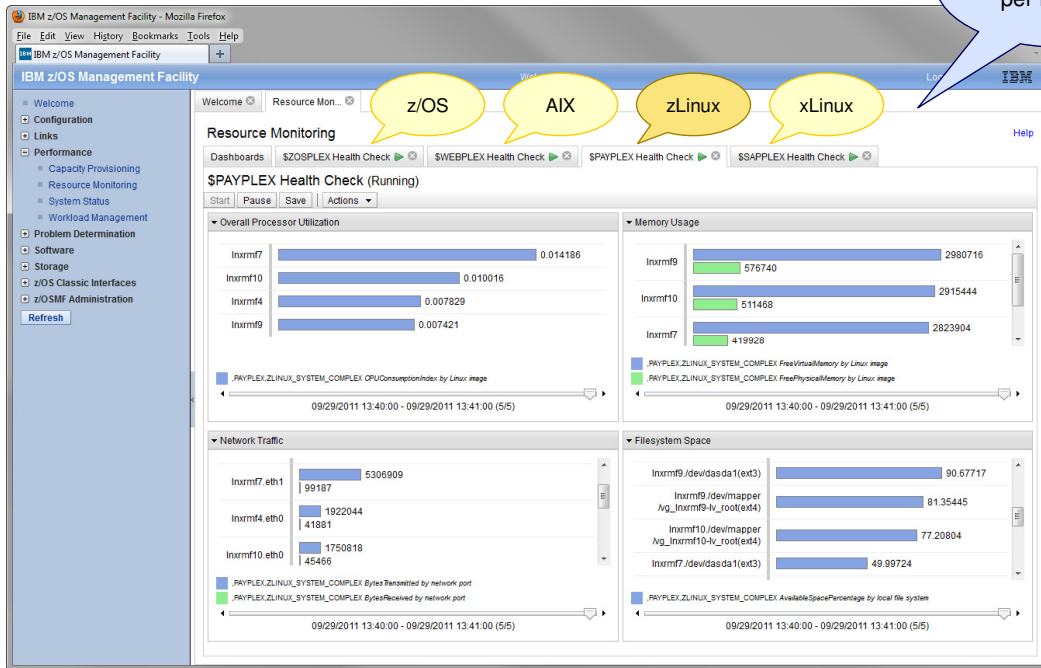
- The z/OSMF *System Status* task let's you easily define the new Operating System types
- From the *Target system type* combo-box just select the Operating System that your GPM4CIM instance is actually serving
- Then enter a valid hostname or IP address and a free selectable resource name, which denotes the top-level resource of the resource tree
- Now your definition is instantly visible in the *System Status* task and ready for use in the *Resource Monitoring* task without limitations

# RMF XP – Resource Monitoring Task



- Once you define a new metric in the z/OSMF Resource Monitoring Task, you start with the selection of the associated resource
- The *Available resources* view shows you all defined top-level resources, regardless of the operating system type
- Now you are able to expand the resource tree and the individual resources will become visible accordingly to the platform specific resource model
- All subsequent working steps – metric selection, filter definition etc. – are identical for all operating system types

