



Systems and Technology Group

Monitoring z/VM with SNMP

Session 7038

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Agenda

- SNMP and you
- z/VM SNMP capabilities
- z/VM Setup details
- SNMP Network Monitoring Stations

SNMP and you

- Simple Network Monitor Protocol
 - Identifies the host and provides admin contact information
 - Provides port numbers and addresses of network interfaces
 - Sends notifications of link state changes
- The standard network monitor used by network admins everywhere. Good for getting buy in from network team, it makes VM less foreign.
- A good fit for VM: sends notifications when it needs to and uses no CPU when sleeping
- Uses a tree data structure:

The SNMP Tree

A tree of OIDs (Object Identifier)

Dot notation:

.1.3.6.1.2.1.1.1

ASN notation:

.iso.org.dod.internet.mgmt.mib-2.system.sysDescr

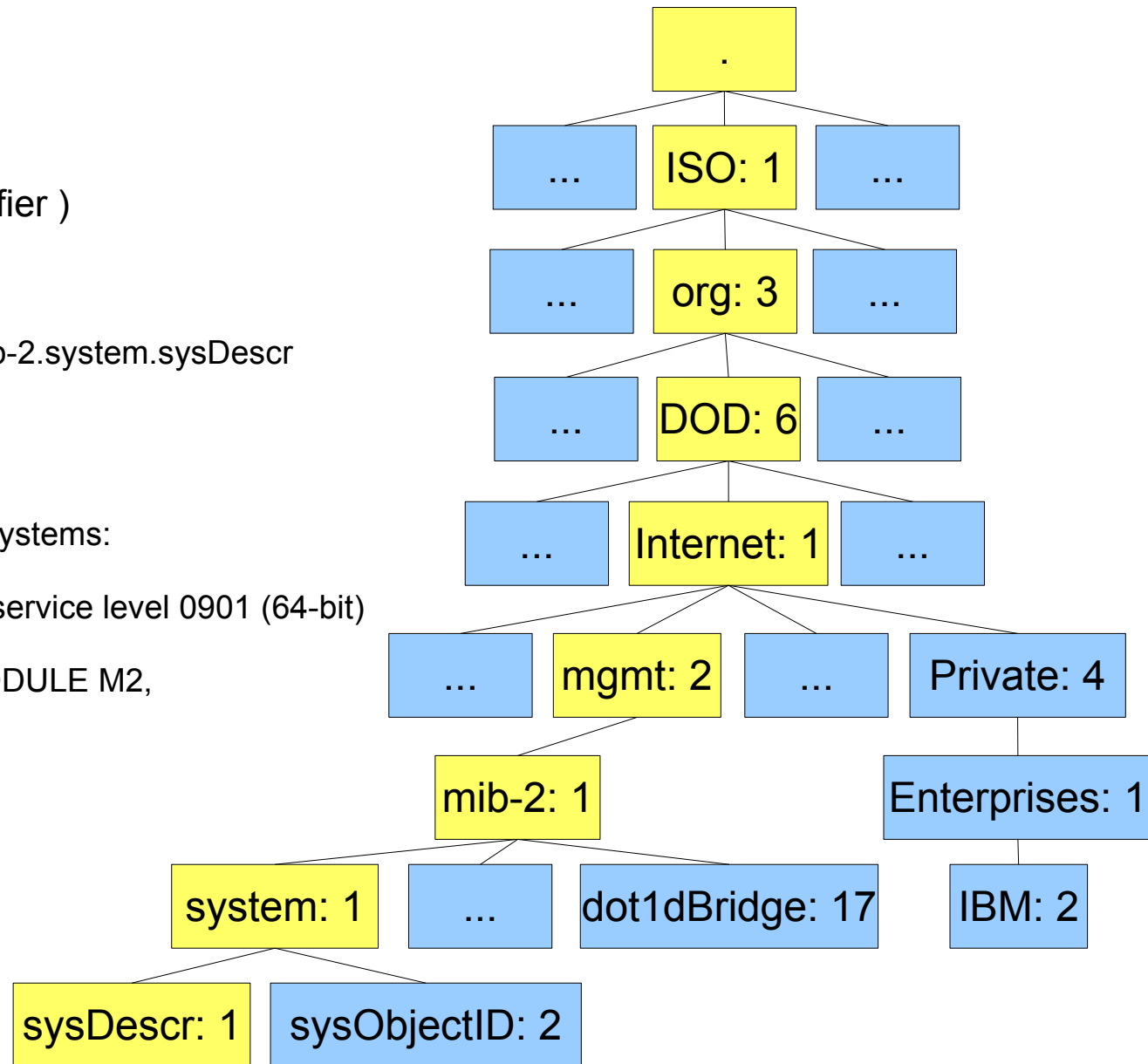
The sysDescr of one of my VM Systems:

