

This Is KAOS. We Do Not SNMP Here.

Douglas M. Scherer
Core Paradigm.

Abstract

This paper presents a first timer's overview of SNMP concepts and tips on setting up the Oracle Intelligent Agent. `dbsnmp` is the name of the Oracle process that broadcasts database status information via SNMP. `dbsnmp` is known more commonly as the Oracle Intelligent Agent (OIA). Oracle Support confirms that it is valid to configure `dbsnmp` to send messages to NetView and other SNMP compliant network management applications without the use of Oracle Enterprise Manager (OEM). Yet, there is too little information to be found in Oracle's UNIX installation documentation for the RDBMS.

While setting up `dbsnmp` to work solely with SNMP consoles Oracle Support is of some assistance, but many questions remain unanswered. OEM, which is the monitoring tool provided by Oracle Corporation, runs only on NT and Windows 95. Some good OIA configuration information can be found in the OEM documentation, but there is nothing that would lead you to look there if OEM is not part of your messaging/monitoring architecture. Here's some information to get you started.

What and Why Is SNMP?

This paper is more about the concerns of manually configuring the OIA than it is about SNMP in general. For background purposes here is a brief discussion of SNMP and it's components.

Usefulness Of SNMP

Using SNMP as a standard along with tools developed by vendors it is possible to create a proactive monitoring configuration for a complex networked environment. For Oracle DBAs this provides a centralized position from which to view the status and performance of multiple databases. Many of the vendors also support the retention of historical data based on the information collected via SNMP. DBAs can use that information to help predict the needs of future databases.

As a protocol it allows a means of proactive management of databases. Instead of the DBA checking each database in a large organization, the Managed Node will monitor the database and send a message via SNMP when there is trouble. Proactive problem reporting seems to be the most important component to come from this model. It is possible for instance to allow the OIA to send a message via SNMP to the Management Application which in turn sends a message to the DBA's beeper. The DBA can then prevent a problem before it occurs.

The Management Application can receive SNMP information in several ways. One is by polling (querying). Polling is the act of the Management Application requesting information. Another is via a trap. A trap is sent from the managed node when a problem is detected. A trap in effect is an interrupt driven means of the managed node communicating to the Management Application.

SNMP

SNMP stands for Simple Network Management Protocol. It is a standard protocol that was originally created to monitor the status of hosts and nodes. Its scope has now been expanded to include management and monitoring of applications running on those hosts.

SNMP is the protocol within the Internet-standard Management Framework. The other components within the Framework are: Structure of Management Information (SMI) and Management Information Base (MIB).

SMI

SMI is the specification that supports the definition of object types. An object type supports the definition of a managed object. A managed object is something about which we want information. For example, a managed object will show the variable size in the SGA. There may be multiple instances of an object on a Managed Node. These instances are referred to as variables. This would occur for example if one Managed Node was running two Oracle databases.

MIB

A MIB is a file that contains the definition of a group of managed objects. The MIB is loaded into the Management Application, not into the agents on the Managed Node. This seems to always be a point of confusion. Another misconception is that in order to use SNMP a MIB must be written by the end user. Users may create their own MIBs, but many of the applications that support SNMP monitoring provide their own MIBs. There are also standard MIBs defined by the Internet Engineering Task Force (IETF). One such MIB is the rdbmsMIB. The rdbmsMIB MIB contains object types that are common to relational databases. This MIB may be used to monitor Oracle, SYBASE, and other relational databases. A portion of the oraDbMIB is shown below. Some of the Oracle MIBs contain descriptions of the objects, which are useful to read whether or not SNMP will be employed.

oraDbSGATable OBJECT-TYPE

SYNTAX SEQUENCE OF OraDbSGAEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"Summary information on the System Global Area"

::= { oraDbObjects 6 }

oraDbSGAEntry OBJECT-TYPE

SYNTAX OraDbSGAEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"A single entry from the v\$sga table"

