## 2012
## IBM System z Technical University

**Enabling the infrastructure for smarter computing**

# Setup SNMP Monitoring in z/VSE

**zDG09**

Wilhelm Mild & Ingo Franzki

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# What is and why use monitoring

§ **Monitoring definition**

§ Monitoring is a continuous process to keep eye on systems or scheduled activities.

§ Its aim is to obtain real-time information to ease the overview or action in certain cases.

§ Monitoring varies from to time, project to project and activity to activity.

§ Can be Real-time or Event driven

§ **Why use monitoring**

§ to be aware of the state of a system

§ to observe a situation for any changes which may occur over time

§ to react on unpredicted or predicted situations

# Business Monitoring and Technical Monitoring

## § Business monitoring

§  Monitoring and aggregation of data, like data input values, data changes, paths in application depending of data, or human centric data.

## § Business activity monitoring (BAM)

§  Business Monitoring of data from business processes.
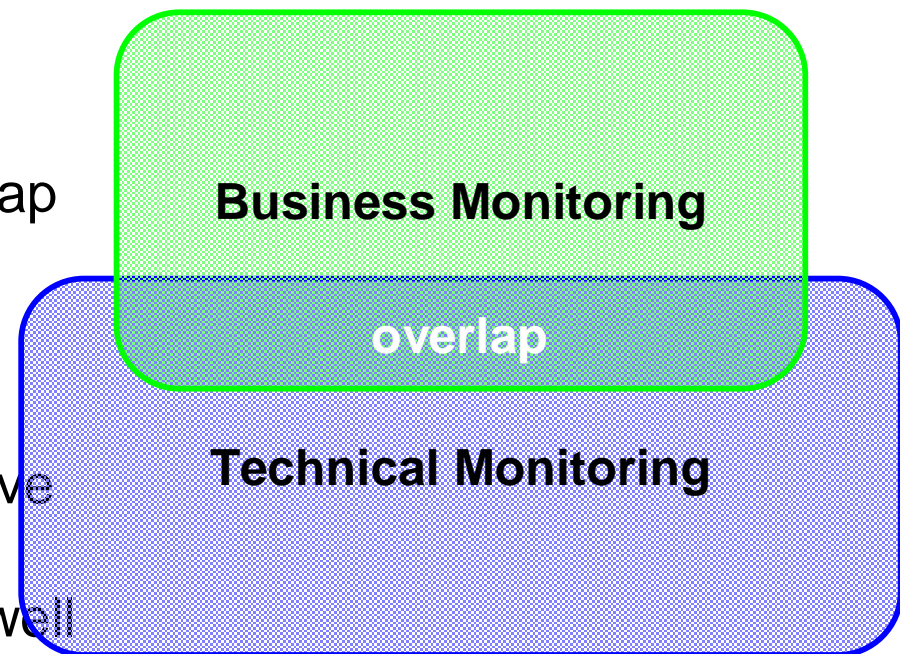
## § Technical monitoring

§  Monitoring for supporting and controlling any system, application, or service to ensure that they run as designed and as expected.

# Business Monitoring and Technical Monitoring

§ Borders between both monitoring intentions are smooth

§ Technical Monitoring and Business Monitoring may overlap in some cases

§ In most cases doing business monitoring, dealing with sensitive or critical data, technical monitoring may be applied as well

**Business Monitoring**

**overlap**

**Technical Monitoring**

# Monitoring types

## Business Monitoring and Technical Monitoring

- § **Business Monitoring - *Near-time Monitoring***

  - § displaying **measurements** or **KPIs** (Key Performance Indicators) to a business process **controller / management**
    - ú measurements with a Target Near-time Monitoring
    - ú applying a range or SLA

- § **Technical Monitoring - *Real-Time Monitoring***

  - § **displaying real-time** technical information
    - ú to IT Support / Maintenance / Administration experts
  - § **acting on specific events** or situation changes
    - ú Event driven monitoring

# Commonly accepted architectural overview of IT layers

| Web 2.0 Collaborative Innovation | Software Development | Virtual Classroom | Data Intensive Processing | High Volume Transactions |
|---|---|---|---|---|

**Workloads**

| Request UI Operations UI | Service Catalog & Automation | Provisioning | Monitoring & Metering | Security | SLA Mgmt | Capacity Planning |
|---|---|---|---|---|---|---|

**Service Management**

| Virtual Servers | Virtual Storage | Virtual Networks | Virtual Applications & Middleware | Virtual Clients |
|---|---|---|---|---|

**Virtualization**

| Non-IBM Servers | IBM System z Power Systems | System x, BladeCenter | IBM & Other Storage | Networking |
|---|---|---|---|---|

**Physical Layer**

# Anticipating Virtualization Challenges

When a virtual environment has a problem, where did it originate?

The are no "virtual performance problems", only very real performance problems manifested in a very complex consolidated, virtual environment.
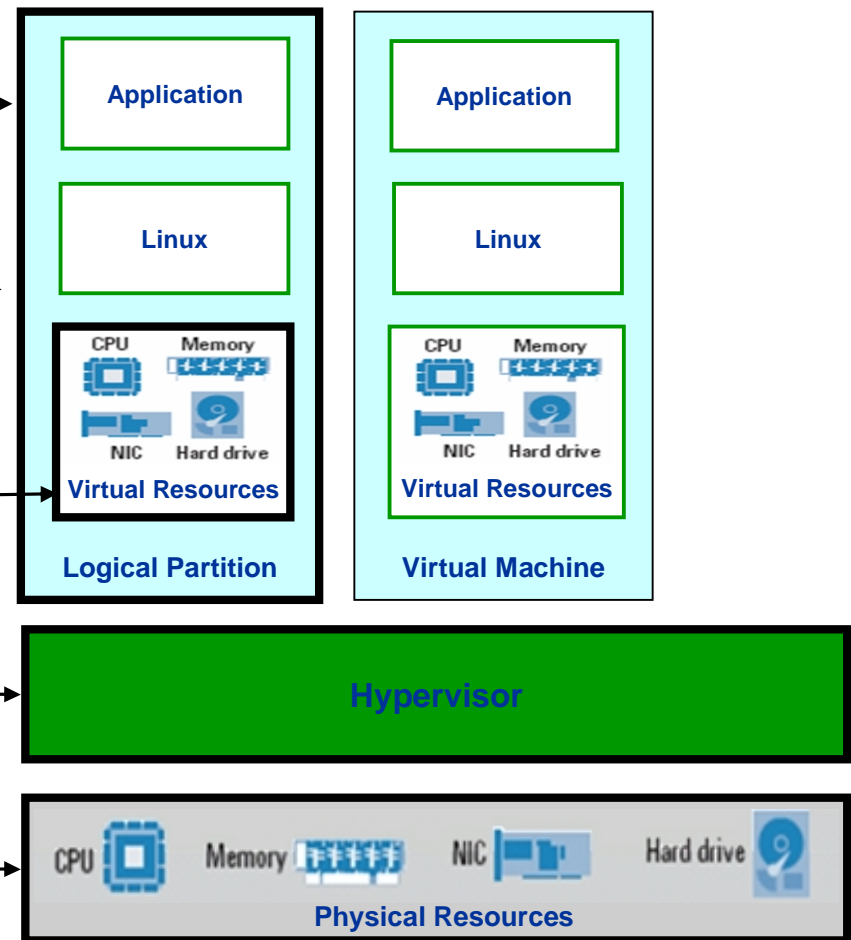
In the **Application (bad process) running** on the virtual resource?

