LSU Nordic

z/OS 1.9
New Face of z/OS

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New Face of z/OS…

- **The New Face initiative is a series of ongoing efforts designed to simplify the management, administration and configuration of the system:**
  - New user interfaces (UIs)
  - **Enablement of remote access technologies**
  - **Extensions to base operating system components to allow for such management**

- **Marketplace forces, including the 'graying of the z/OS work force', added to the difficulty to attract and train new skills to this platform due to the perception that the management tools are archaic (3270), demand that the platform improve and modernize accessibility in a way that is in common with the rest of the industry.**

- **In z/OS R9, a set of small steps have been taken to start laying the foundation for simplified access to the platform.**

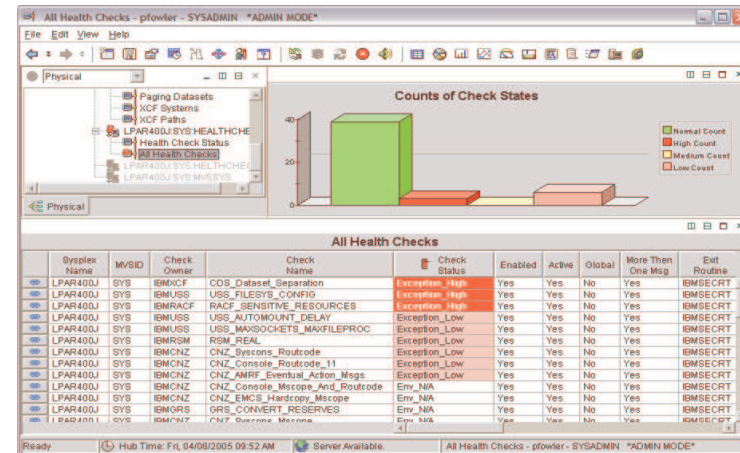# z/OS Management Simplification Strategy

Today

Tomorrow

Expert-friendly, long learning curve for people new to platform

- Multiple, inconsistent UIs – no central system management portal
- Many interfaces foreign to those new to platform
- Manual tasks requiring extensive documentation
- Years of z/OS experience

✓ *Central* z/OS management portal
✓ *Simplified*, *automated* task-oriented mgmt interface, with integrated user assistance
✓ *Modern* look & feel; more familiar to those new to platform
✓ Focus on *customer goals*
✓ *Optional* for those who prefer traditional interfaces
✓ Months of training

New tools enhancing the "MVS face" of z/OS…

- **System REXX:**
  - REXX execs to be executed outside TSO/E and batch environments

- **SDSF REXX**
  - Access to SDSF through the REXX programming language

- **XL C METAL compiler option**
  - C language capabilities for classical MVS exits

- **Common event adapter (CEA)**
  - Delivers z/OS events to C-language clients

- **XLM System Services enhancements**
  - Improved performance and C/C++ APIs

z/OS 1.9 Application Development/Simplification
System REXX - overview

- **SYSREXX**

  - Is part of the BCP product, rollback support to z/OS 1.8 (Web deliverable)

  - SYSREXX allows execs to be run simply and independently from traditional TSO/E & Batch

- **Exploiters**

  - CIM Server .. Cluster Instrumentation

  - Health Checker

  - Open to exploitation by IBM, ISV and Customer Code

- **SYSREXX is a Server**

  - Starts early during Master Scheduler Initialization

  - No STOP capability but AXR address space can be forced

z/OS 1.9 Application Development/Simplification
System REXX – details

- **System REXX execs may be initiated through an assembler macro interface called `AXREXX` or via operator command**

- **Two execution environments supported: `TSO=NO` and `TSO=YES`**

- **Exec runs in problem state, key 8, in an APF authorized AS under the MASTER subsystem**

- **Any modules that are loaded, linked or attached from the exec must reside in an APF authorized library.**

- **Also in both cases, the REXX exec runs under the WLM enclave of the `AXREXX` invoker**

- **New functions for writing execs**

  – AXRCMD   issue console command and retrieve command response

  – AXRWTO   issue single line message to the console

  – AXRMLWTO issue multi line message to the console

SYSREXX example

```
/*REXX*/
MyCmd = 'D IPLINFO';
Result = AXRCMD(MyCmd,'OutputVar.',10);
IF Result = 0 THEN
    DO;
          IplVolume = ' '
          DO LineNum = 1 TO OutputVar.0 WHILE(IplVolume=' ');
             PARSE var OutputVar.LineNum ' VOLUME ' IplVolume;
          END;
          ......
    END;
```