# RMF XP & z/OSMF – Single Point of Control

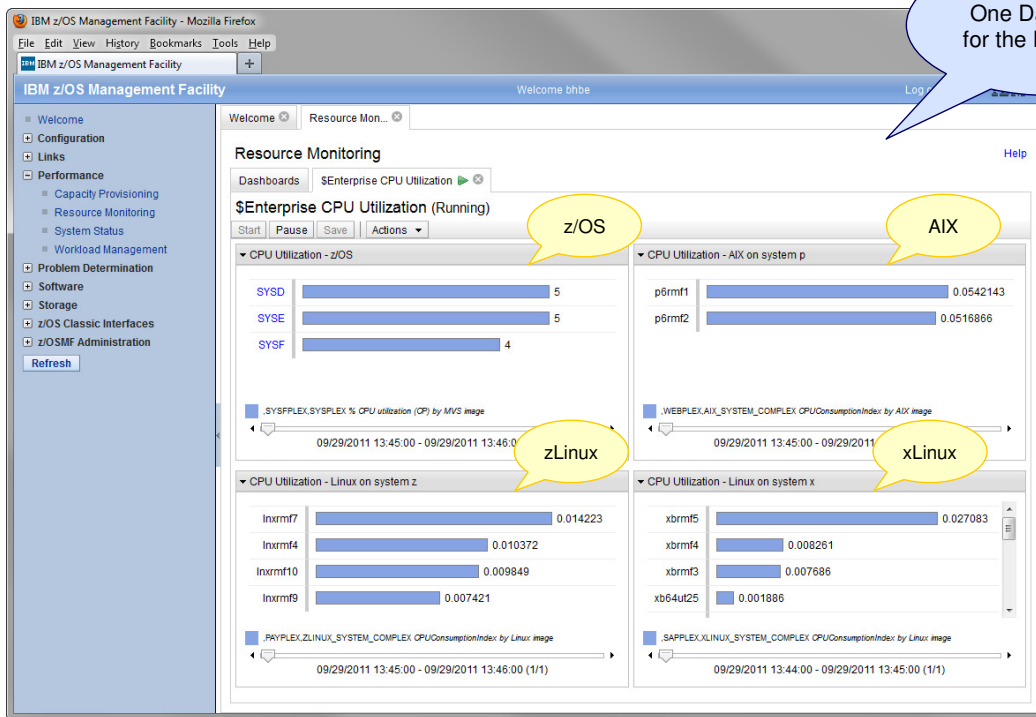


One Dashboard per Platform



- One workstation can serve as singlepoint of control when RMF XP is used together with the z/OSMF Resource Monitoring facility
- The user can customize his own Dashboards for each platform and run all the Dashboards in parallel
- Hence, each platform can be monitored in the same browser session by simply switching between tabs

