

Xymon Client for z/VM Installation and Configuration Guide

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Changes

2007/02/06 – Modified for the release of 1.3
2007/07/27 – Minor editorial changes
2008/09/25 – Support for multiple Hobbit servers added
2008/10/31 – Documentation reformatted and editorial changes
2009/02/11 – Xymon name change

Introduction

Xymon is an open source network services monitor. It runs on Linux (including Linux for System z). The Xymon Client for z/VM will perform tests on a VM system and report the status of those tests back to the Xymon server.

The client is written mostly in REXX with an assembler based function and requires TCP/IP sockets services to send the status message(s) to the Xymon server.

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Design Criteria

The Xymon Client for z/VM is not intended as a performance monitor. The fact that it gathers some performance metric data is rooted in the nature of Xymon's role as a network host threshold monitor. It collects information every five minutes and reports it back to the Xymon server; this is much too sparse for true performance monitoring. It should not take on the task of a performance monitor as that is not its purpose.

Changes Since V1.2

The name of the client is changed to Xymon Client for z/VM to match the name of the Sourceforge project. Most program names will still refer to Hobbit and use the HOB prefix.

By far the biggest change is that the client can take advantage of Xymon's client data stream to report the test results. This allows configuration of threshold values at the Xymon server (centralized configuration) instead of at the client (local configuration). This configuration parameter is set in the HOBVARS file (see below). Some tests (the new ones, see below) only report status via the client data stream.

Centralized configuration requires Xymon Server Version 4.3.

There are some new tests:

The FILE test will report on the existence of a file. The file test works for a file on a minidisk or in SFS. The file size can be tracked as well as whether it has changed recently.

The LPAR test will report CPU Utilization for LPARs in the CEC that z/VM is running

in. This test requires the Performance Toolkit from IBM.

The PORTS test will report on listeners and connections to certain ports on the z/VM TCP/IP stack. It is configurable by port number and can tell if an application is listening on a certain port (eg: FTP) and how many connections there are to a specific port.

A Linux formatted VMSTAT test is generated purely for graphing purposes. It requires the IBM Performance Toolkit. Aside from turning it on or off, there is no additional configuration for this test.

The MSGS test is designed to analyze log files for specific strings of characters.

Multiple bbdDisplays are now supported.

The following tests have been changed:

The DISK test now reports the test results in Linux 'df' format. This was done so that the Xymon server can graph the results of the test. CP formatted disk areas (PAGE, SPOOL, TDISK and DRCT) are reported as filesystems starting with /CP. SFS and BFS filepools and filespaces are reported as filesystems starting with /SFS or /BFS. Minidisks are reported as filesystems starting with /MDISK.

PG_UTIL and VMSPPOOL have been merged into the DISK test, there are no longer separate test EXECs for them.

The size of the client virtual machine needs to be at least 8M to accommodate the use of the TCP/IP NETSTAT command.

An interfaces test has been added, the results are graphed to show the amount of data moving through the VM TCP/IP stack.

The timing of tests is now handled by WAKEUP. This allows for better control over how often certain tests are run. The HOBVMTST file is no longer used.

The client can be controlled via SMSG, it can be shutdown and told to reload its configuration data from another virtual machine. The virtual machines and nodes that are allowed to do this are designated in the configuration file (HOBVARS).

Significant new functionality added by Thomas Kern, a consultant for the U.S. Department of Energy. Many thanks to Tom for his time, his help and his ideas.

Installation of the Client

The installation of the client code is quite simple. A VM user must be created. It is very

convenient to create this user on a Shared File System filepool such that changes to the Xymon z/VM Client configuration files can be made while the client code is running. The configuration files are re-read during each test cycle.