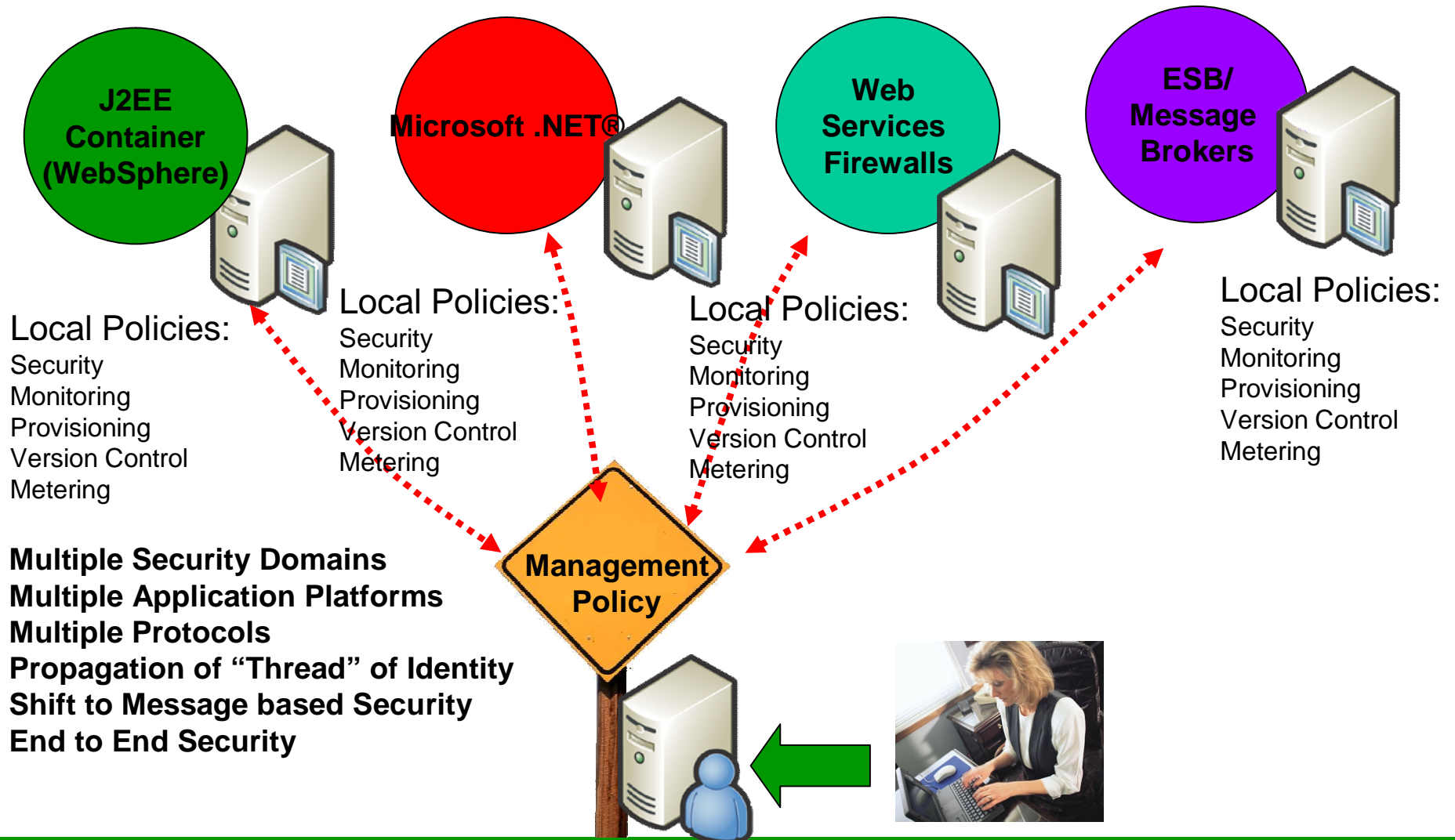In the **Logical Partition/Machine** sharing the same physical resource?

In the **VIRTUAL RESOURCE?**

In the **HYPERVISOR** overhead?

Or in the **PHYSICAL RESOURCE?**

**Application**

**Linux**

CPU     Memory

NIC     Hard drive

**Virtual Resources**

**Logical Partition**

**Application**

**Linux**

CPU     Memory

NIC     Hard drive

**Virtual Resources**

**Virtual Machine**

**Hypervisor**

CPU     Memory     NIC     Hard drive

**Physical Resources**

# Composite Application Integration Challenges

**J2EE Container (WebSphere)**

**Microsoft .NET®**

**Web Services Firewalls**

**ESB/ Message Brokers**

Local Policies:
Security
Monitoring
Provisioning
Version Control
Metering

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Provisioning
Version Control
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Local Policies:
Security
Monitoring
Provisioning
Version Control
Metering

**Management Policy**

**Multiple Security Domains**
**Multiple Application Platforms**
**Multiple Protocols**
**Propagation of "Thread" of Identity**
**Shift to Message based Security**
**End to End Security**

# Integrated Monitoring drives Automation Service Interactions with the Platform



**Secure User Centric Self-Service Portal, Automation engine and**

Service Subscription

Service Operations

Service Activation

**Automated Provisioning and Image Management**

**Monitoring, Security and Metering**
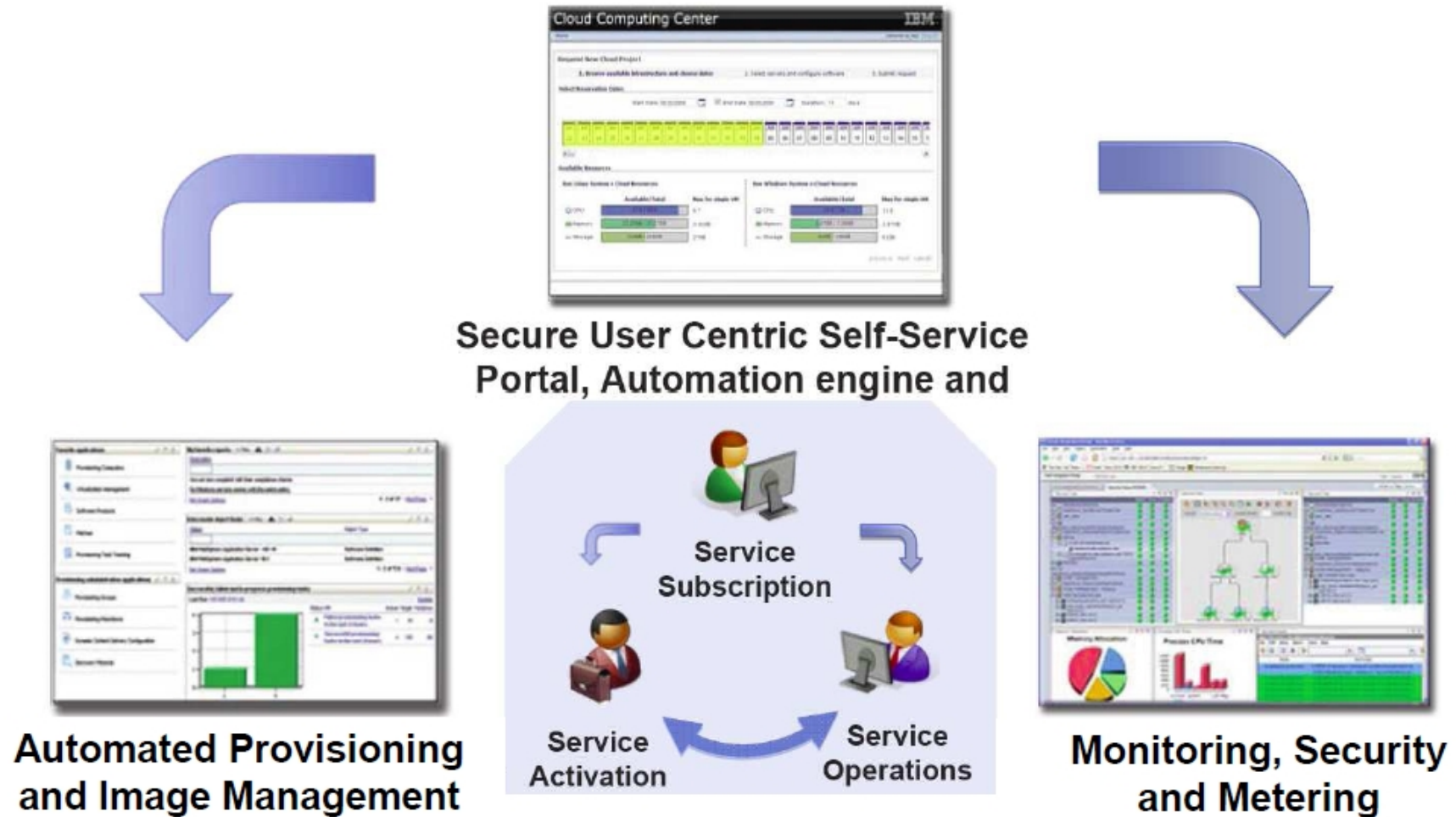
## Tivoli Resource and Availability Monitoring and Management Portfolio

| Discovery | End User Experience | Transaction Tracking | Deep Dive | Analytics |
|---|---|---|---|---|
| *Visibility into application resource dependency* | *Transaction performance monitoring to ensure SLA compliance* | *Rapid problem isolation through transaction path analysis* | *Domain-specific operations tools for diagnosis and repair* | *Proactive Management to reduce outages and improve business performance* |
| **TADDM** | **ITCAM for Transactions** | | **ITM , ITCAM & OMEGAMON Family** | |