# RMF XP & z/OSMF – Single Point of Control



One Dashboard for the Enterprise

z/OS

AIX

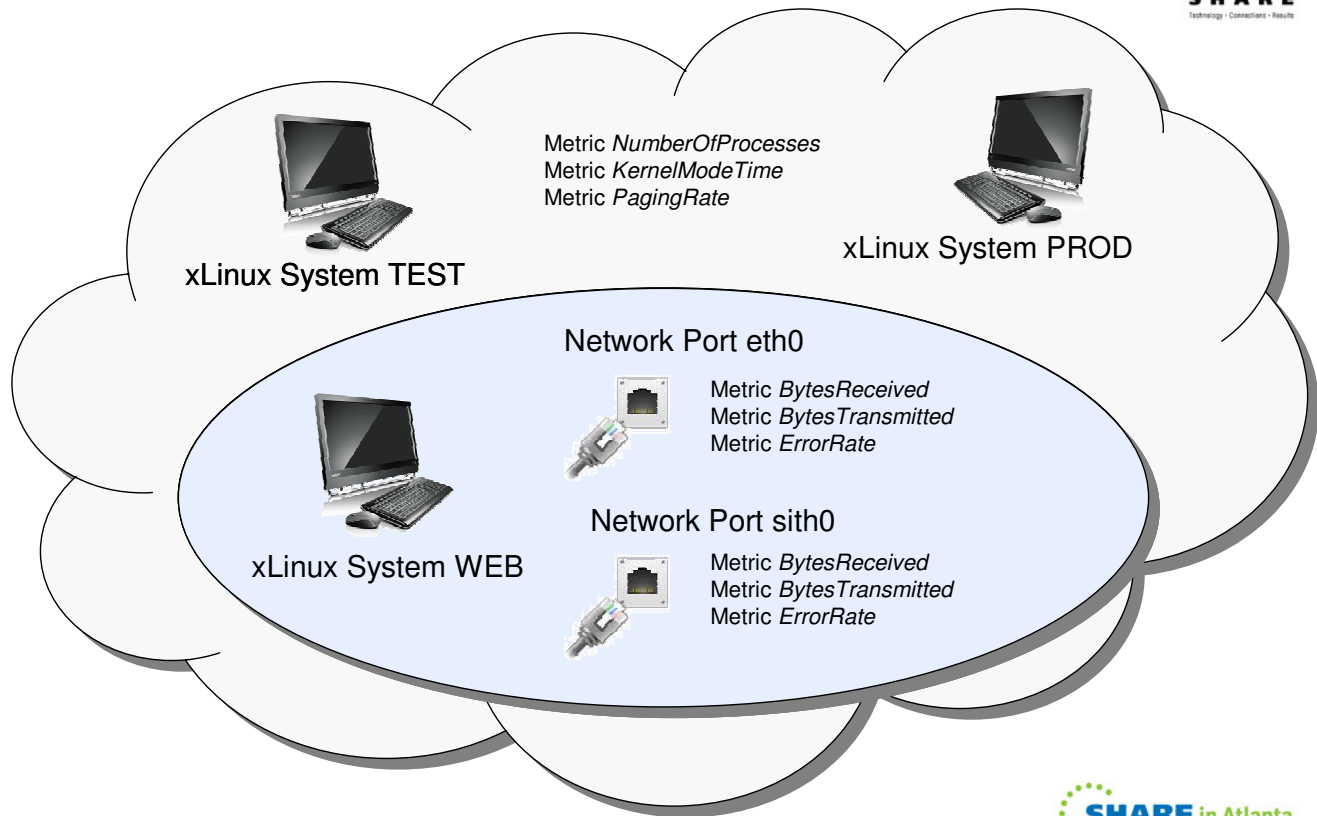
zLinux

xLinux



- One workstation can serve as singlepoint of control when RMF XP is used together with the z/OSMF Resource Monitoring facility
- The user can and define a Metric Group for each platform within the same Dashboards
- Hence, the selected key metrics can be monitored for all platforms at a glance

# RMF XP – The Metric Promotion Concept



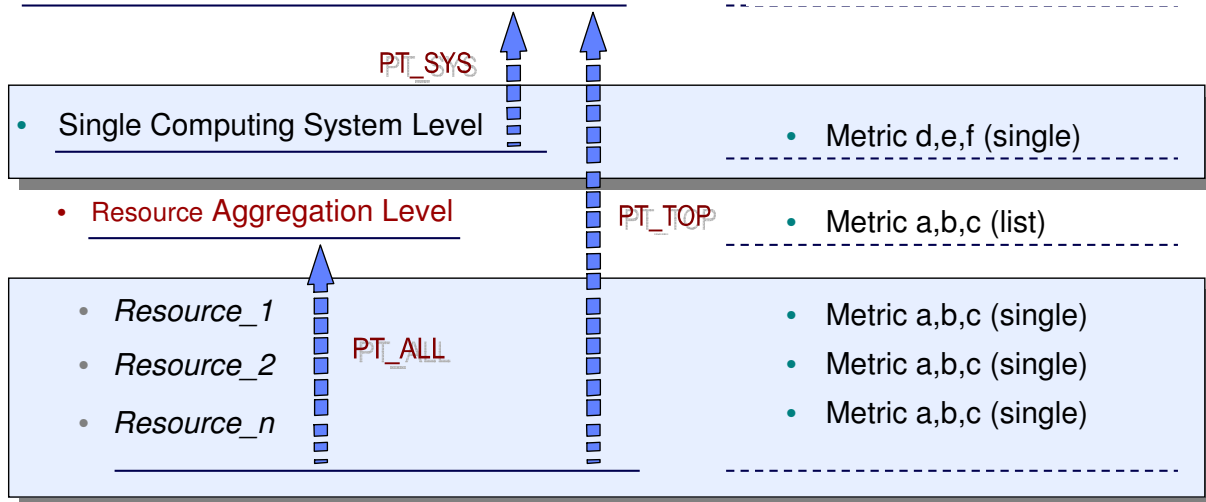
- The performance of a computing system can be evaluated by different kinds of metrics:
  - Metrics which are applicable to the entire system (e.g. *KernelModeTime*) or a unique resource within a system (e.g. *PagingRate* for the Memory resource)
  - Metrics which are applicable to resources where multiple instances can exist within a system (e.g. *BytesReceived* for Network Port resources)
- Hence, exactly one measurement value can arrive for the first kind of metrics while multiple measurement values can arrive for the other ones
- RMF XP can collect all metric values by means of the CIM API in terms of name-value pairs
- In the above example, exactly 9 measurement values can be retrieved for each system