Figure 1 shows an example directory entry for the Xymon client for z/VM.

```
USER XYMONVM XYMONVM 8M 8M DG
ACCOUNT 1000 XYMONVM
IPL CMS PARM AUTO CR FILEPOOL VMSYSU
MACH ESA
SPOOL 000C 2540 READER *
SPOOL 000D 2540 PUNCH A
SPOOL 000E 1403 A
CONSOLE 009 3215 T
LINK MAINT 0190 0190 RR
LINK MAINT 019D 019D RR
LINK MAINT 019E 019E RR
LINK TCPMAINT 0592 0592 RR
```

Figure 1 – Sample Directory Entry

Class D privileges are required to use the Q ALLOC commands. The FILEPOOL in the IPL statement can be any valid SFS filepool on your system. Allocate either a minidisk (5 cylinders is sufficient) or enroll the user in a filepool (800 blocks is sufficient). Using a filepool is suggested since it makes modifying the configuration easier and doesn't require shutting down the client, since the client reads the configuration data during each run.

The entire package is distributed as a ZIP file. Within the zip file is a VMARC file. You will need the VMARC package on your VM system to expand the archive. VMARC can be obtained from <http://www.vm.ibm.com/download>. The VMARC file contains the client code and should be FTPed to the XYMONVM user on the VM system. When sending the file, it is easiest to tell the FTP software to respect the 80 byte line length of the client programs. Use the commands 'SITE FIX 80' (or 'QUOTE SITE FIX 80' on Windows) and 'BIN' before transferring the file. Once uploaded the VMARC file can be expanded onto the client's A disk by logging on to the XYMONVM virtual machine and issuing following command:

```
VMARC UNPK XYMVM13 VMARC A = = A
```

Installation is complete. Configuration can be started.

Contents of the Package

All of the required files are in the archive, including a sample PROFILE EXEC (called PROFILE SAMPLE). This PROFILE EXEC will automatically start the client when the machine is autologged. If the machine is logged on via a terminal session, it will ask if the client should be started.

Figure 2 shows a list of the files in the archive and how they are used.

<i>Filename</i>	<i>Usage</i>
HOBVMDRV	Driver for the Xymon VM Client. It sets up the environment for the client and starts WAKEUP.
HOBBIT TIMES	The WAKEUP parms file that is used to control the scheduling of the rest of the test.
HOBVARS	Variables used during the execution of the client. These include the IP Address of the Xymon server and various thresholds that determine the color used in the status messages sent back to the server.
HOBVMCPU	Performs the CPU Utilization test.
HOBVMDSK	Performs the CP disk areas, SFS File Pool and optional filespace utilization test.
HOBVMPRC	Performs the running processes test (checks for specific logged on users).
HOBVMPT	Performs the CP Paging Rate test (this test is only used in client configuration mode, in server configuration mode the page rate is done by analyzing the same data from the CPU Utilization test).
HOB-LPAR	Performs the LPAR utilization test. This test requires the IBM Performance Toolkit.
HOBVMSTT	This test takes VM performance data and formats it to look like the Linux 'vmstat' output. It also requires the IBM Performance Toolkit.
HOBVMPOR	Performs the PORTS test to show listening and established TCP/IP port connections.
HOBVMFLE	Performs the FILE test to determine the existence of certain files.
HOBVMLOG	Performs the MSGS test.
HOBVMIFC	Performs the VM TCP/IP Interfaces query.
HOBVMCD	This EXEC collects all of the data for the tests that use the Xymon client data stream and sends the data to Xymon.
DATEFMT	Provides date formatting functions. The FILE test can use special characters that designated certain date and time formats. This exec is used to interpret those characters and return the correct data for the FILE test. The various formats are patterned after the Linux 'date' command.
MD5	Files used to compute MD5 checksums for files identified in the FILE test.
HOBVM	Used to disable the VM client on Xymon in the event that a shutdown is processed through SMSG. Will also enable the VM client on Xymon when the client is started.

Figure 2 – List of files distributed with the package

Figure 3 shows an example of the HOBBIT TIMES file.

