



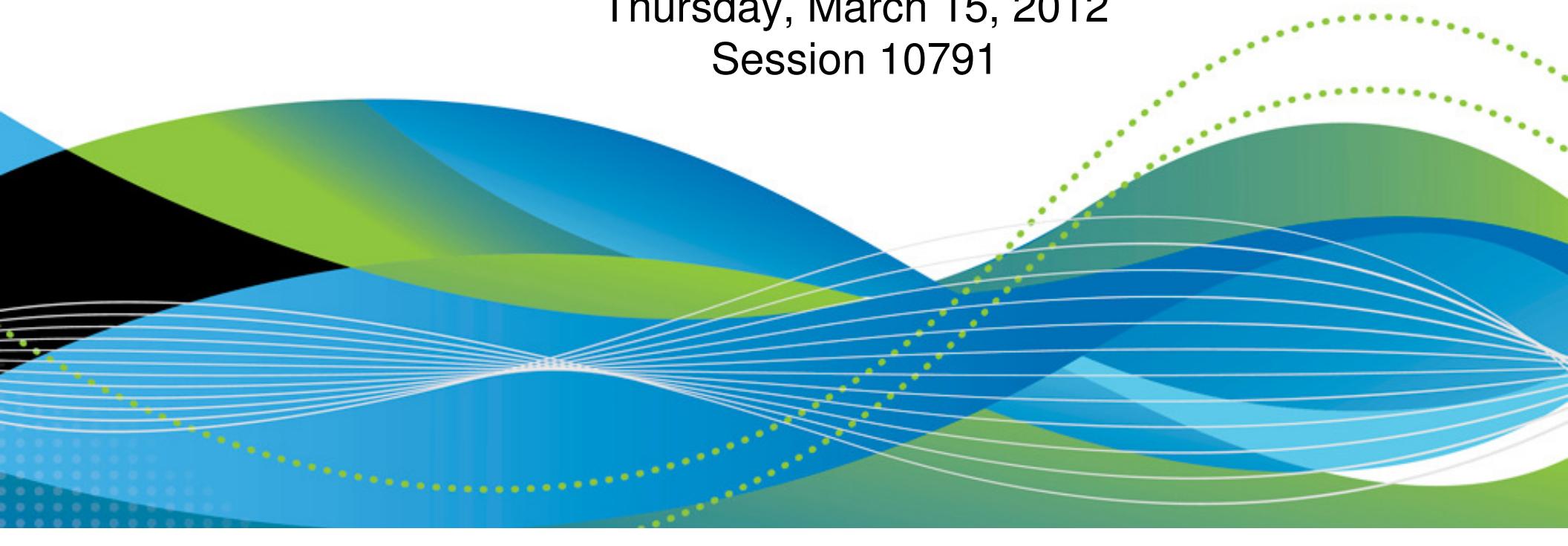
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# Now that you have z/OS CIM configured, what can it do for you?

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IBM Corporation

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Session 10791



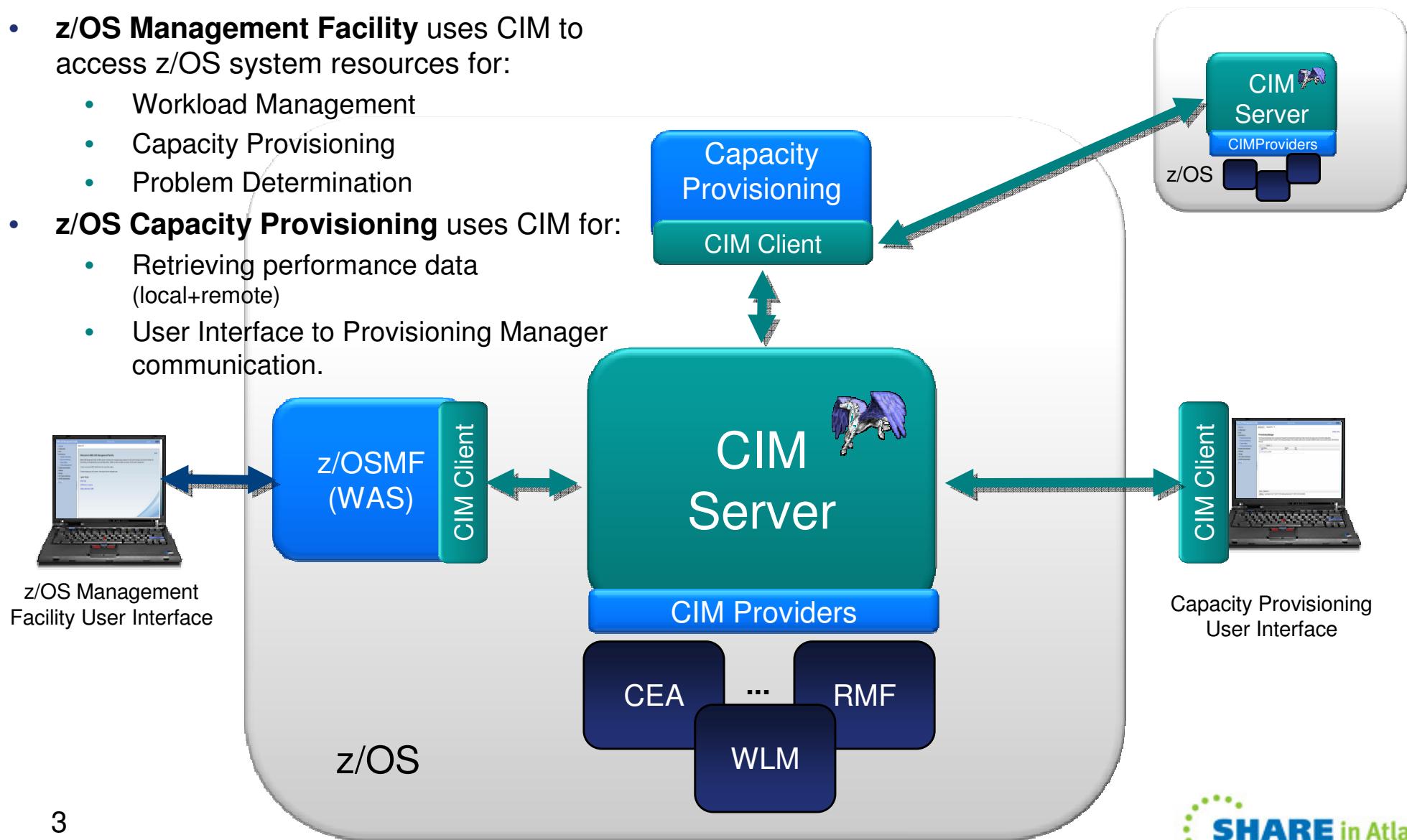
# Agenda

- Explanation of how CIM is used on z/OS today
- Introduction to the concepts of CIM
  - What is it?
  - For what is used?
- Description of the z/OS CIM components
- What information is available through z/OS CIM
- What CIM can do for you ...
  - As an administrator
  - As a developer

