

Point of Sale Subsystem



## **UnifiedPOS**

# **Retail Peripheral Architecture IBM Defined Management Services**

**Version 1.9.6**

**May 2008**

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## 1.0 IBM Defined Management Services

### 1.1 Introduction

This document explains the high level design of the UnifiedPOS Management Services Subsystem and related components. This strategy conforms to the Common Information Model (CIM) from the Distributed Management Task Force (DMTF). The CIM mode for Retail devices has been proposed to UnifiedPOS Committee, and it is currently being reviewed by UnifiedPOS committee. The IBM management service for Retail devices is based off the CIM schema for Retail devices.

### 1.2 UnifiedPOS Changes

To seamlessly support the integration of UnifiedPOS management services, some changes are required to the UnifiedPOS specification, as well as the device controls provided by members of the committee.

Each component, the control and the service will have the capability to expose the device to UnifiedPOS Management Services. A read/write Boolean property, **AllowManagement** at control, will allow the application to determine if the device should participate in systems management. The default value is true for **AllowManagement** property. The property is initialized at open time.

Also, each Service should implement the **UPOSManagementService** interface. The interface, from UPOS Management Services, it is what the component passes to Management Services when it registers with it. This interface serves as the connection point to Management Services and eventually the CIMOM. Registration occurs when the device is opened, and un-register when closed.

When the device is open, it should check with its corresponding control and service to determine if it will handle systems management, checking the **CapServiceAllowManagement** capability and **AllowManagement** property. If **CapServiceAllowManagement** is true, the Service will accept the responsibility to interact with systems management and register its own **UPOSManagementService** with UPOS Management Services and handle the systems management interface on behalf of the named device.

During open time when **CapStatisticsReporting** is true the **UPOSManagementService** will try to claim and enable the device to call the retrieveStatistics method and gather the device information statistics like SerialNumber. Once the retrieveStatistics method is complete the device will be released and the control returned to the application.

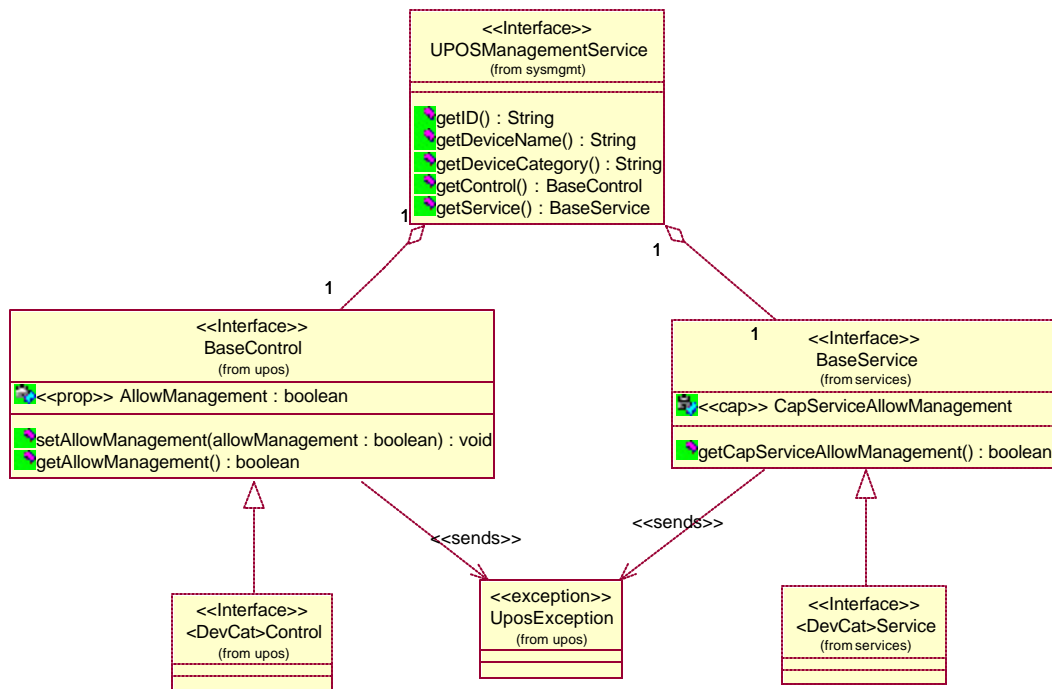
When **CapServiceAllowManagement** is false and the **AllowManagement** is true the control of the device will register the **UPOSManagementService** with UPOS Management Services. Finally when both are false the device will not participate in systems management.