# RMF XP – The Metric Promotion Concept ...



- **Computing System Complex Level**
  - Metric a,b,c,d,e,f (list)

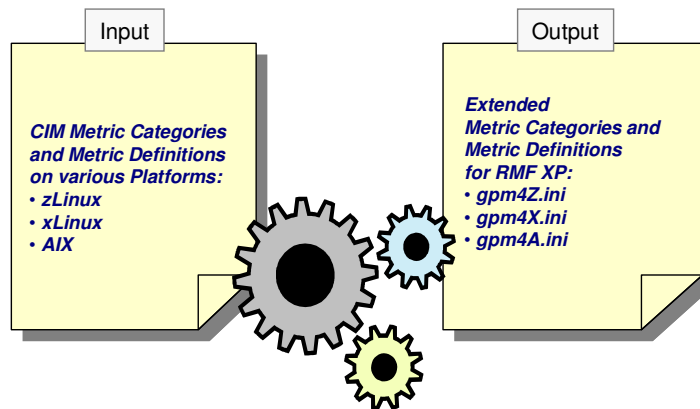


- ⇒ **PT\_SYS:** Promotion Type System
- ⇒ **PT\_ALL:** Promotion Type All
- ⇒ **PT\_TOP:** Promotion Type Top



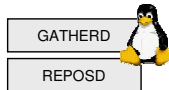
- The starting point for the promotion are the basic metrics supported by the CIM API
- RMF XP introduces new (virtual) resources and assigns the existing metrics to those resources in terms of *list-valued* metrics
- Following a well defined scheme, the new resources are created with on two levels:
  - Resource Aggregation Level (multiple new resources)
  - System Complex Level (exactly one new resource)
- We distinguish the following promotion types:
  - **PT\_ALL**
    - A new resource of the type ALL is created (e.g. ALL\_NETWORK\_PORTS)
    - The original metrics of type single are assigned to the ALL resource in terms of list valued metrics (e.g. BytesReceived by Network Port)
  - **PT\_TOP**
    - Similar than PT\_ALL, but the promotion is performed beyond the boundaries of a single system to the system complex level
    - In order to identify a resource within a system complex, the instance name of a resource needs to be prefixed with it's system name
  - **PT\_SYS**
    - A metric which exists only once within a system is promoted to the system complex level
    - The original metrics of type single are assigned to the system complex in terms of list valued metrics (e.g. PagingRate by System)

# Metric Promotion – “Making Of”



- The remote CIM API allows to retrieve the supported metric categories and metric definitions for the AIX and Linux operating system
- The transformation to the extended metric categories and metric definitions is performed automatically and the results are stored to platform specific initialization file
- Finally the initialization files are processed during the GPM4CIM startup and the contained definitions are visible for the RMF XP users

# “Making Of“ – The Starting Point



 Input: CIM metric definitions for a specific platform

```

ProtocolEndpointMetric.Id="BytesReceived.113"
ProtocolEndpointMetric.Id="BytesTransmitted.112"
Linux_IPProtocolEndpointMetric.Id="ErrorRate.114"
Linux_IPProtocolEndpointMetric.Id="PacketsReceived.116"
Linux_IPProtocolEndpointMetric.Id="PacketsTransmitted.115"
Linux_LocalFileSystemMetric.Id="AvailableSpace.117"
Linux_LocalFileSystemMetric.Id="AvailableSpacePercentage.118"
Linux_NetworkPortMetric.Id="BytesReceived.121"
Linux_NetworkPortMetric.Id="BytesTransmitted.120"
Linux_NetworkPortMetric.Id="ErrorRate.122"
    
```