# Use of z/OS CIM today

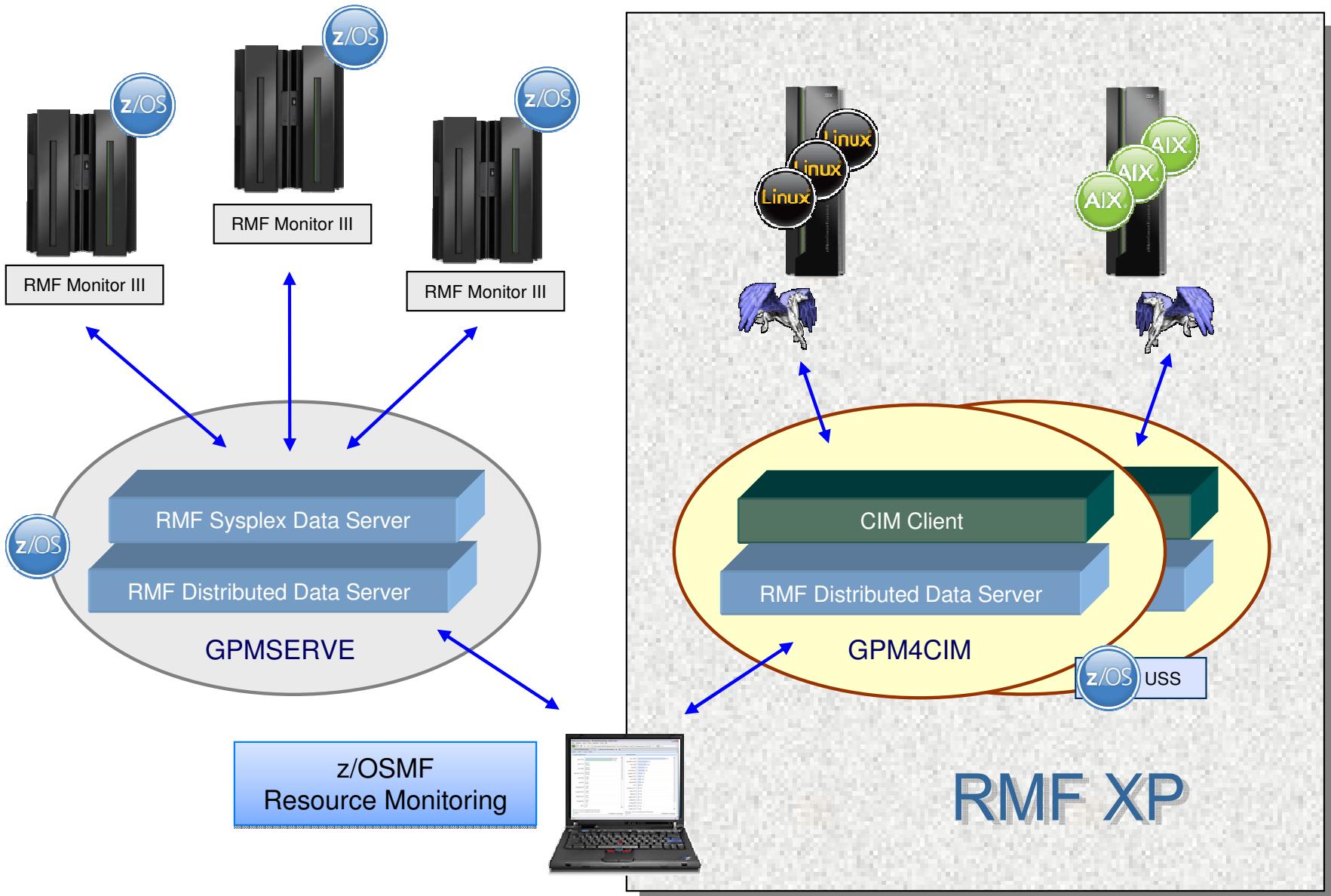
## z/OSMF and z/OS Capacity Provisioning

- **z/OS Management Facility** uses CIM to access z/OS system resources for:
  - Workload Management
  - Capacity Provisioning
  - Problem Determination
- **z/OS Capacity Provisioning** uses CIM for:
  - Retrieving performance data (local+remote)
  - User Interface to Provisioning Manager communication.

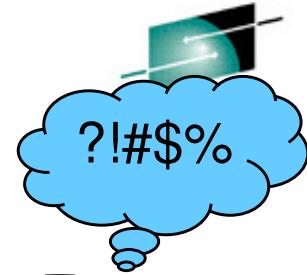


# Use of z/OS CIM today

## RMF XP



# Managing the Enterprise

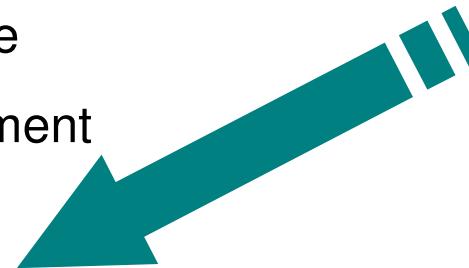


Raising complexity of IT environments:

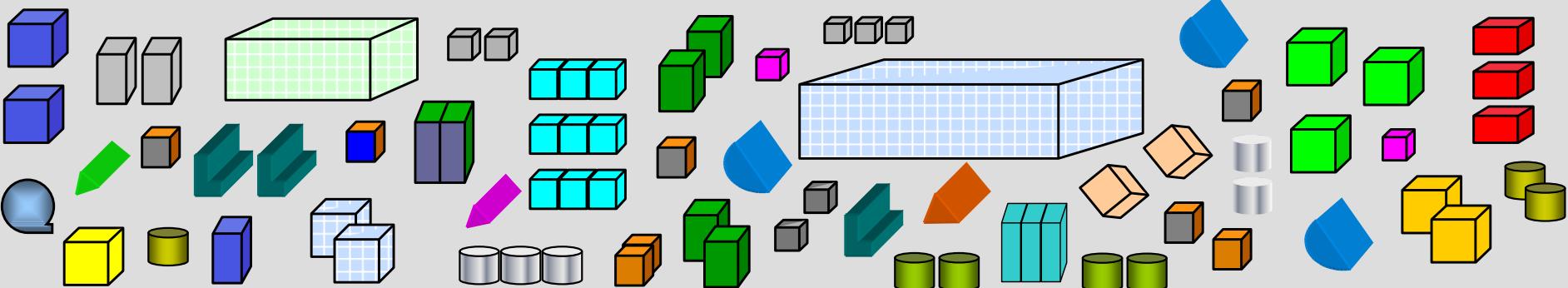
- Applications run distributed across servers, storage systems and networks.
- Variety of different hardware and software
- Every vendor has its own set of management solutions