Output from
'd iplinfo' }

```
IEE254I  13.44.24 IPLINFO DISPLAY 923
    SYSTEM IPLED AT 12.09.29 ON 10/07/2007
    RELEASE z/OS 01.08.00    LICENSE = z/OS
    USED LOAD74 IN SYS1.IPLPARM ON 180C
    ARCHLVL = 2   MTLSHARE = N
    IEASYM LIST = (00,40)
    IEASYS LIST = (40,4A) (OP)
    IODF DEVICE 180C
    IPL DEVICE 1BEA VOLUME MDI4AB
```

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System REXX – TSO YES/NO

- **When `TSO=NO` on the `AXREXX` invocation**

  - Exec is executed in an MVS host command environment

  - Dataset allocation, other than `REXXINDSN` and `REXXOUTDSN` provided by the `AXREXX` macro, is not supported in this environment

- **When `TSO=YES` on the `AXREXX` invovation**

  - Exec runs isolated in a single AS, and can safely allocate datasets without concern of a `DDNAME` conflict with a concurrently running exec

➢ **Note that not every command, function or service that runs under the TSO/E is supported in the `TSO=YES` environment.**

There can be up to 64 REXX worker tasks, running `TSO=NO` execs and up to 8 TSO Server address spaces running `TSO=YES` execs.

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System REXX - security and enclave Considerations

- **`AXREXX` is an <u>Authorized</u> System Service**

  – Security Controls Essential

    • Access to APF Library

    • Permissions:

      – Standard security administration

        > what can be accessed and/or run

- **EXECs by default use Invoker's Security Environment**

  – Alternatively may use:

    • Authority of a 3rd party

    • Special userid assigned to **`AXRUSER`**

- **EXECs use Invoker's Enclave service class**

    • Prevent CPU priority inversion and excessive resource usage

    • Resource usage is charged back

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System REXX - installation and using

- **Starting SYSREXX Requires**
  - **CTIAXR00** Parmlib member
  - The **SYS1.SAXREXEC** data set
    - REXX Execs Read From **SYS1.SAXREXEC**
  - **Restart AXR** using the **AXRPSTRT** procedure

- **Parmlib Support**
  - SYSREXX Customization: **AXR00**
    - **CPF('cpfvalue',SYSTEM|SYSPLEX)**
    - **AXRUSER(userid)**
  - Component Trace (**SYSAXR**): **CTIAXRxx**

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System REXX - REXX Server versus TSO Server

REXX Server

- **Execs run in AXR AS**

  - 1-64 Worker Subtasks

  - EMCS for each subtask

  - Detach after 100 execs

  - Default HCE - MVS

  - Recommend no Data Set Allocation here

- **Availability impact if something serious breaks**
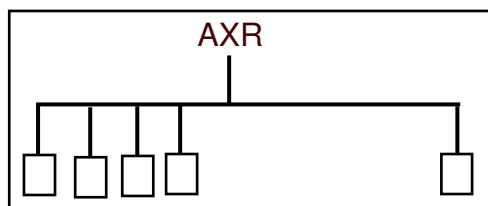
TSO Server

- **Execs run in AXRnn AS**

  - 1-8 Worker Address Spaces

  - EMCS for each AS

  - Detach after 1000 execs

  - All Allocation capabilities

  - Default HCE + TSO

    - IKJTSOEV Service

    - SYSCALL not supported

- **Better availability should something serious break.. just cancel AXRnn AS**

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SDSF REXX - overview

- **SDSF REXX allows REXX execs to be written that can directly access SDSF data and function**

- **Using SDSF REXX, you can perform SDSF functions through REXX:**
  - Display and modify jobs
  - Display and modify devices
  - Browse sysout data sets
  - Print sysout data sets

- **Host environment commands**
  - **ISFEXEC**, executes an SDSF command
  - **ISFACT**, performs an SDSF action or column overtype

z/OS 1.9 Application Development/Simplification
SDSF REXX Quick Start – Cancel a Job

Add host command environment

rc=isfcalls("ON")

Address SDSF "ISFEXEC ST"

Access the ST panel

do ix=1 to JNAME.0   (variable names same as FLD names)
    if pos("KEN",JNAME.ix) = 1 then

Find the job

   Address SDSF "ISFACT ST TOKEN('"TOKEN.ix"') PARM(NP P)"

....