### Data Center Management

**ITM, ITM For Virtual Servers**
*Management of operating systems and virtual environments*

**ITM For Energy Management**
*Reduce data center energy consumption*

### Unified Management
- Central location to view & act on contextualized information
- Reporting Interface to comprehend current appl environment and trends
- Central repository for enterprise-wide performance mgmt data

### Broader Coverage
§ OS & Virtual Environment
§ Databases
§ Web Servers and App Servers
§ Packaged Applications
§ Agent Builder supports custom apps

### Virtualization
§ Predict physical and virtual resource capacity bottlenecks
§ Ensure maximum resource utilization

### Predictive Analytics
§ Automating Threshold Mgmt
§ Automate Trending to identify emerging Capacity and Performance issues
§ Predictive Learning – uncover anomalies

## Monitoring Power and Thermal

**Tivoli Monitoring for Green Energ**
**Data Center Optimization and Repo**

§ Monitor power usage and thermal data from IT resources through embedded sensors or via remote sensors

§ Operations dashboard integrates traditional IT measurements and emerging environmental measurements onto common dashboard

§ Aggregation of IT and environmental metrics with ability to take manual or automated actions when needed
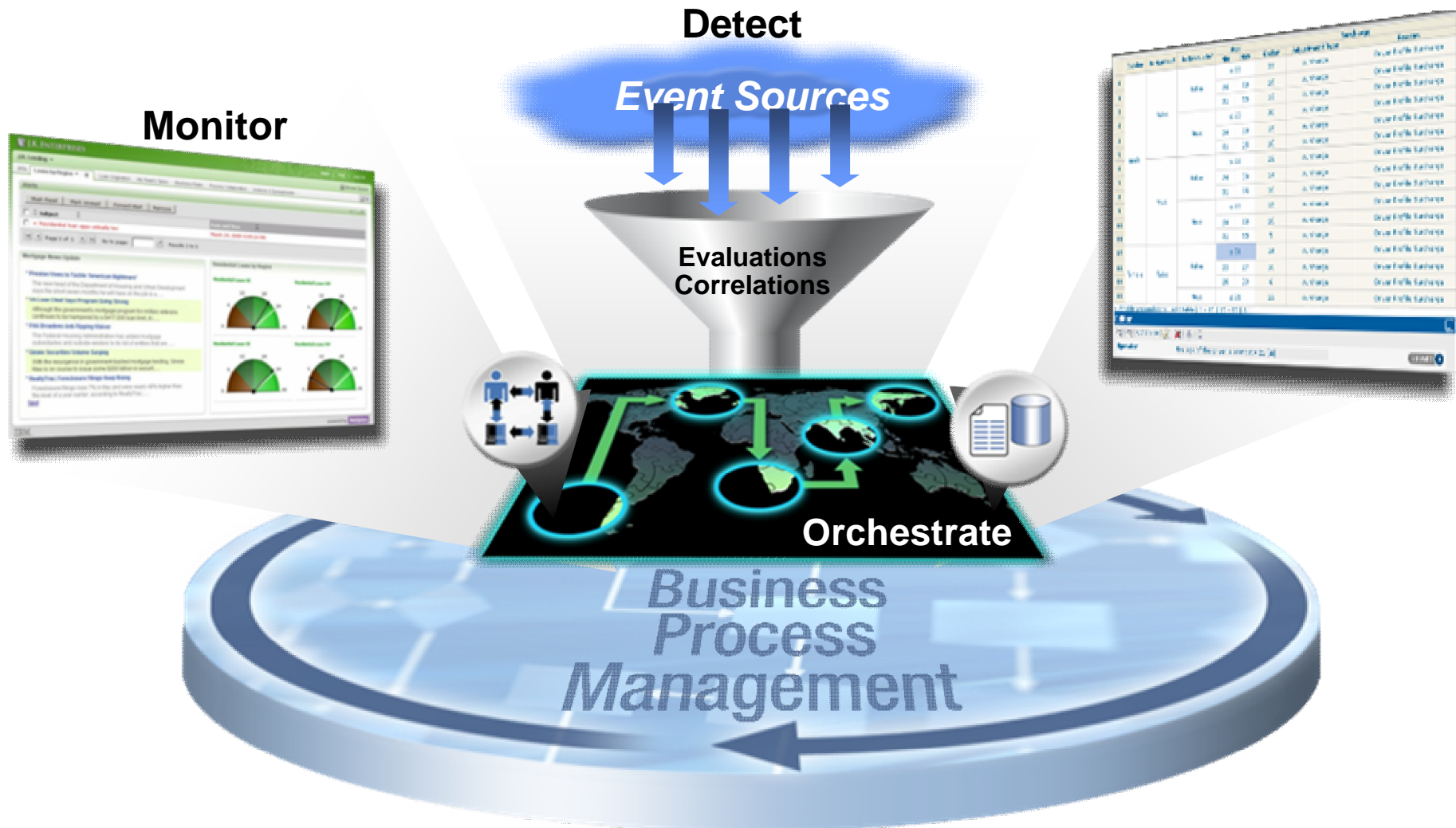
§ Intelligent thresh-holding and event generation

Metric Collection, Analytics, Thresholding and Evening
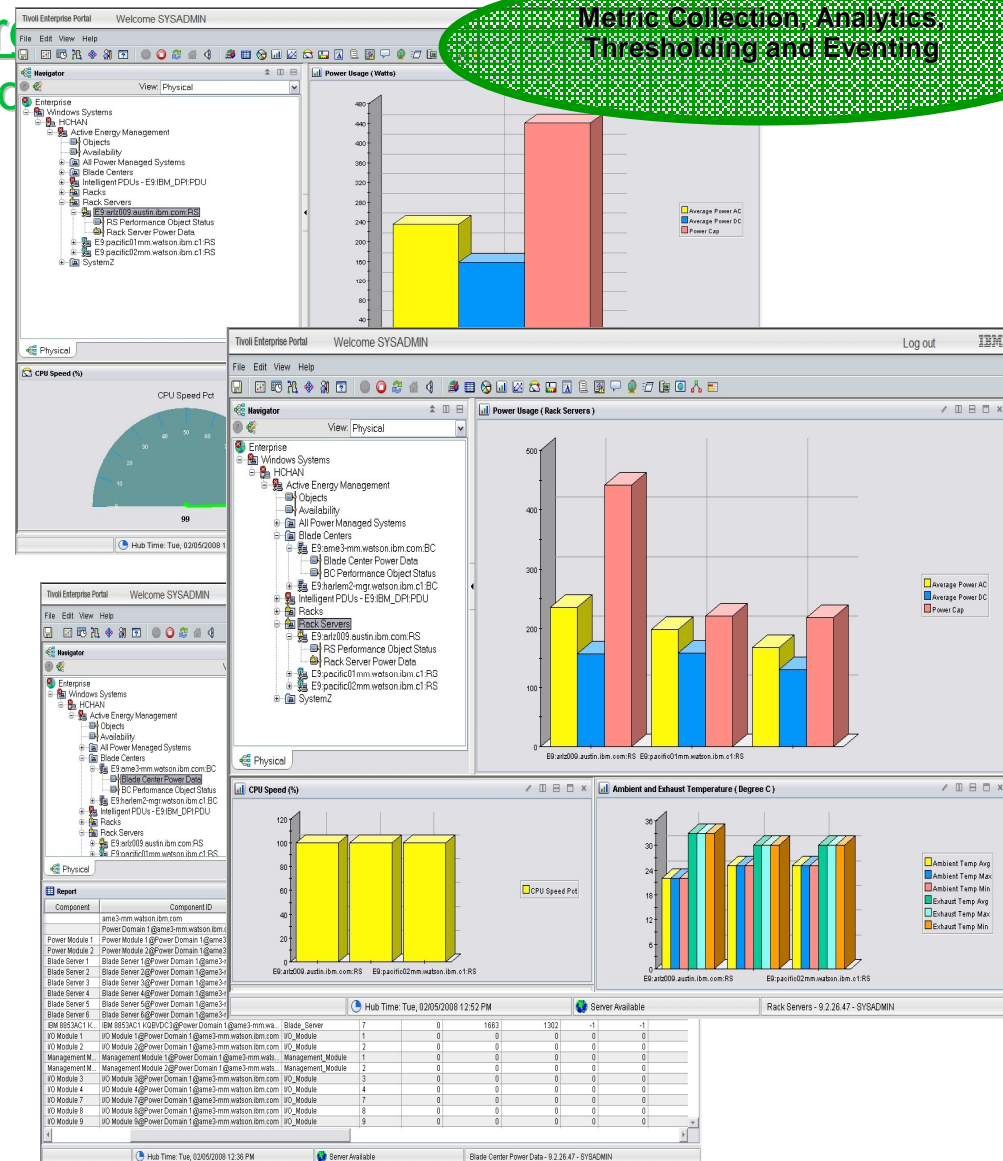
# IBM® Tivoli® Monitoring
## The Industries' Most Extensive Resource Monitoring