==/==/== +5	14:05:08	EXEC	HOBVARS
==/==/== +5	14:05:13	EXEC	HOBVMCPU
==/==/== +5	14:05:26	EXEC	HOBVMPRC
==/==/== +5	14:05:31	EXEC	HOBVMPRT
==/==/== +5	14:05:32	EXEC	HOBVMSDK
==/==/== +5	14:05:33	EXEC	HOBVMFLE
==/==/== +5	14:05:34	EXEC	HOBVMLOG
==/==/== +5	14:05:34	EXEC	HOBVMIFC
==/==/== +5	14:05:37	EXEC	HOBVMPOR
==/==/== +5	14:05:41	EXEC	HOB-LPAR
==/==/== +5	14:05:43	EXEC	HOBVMSTT
==/==/== +5	14:05:47	EXEC	HOBVMCD
ALL	00:00:01	01/31/07	MSG01
ALL	23:59:55	01/30/07	MSG02

Figure 3

The +5 indicates that each test will run in five minute intervals. Changing the interval is OK, but it should not be more than 30 minutes for any one interval, or the Xymon server will think that the client is gone and will turn the test purple. The name after EXEC indicates the test that is run. HOBVMCD should always be run to send the client data stream to Xymon for those tests that only use the client data stream, even if client configuration mode is selected.

Tests can be commented out with a '*' in the first character; eg, HOB-LPAR and HOBVMSTT should be commented out if your site does not have the IBM Performance Toolkit installed.

Figure 4 shows an example of the HOBVARS file.

```
bbdisplay='192.168.201.6' /* Address of Xymon Server */
bbport= '1984' /* Xymon port number */
fqdn= 'N' /* FQDN value, s/b same as on server */
vmptk= 1 /* is VM Perf Toolkit available l=yes */
ptksvm= 'PERFSVM' /* VMPTK server name */
/* The following controls where the configuration thresholds for
the z/VM client are kept. 'server' indicates that the z/VM
client is configured on the Xymon server just like the Linux
client. 'client' indicates that the z/VM client is configured
on the client itself, in this file. */
cfgmode= 'SERVER'
/*-----/
/- auth_users is the list of users that can send SMSGs and -/
/- file replacements to the Xymon svm. -/
/*-----*/
auth_users='MAINT RKS0 OPERATOR' /* Authorized users */
auth_nodes='RKS0VM1' /* Authorized nodes */
/* Thresholds
E.G. Target yellow_value red_value
Where target is a predefined test performed by the script
value is the value or threshold to check for.

The color will be sent back to Xymon based on whether
the measurement for the target had exceeded the
threshold value.
```

```

        These threshold values are only used when cfgmode='client'
        is being used.  Otherwise threshold values are configured
        on the Xymon server.                                */

CPU    ='98  100'
LPAR   ='85   95'
PAGING='500 1000'
SPOOL  ='80   95'
PAGE   ='80   95'
PROC   ='40 FTPSERVE VMSERVU WAKEUP'
/* End of client based thresholds */

/* DISK indicates which shared file pool disk areas are monitored */
DISK   ='vmsys;2;2:30:40:70:80  vmsysu;all;2,3:40:55:50:70'

/* ----- *
 * MDISK indicates which minidisks are monitored *
 * MDISK=Owner Vaddr password *
 * Owner=virtual machine that owns the minidisk *
 * Vaddr=owners minidisk address *
 * password=read password of minidisk if needed *
 * CAUTION! If a read password is required and one is not provided *
 * the Xymon client virtual machine will be presented *
 * with a VMREAD and will be blocked.  It is important to *
 * verify that access to the minidisk works before adding *
 * it to this list! *
 * ----- */
mdisk.0 = 1
mdisk.1 = 'RKS0 191 READ'

/*-----*/
/- FILE status checking configuration statements -/
/- -/
/- FILE.0 = number of files to check -/
/- FILE.n = MDISK:Owner.Vaddr Filename FileType -/
/- FILE.n = SFSfp:Owner.dir Filename FileType -/
/- e.g. file.1 = 'MDISK:OPERATOR.191 %Y%m%d CONLOG' -/
/- file.2 = 'MDISK:OPERATOR.191 CURRENT CONLOG' -/
/*-----*/
file.0 = 1
file.1 = 'MDISK:RKS0.191 PROFILE EXEC '
/*-----*/
/- MSGS is same syntax as FILE but the header is set as logfile: -/
/- instead of file:. And the content of the file is also sent -/
/- to the hobbit server with a msgsg: header. -/
/- MSGPIPE is inserted into the pipeline for you to subset the -/
/- system's master logfile. -/
/*-----*/
MSGSG   ='MDISK:OPERATOR.191 LG%Y%m%d DOEVM' /* PROP */
MSGSGPIPE='| locate 41.1 /:/ | specs 39-* 1'
MSGSG   ='MDISK:OPERATOR.191 %Y%m%d CONLOG' /* Performance ToolKit */
MSGSGPIPE='| locate 6.1 /:/ | specs 4-* 1'