The **UPOSManagementService** is unregistered when the device is closed.

**CapServiceAllowManagement** capability has as default value false

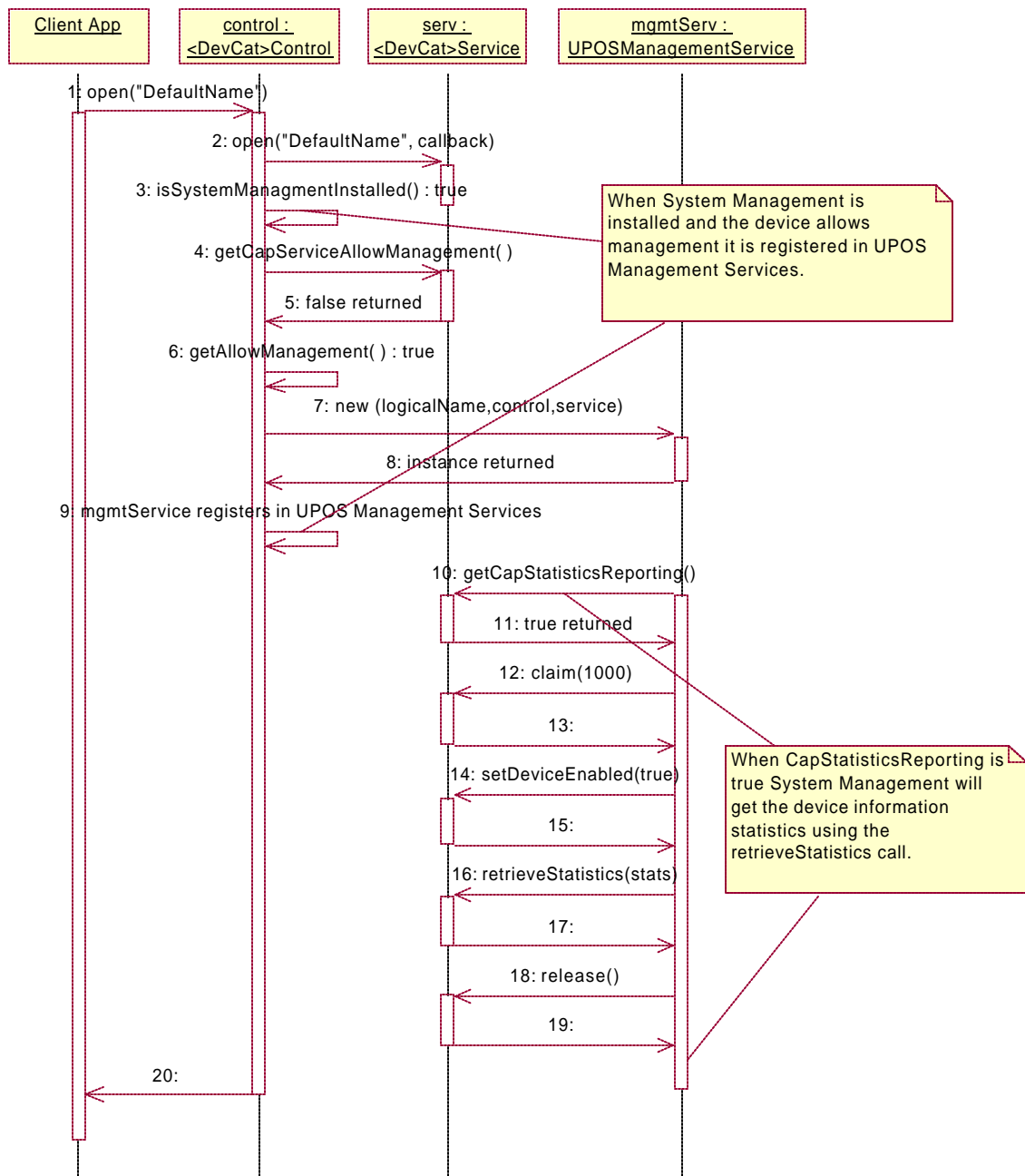
The following sections describe the class diagrams and sequence diagrams created in IBM UnifiedPOS 1.9.1 release.