IBM 2097

z/VM Version 6 Release 1.0, service level 0901 (64-bit)

VM TCP/IP Level 610

RSU 0901 running TCPIP MODULE M2,
dated 10/29/09 at 16:47



z/VM's SNMP capabilities

- z/VM's SNMP agent is already used by existing management tools
- Link State Changes (traps)
 - Sep 1 11:13:26 litnetm1 snmptrapd[1178]: 2009-09-01 11:13:26 192.168.70.28(via UDP: [192.168.71.15]:161) TRAP, SNMP v1, community LTICVM9 IF-MIB::ifIndex Link Down Trap (0) Uptime: 5 days, 15:36:55.00 IF-MIB::ifIndex = INTEGER: 1
- mib-2 data provided:
 - System: sysDescr, sysObjectID, sysUptime, sysContact, sysName, sysLocation
 - Interfaces: ifNumber, ifTable: ifIndex, ifType, ifDescr, ifMtu, ifSpeed, ifPhysAddress, ifAdminStatus, ifOperStatus, ifLastChange, ifInOctets, ifInUcastPkts, ifInDiscards...
 - IP: ipForwarding, ipInReceives, ipInDiscards, ipOutRequests, ipAddrTable, ipRouteTable...
 - ICMP: icmpInMsgs, icmpOutMsgs, icmpInEchos, icmpOutEchos, icmpOutDestUnreachs...
 - TCP: tcpActiveOpens, tcpPassiveOpens, tcpRetranSegs, tcpInSegs, tcpOutSegs, tcpConnTable...
 - UDP: udpInDatagrams, udpOutDatagrams, udpTable...

z/VM's SNMP capabilities

- z/VM 5.4 added support for a SNMP Subagent which provides access to VSWITCH counters.
 - APAR VM64646 required to fix CP's responses to the subagent so that it does not abend
- dot1dBridge data provided:
 - dot1dBase: dot1dBasePortAddress, dot1dBaseNumPorts, dot1dBasePortTable, dot1dBasePortDelayExceededDiscards, dot1dBasePortMTUExceededDiscards...
 - dot1dTp: dot1dTpPortTable: dot1dTpPortMaxInfo, **dot1dTpPortInFrames, dot1dTpPortOutFrames, dot1dTpPortInDiscards**
 - Most useful is likely to be the port counts
They provide the same data as seen in Q VSWITCH <vswname> USER <userid>

z/VM's SNMP limitations

- **SNMP v1 only**
 - Plain text community names in all requests / responses
 - Data structure limitations in v1 tree prevent some network configurations from being “walkable”
- **Currently no way to tie a Vswitch port number to a guest**
 - Guests couple in to the lowest numbered port starting at port 65
 - Data returned by Q VSWITCH is stale as soon as its returned: a point in time snapshot
 - Some SNMP monitor stations may be able to connect the dots based on MAC addresses
 - Port count values are read only, and cannot be reset. Uncouple / Couple zeroes these values, but also changes the port number that the NIC is plugged in to.
 - Ports are ephemeral – they only exist when a guest NIC is coupled to them.