INDEX { rdbmsDbIndex }

::= { oraDbSGATable 1 }

OraDbSGAEntry ::=

SEQUENCE {

oraDbSGAFixedSize

INTEGER,

oraDbSGAVariableSize

INTEGER,

oraDbSGADatabaseBuffers

INTEGER,

oraDbSGARedoBuffers

INTEGER

}

OID

While humans may identify an object by its description SNMP compliant programs uniquely identify objects by their Object Identifier (OID). OIDs are organized hierarchically as in the example below. The number 111 in the seventh position defines these as Oracle objects. The names on the left are the descriptors.

```

"oraDbMIB",           "1.3.6.1.4.1.111.4",
"oraDbObjects",      "1.3.6.1.4.1.111.4.1",
"oraDbSGATable",     "1.3.6.1.4.1.111.4.1.6",
"oraDbSGAEntry",     "1.3.6.1.4.1.111.4.1.6.1",
"oraDbSGAFixedSize", "1.3.6.1.4.1.111.4.1.6.1.1",
"oraDbSGAVariableSize", "1.3.6.1.4.1.111.4.1.6.1.2",
"oraDbSGADatabaseBuffers", "1.3.6.1.4.1.111.4.1.6.1.3",
"oraDbSGARedoBuffers", "1.3.6.1.4.1.111.4.1.6.1.4",

```

SNMP and OIA

Overview Of An SNMP Monitoring Environment With the OIA

A simple SNMP environment consists of a monitor, or some kind of software on a Management Station waiting to receive information via SNMP. On the Monitored Node there is a Master Agent and Subagents. The Master Agent is supplied by the OS vendor and is the interface between the Management Station and the Subagents. The Subagents also reside and run on the monitored machine. Each Subagent can monitor a separate aspect/process of the machine. OIA is one such Subagent and is designed to monitor the Oracle environment.

(Place Fig1.pcx here.)

OIA Through The Eyes Of NetView/6000

NetView/6000 is one Management Application that can monitor Oracle via SNMP. Figure 2 shows the results of a NetView query against the OIA.

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Figure 3 shows the results of a trap received by NetView from the OIA.

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NetView/6000 is one of the tools that participates in Oracle's Systems Management Tools Initiative (SMTI). There are many other vendors that supply tools as part of the initiative.

Overview Of The OIA

The descriptions that follow refer to using the OIA under AIX. It's important to note that when the OIA is used in conjunction with OEM the two do not communicate via SNMP. Rather, they interact via SQL*Net.

OIA is a euphemism for an executable called dbsnmp. Starting and stopping the OIA is done with the lsnrctl command as described below. When the OIA is started it is possible to see that two copies of it begin to run in memory:

```

SQL> host ps -ef

  UID   PID  PPID  C   STIME   TTY  TIME   CMD
  root     1     0   1   Nov 01    -  274:26  /etc/init
oracle 14506     1   0   Jan 31 pts/1  0:06   dbsnmp
oracle 24040 14506   0 21:34:37 pts/1  0:01   dbsnmp

SQL> select username, osuser, program, process
  2*   from v$session
  3*   where username = 'DBSNMP';

USERNAME          OSUSER          PROGRAM          PROCESS
-----

```

```
DBSNMP      oracle      ? @machine01 (TNS V1-V2)  14506
DBSNMP      oracle      ? @machine01 (TNS V1-V2)  24040
```

The first is running under the root process. The second is forked off (running under) the first process. Both of these processes connect to the Oracle database(s).

The first process is called the Work process. The Work process communicates with the Comm process (discussed next) via IPC. If the Comm process should die, the Work process will restart it. The Work process contains a TCL event engine that manages TCL jobs.

The second process is called the Comm process. Its main purpose is to receive RPCs from the Management Application.

There is little additional information available on these two processes.

Installing And Configuring The OIA And Related Components

There are nine pages in the [Oracle 7 Installation Guide For AIX \(7.3.2.1\)](#) which explain how to set up the OIA. Those pages provide information on setting up the OIA for use without OEM. In fact, there is no absolute need to use OEM if you're going to use an SNMP Master Agent and Management Station Application. The Guide unfortunately leaves out some crucial and tough to uncover steps. A sidebar suggests seeing [Oracle Network Manager Administrator's Guide](#) and [Understanding SQL*Net](#), but even those guides don't supply a complete picture. In order to fully understand the parameters it is important to review all of the Oracle publications listed in the Additional Readings section below.

What follows are excerpts from the "Completing Oracle7 Installation" section of the [Oracle7 Installation Guide for AIX](#) along with the additional information I've found necessary to make the installation operational. Therefore this information should be considered supplemental to, and not a replacement for reading the appropriate sections in the Installation Guide. The information is here divided into two main sections: 1. Configuring The Master, 2. Configuring the OIA.

Configuring The Master

What To Choose From The Oracle Installer

The OIA must be installed from the distribution medium as the first step. In the Oracle Installer choose **Oracle Intelligent Agent 7** in addition to SQL*Net and the other products you wish to install. In AIX - 7.3.2 RDBMS installation there is a patch for the OIA that must be requested separately and applied.