| Operating Systems | Infrastructure | Application and Collaboration | Business Integration | Web Environment | Database | Agent Builder |
|---|---|---|---|---|---|---|
| AIX | AIX (LPAR DLPAR WPAR) | SAP | CICS | WebSphere | DB2 | Agentless or Agent Adapter (Universal Agent) |
| i5/OS | VMware | Siebel | Web Services | WebLogic | SQL | |
| z/OS | Windows Hyper-V | PeopleSoft | IMS | IIS | Oracle | OPAL solutions (100+ packages) |
| Windows | Solaris Zones | Tuxedo | MQ | Oracle | Sybase | |
| Linux | Citrix | Domino | Message Broker | NetWeaver | Informix | Microsoft Message Queue and more.... |
| Unix | Clustering | Exchange .Net Biztalk Sharepoint | | JBoss | | |
| z/VSE | | | | Apache | | Blackberry |
| | | | | Sun Java System | | Micromuse |

# Insight for Action - with Tivoli Monitoring and OMNIbus

**Detect**

*Event Sources*

**Monitor**

**Evaluations**
**Correlations**

**Orchestrate**

**Business Process Management**

*Know What's Happening, When to Act and What to Do*

# Omnibus

§ **IBM Tivoli Netcool/OMNIbus Probe for SNMP**

§ The IBM Tivoli Netcool/OMNIbus Probe for SNMP monitors SNMP traps and informs on both UDP and TCP sockets concurrently.

This probe has the following features that allow it to handle generic traps:

§ It can handle a high volume and high rate of traps.

§ It receives traps independently of trap processing, using an internal queue mechanism.

§ It handles high trap rates and high burst rates using two buffers:

   § one buffer is for all of the sockets that the probe monitors,

   § the other buffer is an internal queue between the reader and writer sides of the probe

§ It supports SNMP V1, V2c, and V3 traps

§ It supports SNMP V2c and V3 traps and informs

# z/VSE Monitoring – Technical Monitoring

§ **Real-Time Monitoring**

  § **displaying** technical information

    ú to IT Support/Maintenance/Administration experts

§ **Event driven Monitoring**

  § **acting on specific events** or situation changes

    ú Event driven monitoring

# z/VSE SNMP Monitoring Agent support

§ **z/VSE Monitoring Agent enables customers to monitor z/VSE systems using standard monitoring interfaces (SNMP V1)**

§ Available since z/VSE V4.3

§ It also includes an open interface, which enables customers or vendors to use own programs (plugins) to collect additional data

§ **Data collected by the IBM provided plugins contains**

§ Information about the environment (e.g. Processor, LPAR and z/VM information)

§ Number of partitions (static, dynamic, total, maximum)

§ Partition priorities
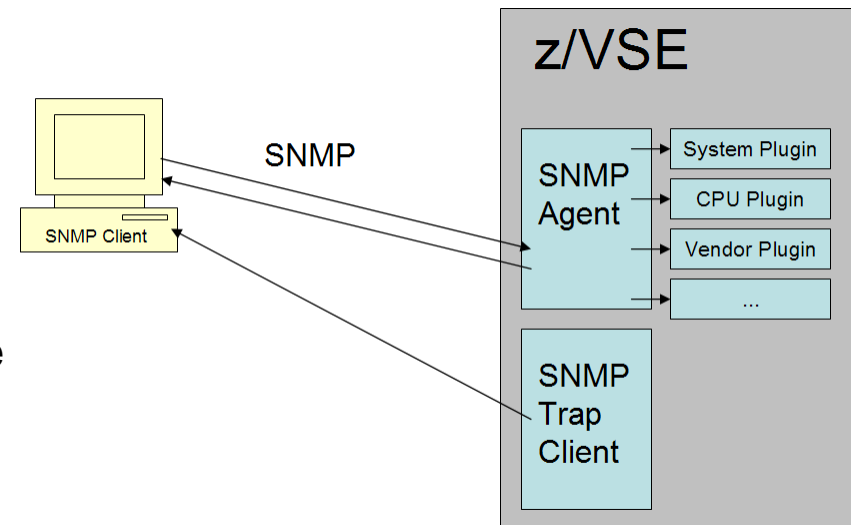
§ Number of CPUs (active, stopped, quiced)

§ Paging (page ins, page outs)

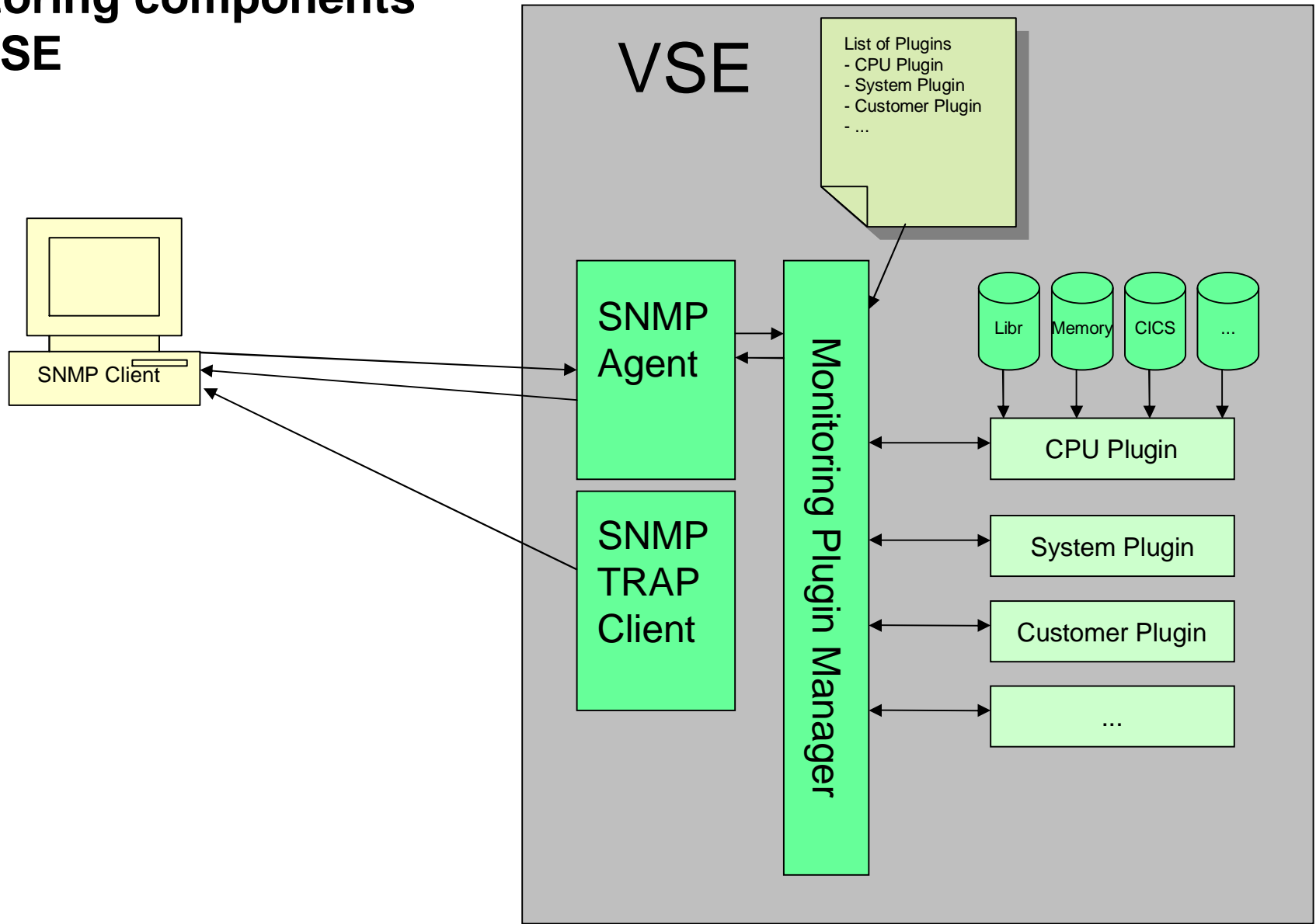§ Performance counters overall and per CPU

§ CPU address and status

§ CPU time, NP time, spin time, allbound time

§ Number of SVCs and dispatcher cycles

# Monitoring components in z/VSE

VSE

List of Plugins
- CPU Plugin
- System Plugin
- Customer Plugin
- ...