z/VM SNMP setup details

- Apply or verify APAR VM64646
 - CP change: requires an IPL
- Requires one OSA device for each Vswitch to be monitored
 - This should be through a different port than the one which services the Vswitch!
- TCPIP Profile changes:
 - Add a Device & Link for the monitoring OSA if you're not using an existing link
 - Add SYSCONTACT and SYSLOCATION statements to fill in the system mib data
 - Add SNMPD to the AUTOLOG section
 - Add SNMPD to the PORT section
 - Add SNMPD to the OBEY section
 - Add the VSWITCH statement to the HOME definition for the LINK
 - Start the new Device

z/VM SNMP setup details

- Add the following to SYSTEM DTCPARMS:

```
:nick.SNMPD :type.SERVER :class.snmp
:owner.TCPMAINT
:parms.-s SNMPSUBA
:nick.SNMPSUBA :type.SERVER :class.snmp_agent
:owner.TCPMAINT
:parms.-u SNMPD
```

- Create PW SRC file accessible by SNMPSUBA:

*Community	*network	*netmask
TICLNET	192.168.71.249	255.255.255.255
TICLNET	192.168.71.48	255.255.255.255
TICLNET	192.168.71.49	255.255.255.255

- Create SNMPTRAP DEST file accessible by SNMPSUBA:

*Host	*Protocol	
192.168.71.249	UDP	
192.168.71.48	UDP	
192.168.71.49	UDP	

*check the manuals
You may not be able to use comments like this

z/VM SNMP setup details

- Copy MIB_EXIT SDATA from TCPMAINT's 591 disk to MIB_EXIT DATA on TCPMAINT's 198 disk
- Copy MIB_DESC SDATA from TCPMAINT's 591 disk to MIB_DESC DATA on TCPMAINT's 198 disk
- Copy MIBX2DSC SAMPEXEC from TCPMAINT's 592 disk to MIBX2DSC EXEC on TCPMAINT's 592 disk
- Run MIBX2DSC to copy some of the statements from MIB_EXIT DATA to MIB_DESC DATA
 - MIBX2DSC MIB_EXIT DATA L MIB_DESC DATA L
- If you did it right there will be a new section at the bottom of MIB_DESC DATA containing the bridge OIDs: 1.3.6.1.2.1.17