Take an action on the job

rc=isfcalls("OFF")

Remove the host command environment (after closing the loop)

```
 Display  Filter  View  Print  Options  Help
 --------------------------------------------------------------------------
 SDSF STATUS DISPLAY ALL CLASSES                         INVALID COMMAND
 COMMAND INPUT ===>                                      SCROLL ===> PAGE
 NP   JOBNAME  JobID     Owner     Prty Queue       C  Pos  SAff  ASys Status
      CCOR     JOB13688 CCOR          15 EXECUTION           MVSG  MVSG
```

z/OS 1.9 Application Development/Simplification
SDSF REXX - More info

http://www-03.ibm.com/servers/eserver/zseries/zos/sdsf/

Usefull redbook: Implementing REXX Support in SDSF SG24-7419-00

z/OS 1.9 Application Development …

- **New `METAL C` option:**

  – Designed for XL C system program development

  – No Language Environment run-time dependency

  – Can imbed HLASM statements in a C program

  – Assembler calls to system services are allowed

  – XL C/C++ support in IBM WebSphere Developer for System z V7.0 (5724-L44)

  – AR mode programming support

z/OS 1.9 METAL C

Programmer supplied prolog/epilog code

- **The compiler generates default prolog/epilog code which operates on a 1M stack space.**

- **It may be necessary for the programmer to supply his/her own prolog/epilog code to set up whatever the environment is necessary.**

z/OS 1.9 METAL C

Programmer embedded HLASM statements

syntax: __*asm* (*code_format_string* : *output* : *input* : *clobbers*)

```
int main() {

    struct WTO_PARM {

        unsigned short len;

        unsigned short code;

        char text[80];} wto_buff = { 4+11, 0, "hello world" };

    __asm( " WTO  MF=(E,(%0)) " : : "r"(&wto_buff));

    return 0;

}
```

```
LA   4,@wto_buff
WTO MF=(E,(4))
```

z/OS 1.9 METAL C

AR mode programming support

- **C language construct provided for:**

  – Marking a function to be an AR mode function by the __attribute__((armode)) attribute

  – Qualifying a pointer to be a far pointer by the __far qualifier.

- **Supported for both 31-bit and 64-bit mode.**

- **The DSPSERV and ALESERV macros can be used to create data spaces**

Overview – z/OS Common Event Adapter

- **The z/OS Common Event Adapter enables a z/OS Unix process to subscribe to various "legacy" asynchronous BCP events by type and matching criteria:**
  - WTO
  - ENF
  - Program Specified Event

- **Value:**
  - Extends the reach of "legacy" events to z/OS Unix processes.
  - Components with existing events do not have to be re-implemented to communicate with CIM indication providers.

- **Notes:**
  - CEA address space started automatically during z/OS initiation and does not terminate

z/OS 1.9 Application Development
XML System Services enhancement - overview

- **Using XML System Services R9 you can:**

  – Realize improved performance for XML parsing

  – Use the C/C++ interfaces to invoke the XML parser

  – Take advantage of zAAP specialty engines for XML parsing

- **Performance:**

  – Improvements primarily made to internal algorithms

  – About a **30% improvement in performance** attained (cycles per bytes parsed)

- **Interfaces:**

  – With new C/C++ APIs no need to switch to PL/1 or assembler to invoke XML System Services

- **zAAP**

  – XML code switches over to zAAPs prior to parsing a document.

  – zAAP do not apply, when running in SRB mode.

z/OS 1.9 Application Development
XML System Services enhancement - future

- z/OS XML System Services parsing workload done in TCB mode offloaded to zAAP, enclave-mode SRB work to zIIP in the future *

- IBM intends to add validating parsing to z/OS XML System Services *

- IBM intends to enhance the XML Toolkit for z/OS so eligible workloads use z/OS XML*

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Common Information Model (CIM)

- **CIM is a standard data model developed by a consortium of major hardware and software vendors (including IBM) called the Distributed Management Task Force (DMTF) as part of the Web Based Enterprise Management (WBEM) initiative. CIM was introduced in z/OS V1R7.**

- **WBEM includes a set of standards and technologies that provide management solutions for a distributed network environment. Interoperability is a major focus of WBEM and using WBEM technologies can help you develop a single set of management applications for a diverse set of resources.**