SNMP Client

SNMP Agent

SNMP TRAP Client

Monitoring Plugin Manager

Libr | Memory | CICS | ...

CPU Plugin

System Plugin

Customer Plugin

...

# z/VSE SNMP Monitoring Agent support

§ **Management Information Base (MIB)**

§ SNMP itself does not define which information (which variables/counters) a managed system should offer

§ Rather, SNMP uses an extensible design, where the available information is defined by management information bases (MIBs).

§ MIBs describe the structure of the management data of a device subsystem

ú They use a hierarchical namespace containing object identifiers (**OID**).

ú Each OID identifies a variable (e.g. a performance counter) that can be read or set via SNMP.

§ **SNMP V1 Protocol**

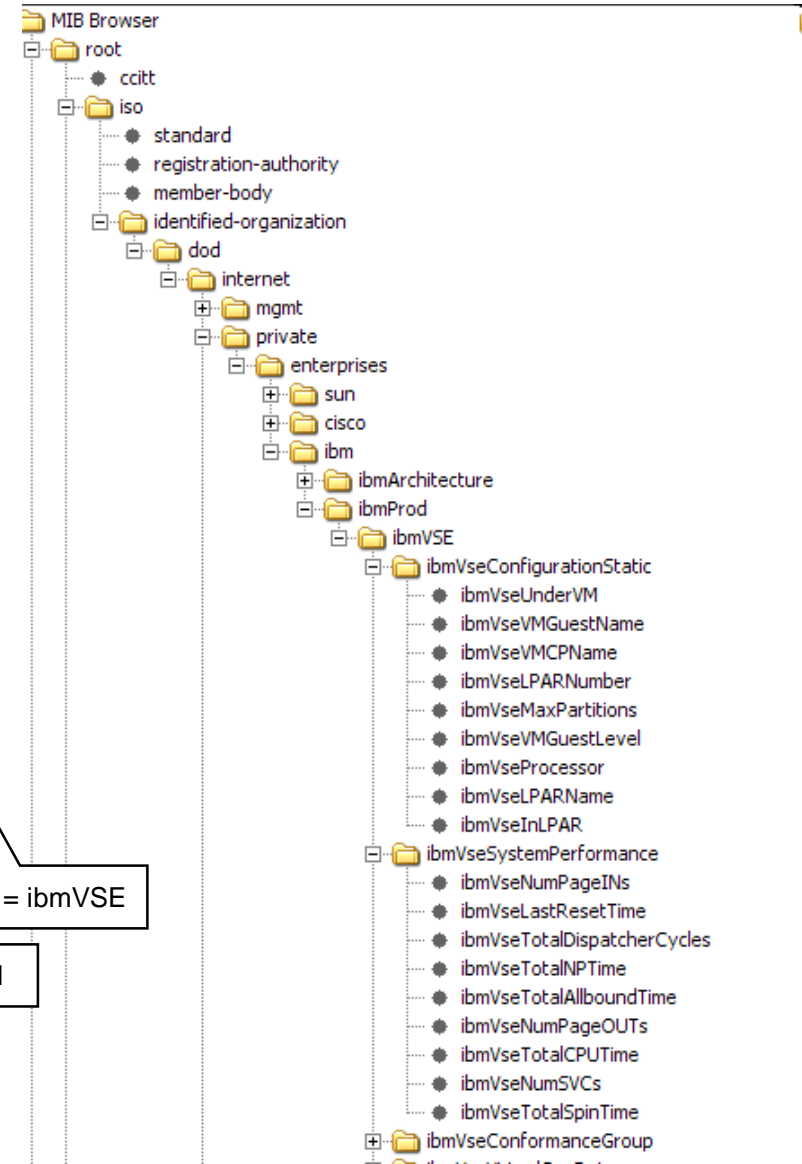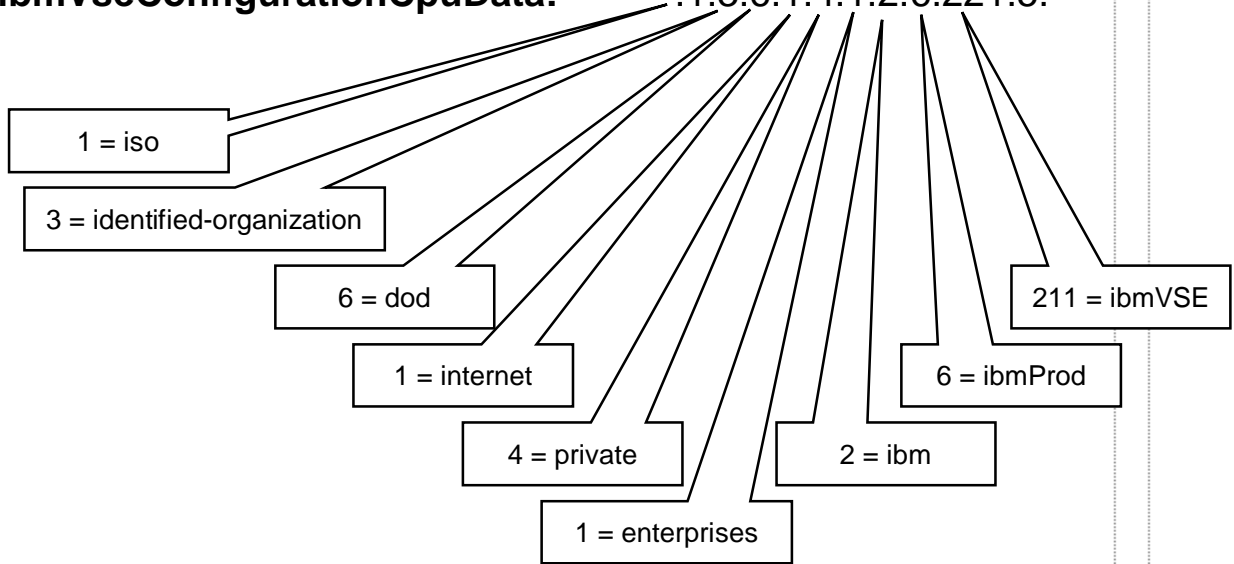| | |
|---|---|
| § Get | Get the value of an object identified by its OID |
| § GetNext | Get the value of the next object identified by an OID |
| § Set | Set the value of an object identified by its OID (not used by z/VSE) |
| § Trap | Asynchronous notification about something (an event) |

à **http://en.wikipedia.org/wiki/Simple_Network_Management_Protocol**

# z/VSE SNMP Monitoring Agent support

§ **A MIB (Measurement Information Base) is provided describing the data collected**

à IESMPMIB.Z in PRD1.BASE (plain text member)

| | |
|---|---|
| **ibmVSE:** | .1.3.6.1.4.1.2.6.221 |
| **ibmVseConformanceGroup:** | .1.3.6.1.4.1.2.6.221.1.* |
| **ibmVseConfigurationStatic:** | .1.3.6.1.4.1.2.6.221.2.* |
| **ibmVseConfigurationDynamic:** | .1.3.6.1.4.1.2.6.221.3.* |
| **ibmVseConfigurationPerformance:** | .1.3.6.1.4.1.2.6.221.4.* |
| **ibmVseConfigurationCpuData:** | .1.3.6.1.4.1.2.6.221.5.* |