Configuring the OS Environment

The root user will do these steps.

1. Put two lines into the /etc/snmpd.conf file.

```
smux 0.0 "" IP_address
```

The Guide says to use the IP address. Make sure to use the IP address of the machine where this Master Agent will run. Do not use a hostname. The smux line must be present for the OIA to startup.

```
trap public hostname_or_IP_address
```

The above trap line only needs to be added if you are going to use traps.

2. Recycling the Master Agent

This needs to be done so that the Master Agent can pick up the new entries in snmpd.conf. Also note from these commands that the Master Agent's name in AIX is snmpd.

```
# stopsrc -s snmpd
```

```
# startsrc -s snmpd
```

Configuring The Master Management Site Application.

The files that contain the MIBS are located in \$ORACLE_HOME/network/admin. This is incorrectly stated in the Installation Guide to be in \$ORACLE_HOME/network/doc. The Installation Guide says to "copy all the files in the \$ORACLE_HOME/network/admin directory to /usr/OV/snmp-mibs on the machine where NetView/6000 runs. There are a couple of problems with this.

1. Copying all the files from \$ORACLE_HOME/network/admin puts many unnecessary files on the Master Management Site machine. The only files that are needed from that directory are the ones with a .v1 extension.

2. Load the MIBs into NetView/6000. The MIBs will not load properly without some alteration. Many hours can be spent with Oracle Support trying to analyze this problem. A solution will probably be found by simply removing the comments that appear at the top of each MIB. See the NetView guides for NetView specific instructions on loading MIBs.

3. Which MIBs should be loaded? Here's a list of what the MIBs contain:

database.v1 = rdbmsMIB = standard/public RDBMS MIB

listener.v1 = oraListenerMIB = Oracle Listener MIB

netserv.v1 = application = Network Services MIB

nrs.v1 = oraInterchangeMIB = Oracle Multi-Protocol Interchange MIB

oemtraps.v1 = oraAgent = Oracle Enterprise Manager MIB

onrs.v1 = oraNamesMIB = Oracle Names Server MIB

oradb.v1 = oraDbMIB = Oracle Database MIB

replication.v1 = oraRepObjects = Symmetric Replication MIB

4. At this point only the Master Agent and Master Application Site have been configured, but the OIA has not. Therefore querying the MIB will not yield correct results.

Configuring The OIA

Create the snmp.ora file

This is by far the trickiest piece in the whole setup. Oracle Support recommends that Network Manager be used for this step. They do say though that it can be accomplished via the instructions in the Installation Guide. Note that Network Manager is only available for the Windows operating systems. It is in its discussion of snmp.ora parameters where the Installation Guide is the most incomplete.

snmp.ora resides in \$ORACLE_HOME/network/admin or in a directory specified in \$TNS_ADMIN on the Managed Node. In that location Oracle supplies a file named snmp.ora.sample as a template. Before preparing snmp.ora configure the listener.ora file, and the tnsnames.ora file and/or Oracle Names Server.

In the Installation Guide it is difficult to determine which are the essential snmp.ora parameters. They do mention that a fully configured snmp.ora file will include snmp.visibleservices, snmp.index, snmp.connect, snmp.sid, snmp.contact and snmp.dbpolltime. However, snmp.connect, snmp.contact, snmp.dbpolltime are optional parameters depending on how you wish to configure your system. There are additional parameters - optional or required - which are not mentioned in the Installation Guide.

1. Here are the required parameters shown in the Installation Guide's fully configured example.

snmp.visibleservices is a list of named services that you wish to monitor. The names in this parameter must be service names as found in listener.ora, tnsnames.ora or Oracle Names. A typical snmp.visibleservices is:

```
snmp.visibleservices=(dev1,LISTENER,dev2)
```

where dev1 and dev2 are service names for databases on the Managed Node, and LISTENER is the name of the listener on the Manager Node. It is important to note that if there is an snmp.ora in the same directory where the listener.ora exists that snmp.ora file MUST CONTAIN AN ENTRY FOR THE LISTENER. Otherwise the listener will not start properly. This is Oracle bug number 333704 and will hopefully be fixed in a future release. The net effect of this is that you must tell the OIA to check on the Oracle listener whether or not you desire that functionality.