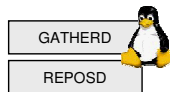


 Output: RMF DDS resource table with associated metrics (gpm4x.ini)

Resource	Metric Name
NETWORK_PORT	<ul style="list-style-type: none"> <li>▶ BytesReceived</li> <li>▶ BytesTransmitted</li> <li>▶ ErrorRate</li> </ul>

- The first step of the transformation is the pure one-to-one mapping of the CIM definitions
- No additional resources or metrics are created at this time

# “Making Of“ – Broaden the Metric Scope (1)



 Input: CIM metric definitions for a specific platform

```
Linux_NetworkPortMetric.Id="BytesReceived.121"
Linux_NetworkPortMetric.Id="BytesTransmitted.120"
Linux_NetworkPortMetric.Id="ErrorRate.122"
```



 Output: RMF DDS resource table with associated metrics (gpm4x.ini)

Resource	Metric Name	
LINUX_SYSTEM_COMPLEX	<ul style="list-style-type: none"> <li>▶ BytesReceived by network port</li> <li>▶ BytesTransmitted by network port</li> <li>▶ ErrorRate by network port</li> </ul>	<input checked="" type="checkbox"/> promotion type: TOP
ALL_NETWORK_PORTS	<ul style="list-style-type: none"> <li>▶ BytesReceived by network port</li> <li>▶ BytesTransmitted by network port</li> <li>▶ ErrorRate by network port</li> </ul>	<input checked="" type="checkbox"/> promotion type: ALL
NETWORK_PORT	<ul style="list-style-type: none"> <li>▶ BytesReceived</li> <li>▶ BytesTransmitted</li> <li>▶ ErrorRate</li> </ul>	<input checked="" type="checkbox"/> metric base

- In the second step, the promotion types PT\_ALL und PT\_TOP are performed:
  - PT\_ALL metrics of type *single* will be available on parent level in terms of *list valued* metrics
  - PT\_TOP metrics of type *single* will be available on system complex level in terms of *list valued* metrics

# “Making Of“ – Broaden the Metric Scope (2)



 Input: CIM metric definitions for a specific platform

```
Linux_OperatingSystemMetric.Id="NumberOfProcesses.124"
Linux_OperatingSystemMetric.Id="NumberOfUsers.123"
Linux_OperatingSystemMetric.Id="PageInRate.137"
```



 Output: RMF DDS resource table with associated metrics (gpm4x.ini)

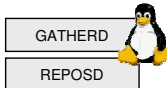
Resource	Metric Name
LINUX_SYSTEM_COMPLEX	<ul style="list-style-type: none"> <li>▶ NumberOfProcesses by Linux image</li> <li>▶ NumberOfUsers by Linux image</li> <li>▶ PageInRate by Linux image</li> </ul>
LINUX_IMAGE	<ul style="list-style-type: none"> <li>▶ NumberOfProcesses</li> <li>▶ NumberOfUsers</li> <li>▶ PageInRate</li> </ul>

promotion type: SYS

metric base

- For CIM metrics with just one instance within a system, the promotion type PT\_SYS is applied: metrics of type *single* will be available on system complex level in terms of *list valued* metrics

# “Making Of“ – Result (xLinux example)



Input: 96 CIM metrics assigned to 11 resource types

```

protocolEndpointMetric.Id="BytesReceived.113"
protocolEndpointMetric.Id="BytesTransmitted.112"
Linux_IPProtocolEndpointMetric.Id="ErrorRate.114"
Linux_IPProtocolEndpointMetric.Id="PacketsReceived.116"
Linux_IPProtocolEndpointMetric.Id="PacketsTransmitted.115"
Linux_LocalFileSystemMetric.Id="AvailableSpace.117"
Linux_LocalFileSystemMetric.Id="AvailableSpacePercentage.118"
Linux_NetworkPortMetric.Id="BytesReceived.121"
Linux_NetworkPortMetric.Id="BytesTransmitted.120"
Linux_NetworkPortMetric.Id="ErrorRate.122"
    
```