### 1.3 Controls Class Diagram for Management Service



## 1.4 Device Registration Sequence Diagram

The following sequence diagram show the new sequences added to the Device Control to register the device with IBM Management Services at open() time.



## 1.5 CIM ClassNames for UnifiedPOS Device Category Names

The correlations of UnifiedPOS programmatic names and CIM class names are defined in the following table

UnifiedPOS Device Programmatic Names	CIM Class Name	Supported since
BumpBar	UPOS_BumpBar	
CashChanger	UPOS_CashChanger	
CashDrawer	UPOS_CashDrawer	1.9.1
CAT	UPOS_CAT	
CheckScanner	UPOS_CheckScanner	1.9.1
CoinDispenser	UPOS_CoinDispenser	
FiscalPrinter	UPOS_FiscalPrinter	
HardTotals	UPOS_HardTotals	1.9.1
Keylock	UPOS_Keylock	1.9.1
LineDisplay	UPOS_LineDisplay	1.9.1
MICR	UPOS_MICR	1.9.1
MotionSensor	UPOS_MotionSensor	1.9.1
MSR	UPOS_MSR	1.9.1
PINPad	UPOS_PINPad	
PointCardRW	UPOS_PointCardRW	
POSKeyboard	UPOS_POSKeyboard	1.9.1
POSPower	UPOS_POSPower	
POSPrinter	UPOS_POSPrinter	1.9.1
RemoteOrderDisplay	UPOS_RemoteOrderDisplay	
Scale	UPOS_Scale	1.9.1
Scanner	UPOS_Scanner	1.9.1
SignatureCapture	UPOS_SignatureCapture	
SmartCardRW	UPOS_SmartCardRW	
ToneIndicator	UPOS_ToneIndicator	1.9.1

Refer to "<installdir>\sysmgmt\UPOSMgmtSrvProv.mof" file for a complete class definition

## 1.6 IBM UnifiedPOS Provider for System Management

The IBM Provider acts as driver and interface between the abstract world of the Common Information Model (CIM) and the UnifiedPOS device characteristics of Retail Hardware.

Following describes the providers supported by IBM:

### 1.1.1 Instance Provider

An instance provider supplies instances of one or more given classes. For example, an instance provider can supply information regarding a POSPrinter device.

The information provided at CIM getInstance call will depend on the current state of the Device, when the **DeviceEnabled** property is false the Provider will generate an instance with all the properties available at open time plus all properties defined by UPOS statistics (device information and device specific properties).

Note: When device is not enabled the initial statistic properties detected during open time are used.

When the **DeviceEnabled** property is true the Provider will generate an instance with all the properties defined at the UPOS CIM Class.

CIM Method	WMI Equivalent	Supported by	
		Windows	IRES 2
GetInstance	GetObjectAsync	Yes	Yes
ModifyInstance	PutInstanceAsync	No	No
DeleteInstance	DeleteInstanceAsync	No	No
EnumerateInstances	CreateInstanceEnumAsync	Yes	Yes
EnumerateInstanceNames		No	Yes
ExecQuery	ExecQueryAsync	No	No

### 1.1.2 Method Provider

A method provider allows CIMOM access to the methods of a class.