snmp.index identifies an instance of a variable and is a unique value within an snmp.ora file. It does not represent a database instance, but rather an SNMP variable instance as described above. It will, for example also help to distinguish between SNMP variables that represent the listener when there are two listeners running on the Managed Node. An individual entry must be made in the snmp.ora file for each service listed in snmp.visible services. For the sample snmp.visible services line above, corresponding snmp.index entries would be:

```
snmp.index.dev1=1
```

```
snmp.index.LISTENER=2
```

```
snmp.index.dev2=3
```

snmp.sid identifies the Oracle SID associated with a service name listed in snmp.visible services. In our example the corresponding snmp.sid entries will be:

```
snmp.sid.dev1=dev1
```

```
snmp.sid.dev2=dev2
```

2. Here are the optional parameters shown in the Installation Guide's fully configured example.

snmp.connect identifies the account name in the database to connect to, if the default is not used. Above is shown a select statement from within SQL*Plus that shows the two connections made to the database from the OIA. The Work process creates one database session and the Comm process creates one. If you desire to change the name of the account under which these two processes connect to the database, you must specify that new account name and/or password in the snmp.connect parameter. Of course you must also make the relative change in the database. This is a useful option to employ for security reasons. The default password for OIA database connections is DBSNMP. A typical entry for snmp.connect would be:

```
snmp.connect.dev1.name=agent99
```

```
snmp.connect.dev1.password=control
```

```
snmp.connect.dev2.name=maxwell
```

```
snmp.connect.dev2.password=smart
```

snmp.contact identifies who should be contacted in case a situation arises in one of services listed in snmp.visible services. A typical entry for our example would be:

```
snmp.contact.dev1="Siegfried 800-555-1212"
```

```
snmpcontact.LISTENER="The Chief 800-555-1212"
```

```
snmp.contact.dev2="Agent 99 800-555-1212"
```

snmp.dbpolltime identifies the amount of time between "database up" checks. By default, the OIA will check every thirty seconds to make sure that the databases listed in snmp.visible services are alive. If you want to increase that to two minute intervals you would use:

```
snmp.dbpolltime=120
```

snmp.dbpolltime does not refer to the amount of time between intervals of SNMP variable information collection. That interval is fixed. Also, while snmp.connect and snmp.contact have 1 entry per visible service, and may have an entry for some services and not for others, snmp.dbpolltime refers to all databases listed in snmp.visible services.

So far, our snmp.ora file looks like this:

```
snmp.visible services=(dev1,dev2,LISTENER)
```

```
snmp.index.dev1=1
```

```
snmp.index.dev2=2
```

```
snmp.index.LISTENER=3
snmp.sid.dev1=dev1
snmp.sid.dev2=dev2
snmp.contact.dev1=" Siegfried 800-555-1212"
snmp.contact.dev2="Agent 99 800-555-1212"
snmp.contact.LISTENER="The Chief 800-555-1212"
snmp.dbpolltime=120
```

3. Here are the required snmp.ora parameters that are not in the Installation Guide.

snmp.oraclehome is the ORACLE_HOME directory for each database listed as a visible service. This is required if you are monitoring more than one database on a Managed Node. There will be one entry for each database service as follows:

```
snmp.oraclehome.dev1=/app/home/oracle/product/7.3.2
snmp.oraclehome.dev2=/app/home/oracle/product/7.3.2
```

dbsnmp.address identifies the address on which the Comm process listens for incoming requests. An example is;

```
dbsnmp.address=(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=machine01)(PORT=1528)))
```

dbsnmp.spawnaddress identifies the TNS address that the agent can use to accept RPCs. An example of this is:

```
dbsnmp.spawnaddress=(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=machine01)(PORT=1538)))
```

In the OEM documentation it says that this line is optional. Oracle Support also reports that this parameter is optional. Yet, I have never gotten the OIA to start properly without it. I spoke with some Oracle developers at the campgrounds at IOUW '96 who have confirmed that it must be present (at least with the configuration that is here discussed). To be sure that the port numbers you are choosing for these parameters are not in use you may use:

```
# netstat -an | grep 1538
```

nmi.register_with_names parameter appears not to be documented anywhere. It tells the OIA whether or not to communicate with the Oracle Names Server. If this parameter is not included in snmp.ora, the OIA assumes that you are using the Oracle Names Server. If you are not using the Oracle Names Server, an error is produced upon starting up the OIA. In order to avoid the error include the line below:

```
nmi.register_with_names=false
```

4) Lastly, here are some optional and curious snmp.ora parameters that are not in the Installation Guide.

dbsnmp.log_file identifies a log file for SNMP support. It does not produce a log file, nor does a log file get created by default as reported in Understanding SQL*Net release 2.3. Oracle Support has been unable to explain this.