1 = iso

3 = identified-organization

6 = dod

1 = internet

4 = private

1 = enterprises

2 = ibm

6 = ibmProd

211 = ibmVSE

MIB Browser
- root
  - ccitt
  - iso
    - standard
    - registration-authority
    - member-body
    - identified-organization
      - dod
        - internet
          - mgmt
          - private
            - enterprises
              - sun
              - cisco
              - ibm
                - ibmArchitecture
                - ibmProd
                  - ibmVSE
                    - ibmVseConfigurationStatic
                      - ibmVseUnderVM
                      - ibmVseVMGuestName
                      - ibmVseVMCPName
                      - ibmVseLPARNumber
                      - ibmVseMaxPartitions
                      - ibmVseVMGuestLevel
                      - ibmVseProcessor
                      - ibmVseLPARName
                      - ibmVseInLPAR
                    - ibmVseSystemPerformance
                      - ibmVseNumPageINs
                      - ibmVseLastResetTime
                      - ibmVseTotalDispatcherCycles
                      - ibmVseTotalNPTime
                      - ibmVseTotalAllboundTime
                      - ibmVseNumPageOUTs
                      - ibmVseTotalCPUTime
                      - ibmVseNumSVCs
                      - ibmVseTotalSpinTime
                    - ibmVseConformanceGroup

# z/VSE SNMP Monitoring Agent support

§ Standard **SNMP based monitoring tools** can be used to collect, display and analyze z/VSE performance monitoring data
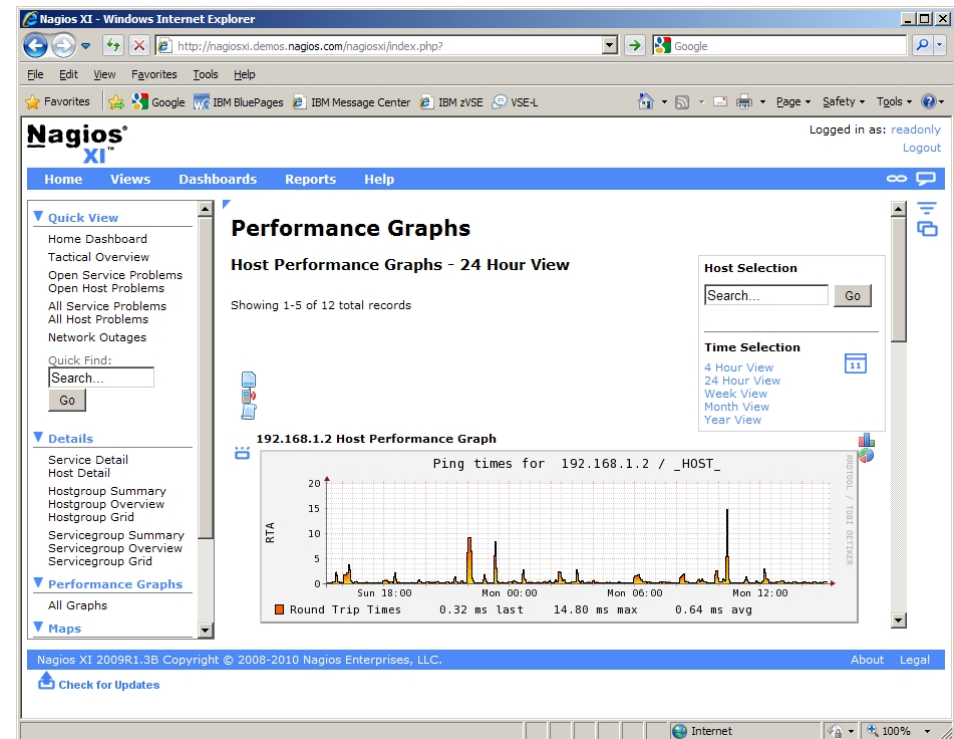
   § e.g. ITM (IBM Tivoli Monitoring), Velocity monitoring, Nagios ([www.nagios.org](www.nagios.org))

§ z/VSE **SNMP Trap** client

   § Sends SNMP V1 traps to inform one or more monitoring stations or servers about important events

   § For example:

      ú The end of a job stream is reached.

      ú An error has occurred during a job stream

# z/VSE SNMP Monitoring Agent support - Setup

**To setup the z/VSE Monitoring Agent you have to do the following steps:**

1. **Create the configuration files**
   - § Use skeletons IESMASCF and SKMASCFG (ICCF library 59) to create the z/VSE Monitoring Agent configuration file
   - § If you want to use the System Plugin, use the skeletons IESMPSCF and SKMPSCFG (ICCF library 59) to create the System Plugin configuration file

2. **Create the startup job**
   - § Use skeletons SKSTMAS (ICCF library 59) to create a z/VSE Monitoring Agent startup job

3. **Download the MIB** (IESMPMIB.Z in PRD1.BASE) from your z/VSE system to be able to use it with your SNMP client

4. **Start the z/VSE Monitoring Agent** (using the startup job), e.g. R RDR,STARTMAS

## z/VSE SNMP Monitoring Agent support – Setup

### System Plugin configuration file:

```
* ********************************************* *
* CONFIG FILE FOR MONITORING PLUGIN IESMPSYS    *
* ********************************************* *
* ENTER CONTACT INFORMATION AND LOCATION HERE
CONTACT = 'Joe Tester'
LOCATION = 'Colorado'
* THE SYSTEM NAME AND DESCRIPTION ARE OPTIONAL
*DESC = 'z/VSE TEST SYSTEM'
*SYSNAME = 'VSETestSystem'
```

Enter your information here

## z/VSE SNMP Monitoring Agent support – Setup

## Startup job for the Monitoring Agent:

```
* $$ JOB JNM=STARTMAS,DISP=L,CLASS=R
// JOB STARTMAS STARTS THE SNMP MONITORING AGENT
* ******************************************************** *
* This Job starts the SNMP MONITORING AGENT.              *
* Please change the ID and the SYSPARM card if necessary *
* ******************************************************** *
// ID USER=VCSRV,PWD=VCSRV
// LIBDEF *,SEARCH=(PRD2.CONFIG,PRD1.BASE,PRD2.SCEEBASE)
// OPTION SYSPARM='00'
// EXEC IESMASNM,PARM='DD:PRD2.CONFIG(IESMASCF.Z)'
/*
/&
* $$ EOJ
```

Location of the z/VSE Monitoring Agent Config File

# z/VSE SNMP Monitoring Agent support – Usage

## Operating Monitoring Agent:

**To get status information from the z/VSE Monitoring Agent, enter at the z/VSE console**
```
msg <jobname>,data=status
```

**Sample output:**
```
AR 0015 1I40I READY
R1 0045 IESMA118I AGENT STATUS:
R1 0045 AGENT VERSION:            0004.3000
R1 0045 CONFIG MEMBER:           DD:PRD2.CONFIG(IESMASCF.Z)
R1 0045 PORT:                    161
R1 0045 COMMUNITY STRING:        public
R1 0045 RECEIVED REQUESTS:       5869313
R1 0045 WRONG COMMUNITY STRING: 0
R1 0045 WRONG SNMP VERSION:      0
R1 0045 ANSWERED REQUESTS:       5869313
R1 0045 IESMM002I MONITORING PLUGIN MANAGER STATUS:
R1 0045 MANAGER VERSION:         0004.3000
R1 0045 INSTALLED PLUGINS:       2
R1 0045 HANDLED OIDS:            34
R1 0045 HANDLED OID GROUPS:      1
```

| Supported Commands: | |
| --- | --- |
| HELP | Displays help information |
| STATUS | Displays the server status |
| RESETSTAT | Reset statistics |
| LISTOIDS | List all handled OIDs |
| LISTOIDSDET | List all handled OIDs (detailed) |
| LISTPLUGINS | List all active plugins |
| SHUT | Ends the server |
| SHUTDOWN | Ends the server |