```

Figure 4

Configuring the Client

Configuration of the Xymon Client for z/VM will involve modification of the HOBBIT TIMES and HOBVARS EXEC files.

HOBBIT TIMES is used to determine which tests to run. Comment out the tests that you don't wish to use. For instance, if you don't license the Performance Toolkit from IBM the HOBVMSTT and HOB-LPAR tests will not work properly, so they will need to be

commented out by putting an asterisk (*) in column 1 of the line. HOBVMCD is critical to the operation of the client, do not comment it out.

HOBVARS EXEC is used to provide information to the client for its operation. The client can run in two modes (as indicated by the cfgmode setting), CLIENT and SERVER. The 'CLIENT' setting indicates that the client is in local mode, meaning that all threshold settings are made on the client. The 'SERVER' setting indicates that the client is in server mode, meaning that the Xymon server holds all of the threshold settings. Xymon Server Version 4.3 or higher is required to use SERVER mode.

<i>Variable Name</i>	<i>Usage</i>
bbdisplay	The IP Address of the Xymon server. Multiple bbdDisplays are supported to send client data to more than one Xymon server. Separate the IP addresses of the bbdDisplays with one or more spaces. The port number can also be specified for each bbdisplay by adding a colon and the port number to the IP Address, eg: 192.168.1.72:1984.
bbport	The port number used to communicate to the Xymon server (the default is 1984). This serves as the default for each bbdisplay specified in the bbdisplay variable. It must be specified even if the port number is coded explicitly with the IP Address.
fqdn	Used to control whether only the hostname or fully qualified domain name is returned in the status message. If you are using only host names in your bb-hosts file, set this to 'N'. If you are using fully qualified domain names in bb-hosts, set this to 'Y'.
vmptk	Indicates whether the IBM Performance Toolkit is available on the system
ptksvm	The name of the virtual machine running the IBM Performance Toolkit
cfgmode	Indicates whether server mode (SERVER) or client mode (CLIENT) is to be used
auth_users	The users authorized to use the SMSG interface to enable or disable Xymon
auth_nodes	The nodes authorized to use the SMSG interface to enable or disable Xymon
CPU	The CPU test threshold values. The CPU Utilization is obtained by analyzing the output of the CP IND command. If server based configuration is being used, the CPU variable is not required and the CPU threshold is configured with the LOAD parameter in hobbit-clients.cfg on the Xymon server.
LPAR	The LPAR utilization threshold. The LPAR Utilization is obtained from the IBM Performance Toolkit. The threshold for this test can only be set on the client, there is no server equivalent.
PAGING	The Paging test threshold values. The page rate is obtained by analyzing the output of the CP IND command. If server based configuration is being used, the PAGING variable is not required and the PAGING threshold is configured with the PAGING parameter in hobbit-clients.cfg on the Xymon server.
SPOOL	The Spool Utilization test threshold values. The percentage is obtained by analyzing the output of the CP Q ALLOC MAP command. The SPOOL value only has effect when running in client configuration mode. When running in server configuration mode, the spool utilization thresholds are set with the DISK parameter in hobbit-clients.cfg on the Xymon server.