CIM Method	WMI Equivalent	Supported by	
		Windows	IRES 2
InvokeMethod	ExecMethodAsync	No	No

### 1.1.3 UPOS System Management Events

```
class UPOS_SysMgmtEvent : __ExtrinsicEvent
{
    String eventtype;
    String classname;
    String deviceid;
    String codename;
};
```

#### eventtype property

The type of event generated

Values	Meaning
addInstance	An UPOS device has registered with UPOS System Management
modifyInstance	The UPOS device has generated an Status Update Event
dellInstance	An UPOS device has unregistered with UPOS System Management

#### classname property

The CIM class name. Refer to section 1.5 in “CIM Class name” column for values.

#### deviceid property

The ID whom generates the event, currently this ID is created in base of the logicalName and CIM class name.

For example:

“POSPrinter1UPOS\_POSPrinter”

#### codename property

Property used when the event type is “modifyInstance”. The value describes the type of device category-specific status change. Below the details for supported categories.

UPOS Device Category	Status Update Events (SUE) reported to System Management
Common (all devices)	JPOS_SUE_POWER_ONLINE = 2001
	JPOS_SUE_POWER_OFF = 2002
	JPOS_SUE_POWER_OFFLINE = 2003
	JPOS_SUE_POWER_OFF_OFFLINE = 2004
	JPOS_SUE_UF_PROGRESS = 2100
	JPOS_SUE_UF_COMPLETE = 2200
	JPOS_SUE_UF_FAILED_DEV_OK = 2201
	JPOS_SUE_UF_FAILED_DEV_UNRECOVERABLE = 2202
	JPOS_SUE_UF_FAILED_DEV_NEEDS_FIRMWARE = 2203
	JPOS_SUE_UF_FAILED_DEV_UNKNOWN = 2204
	JPOS_SUE_UF_COMPLETE_DEV_NOT_RESTORED = 2205



**UPOS Device Category**      **Status Update Events (SUE) reported to System Management**

CashDrawer	CASH_SUE_DRAWERCLOSED	=	0
	CASH_SUE_DRAWEROPEN	=	1
CheckScanner	CHK_SUE_SCANCOMPLETE	=	11
FiscalPrinter	FPTR_SUE_COVER_OPEN	=	11
	FPTR_SUE_COVER_OK	=	12
	FPTR_SUE_JRN_EMPTY	=	21
	FPTR_SUE_JRN_NEAREMPTY	=	22
	FPTR_SUE_JRN_PAPEROK	=	23
	FPTR_SUE_REC_EMPTY	=	24
	FPTR_SUE_REC_NEAREMPTY	=	25
	FPTR_SUE_REC_PAPEROK	=	26
	FPTR_SUE_SLP_EMPTY	=	27
	FPTR_SUE_SLP_NEAREMPTY	=	28
	FPTR_SUE_SLP_PAPEROK	=	29
	FPTR_SUE_IDLE	=	1001
	FPTR_SUE_JRN_COVER_OPEN	=	60
	FPTR_SUE_JRN_COVER_OK	=	61
	FPTR_SUE_REC_COVER_OPEN	=	62
	FPTR_SUE_REC_COVER_OK	=	63
	FPTR_SUE_SLP_COVER_OPEN	=	64
	FPTR_SUE_SLP_COVER_OK	=	65
Keylock	LOCK_KP_ANY	=	0
	LOCK_KP_LOCK	=	1
	LOCK_KP_NORM	=	2
	LOCK_KP_SUPR	=	3
MotionSensor	MOTION_M_PRESENT	=	1
	MOTION_M_ABSENT	=	2