# Example: PRTG Traffic Grapher
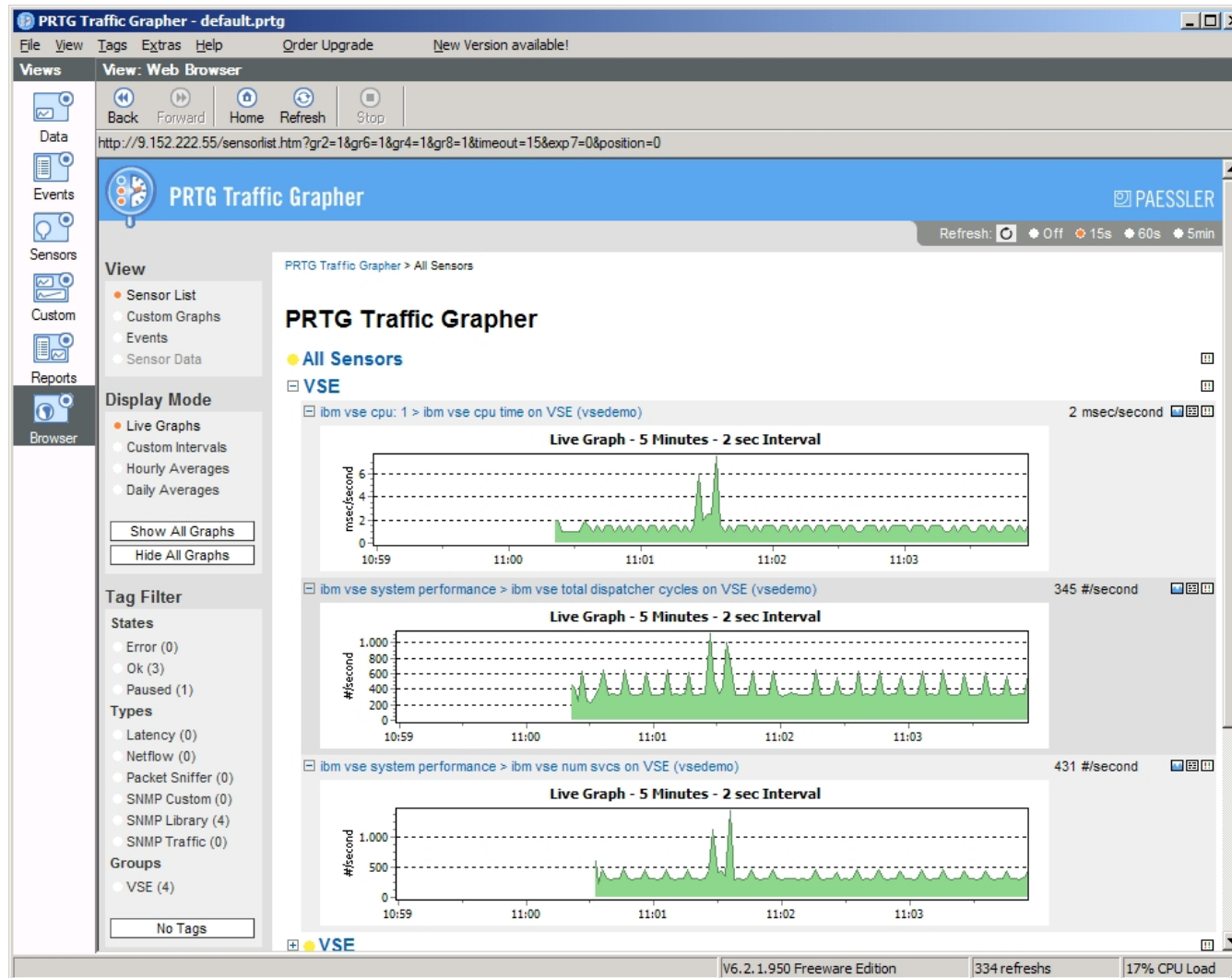
## Example: PRTG Traffic Grapher
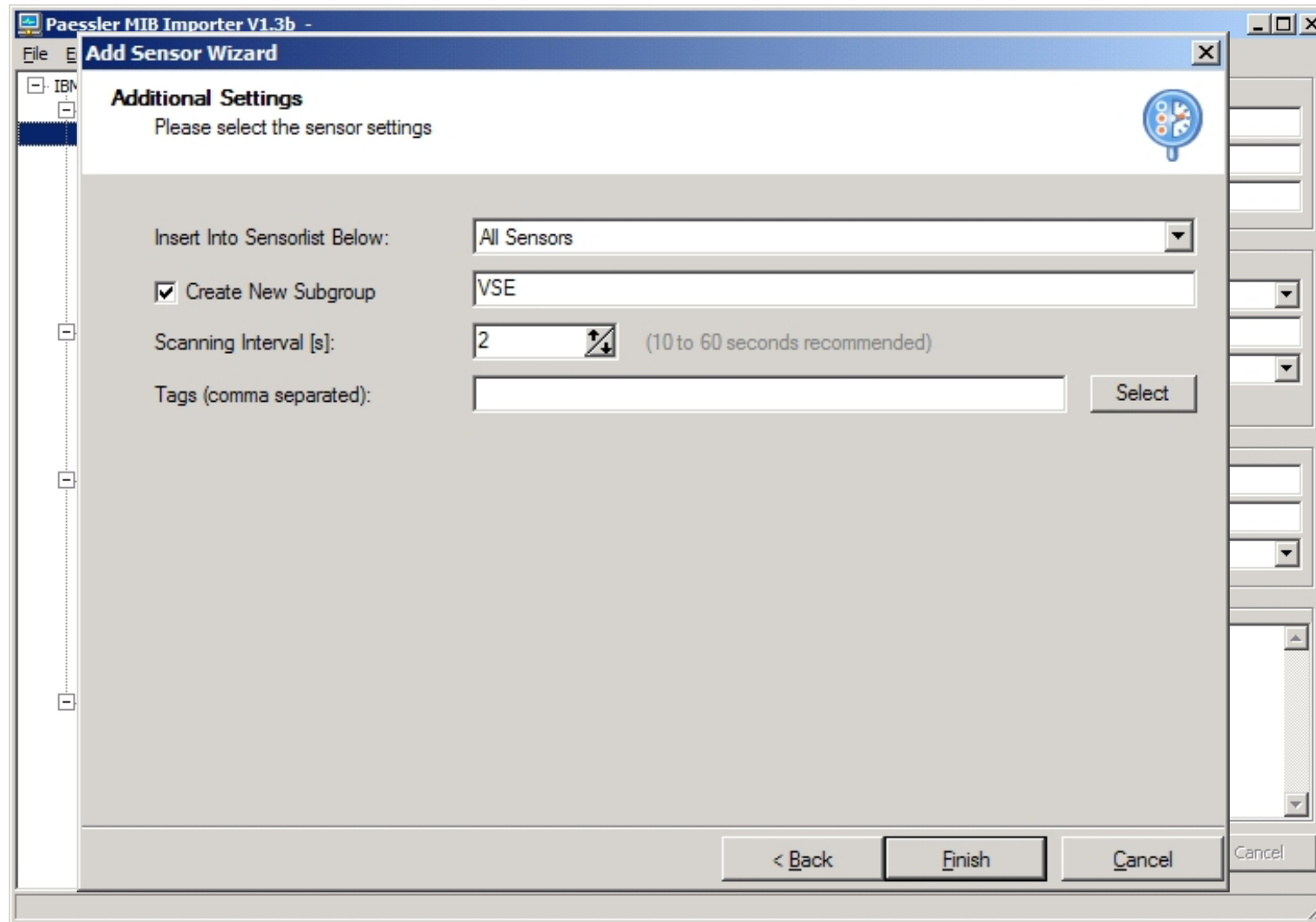
# Example: PRTG Traffic Grapher
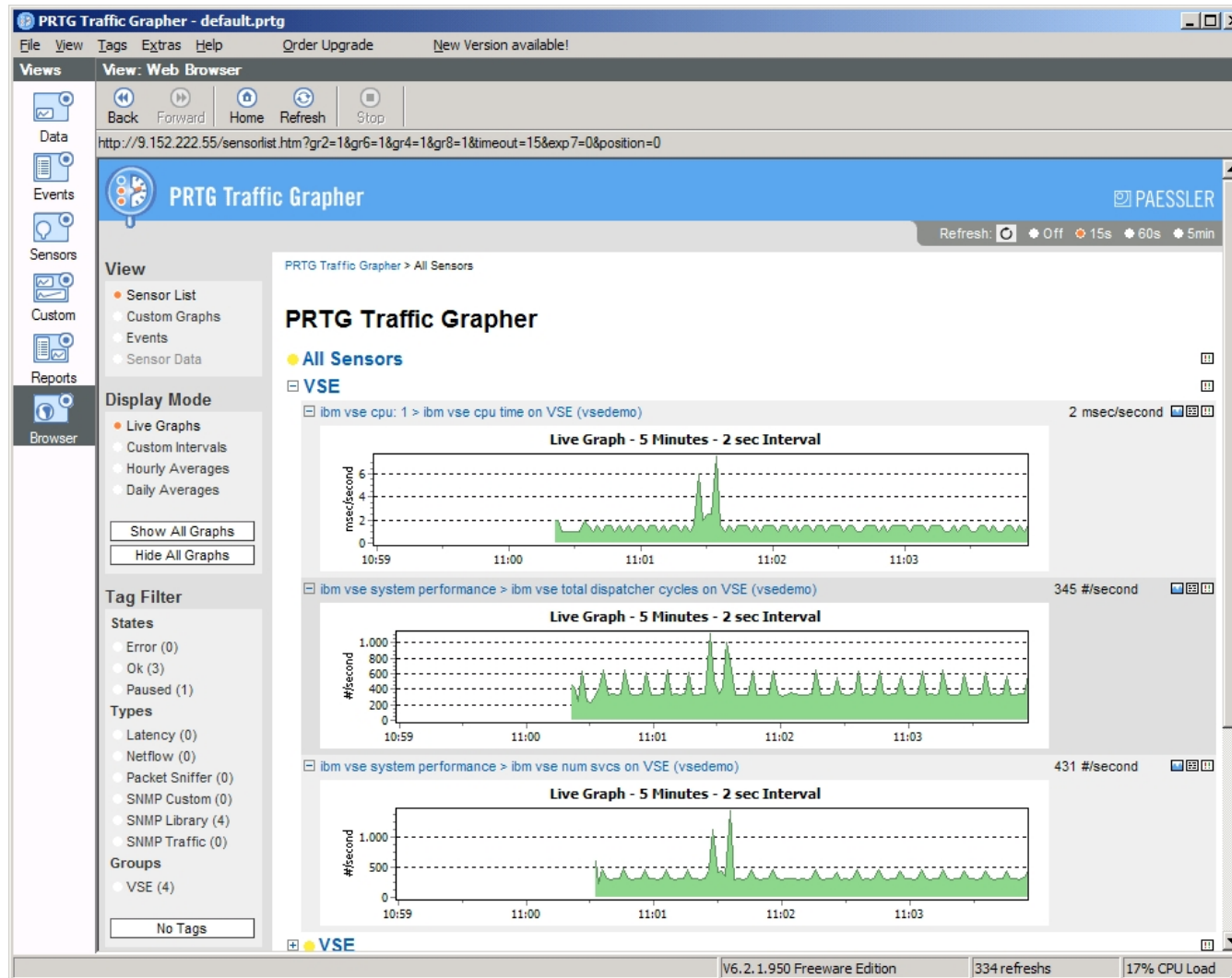
## z/VSE SNMP Monitoring Agent support – Trap Client