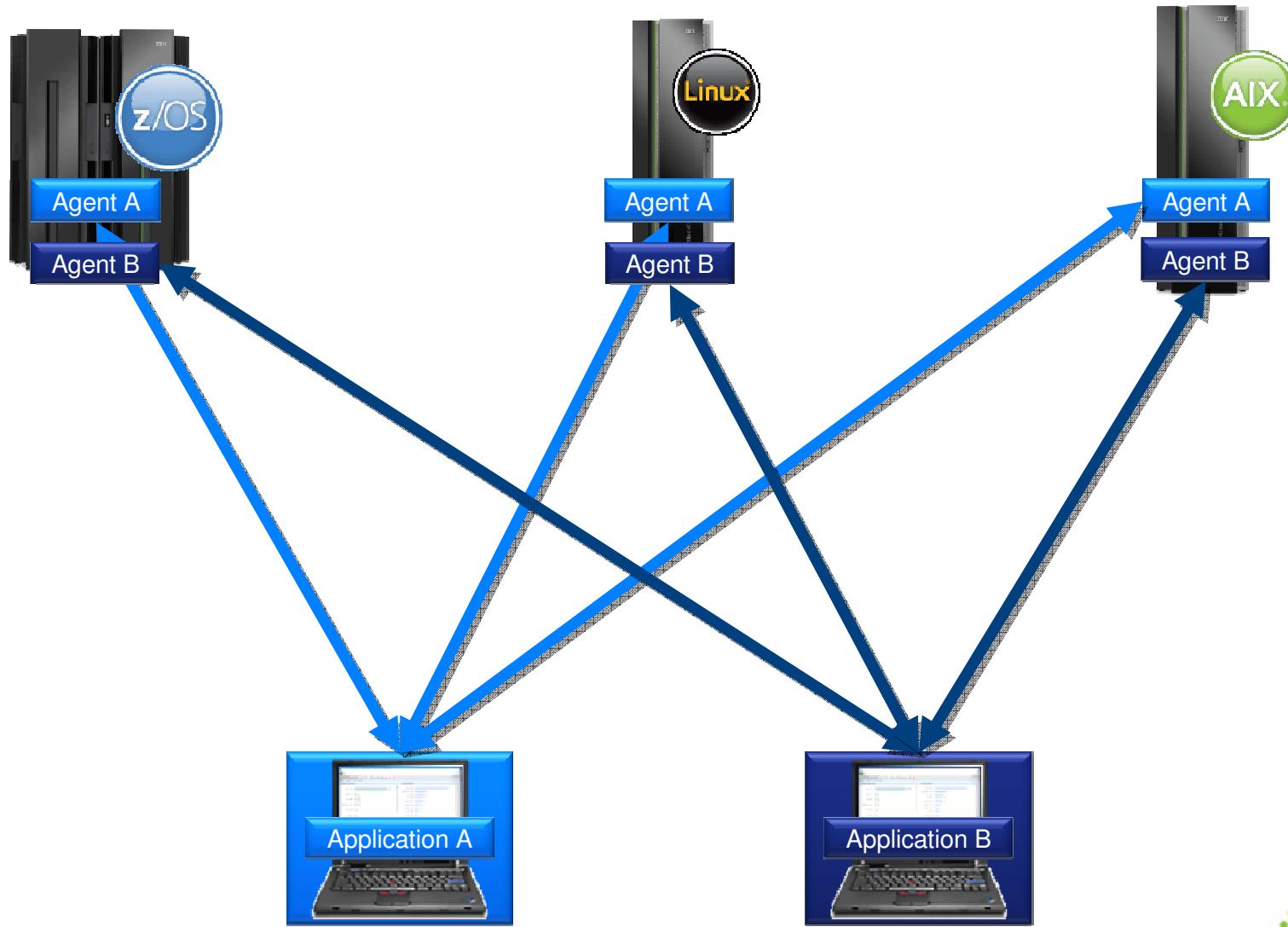
Administrator



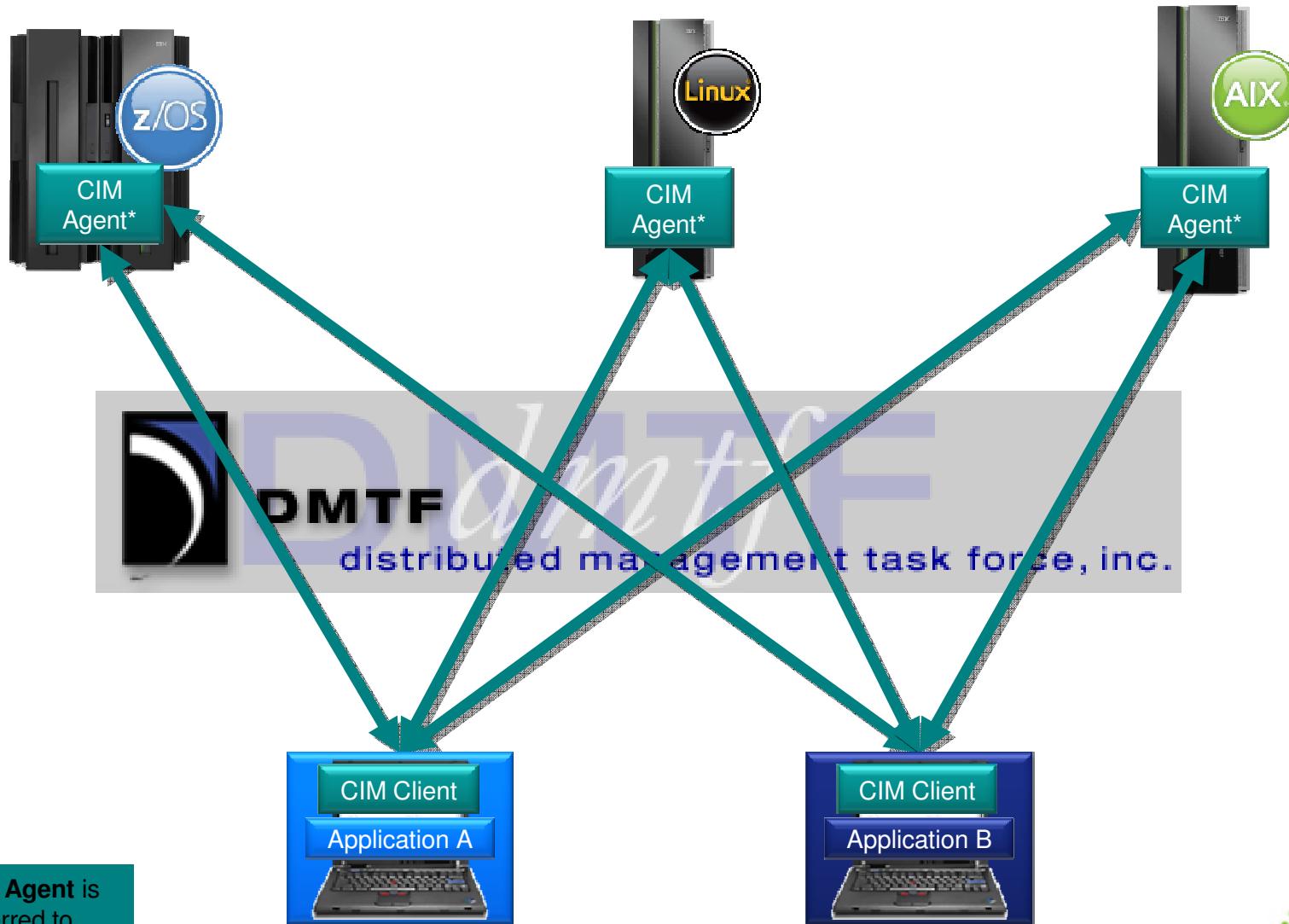
## Application Software, Servers, Storage, Networks and their Virtualization - Clouds