- **CIM implementation in z/OS is based on the open source Pegasus CIM server (CIMOM – Common Information Model Object Manager)**

- **OpenPegasus CIM Server 2.6 with CIM schema 2.11**
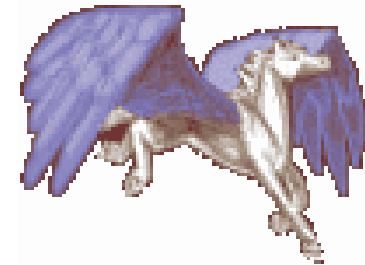
Common Information Model (CIM)

- **With z/OS 1.9 we have a new System management solution based on WBEM standards that provide management solutions for a distributed network environment. WBEM includes**

    – A data model, CIM

    – An encoding specifications, CIM-XML

    – A transport mechanism, CIM over HTTP

Common Information Model (CIM)

- **CIM is a standard data model for describing and accessing management data in heterogeneous environments**
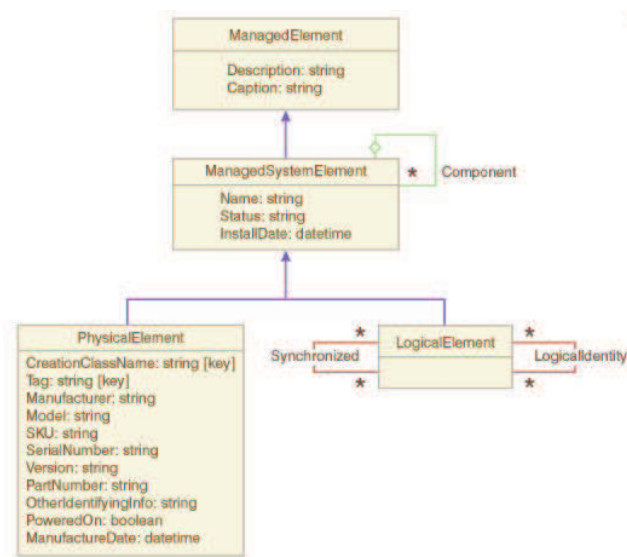
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- **CIM implementation in z/OS is based on the open source Pegasus CIM server (CIMOM – Common Information Model Object Manager)**

- **OpenPegasus CIM Server 2.6 with CIM schema 2.11**

- **With CIM Server on z/OS users have the ability to access z/OS resources through an extendible industry standard model**
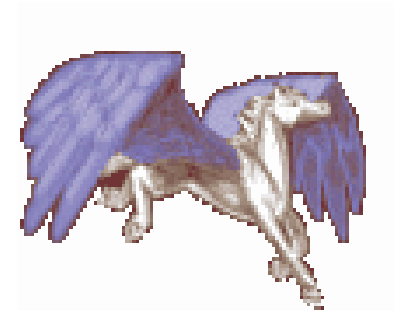
Common Information Model (CIM)

