

# Managing Oracle9i RAC on Windows with HP OpenView Software



Introduction .....	2
Need for the solution .....	2
Executive summary .....	2
OVOW .....	2
DBSPI .....	3
Using OVOW and DBSPI to manage Oracle9i RAC clusters .....	3
Oracle DBSPI metrics and policies .....	4
Oracle DBSPI tools .....	5
Oracle DBSPI graphs .....	6
Oracle DBSPI reports .....	6
HP OpenView SAM .....	7
Using HP OpenView SAM to manage Oracle9i RAC clusters .....	8
Storage Node Manager .....	8
Storage Builder .....	9
Storage Optimizer .....	13
Storage Accountant .....	14
Storage Allocator .....	14
HP OpenView SAM Smart Plug-ins (SPI) for OVOW .....	14
Configuring HP OpenView SAM to monitor an Oracle9i RAC cluster with an HP StorageWorks Modular Smart Array 1000 (MSA1000) .....	15
Summary .....	19
Glossary .....	20
For more information .....	21

## Introduction

Oracle9i Real Application Clusters (RAC) is a clustered database product that provides transparent application scalability by quickly and efficiently sharing clusterwide caches for coordinated data access. Oracle9i RAC provides near-linear scaling transparency with the ability to rapidly add nodes and disk storage. In an Oracle9i RAC environment, every server acts as a backup for every other server in the cluster. Users of a failed server can be quickly failed over to an active server.

A successful introduction of monitoring and managing Oracle9i RAC clusters through the use of software such as HP OpenView Operations for Windows (OVOW) and HP OpenView Storage Area Manager (OpenView SAM) version 3.2 can improve the overall reliability of an Oracle9i RAC solution. The business values associated with using OVOW and OpenView SAM include:

- Provides early indications of possible storage or server failures reducing or eliminating unscheduled downtime of network infrastructures
- Provides continual monitoring of Oracle processes
- Monitors key operational activities and events to ensure always-on availability
- Provides space management including tablespace, freespace, and segment fragmentation

## Need for the solution

With the complexity of Oracle9i RAC clusters and the importance of applications based on Oracle9i RAC, a flexible solution is required to provide data to effectively manage the entire business process. OVOW and OpenView SAM can be used to provide information to the IT staff to help them keep all processes operating effectively with minimal errors. In addition to monitoring, HP OpenView tools can assist with the overall capacity planning of an Oracle9i RAC environment.

## Executive summary

Several HP management tools can be used to manage Oracle 9i RAC clusters. Insight Management Agents provide hardware details about RAC servers and basic configuration information about RAC clusters through a RAC agent. OVOW and Database Smart Plug-in (DBSPI) provide monitoring and management capabilities for RAC clusters. OpenView SAM provides the capabilities to manage and monitor Oracle RAC database application usage of storage subsystems.

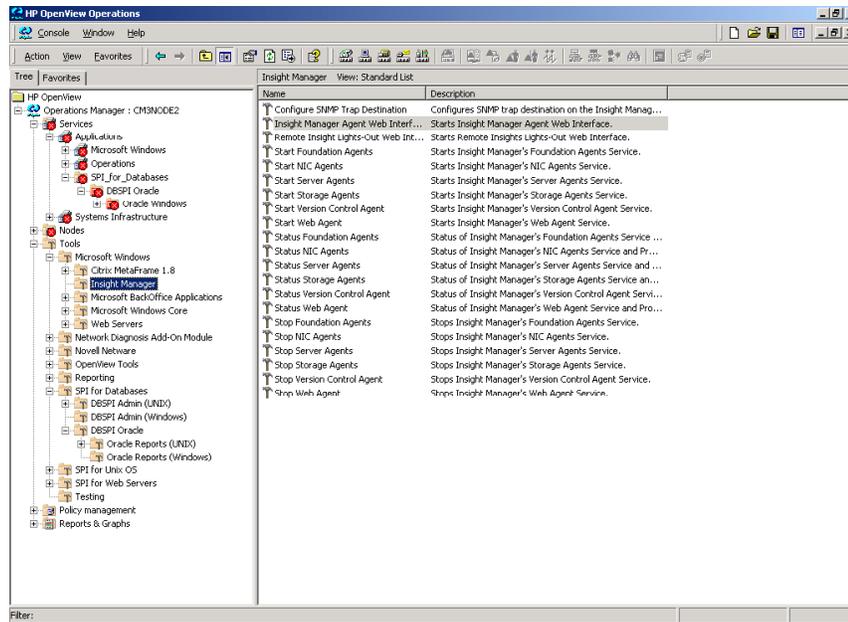
## OVOW

OVOW is a distributed, client/server software solution that provides service-driven event and performance management of business-critical enterprise systems, applications, and services by monitoring, controlling, and reporting on the health of a system. OVOW enables management of distributed, heterogeneous, e-business infrastructures and includes support for a broad range of Microsoft® Windows® and UNIX® systems and applications, including e-commerce, web and application servers, database, conferencing and e-mail, enterprise resource planning (ERP) software, and more.