# Systems Management Example

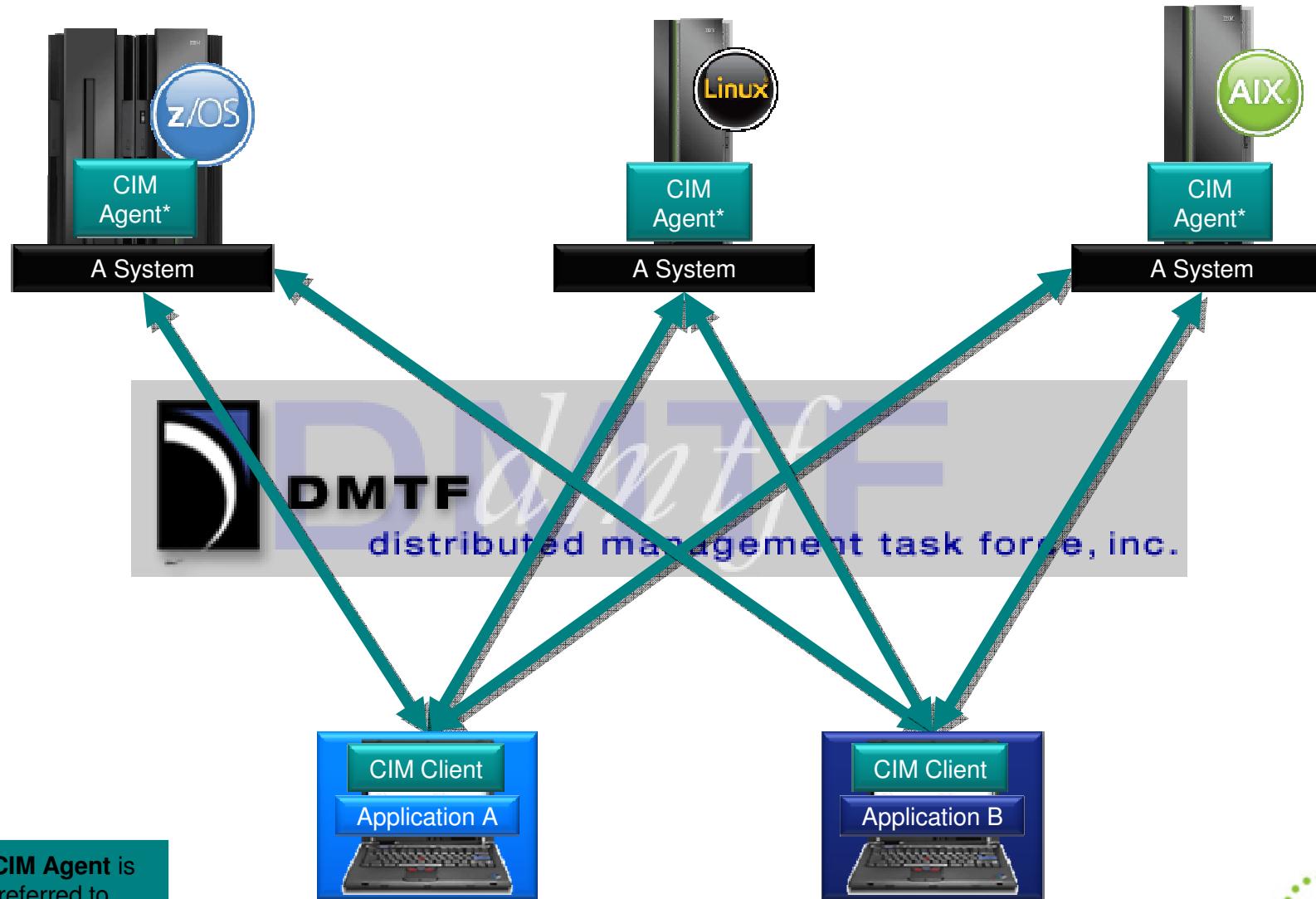


# Systems Management Example with CIM



\*The CIM Agent is also referred to as the CIM Server

# Systems Management Example with CIM Logical View



\*The CIM Agent is also referred to as the CIM Server

# DMTF Management Standards

DMTF = “Distributed Management Task Force” - [www.dmtf.org](http://www.dmtf.org)

The DMTF defines open standards for the management of distributed systems:

- CIM (Common Information Model)
  - Data model to represent IT resources
  - Independent of any specific platform or technologies
- WBEM (Web Based Enterprise Management)
  - Defines the protocols and interfaces for access to CIM data models.
  - Based on standard-technologies like XML, HTTP and Web services
- *more ....*

CIM and WBEM together enable Interoperability between vendors of hard- and software and vendors of management solutions.

Almost all larger vendors of hard- and software are members of the DMTF



# Components of z/OS CIM

The 'glue' between the data model and the actual system resources. These are platform specific and can be extended by vendor software.

The heart of z/OS CIM, serving requests from local and remote management applications.  
A port of the OpenPegasus CIM Server from TheOpenGroup.

A Java API that implements local and remote access to a CIM Server.  
Following the JSR48 standard

**z/OS CIM Providers**

**CIM Server**  
(aka CIM Agent)



Data model that describes the managed resources in a platform neutral way.

**DMTF CIM Schema**

*z/OS specific extensions of the DMTF data model.*

**z/OS Schema Extensions**

**CIM Client API**  
Java JSR48

A C++ API that implements local and remote access to a CIM Server.  
Part of the OpenPegasus project.

**CIM Client API**  
C++

The `cimcli` command line tool can be used to access local and remote CIM Servers.  
Runs in UNIX System Services.

**CIM Command Line Client**



# Resource data available through z/OS CIM

## Basic Data

- Processors
- Operating System
- Address Spaces
- UNIX Processes
- Network Ports