nmi.log_file does produce a log file upon starting the OIA. An example is:

```
nmi.log_file=nmilog.log
```

5. The final list of parameters in our snmp.ora looks like this:

```
snmp.visible_services=(dev1,dev2,LISTENER)
snmp.index.dev1=1
snmp.index.dev2=2
snmp.index.LISTENER=3
snmp.sid.dev1=dev1
snmp.sid.dev2=dev2
snmp.contact.dev1=" Siegfried 800-555-1212"
snmp.contact.dev2="Agent 99 800-555-1212"
snmp.contact.LISTENER="The Chief 800-555-1212"
```

```
snmp.dbpolltime=120
snmp.oraclehome.dev1=/app/home/oracle/product/7.3.2
snmp.oraclehome.dev2=/app/home/oracle/product/7.3.2
dbsnmp.address=(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=machine01)(PORT=1528)))
dbsnmp.spawnaddress=(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=machine01)(PORT=1538)))
nmi.register_with_names=false
nmi.log_file=nmilog.log
```

Run The .sql Setup Scripts

In \$ORACLE_HOME/network/admin there are several .sql scripts. You must run the catsnmp.sql script against each database to be monitored. You are not prompted to do so, but prior to running the script you may change the name of the database account to which the OIA connects. Note that catsnmp.sql is listed as dbsnmp.sql in some Oracle documentation.

There is an additional script in this directory called catsnmpr.sql. It is used to enable replication monitoring. The entire body of the script is commented out with a note that replication MIBs are not yet in production.

To remove the SNMP objects from the database run the script called catsnmp.sql.

OIA/lsnrctl commands

To start the OIA issue the following command:

```
# lsnrctl dbsnmp_start
```

To stop the OIA issue the following command:

```
# lsnrctl dbsnmp_stop
```

To tell whether the OIA is running issue the following command:

```
# lsnrctl dbsnmp_stat
```

lsnrctl stat

This command is used to get status information about the listener. There is one line in this status report that mentions SNMP. It simply states

```
SNMP [ON|OFF]
```

This refers not to the state of the OIA, but rather to the setup of the Master Agent on the Managed Node.

What To Do Now

After these preparations you should be able to query a MIB from the Management Application. Look at the documentation for your Management Application to see how this is done.

Figure 2 shows one such query. In the area labeled "MIB Object ID" we can see the entire name of the object. In the area labeled "MIB Values" we can see duplicate entries for each variable. These duplicates are instances of the objects, each representing an SGA value for one of our two example databases - dev1 and dev2. Remember that snmp.index.dev1=1 and snmp.index.dev2=3. You can see these index numbers tacked onto the end of the MIB Value. In the area labeled "MIB Instance" we can see that the variable highlighted in the MIB Values section refers to instance 3 (in other words - dev2).

Figure 4 shows the another window that's available in NetView/6000.

(Place Fig4.pcx here.)

This shows a description values of the highlighted MIB Value (variable). You can check this against the OIDs listed above and see from where they are derived.

Conclusion

This paper provides the reader with some hints in manually setting up the OIA. The information has been drawn from Oracle documentation, discussions with Oracle Support and much trial and error. The end result, as demonstrated in this paper is only the beginning of configuring a proactive DBA initiative.

It is not enough to receive a trap or notification that a database has gone down. There must be a system in place to pass along the notification. In large corporations, The Management Application will only be seen on a few centralized machines. In fact, the Management Application will probably monitor more than just Oracle databases. It will monitor the health of nodes such as printers and computers along with the applications running on those computers.

In a large corporation, it's quite likely that a centralized Operations Group will monitor the Management Application and notify a member of the appropriate administration group when there is a problem. A clear hierarchy of responsibility needs to be prepared before the SNMP monitoring system is put into production. If possible, it is best to assist the Operations personnel by implementing a means for the Management Application to react on its own to a problematic situation. The Management Application might send either e-mail or beeper messages automatically.

Judging from experience, it seems that the OIA is really designed to best work in conjunction with the Oracle's suite of management tools - even though OEM uses SQL*Net rather than SNMP in its main interactions with the OIA. New additions and upgrades are continually being offered by the SMTI and it will be interesting to see how these new offerings will assist in monitoring and management of databases enterprise wide.

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About The Author

Douglas Scherer

dscherer@coreparadigm.com

Mr. Scherer is a Certified Oracle Database Administrator consulting in New York City. He was a presenter at IOUW '96 and is an instructor in Columbia University's Computer Technology and Applications Program.

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