**UPOS Device Category**      **Status Update Events (SUE) reported to System Management**

POSPrinter	PTR_SUE_COVER_OPEN	=	11
	PTR_SUE_COVER_OK	=	12
	PTR_SUE_JRN_EMPTY	=	21
	PTR_SUE_JRN_NEAREMPTY	=	22
	PTR_SUE_JRN_PAPEROK	=	23
	PTR_SUE_REC_EMPTY	=	24
	PTR_SUE_REC_NEAREMPTY	=	25
	PTR_SUE_REC_PAPEROK	=	26
	PTR_SUE_SLP_EMPTY	=	27
	PTR_SUE_SLP_NEAREMPTY	=	28
	PTR_SUE_SLP_PAPEROK	=	29
	PTR_SUE_JRN_CARTRIDGE_EMPTY	=	41
	PTR_SUE_JRN_CARTRIDGE_NEAREMPTY	=	42
	PTR_SUE_JRN_HEAD_CLEANING	=	43
	PTR_SUE_JRN_CARTDRIGE_OK	=	44
	PTR_SUE_JRN_CARTRIDGE_OK	=	44
	PTR_SUE_REC_CARTRIDGE_EMPTY	=	45
	PTR_SUE_REC_CARTRIDGE_NEAREMPTY	=	46
	PTR_SUE_REC_HEAD_CLEANING	=	47
	PTR_SUE_REC_CARTDRIGE_OK	=	48
	PTR_SUE_REC_CARTRIDGE_OK	=	48
	PTR_SUE_SLP_CARTRIDGE_EMPTY	=	49
	PTR_SUE_SLP_CARTRIDGE_NEAREMPTY	=	50
	PTR_SUE_SLP_HEAD_CLEANING	=	51
	PTR_SUE_SLP_CARTRIDGE_OK	=	52
	PTR_SUE_IDLE	=	1001
	PTR_SUE_JRN_COVER_OPEN	=	60
	PTR_SUE_JRN_COVER_OK	=	61
	PTR_SUE_REC_COVER_OPEN	=	62
	PTR_SUE_REC_COVER_OK	=	63
	PTR_SUE_SLP_COVER_OPEN	=	64
	PTR_SUE_SLP_COVER_OK	=	65

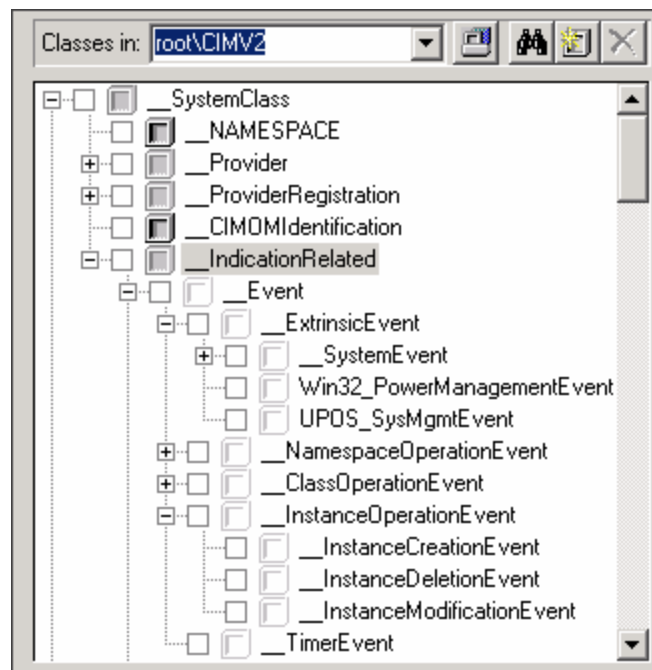
Scale	SCL_SUE_STABLE_WEIGHT	=	11
	SCL_SUE_WEIGHT_UNSTABLE	=	12
	SCL_SUE_WEIGHT_ZERO	=	13
	SCL_SUE_WEIGHT_OVERWEIGHT	=	14
	SCL_SUE_NOT_READY	=	15
	SCL_SUE_WEIGHT_UNDER_ZERO	=	16C

### 1.1.4 Windows Event Provider (WMI)

An event provider is a COM object that supplies WMI notifications of intrinsic and extrinsic events. An intrinsic event reports an internal data change to WMI, while an extrinsic event reports a user-defined event not described by an intrinsic event.

For example, an event in response to changes, creation, or deletion of the UnifiedPOS\_POSPrinter class would classify as an intrinsic event. An event that is generated on the basis of something other than the modification, creation or deletion of an existing WMI object is an extrinsic event.