## Cluster Data

- Sysplex
- Coupling Facility
- XCF

## Job Data

- JES2
- JES3

## WLM Policy Data

## Storage Data

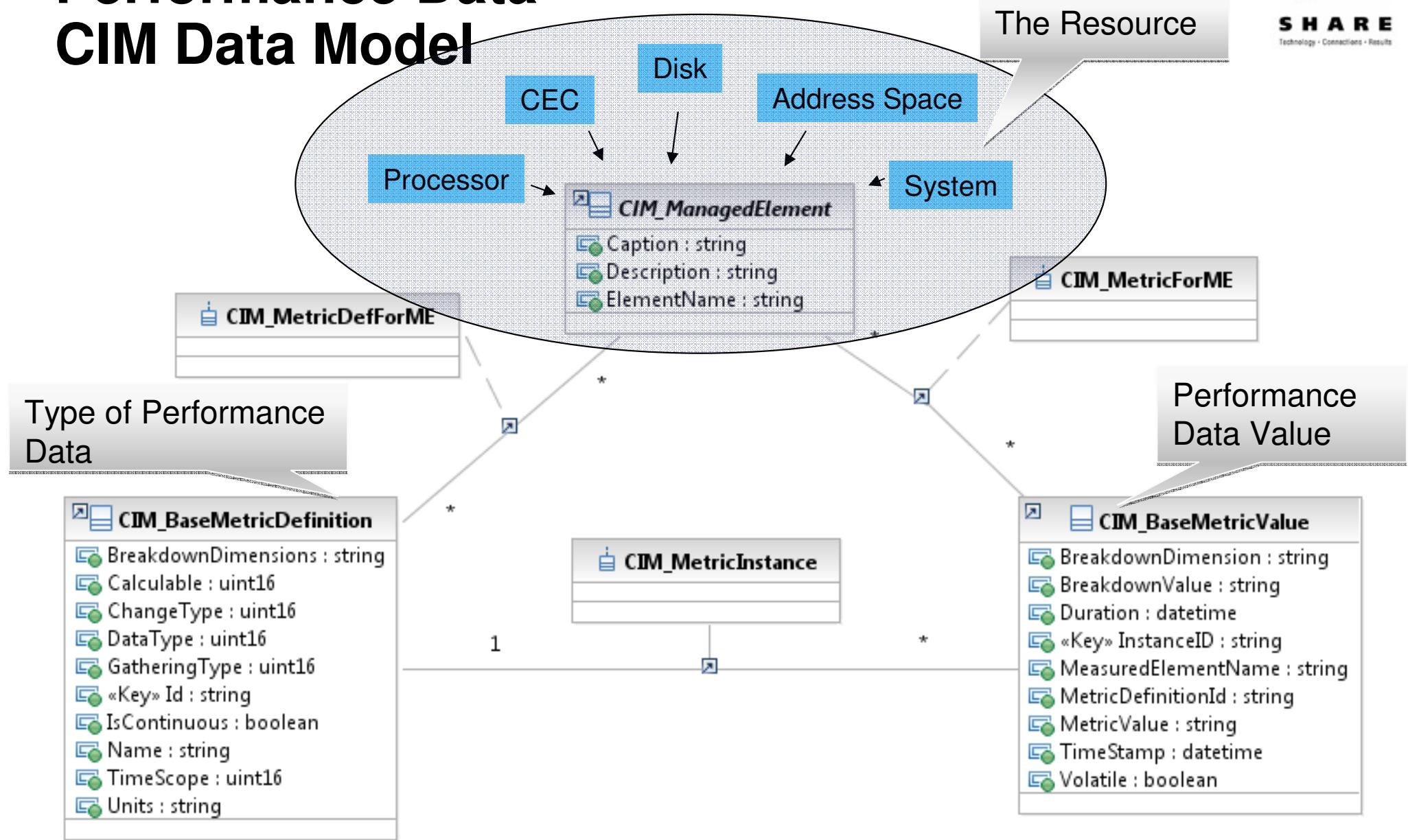
- Logical Volumes
- FC Ports

## Performance Data

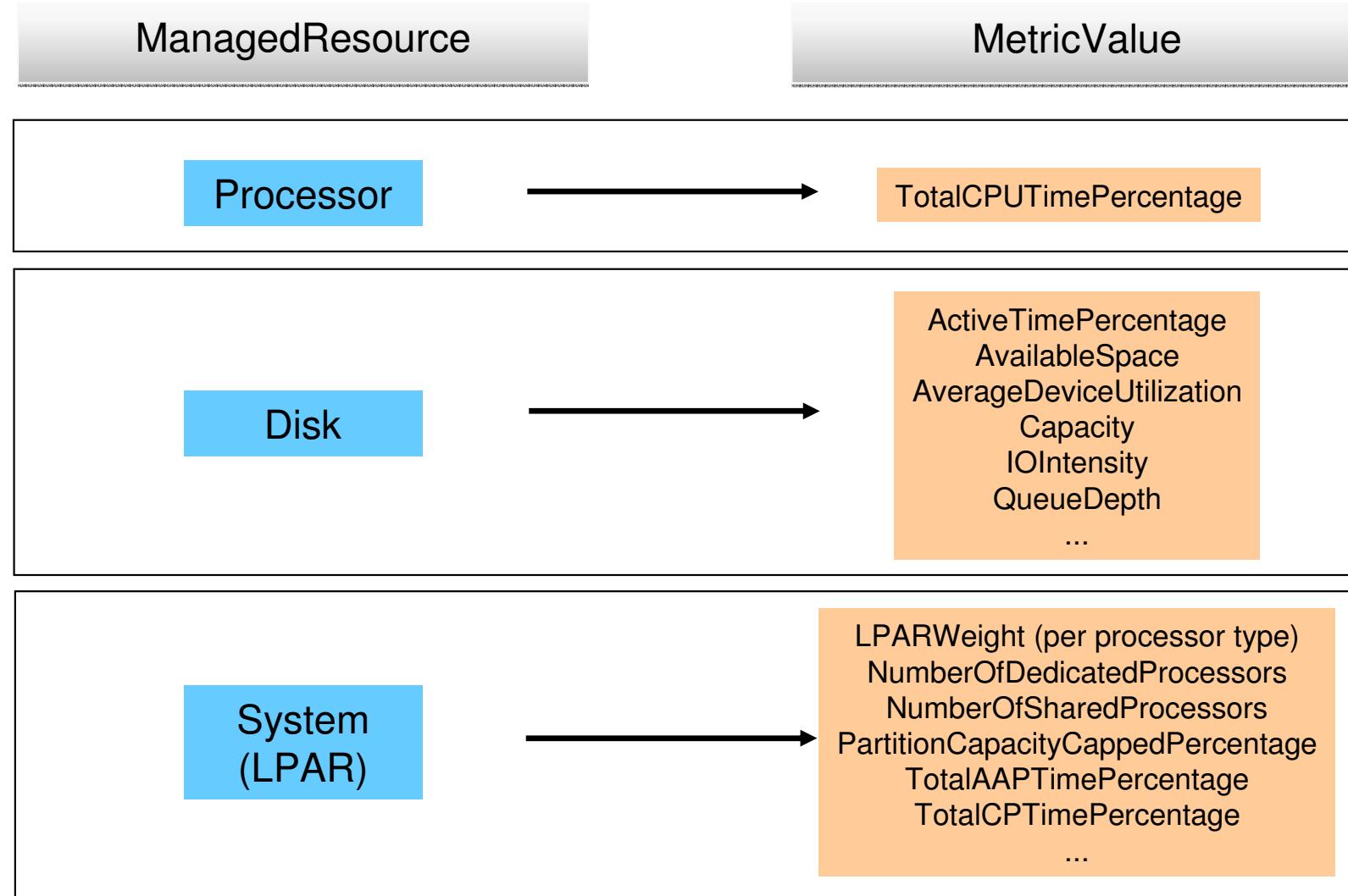
- RMF / BMC

See *z/OS CIM User's Guide (SC33-7999)* for details

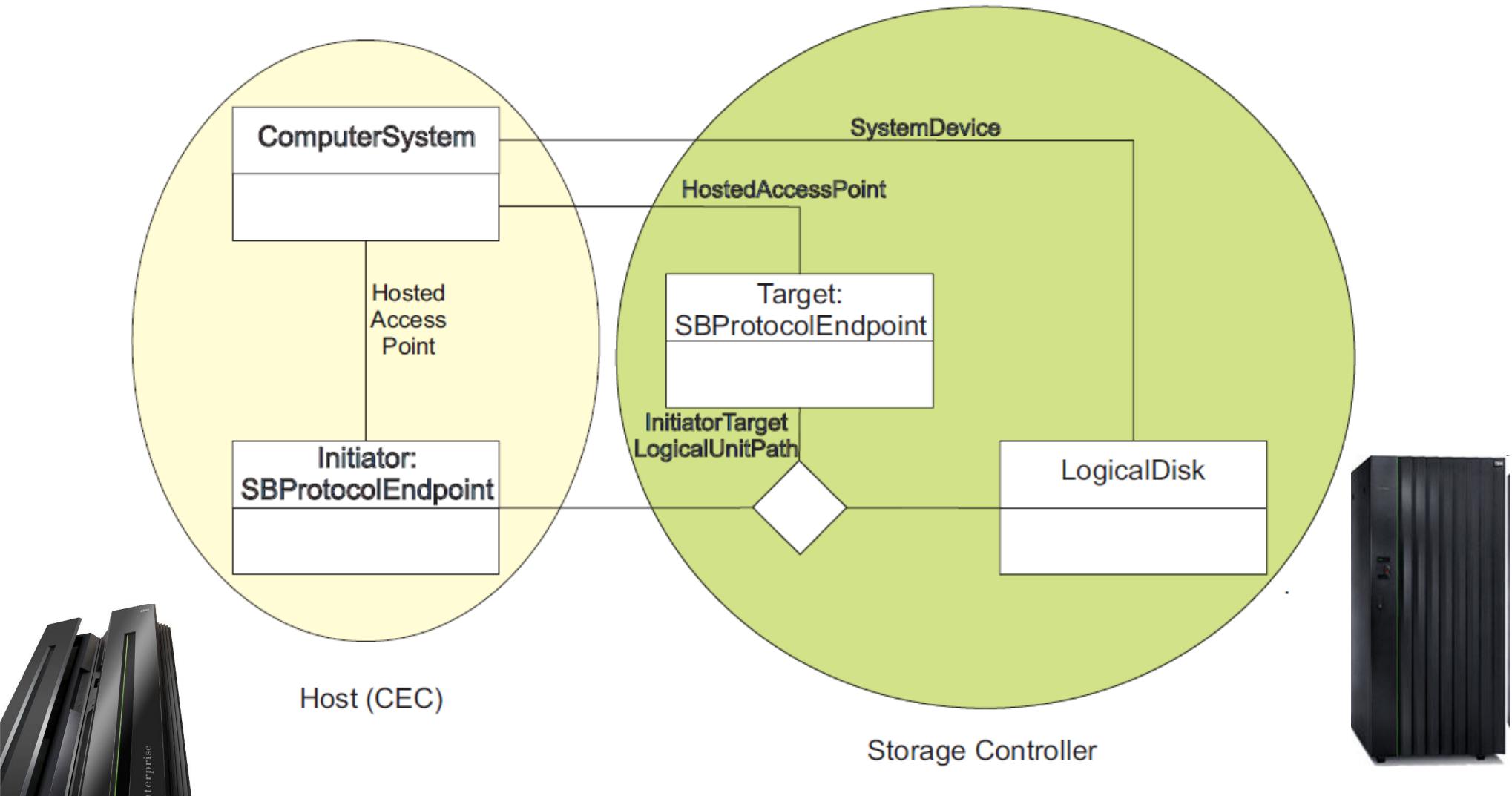
# Performance Data CIM Data Model



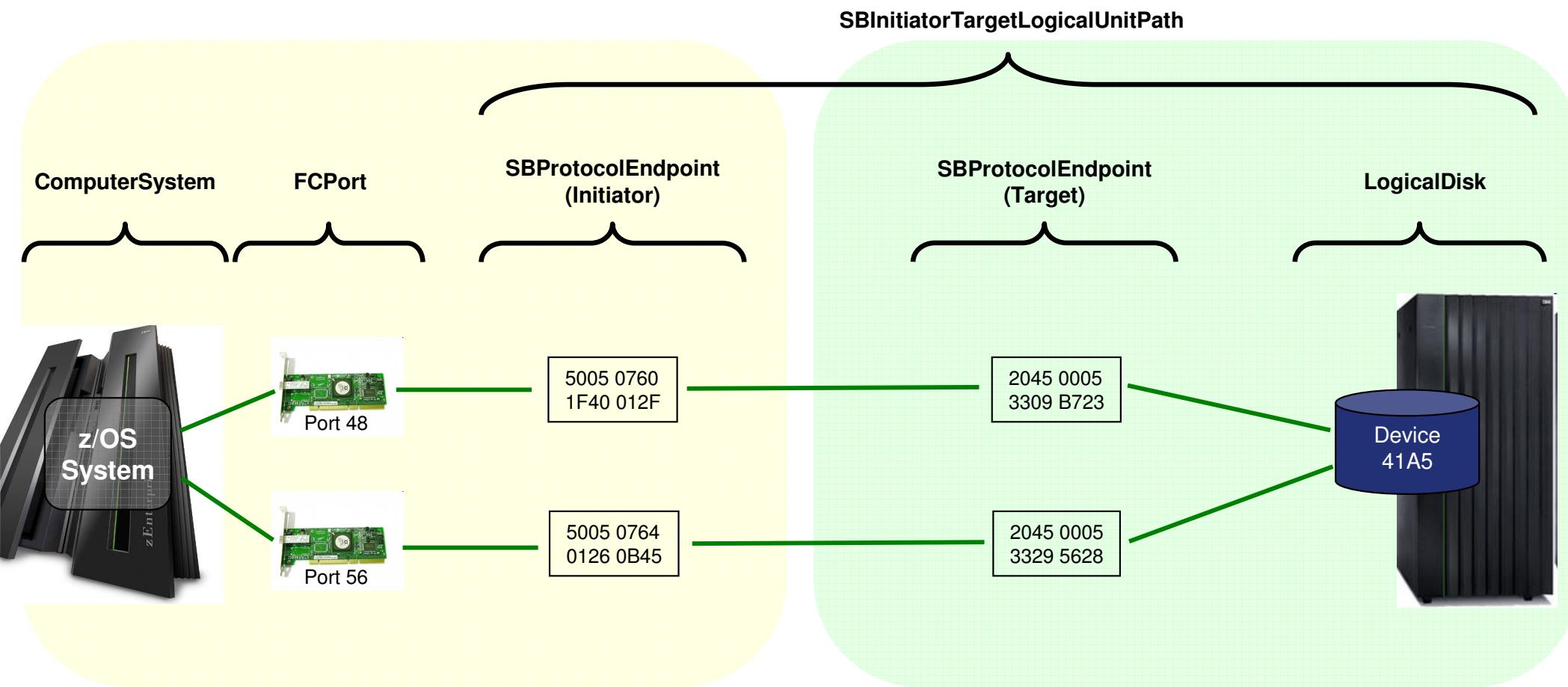
# Performance Data Examples



# Storage Example CIM Data Model



# Storage Example Paths to Disks in CIM terms



# The way CIM works

## By example of examining storage

- List all the FCPorts attached to a z/OS System
  - `EnumerateInstances(CIM_FCPort)`
- Select an FCPort and retrieve the associated ProtocolEndpoints
  - `Associators(ResultClass = CIM_ProtocolEndpoint)`
- Select an (initiator) ProtocolEndpoint and retrieve the associated (target) ProtocolEndpoints and LogicalDisks
  - `Associators(CIM_InitiatorTargetLogicalUnitPath)`