z/VM SNMP setup details

- Verify that SNMPSUBA has class E privileges
- FORCE and XAUTOLOG SNMPD to verify that it brings up SNMPSUBA automatically
- Run snmpwalk from one of the PW SRC network monitor stations
 - snmpwalk -t 10 -c TICLNET -v 1 192.168.70.24 .1.3.6.1.2.1.1
 - snmpwalk -t 10 -c TICLNET -v 1 192.168.70.24 .1.3.6.1.2.1.17

```
SNMPv2-MIB::sysDescr.0 = STRING: IBM 2097; z/VM Version 5
Release 4.0, service level 0901 (64-bit), VM TCP/IP Level 540; RSU
0901 running TCPIP MODULE M2 dated 05/28/09 at 11:41
SNMPv2-MIB::sysObjectID.0 = OID: SNMPv2-
SMI::enterprises.2.2.1.2.3
DISMAN-EVENT-MIB::sysUpTimeInstance = Timeticks: (180428500)
20 days, 21:11:25.00
SNMPv2-MIB::sysContact.0 = STRING: BOB ADMIN (TL 555-1122)
GARY SYSPROG (TL 555-1133) DEPARTMENT OF REDUNDANCY
DEPARTMENT
SNMPv2-MIB::sysName.0 = STRING: LTICVM9.PDL.POK.IBM.COM
SNMPv2-MIB::sysLocation.0 = STRING: BUILDINGA 123 FAKE
STREET POUGHKEEPSIE, NY 12601
SNMPv2-MIB::sysServices.0 = INTEGER: 76
```

```
BRIDGE-MIB::dot1dBaseBridgeAddress.0 = Hex-STRING: 02 09 00 00 00 03
BRIDGE-MIB::dot1dBaseNumPorts.0 = INTEGER: 24
BRIDGE-MIB::dot1dBaseType.0 = INTEGER: transparent-only(2)
BRIDGE-MIB::dot1dTpPort.1 = INTEGER: 1
BRIDGE-MIB::dot1dTpPort.65 = INTEGER: 65
BRIDGE-MIB::dot1dTpPort.66 = INTEGER: 66
BRIDGE-MIB::dot1dTpPort.67 = INTEGER: 67
BRIDGE-MIB::dot1dTpPortMaxInfo.1 = INTEGER: 9152
BRIDGE-MIB::dot1dTpPortMaxInfo.65 = INTEGER: 65472
BRIDGE-MIB::dot1dTpPortMaxInfo.66 = INTEGER: 65472
BRIDGE-MIB::dot1dTpPortMaxInfo.67 = INTEGER: 65472
BRIDGE-MIB::dot1dTpPortInFrames.1 = Counter32: 180755120
BRIDGE-MIB::dot1dTpPortInFrames.65 = Counter32: 17395512
BRIDGE-MIB::dot1dTpPortInFrames.66 = Counter32: 17238306
BRIDGE-MIB::dot1dTpPortInFrames.67 = Counter32: 22867486
BRIDGE-MIB::dot1dTpPortOutFrames.1 = Counter32: 228351243
BRIDGE-MIB::dot1dTpPortOutFrames.65 = Counter32: 6487738
BRIDGE-MIB::dot1dTpPortOutFrames.66 = Counter32: 2554372
BRIDGE-MIB::dot1dTpPortOutFrames.67 = Counter32: 13075687
```

PROFILE TCPIP (partial) example

```

SYSCONTACT
  Bob Admin (TL 555-1122)
  Gary Sysprog (TL 555-1133)
  Department of Redundancy Department
ENDSYSCONTACT

SYSLOCATION
  BUILDINGA Floor 2 Red 11 Blue 48
  123 Fake Street
  Poughkeepsie, NY 12601
ENDSYSLOCATION

AUTOLOG ( trimmed )
  SNMPD password ; SNMP VM Agent Virtual Machine

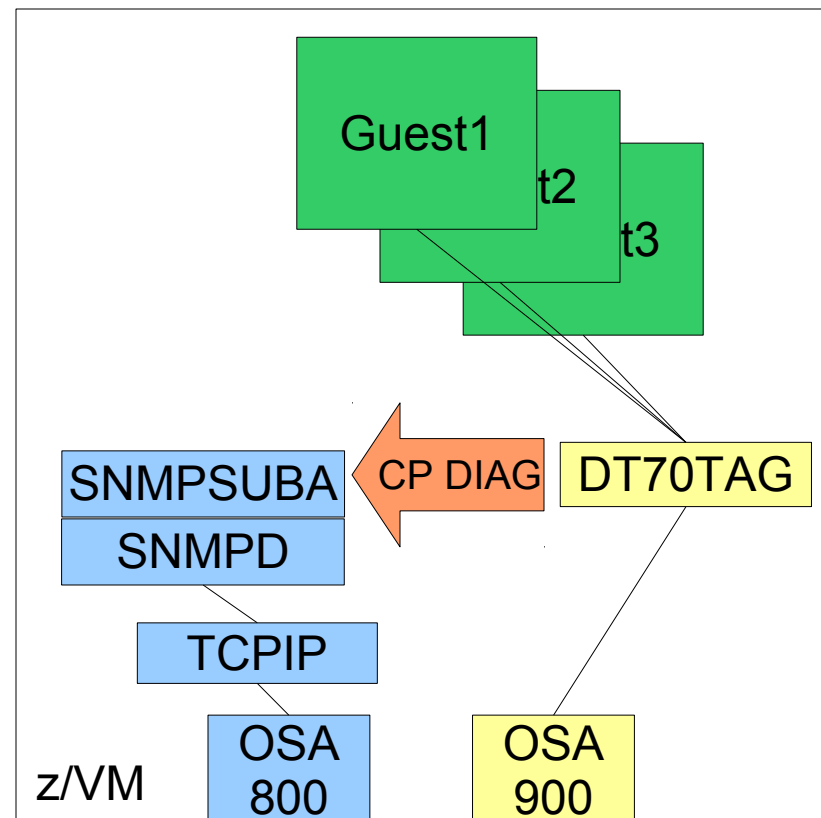
PORT ( trimmed )
  161 UDP SNMPD ; SNMP Agent

OBEY
  SNMPD
ENDOBEY

DEVICE DEVETH4 OSD 0800
LINK LNKETH4 QDIOETHERNET DEVETH4

HOME
  192.168.70.24 VSWITCH DT70TAG LNKETH4

START DEVETH4
  