Output: 245 RMF XP metrics assigned to 19 resource types

```

RD LNXPLEX ----- LINUX_SYSTEM_COMPLEX      lnxplex 0000 C
*
RD ALLPORT LNXIMAGE ALL_NETWORK_PORTS      allport 0000 C
*
RD PORT      ALLPORT  NETWORK_PORT          port    0000 C
*
CD PORT      RMF#0200 0d000200 ----- ??? G    N    0200 ----- B
BytesReceived
PLNOP              PORT      BR
*
CD PORT      RMF#0201 0d000201 ----- ??? G    N    0201 ----- B
BytesTransmitted
PLNOP              PORT      BT
*
CD PORT      RMF#0202 0d000202 ----- ??? G    N    0202 ----- R
ErrorRate
PLNOP              PORT      ER
    
```



- The promotion concept creates additional resource types with additional metric definitions
- As an example for the xLinux platform, the promotion has created 19 RMF XP resource types (from 96 CIM resource types) and 245 metric definitions (from 96 CIM metric definitions)
- Altogether, the huge benefit of the promotion is the comprehensive monitoring beyond the boundaries of one single system

# RMF XP – Summary



- Seamless performance monitoring solution for z/OS and distributed platforms
- Promotion concept allows monitoring beyond the boundaries of a single system
- z/OS as monitoring platform for distributed environments
- Easy to setup, almost no customization needed
- Two graphical frontends
  - Instant access via web browser
  - z/OSMF with advanced capabilities
- zIIP exploitation helps to reduce costs
- Available with z/OS V1R13 RMF and z/OS V1R12 RMF (APAR OA36030)



# Now performing!

RMF XP

BY KARIN GENTHER, HARALD BENDER, AND JÜRGEN BAUMANN

**D**o you want to keep track of one or more IBM zEnterprise BladeCenter Extension (zBX) and performance? Then Resource Measurement Facility Cross Platform (RMF XP) is your choice for cross platform monitoring!

RMF XP provides an integrated performance monitoring solution for heterogeneous environments by currently supporting the operating systems:

- AIX®
- Linux on System x®
- Linux on System z.

Hence, with RMF XP, you can monitor all operating systems which can run on

**Performance data at a glance!**

The core component of RMF XP is the GPM4CIM server. Similar to the existing Distributed Data Server (DDS) for z/OS, the GPM4CIM server receives HTTP requests and sends back responses as structured XML documents. Because the GPM4CIM started task runs in the z/OS UNIX System Services environment, at least one z/OS system is necessary to run the RMF XP component.

**No rehearsal**

To start the GPM4CIM server from the console, RMF provides the procedure GPM4CIM as a member in SYS1.PROCLIB, as the JCL example in the GPM4CIM PROC shows:



- The log and trace output is written to the files specified with the STDOUT and STDERR DD cards.
- The 'cfg=' program parameter in the PARM statement points to the GPM4CIM configuration file.
- Different platforms are distinguished by the variable added to the OS statement:
  - OS=A (AIX on System p®)
  - OS=X (Linux on System x)
  - OS=Z (Linux on System z).

Now available on the web! <http://publibfp.dhe.ibm.com/epubs/pdf/eoz2n1d0.pdf>






# Information & Tools

RMF homepage: [www.ibm.com/systems/z/os/zos/features/rmf/](http://www.ibm.com/systems/z/os/zos/features/rmf/)

- Product information, newsletters, presentations, ...
- Downloads
  - ▶ Spreadsheet Reporter
  - ▶ RMF PM Java Edition
  - ▶ Postprocessor XML Toolkit

RMF email address: [rmf@de.ibm.com](mailto:rmf@de.ibm.com)



Users Guide:  
New RMF XP  
Chapter



Documentation and news:

- RMF Performance Management Guide, SC33-7992
- RMF Report Analysis, SC33-7991
- RMF User's Guide, SC33-7990
- Latest version of PDF files can be downloaded from:  
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