IBM UnifiedPOS provider provides events for creation, deletion and modification of instances (all the supported UnifiedPOS Status Update Events(SUE) are reported as instance modification events). Even though these events could be classified as intrinsic events, they are implemented as extrinsic events, since they are instances of UPOS\_SysMgmtEvent, which is subclass of \_\_ExtrinsicEvent (See figure below). Intrinsic events are generated by the WMI, rather than by the provider. Intrinsic events that concern to UPOS System Management are \_\_InstanceOperationEvent and its subclasses. In order to receive intrinsic events, as a client application, it is necessary to subscribe a consumer with WMI for the intrinsic events specific to the CIM classes that are intended to monitor.



*Detail of class hierarchy around \_\_Event system class.*

*(This class hierarchy is shown using CIM Studio from the WMI Tools, see reference ahead)*

### **1.1.5 Linux Indication Provider (IRES 2)**

The indication provider is not currently supported in Linux.

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## 2.0 Installation and Configuration

The following sections provide details regarding the installation and configuration of IBM UnifiedPOS system management support on Windows and IBM Retail Environment for SUSE LINUX (IRES) V2.

Notes:

1. The system management support is provided for all JavaPOS supported devices.
2. For OPOS, System Management support is provided for the following devices:
  - 4610 POSPrinter (Printer, MICR, CheckScanner, Tone Indicator, Cash Drawer)
  - AnyPlace Kiosk Scanners, MSRs, and the Motion Sensor devices

### 1.7 Installation on Windows

During IBM UnifiedPOS installation, a check box option is provided for selecting system management support. When this option is selected, the installation automatically installs and configures necessary system management components. However, the system management has dependencies on the existence of Windows core components that support system management.

#### Windows WMI Component

The Microsoft WMI components are required to run the IBM UnifiedPOS Management Services on Windows. The WMI component is typically a part of Windows OS, and IBM installation does not install Microsoft WMI components during installation. In case it is missing, it can be downloaded from:

<http://www.microsoft.com/downloads/details.aspx?familyid=013BB284-3946-44A9-AC3C-BF2A569EAA72&displaylang=en>

Optionally, the WMI components can be obtained by installing the Microsoft .NET component.

#### Installation on Windows 2000:

On Windows 2000, it is highly recommended that the WMI component is properly installed from one of the above methods. Otherwise you may see some failures when you try to enumerate POS devices in WMI due to missing DLLs.

## Validating System management :

The WMI Administrative Tools can be used to verify the system management properties of Retail Devices. The tool can be downloaded from.

<http://www.microsoft.com/downloads/details.aspx?FamilyID=6430f853-1120-48db-8cc5-f2abdc3ed314>

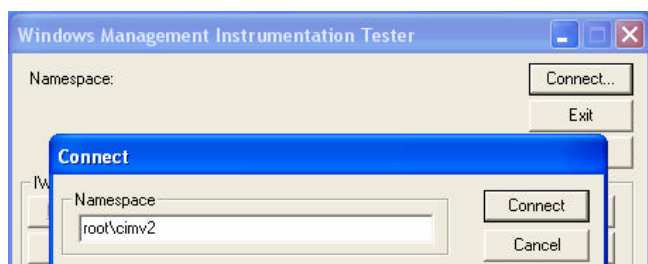
1. Install the WMI tool
2. Open the supported device(s)
3. Launch WMI Tool: Start -> WMI CIM Studio
4. In Connect to namespace, enter "root\cimv2", and log into CIM Studio
5. To view the properties, select the device on left pane, under UPOS\_LogicalDevices

## 1.8 Uninstallation on Windows

When the IBM UnifiedPOS software is uninstalled, it will automatically remove the system management components on Windows XP. However on Windows 2000, some manual clean is required as described below.

### Uninstallation on Windows 2000

IBM UnifiedPOS installer uses the "wmic" utility to delete the mof classes from WMI. Since this utility does not exist on Windows 2000, the mof classes must be manually deleted.