<i>Variable Name</i>	<i>Usage</i>
PAGE	<p>The Page Utilization test threshold values. The percentage is obtained by analyzing the output of the CP Q ALLOC MAP command. The PAGE value only has effect when running in client configuration mode.</p> <p>When running in server configuration mode, the page utilization thresholds are set with the DISK parameter in hobbit-clients.cfg on the Xymon server.</p>
PROC	<p>The running processes test. The name is taken from a similar test on Linux systems, on z/VM this is equivalent to logged on virtual machines. The list of machine names is checked to verify that they are logged on. If the machine listed is not logged on a red status message is sent to the Xymon server.</p> <p>In client configuration mode, an optional number can precede the list of names. This number of checked against the number of machines logged on. If the number is exceeded, a yellow status is sent to the Xymon server.</p> <p>In server configuration mode, the PROC variable in HOBVARS is not required and the virtual machines to be monitored are specified using the PROC keyword in hobbit-clients.cfg on the Xymon server.</p>
DISK	<p>The CP Disk allocation and SFS File Pool utilization test. The CP Disk allocations (DRCT, TDISK, SPOOL and PAGE) are checked by default. Each filepool listed will be tested in sequence. The pools and filespace to be tested in each filepool can be specified, separated by commas, and the filespace separated from the pools by semi-colons. Up to four threshold values can be specified for each filepool, separated by the colon character (:). The first two are the filepool utilization thresholds, if the filepool utilization is less than the first value, a green status is returned, if the utilization is between the two values a yellow status is returned. If the utilization value is equal to or higher than the second value a red status is returned. If a second set of threshold values is specified, those values are used for the filespace within that filepool.</p> <p>Even in server configuration mode, the names of the filepool server machines and the pool number and filespace numbers are still specified. The threshold values are set in hobbit-clients.cfg on the Xymon server.</p>
mdisk	<p>The mdisk keywords indicate which minidisks to test. mdisk.0 is a count of the number of minidisks to be tested. mdisk.n (where n is a number starting with 1) is a list of minidisks to be tested in the format shown in the HOBVARS commentary. It is important to understand that if the minidisk has a read password that it should be specified correctly or the client will be presented with a VM READ and will stop running. The alternative is to specify the LNKNOPAS option on the OPTION directory statement for the CLIENT virtual machine.</p>
file	<p>The 'file' keywords represent files to test. file.0 is a count of the number of files that are to be tested. file.n (where n is a number starting with 1) is a list of files to test in the form shown as examples in the HOBVARS commentary. The filename and filetype can contain date format variables that are taken from the Linux date command. Examples of the different date variables and their meanings are in the commentary of the DATEFMT EXEC. SFS or BFS files that are to be tested will need to be readable by the virtual machine running the client code. Minidisk files that are to be tested will need to be on a minidisk with a read password of ALL, or the virtual machine running the client code will need to have LNKNOPAS specified on it's OPTION directory statement.</p>
MSG MSGPIPE	<p>MSG designates the log file that is to be used to search for messages. MSGPIPE is a CMS Pipelines stage used to filter messages from the log file to be sent to Hobbit.</p> <p>Like the FILE test, SFS or BFS files that are to be tested will need to be readable by the virtual machine running the client code. Minidisks that are to be used with the log test will need to be on a minidisk with a read password of ALL, or the virtual machine running the</p>

<i>Variable Name</i>	<i>Usage</i>
	client code will need to have LNKNOPAS specified on it's OPTION directory statement.

Figure 5 – HOBVARS EXEC and description of client configuration options

Figure 6 shows an example from hobbit-clients.cfg for server side configuration of the monitoring thresholds:

```
HOST=vm1
LOAD      80.0 90.0
PAGING    5 10
DISK      /CP/PAGE      75 90
DISK      /CP/SP00L     75 90
FILE      /RKS0/0191/PROFILE.EXEC
PORT      "LOCAL=%[:]21$" STATE=LISTEN TEXT=FTP
PORT      "LOCAL=%[:]23$" STATE=LISTEN TEXT=Telnet
PORT      "LOCAL=%[:]23$" STATE=ESTABLISHED min=0 TRACK=telnet "TEXT=Telnet Connections"
PROC      %.* 1 25 yellow TRACK=AllVMs "TEXT=All Machines"
PROC      %L3.* 1 5 yellow TRACK=LinuxVMs "TEXT=Linux Machines"
PROC      VMSERVU 1 1 yellow "TEXT=VMSERVU File Pool"
```