```



PROFILE TCPIP (partial) example: more vswitches!

```
DEVICE DEVETH4  OSD  0800
LINK LNKETH4  QDIOETHERNET DEVETH4
```

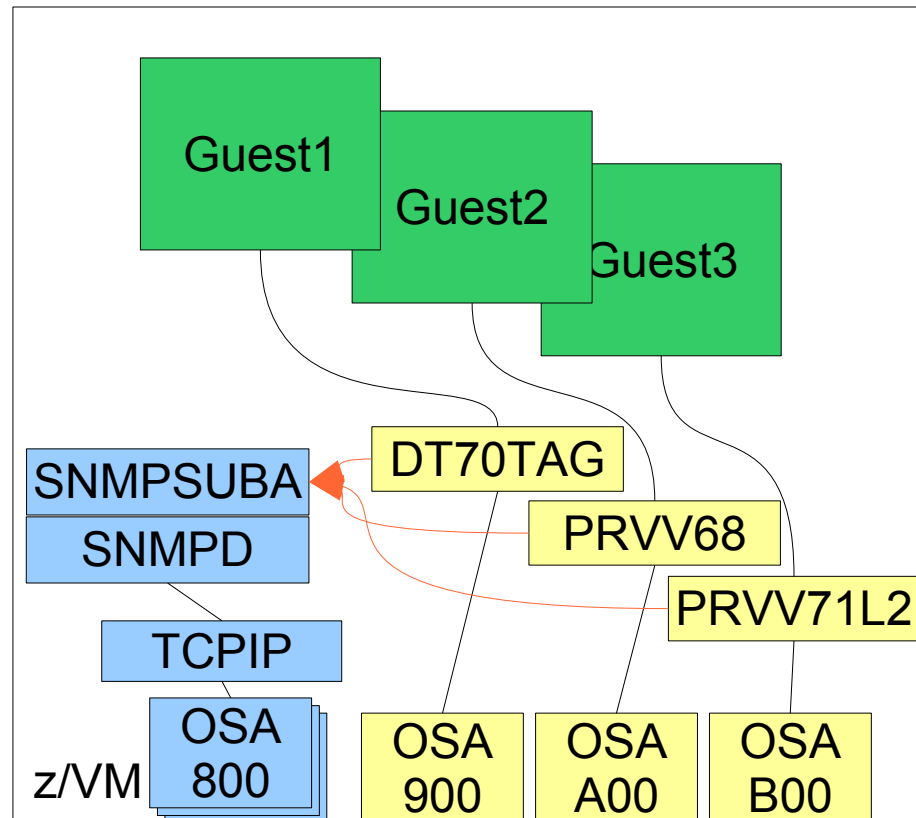
```
DEVICE DEVETH5  OSD  0804
LINK LNKETH5  QDIOETHERNET DEVETH5
```

```
DEVICE DEVETH6  OSD  0808
LINK LNKETH6  QDIOETHERNET DEVETH6
```