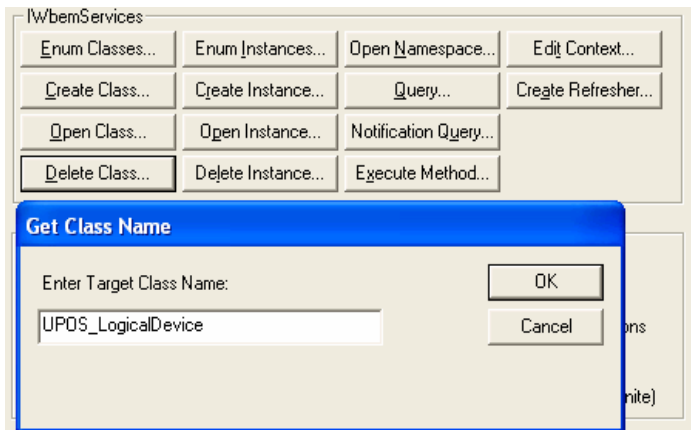
- 1.- Press Start-> run menu item.
- 2.- Type "wbemtest" at open field and press the "OK" button.

At "Windows Management Instrumentation Tester" window :

- 3.- Click on "connect..." button.

At Connect window:

- 4.- type "root\cimv2" at Namespace label.
- 5.- Click "connect" button.



6. Click on “Delete Class...”

At “Get Class Name” window

7.- Type “UPOS\_LogicalDevice” and click “OK” button.

8.- This will delete the parent “UPOS\_LogicalDevice” class and all its children classes from WMI.

9.- Repeat 6 and 7 steps for “UPOS\_DecoupledProvider” and “UPOS\_SysMgmtEvent” classes.

## 1.9 Installation on IBM Retail Environment for SUSE LINUX (IRES)

The IRES 2 Image Builder Tool currently does not support the automatic installation of system management components. The system management components therefore must be installed manually. Below is a brief description of system management system configuration.

Note that the system management support on IRES 2.1.5 is provided on use as-is basis.

### Running on IRES 2.1.5

In this release the supported version of Pegasus is 2.6.1

### IBM JavaPOS System Management Components:

The IBM UnifiedPOS support for System Management comprises of the following components:

rpms:

posIBM\_sbllim-cmpi-upos-server-<version>.i586.rpm  
posIBM\_XML4C-5.4.6-1.i586.rpm

jar files:

jpos1911.jar.sysmgmt:  
jpos\_sysmgmt.jar.sysmgmt

These files will be located in /opt/ibm/javapos/lib directory after installing the ibm-javapos-<version>.i386.rpm.

### Pre-requisites

- The UnifiedPOS system management support leverages the existing IRES system management infrastructure. Therefore the core IRES system management rpms, such as IBM\_sbllim, must be installed on systems.
- The Pegasus CIM Server 2.6.1 rpm must be installed.
- A working IBM JavaPOS configuration. In other words, the application should be able to open UPOS devices.
- The instructions assume cimcli is installed on the system for verifying the configuration.



## Installation and Configuration:

You must be root user to install and configure the system management components.

- Ensure that the Pegasus CIM server is running on branch server:
  - Check status: `/etc/init.d/tog-pegasus status`
  - Start server if needed: `/etc/init.d/tog-pegasus restart`
- Install `posIBM_XML4C-5.4.6-1.i586.rpm` is installed.
- Install `"posIBM_sblim-cmpi-upos-server-<version>.i586.rpm"`.
- Enable the JavaPOS Controls for system management. This can be done through copy operation on IRES Image Builder tool as follows
  - a. Select Configuration on left pane
  - b. Under Options, click on Applications
  - c. Click on Command
  - d. In the text field on the right side, add the following copy commands
    - `cp /opt/ibm/javapos/lib/jpos1911.jar.sysmgmt /opt/ibm/javapos/lib/jpos1911.jar`
    - `cp /opt/ibm/javapos/lib/jpos_sysmgmt.jar.sysmgmt /opt/ibm/javapos/lib/jpos_sysmgmt.jar`
  - e. Enable check box "Automatically Run Command"
  - f. At the bottom, select "Run As" root
- Open one or more devices using a JavaPOS application.
- Get System Management properties for a given device by issuing Pegasus **cimcli** command. For example, to retrieve POSPrinter device properties.
  - `cimcli ei -n root/cimv2 UPOS_POSPrinter -u root -p <root password>`

## 1.10 System Management Configuration File

To customize some of the system management functions, several properties are defined in sysmgmt.properties file. The details are described below.