Network Environment Managed with CIM Management Applications
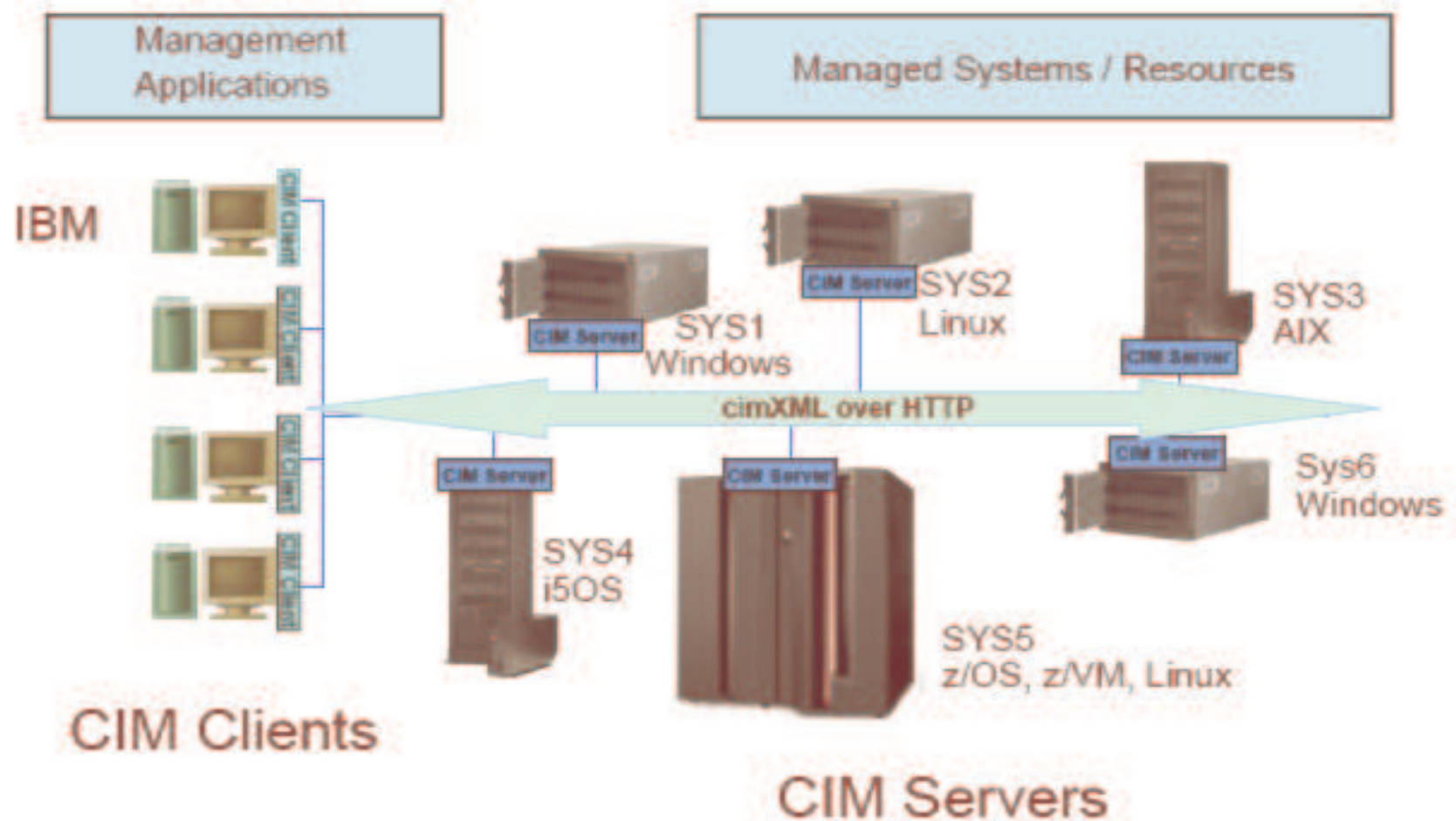
Common Information Model (CIM)

- **WBEM defines how the clients communicate with the Server**

  - CIM-XML over HTTP protocol

  - CIM operations over HTTP

  - CIM Server supports AT-TLS
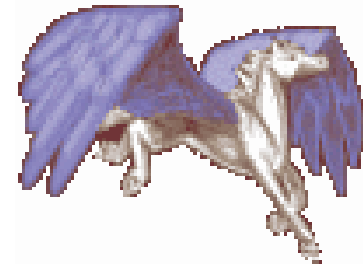
Common Information Model (CIM)