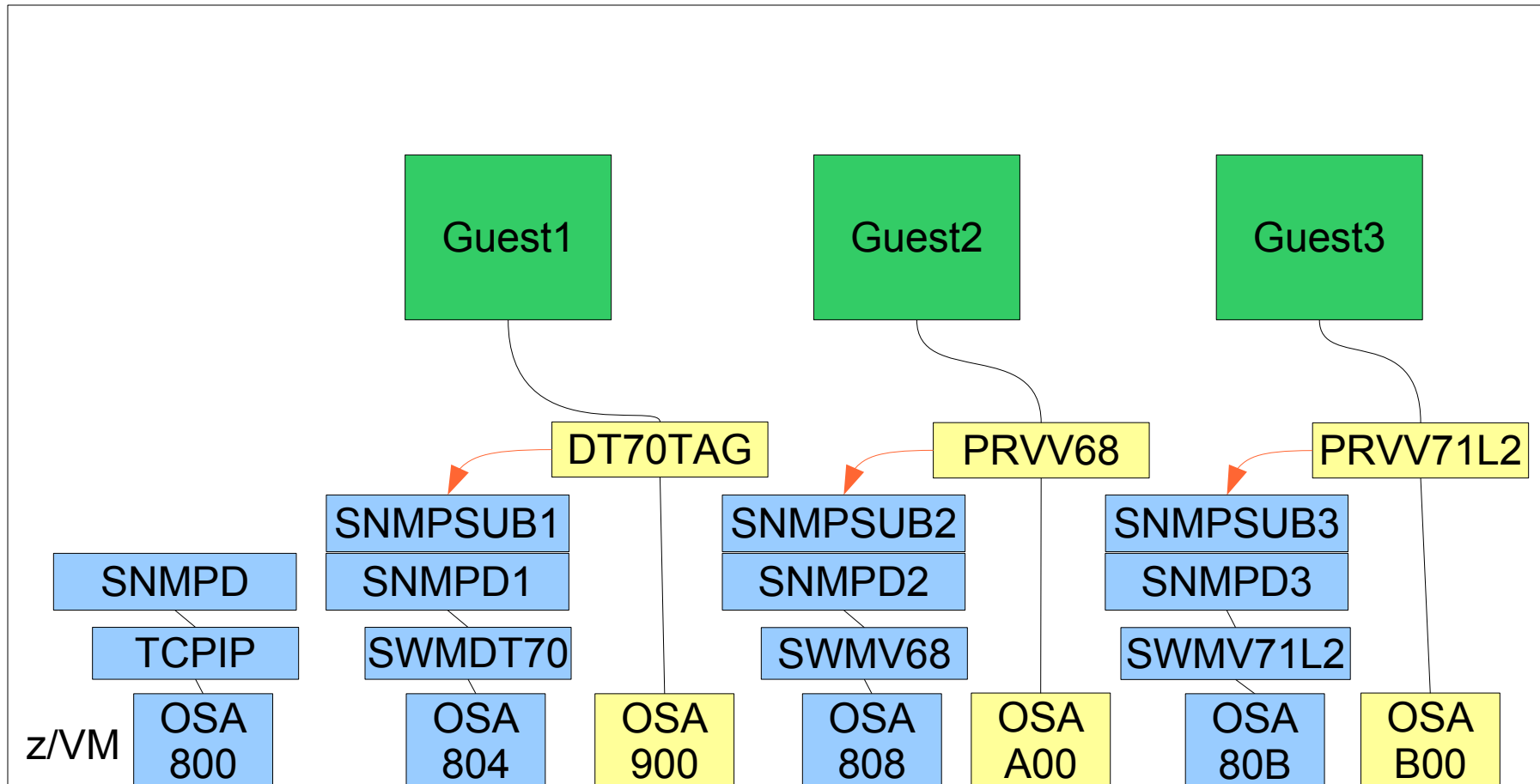
```
HOME
192.168.70.24      VSWITCH DT70TAG LNKETH4
192.168.70.25      VSWITCH PRVV68  LNKETH5
192.168.70.26      VSWITCH PRVV71L2 LNKETH6
```

```
START DEVETH4
START DEVETH5
START DEVETH6
```

- This appears as a single device to the SNMP Monitor station!
- Security implications if the three Vswitches are in different security zones



Example: more vswitches and more security!