Figure 6 – Client configuration for z/VM

The *HOST* keyword identifies the hostname as defined in bb-hosts on the Xymon server. The *LOAD* parameter values are the CPU Utilization thresholds. The first value is the yellow threshold and the second is the red threshold.

The *PAGING* parameter defines the page rate thresholds.

The *DISK* parameters define the thresholds for the 'filesystems' reported to the Xymon server. Filesystems beginning with /CP are the CP disk areas. Those beginning with /SFS or /BFS are filepools or filespace in the Shared File System. Filesystems beginning with /MDISK are minidisks.

The *FILE* keyword identifies the files that are being tested to Xymon.

The *PORT* keyword defines which ports to test for. Ports can be checked for LISTENers, or ESTABLISHED connections. The number of connections can optionally be tracked (graphed).

The *PROC* keyword defines which virtual machines either must be logged on, or are tracked (graphed). A specific machine can be checked (as in the third example above for VMSERVU). Machines that fit a name pattern can also be tracked, the second PROC example shows that by checking for all machines with a name beginning with L3 (potentially Linux virtual machine naming convention). The first PROC example tracks all logged on virtual machines.

Starting the Client for the First Time

When initial configuration of the client is complete. Rename the file PROFILE SAMPLE to PROFILE EXEC. If any additional links are required for your installation, add them. When the PROFILE EXEC is set up properly, execute it. It will ask if you want to start the Xymon client. Respond 'Y'. It may initially indicate that some files are not found, that's OK for the first run of the client.

Operating the Client

The Xymon Client for z/VM accepts messages from selected users as identified by the *auth_users* variable in HOBVARS. These messages are in the form of messages sent via the CP SMSG command. The accepted client commands are 'STOP' and 'RLDDATA'.

STOP will terminate the client. If the client is running disconnected, it will be logged off.

RLDDATA will cause the client to immediately reload the HOBVARS file.

To send a command to the Xymon Client virtual machine use the CP SEND command as follows:

```
SMSG XYMONVM STOP
```

Notification will be returned to the sender that the client received a message.

The client is also enabled for the CP shutdown signal. The command:

```
SIGNAL SHUTDOWN XYMONVM
```

will terminate the client. A shutdown of z/VM will automatically terminate the client.

The XYMONVM virtual machine can be autologged at z/VM IPL time, it should come up after the TCP/IP stack has had a chance to initialize. If the client's files are on a SFS file pool or if it is testing a filepool server, it will also need to come up after the filepool server virtual machines. The Xymon client virtual machine must be a filepool administrator for any filepools that are to be monitored.

The client code has been tested on various releases of z/VM Version 4 and 5, but should work on any release that provides the appropriate responses to the CP commands and provides the CSL routines used by the SFS disk utilization test (DMSQUSG, DMSQUSGD, DMSQLIMA, and DMSQLIMD).

The Xymon server should be configured to perform at least a basic connection test on the z/VM system where the client is installed. If this is not done, the default behavior of Xymon will be to ignore the status messages received from the client.

The PORTS test requires that the ETC SERVICES file be available. The file is distributed as a sample file called ETC SAMPSESV, it should be copied or renamed.

In the TCPIP DATA file, if the hostname of the VM system is in upper case, the hostname in the Xymon configuration file (bb-hosts) should also be in upper case. If the case of the hostname doesn't match the value specified in bb-hosts or the name is just

different, use the `CLIENT` directive in Xymon's `bb-hosts` configuration file to tell Hobbit that a different hostname is being reported to the server.

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Finally, thanks to Henrik Storer for writing the package and for assistance with the C code for the backend to support the clients.