## Send a Trap (see SKSTTRAP in ICCF library 59):

```
* *************************************************** *
* SNMP TRAP CLIENT sample
* You can add one or more destinations.
* The ADDSYSINF parameter adds system information to
* trap packet.
* If you specify the HELP parameter you will find a
* detailed help and a list of all supported parameters
* in the job listing.
* A '*' marks lines as comments
• ***************************************************
// OPTION SYSPARM='00'
// EXEC IESMTRAP
DEST=192.168.1.55
DEST=myserver1:162
OID=1.2.3.4
MSG=This is a test
ADDSYSINF
/*
```

**Trap Details**

Trap Type [6]

Community [public]       Specific Type [0]

TimeStamp [4 days 18h:47m:23.77s]

Ip Address [9.152.84.155]

Sender OID [1.3.6.1.4.1.2.3.116]       Trap Type [SNMPv1]

Variable Bindings

| OID | Type | Value |
| --- | --- | --- |
| 1.2.3.4 | String | This is a test |
| ibmVseConformanceGroup.16 | String | Tue Mar 22 10:02:53 2011 |
| sysDescr | String | z/VSE 4.3.0 ('VSELFP43') running in z/V... |

[Close]       [Show Raw]       [<< prev] [next >>]

> Two destinations for the TRAP

> Add System Info to the Trap message

> This is the trap message
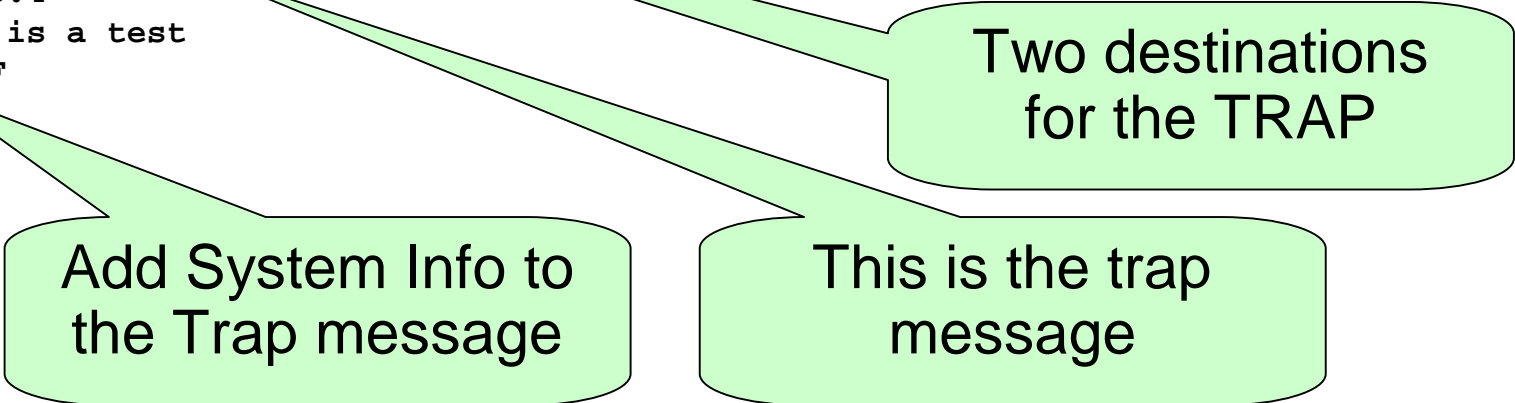
# z/VSE Event Monitoring – Trap Client Enhancements z/VSE 5.1

§ **z/VSE 4.3: SNMP traps (events) can be sent from batch jobs only**
  § via // EXEC IESMTRAP in a batch job

§ **z/VSE 5.1 adds the possibility to send SNMP traps from within customer programs**
  § Using the new SNMP Trap API
  § Send traps from within batch programs (LE enabled, i.e. COBOL, PL/1, C)
  § Send traps from within a CICS application (EXEC CICS LINK interface)

```
01 IESMTRPB          PIC X(8) VALUE 'IESMTRPB'.
Procedure Division.
    Move Length Of MTRA-AREA to AREA-LENGTH.
    Move '9.152.224.43' to DEST.
    Move 0 to RET-CODE.
    Move 'PUBLIC' to COMMUNITY.
    Move '1.2.3.4' to OID.
    Move 0 to DEBUG.
    Move 1 to ADDSYSINF.
    Move 6 to TRAPTYPE.
    Move 1 to MSGTYPE.
    Move 'HELLO VSE WORLD' to MSGSTR.
    DISPLAY "CALLING TRAP INTERFACE ...".
    CALL IESMTRPB USING BY REFERENCE MTRA-AREA.
    DISPLAY "RC:".
    Display RET-CODE.
```

NEW!

# Questions ?
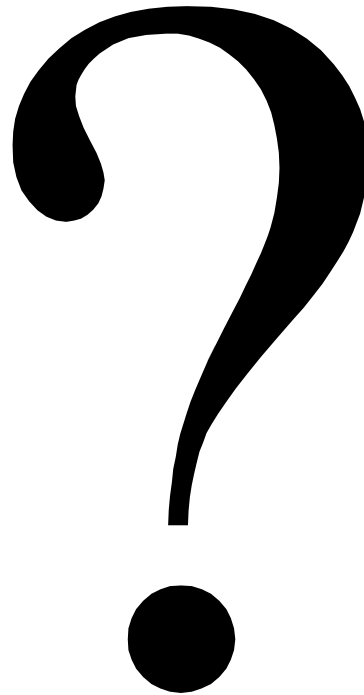
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