SNMP Network Monitor Stations

- Snmptrapd & (Nagios | Xymon)
- OpenNMS

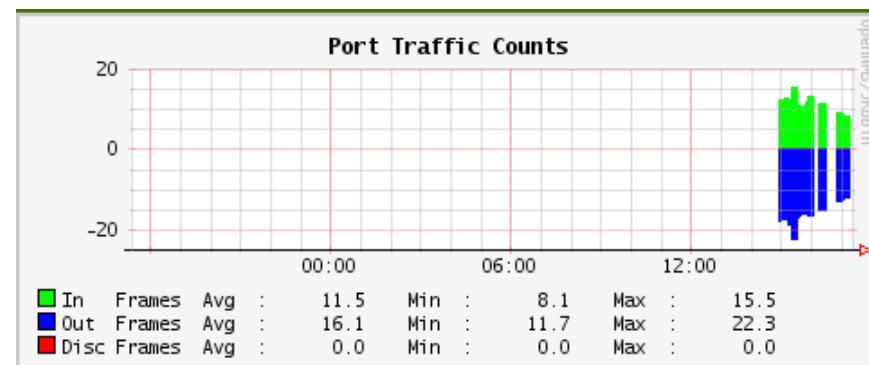
- NetView
- IBM Tivoli Network Manager IP Edition
 - formerly Netcool / Precision IP

SNMPtrapd and Nagios / Xymon

- Xymon is the new name for the Hobbit Monitor
- Both Nagios and Xymon are poller / pinger frameworks that come with built in scripts to verify service availability.
- Snmptd running on Linux receives and logs traps to /var/log/messages or whatever
- SNMPTT (SNMP Trap Translator) processes the logs and sends events to either Nagios or Xymon
- <http://www.snmpptt.org/about.shtml>
- <http://www.nagios.org/>
<http://snmpptt.sourceforge.net/docs/snmpptt.shtml#Nagios-Netsaint>
- <http://www.xymon.com/>
<http://cerebro.victoriacollege.edu/hobbit-trap.html>

OpenNMS

- Open Network Monitor System
- Java based native SNMP monitor
 - Bit of a resource hog, but rich functionality makes up for it
- Native Trap processing and notification functions
- <http://opennms.org/>



✓ ID	Event ID	Severity	Sent Time	Responder	Respond Time	Node	Interface	Service
<input type="checkbox"/> 1690	662902	Minor	11/6/09 12:42:12 PM			LTICVM9_PRVV71L2	192.168.70.26 [+]	
LTICVM9_PRVV71L2 snmp link down trap received at Friday, November 6, 2009 12:42:08 PM EST Port number 78 ... I think. Maybe.								
<input type="checkbox"/> 1666	648832	Normal	11/5/09 4:57:15 PM			LTICVM9_PRVV71L2	192.168.70.26 [+]	
LTICVM9_PRVV71L2 link came up at Thursday, November 5, 2009 4:57:12 PM EST Port number ... I think. Maybe.								

IBM offerings

- Tivoli NetView
 - <http://www.ibm.com/developerworks/wikis/display/tivolidoccentral/Tivoli+NetView>

- Tivoli Network Manager IP Edition
 - <http://www.ibm.com/developerworks/wikis/display/tivolidoccentral/Tivoli+Network+Manager+IP+Edition>

For more information

- System Z Platform Test library:
 - http://www-03.ibm.com/systems/services/platformtest/servers/systemz_library.html

- The SNMP Paper this presentation is based on:
 - <http://www-03.ibm.com/systems/resources/snmp-whitepaper-legal.pdf>

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