# Command Line Example

## Listing FCPorts

Requesting a list of FC Ports on the local system through **cimcli**:

```
>> cimcli enumerateinstances cim_fcport
   -pl creationclassname,systemname,portnumber,
        permanentaddress
   -o table
```

SystemName	CreationClassName	PortNumber	PermanentAddress
BOEPEG4.boeblingen.de.ibm.com	IBMzOS_FCPort	48	500507601F40012F
BOEPEG4.boeblingen.de.ibm.com	IBMzOS_FCPort	49	5005076401660ABA
BOEPEG4.boeblingen.de.ibm.com	IBMzOS_FCPort	50	5005076401A60ABA
BOEPEG4.boeblingen.de.ibm.com	IBMzOS_FCPort	51	5005076401E60ABA
BOEPEG4.boeblingen.de.ibm.com	IBMzOS_FCPort	52	500507601F4005AF
BOEPEG4.boeblingen.de.ibm.com	IBMzOS_FCPort	53	5005076401660B32
BOEPEG4.boeblingen.de.ibm.com	IBMzOS_FCPort	54	50050764012263FE
BOEPEG4.boeblingen.de.ibm.com	IBMzOS_FCPort	55	5005076401E60B32
...			

# Command Line Example

## Retrieving associated elements

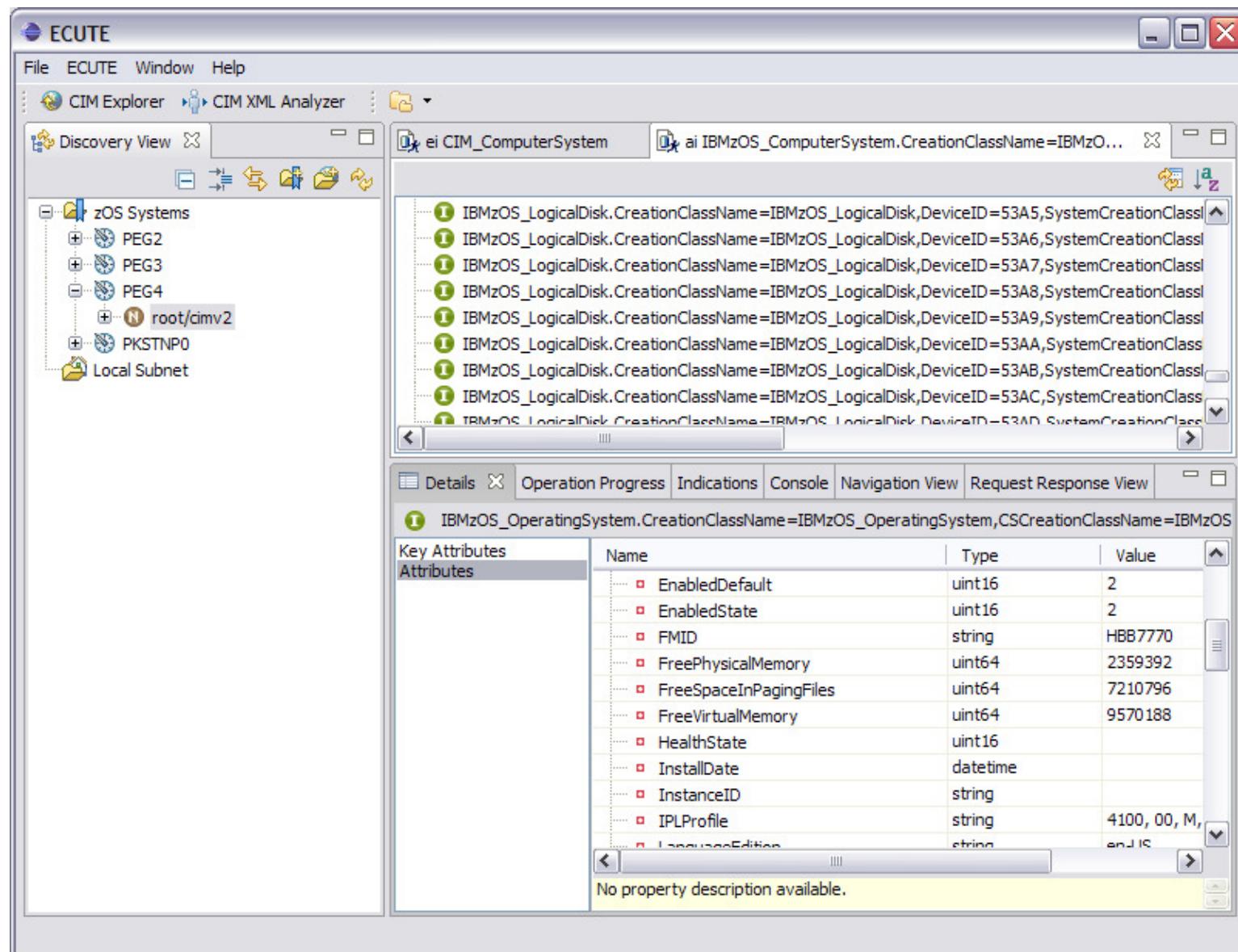
Requesting the ProtocolEndpoints connected to a specific FC Port on the local system through **cimcli**:

```
>> cimcli associators cim_fcport -i
   -rc cim_protocolendpoint
   -pl name,role,creationclassname,systemname
```

```
path=
//BOEPEG4/root/cimv2:IBMzOS_SBProtocolEndpoint.CreationClassName="IBMzOS_SBProtocol
Endpoint",Name="500507601F40012F",SystemCreationClassName="IBMzOS_ComputerSystem",S
ystemName="BOEPEG4.boeblingen.de.ibm.com"

instance of IBMzOS_SBProtocolEndpoint
{
    SystemName = "BOEPEG4.boeblingen.de.ibm.com";
    CreationClassName = "IBMzOS_SBProtocolEndpoint";
    Name = "500507601F40012F";
    Role = 2;
};
```

# CIM Browser Example – ECUTE CIM Explorer



The screenshot shows the ECUTE CIM Explorer interface. The left pane displays a tree view of system resources under "zOS Systems", including PEG2, PEG3, PEG4, root/cimv2, and PKSTNPO. The right pane shows a list of logical disks under "Discovery View". A specific item, "ibm CIM\_ComputerSystem", is selected. Below it, a detailed view of the "IBmOS\_OperatingSystem.CreationClassName = IBMOS\_OperatingSystem, CSCreationClassName = IBMOS" object is shown. The "Key Attributes" table lists various properties:

Name	Type	Value
EnabledDefault	uint16	2
EnabledState	uint16	2
FMID	string	HBB7770
FreePhysicalMemory	uint64	2359392
FreeSpaceInPagingFiles	uint64	7210796
FreeVirtualMemory	uint64	9570188
HealthState	uint16	
InstallDate	datetime	
InstanceID	string	
IPLProfile	string	4100, 00, M, and IS
LanguageEdition	string	

A note at the bottom of the table states: "No property description available."