File Name: systemgmt.properties

Location : <install directory>\sysmgmt directory (Windows)  
/opt/ibm/javapos/etc (IRES)

**Property:** provider.eventSocket.Port

**Default value:** 42114

**Description:** Port number used by Windows Event CIM Provider.

**Property:** provider.response.timeout

**Default value:** 30000

**Description:** Timeout value from CIM Provider to UPOS Management Services..

**Property:** upos.requestSocket.Port

**Default value:** 42115

**Description:** Port number used by UPOS Management Services.

**Property:** provider.eventSocket.IP

**Default value:** 127.0.0.1

**Description:** Destination IP address for event UDP datagrams. Typically this would be the local machine, however due to limitations in IRES implementation, it might be necessary to report events directly to the Pegasus Server.

**Property:** provider.maxQueryThreads

**Default value:** 10

**Description:** Maximum number of threads that are allowed to connect to the Java drivers at the same time.

---

## 3.0 Problem Determination

The IBM JavaPOS provides facility to gather trace information for JavaPOS and Provider components. You can selectively enable/disable traces as follows.

### Enabling Java Trace:

1. Go to IBM JavaPOS properties directory and open the "jutil.properties", for windows is "c:\pos\IBMJPOS\CONFIG" and for IRES is "/opt/ibm/javapos/etc"
2. Turn on the "com.ibm.jutil.tracing.TurnOnAllNamedTracers=ON" trace.
3. The location for these files is "<HOME>/.ibmjpos" where <HOME> is the absolute path to the user's home directory.

### Enabling Provider logging:

1. Create a system environment variable called = "UPOS\_SYSMGMT\_LOG" with value="1"
  - a. As an example for Windows XP:
    - Right click on "My Computer" and select properties
    - Select "advanced" tab.
    - Click on "Environment variables".
    - In "System variables" select "new".
    - At "variable name:" write "UPOS\_SYSMGMT\_LOG".
    - At "variable value:" write "1";
    - Click on "OK" at "New System variables" window.
    - Click on "OK" at "environment variables" window.
    - Click on "OK" at "System Properties" window.
  - b. An example for Linux:
    - Edit the "/etc/profile" file
    - Add the following line "export UPOS\_SYSMGMT\_LOG=1"
    - Restart the system
2. The log file "UPOS\_SysMgmt.log" will be created in "c:\pos\log" directory on Windows and "/var/log" directory on IRES.

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## 4.0 References

Documents referenced and utilized for the implementation of UnifiedPOS Management Services:

- UnifiedPOS Retail Peripheral Architecture Version 1.9 <http://www.nrf-arts.org/>
- Common Information Model Version 2.2 <http://www.dmtf.org/standards/cim>
- Common Information Model Schema 2.9  
[http://www.dmtf.org/standards/cim/cim\\_schema\\_v29](http://www.dmtf.org/standards/cim/cim_schema_v29)
- Java WBEM Services 1.0 API <http://wbemservices.sourceforge.net/javadoc/api/index.html>
- JSR 48: WBEM Services Specification <http://jcp.org/en/jsr/detail?id=48>
- SBLIM Project <http://sblim.sourceforge.net/index.html>
- CMPI Specification v1.3  
<http://www.wbemsource.org/doc.tpl?CALLER=documents.tpl&dcat=&gdid=3712>
- Pegasus site <http://www.openpegasus.org>
- CIM Schema for Retail Devices: CIM-UPOS(6).pdf <http://www.nrf-arts.org/>