Example with MF monitoring provider
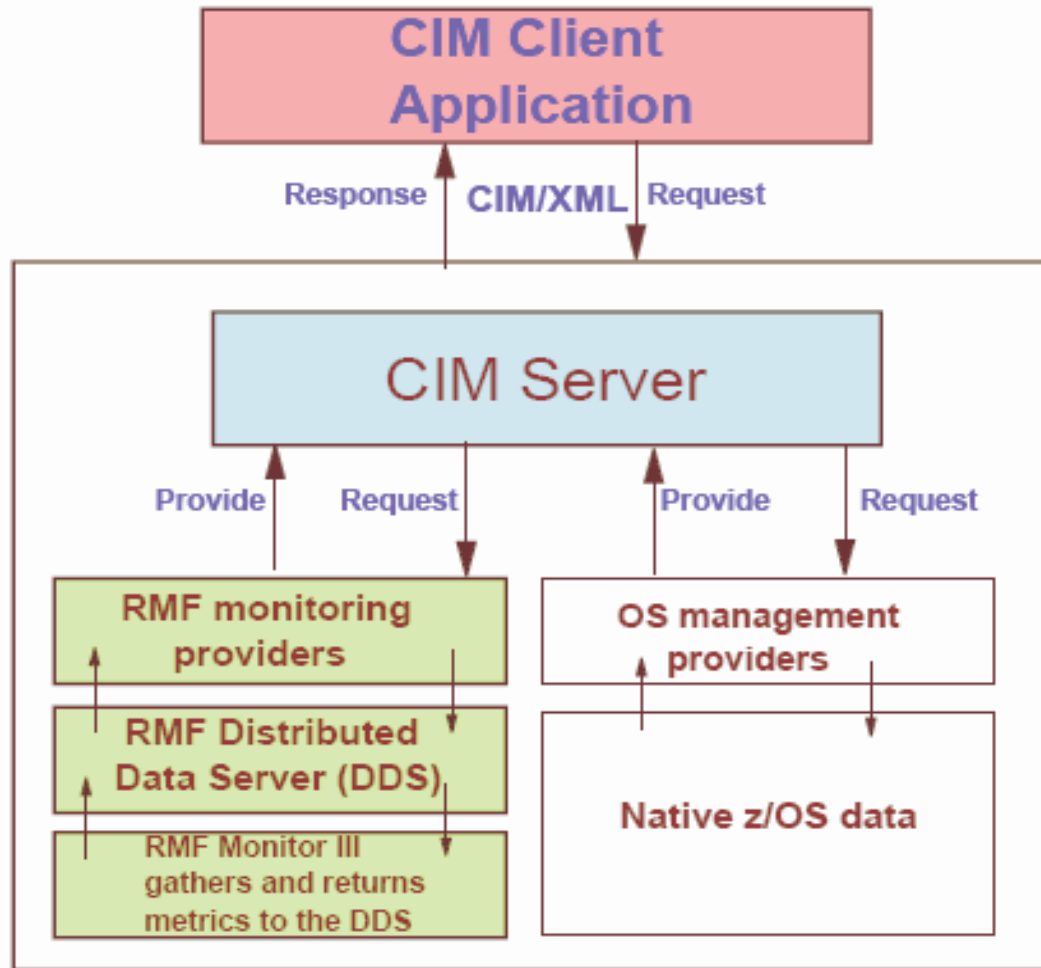
Common Information Model (CIM)

Example with MF indication provider

Indication Subscriber

Indication Consumer

CIM Client Application

Indication

CIM Server

Provide

Indication providers

Event

z/OS – CIM Overview

Happy Systems Manager

z/OS Management Applications

CIM over HTTP protocol

Legend

Application code
Existing z/OS code
New z/OS Code

z/OS

CIM Server

USS/LE Environment

CIM Model (provider)

BCP Environment

Component Interfaces

System REXX
- Parsing
- System command/response support
  - (EMCS console)

Component Provided Rexx Scripts

Event Data

Common Event Adapter
- Process unsolicited events
- Extract needed info
- Pass data to owning CIM provider

WTO

ENF

Other events

CIM - Security

- **Since this support allows for the modification of key system resources, maintaining appropriate authorization is key:**

  – The CIM server authenticates the end user,

  – The CIM server checks the authority of the user based on provider level checks,

  – The credentials of the user are propagated from the CIM server, through the provider, down to the CEA, SYSREXX and other component interfaces, where authorization checks are made.

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CIM – Wrap up

- **News in z/OS V1R9**

  - CIM Client for Java

  - Instrumentation added for jobs, sysplex and coupling facility resource management

  - Automatic restart using ARM

  - Logging changed to use system logger

- **z/OS Management instrumentation for CIM**

  - Processor classes

  - File system classes

  - Network classes

  - WLM classes

  - CIM classes implemented by RMF

Other New Faces (GUI initiatives)

- **IBM Ported Tools for z/OS**

  - OpenSSH

  - Perl

  - PHP

- **Eclipse based access to z/OS**

  - Rational Developer for System z (former WDz)[1]

  - WebSphere Developer Debugger for System z

1) direct access to zOS and USS file systems, access to JES, ISPF like editor, interactive debug

Other New Faces (Education)

- **zNextGen Project at Share**

- **z/OS basic skills information center**
  - z/OS concepts
  - Application programming on z/OS
  - ....

- **ABCs of z/OS System Programming**

- **IBM Academic Initiative System z program**

z/OS Basic Skills Information Center

- **Great for new users or for current users can brush up on existing skills**

- **Information for "on-the-job" training**

- **Educational topics plus interactive exercises**

http://publib.boulder.**ibm.com**/infocenter/zoslnctr/v1r7/index.jsp

ABCs of z/OS System Programming

http://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/sg246981.html?OpenDocument