Available at: <http://sourceforge.net/apps/mediawiki/sblim/index.php?title=Ecute>

# Example – WS Management

New with  
z/OS R13

- **The Windows Vista / 7 “winrm” command:**
  - A feature of the Microsoft Windows Operating System that can be used to execute CIM requests against the z/OS CIM Server over the WS-Management protocol
  - Windows 7 Example (Run a “Command Prompt” as administrator):

- Setup:

- > winrm quickconfig
- > winrm set winrm/config/client @{AllowUnencrypted="true"}
- > winrm set winrm/config/client/auth @{Basic="true"}
- > winrm set winrm/config/client @{TrustedHosts=""}

- **EnumerateInstances example:**

- > winrm enumerate  
http://schemas.dmtf.org/wbem/wscim/1/cim-schema/2/CIM\_FCPort  
-username:<user>  
-r:<z/OS IP address>:5988  
-auth:basic  
-format:#text  
-encoding:utf-8

# CIM Client API for Java

- The SBLIM CIM Client 2 is a pure Java implementation of ...
    - the WBEM Operations API
    - Supports the CIM-XML over HTTP(S) protocol
    - the CIM Meta-Model representation
    - an Indication listener
    - Based on JSR48 Standard
  - Located at `/usr/lpp/wbem/jclient`
    - Client library `sblim-cim-client2.jar`
      - Configuration file `cim.defaults`
    - API Java DOC `sblim-cim-client2-doc.zip`
  - Additional documentation is provided at  
<http://sourceforge.net/apps/mediawiki/sblim/index.php?title=CimClient>
- Additonal samples in source package of the SBLIM CIM Client 2
- `\smpl\org\sblim\cimclient\samples\JSR48*.java`

# Java CIM Client 2 API Example

## Listing FCPorts

```

import javax.cim.*;
import javax.wbem.*;
...

UserPrincipal userPr = new UserPrincipal("AUSER");
PasswordCredential pwCred = new PasswordCredential("APASSWORD");

String nameSpace = "http://sys1.acme.com:5988/root/cimv2";
CIMObjectPath serverPath = new CIMObjectPath(nameSpace);

Subject pSubject = new Subject();
pSubject.getPrincipals().add(userPr);
pSubject.getPrivateCredentials().add(pwCred);

WBEMClient cimClient = WBEMClientFactory.getClient("CIM-XML");
cimClient.initialize(serverPath, pSubject, LocaleFactory.create(language));

CIMObjectPath processPath = new CIMObjectPath("CIM_FCPort", "root/cimv2");

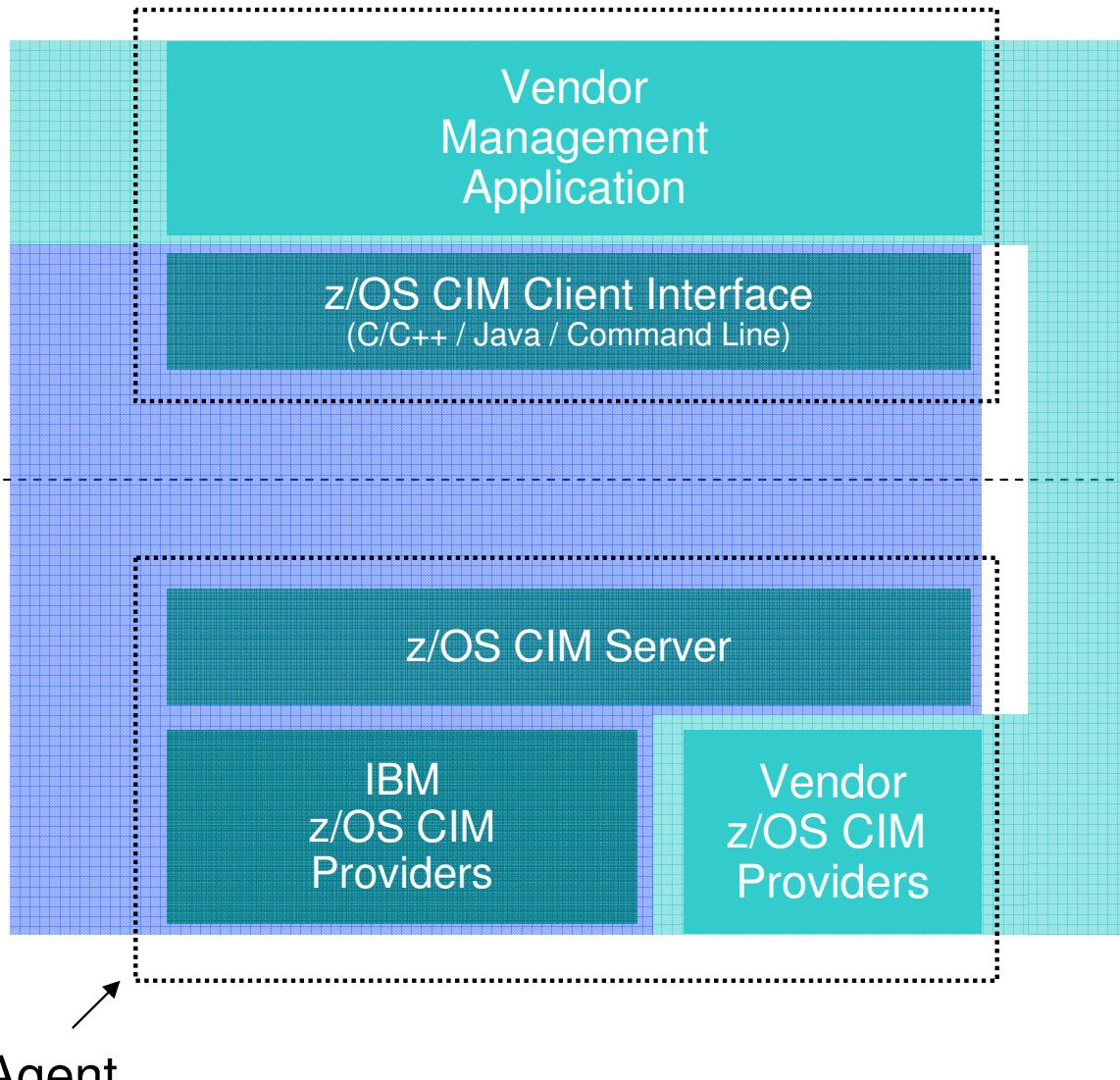
CloseableIterator instances;
instances = cimClient.enumerateInstances(processPath, true, false, false, null);
while(instances.hasNext()){
    CIMInstance cimInstance = (CIMInstance)instances.next();
    System.out.println(cimInstance.toString());
}
instances.close();
...

```

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# Using the CIM Infrastructure for Management Apps

User Interface →



Agent

# Further information on CIM/WBEM

- General information about the CIM/WBEM standards  
→ <http://www.dmtf.org/standards>
- DMTF's CIM Tutorial  
→ <http://www.wbemsolutions.com/tutorials/CIM/>
- OpenPegasus CIM Server  
→ <http://www.openpegasus.org>
- Storage Management Initiative Specification (SMI-S)  
→ [http://www.snia.org/tech\\_activities/standards/curr\\_standards/smi](http://www.snia.org/tech_activities/standards/curr_standards/smi)
- z/OS CIM Users Guide  
→ <http://www-03.ibm.com/systems/z/os/zos/bkserv/r13pdf/#cfz99l13.scr>