The standard OVOW installation includes Insight Management Agent plug-ins for ProLiant servers. Using the links provided within OVOW, you can drill down to the System Management Homepage and get detailed status and information about the software and hardware running on your servers as well as information on attached storage. Events generated by Insight Management Agents are viewable on the OVOW management console.

OVOW provides console and server functionality to monitor performance and events using agency installed on nodes being managed. To install add-ons and Smart Plug-ins (SPI), an administrator must first install the OVOW software on a management server.

**Figure 1.** Launching Insight Management web interface from OVOW



## DBSPI

DBSPI adds Oracle RAC database monitoring capabilities to OVOW. When the DBSPI is configured and deployed you can increase the availability and performance of the database servers. After DBSPI is set up, within the OVOW console information is displayed about the performance and availability of monitored database servers. The DBSPI components include tools and policies for configuring and receiving data in the form of service map alerts, messages, and metric reports. OVOW includes report- and graph-generating capabilities that show database-related data accumulating over time to help manage capacity and spot performance bottlenecks.

## Using OVOW and DBSPI to manage Oracle9i RAC clusters

After OVOW and DBSPI are installed on a management server, begin configuration of OVOW for Oracle9i RAC. All servers in the RAC cluster are added to the list of managed nodes to be monitored by OVOW. Afterwards, they are automatically discovered by OVOW. OVOW recognizes the existence of standard Windows components as well as Insight Management Agents on ProLiant servers and deploys the standard policies. The DBSPI discovery policy recognizes the existence of Oracle9i RAC and deploys the predefined policies to servers automatically. After the database is discovered, use the Database Configuration Manager tool to set up user and password information and enable the configuration.

DBSPI automatically detects databases running in clusters. DBSPI identifies one active node for global metric collection. Metrics designated as global generate alarms only from this selected node. For example, because storage is shared in a RAC cluster, storage metrics are collected only from a single node. No redundant messages for global metrics appear in the OVOW message browser.

## Oracle DBSPI metrics and policies

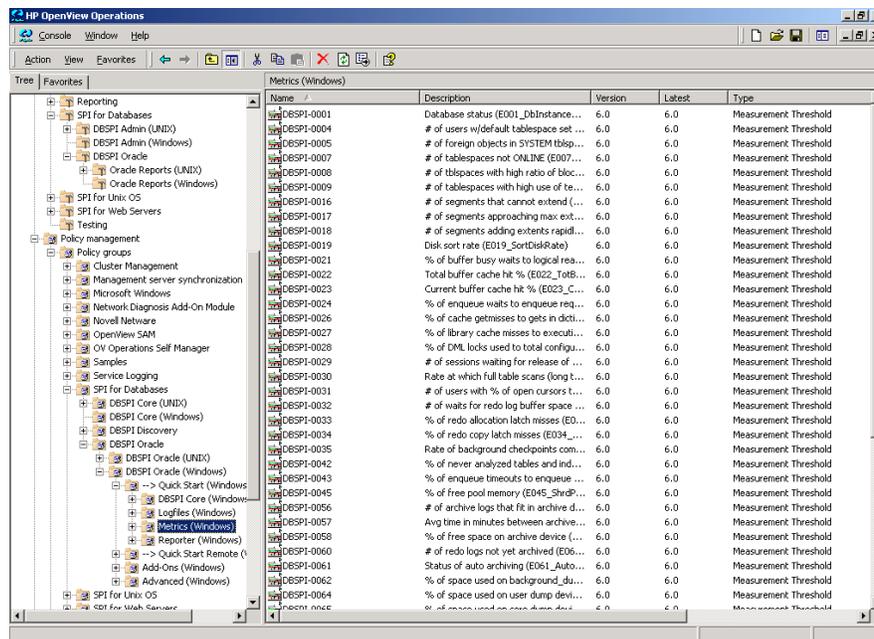
The DBSPI contains metrics and policies specifically designed to manage Oracle. There are over 90 predefined policies that incorporate hundreds of metrics specifically designed to monitor Oracle databases. Users can easily customize the predefined metrics or add new metrics. The DBSPI includes policies that run every 5, 15, 30, or 60 minutes and some that run daily to monitor the health of your Oracle 9i RAC cluster.

DBSPI metrics monitor availability, space management, tablespace, segments, performance, sort rates, transactions, buffer cache, shared pool, errors, locks, calls, checkpoints, redo, users, and archives.

Some policies include:

- DBSPI-001 monitors availability of Oracle database instances.
- DBSPI-006 monitors tables with low free space.
- DBSPI-011 monitors the number of fragmented tablespaces.
- DBSPI-016 monitors the number of segments that cannot extend.
- DBSPI-020 monitors the percentage of memory sorts.
- DBSPI-029 monitors the number of sessions waiting for the release of a lock.
- DBSPI-054 monitors the rate at which rollbacks are being generated.
- DBSPI-060 monitors the number of redo logs not yet archived.
- DBSPI-203 monitors the number of extents needed for the largest segment.

Figure 2. DBSPI metrics



The screenshot shows the HP OpenView Operations console with a tree view on the left and a table of metrics in the main pane. The table has columns for Name, Description, Version, Latest, and Type. The metrics listed are:

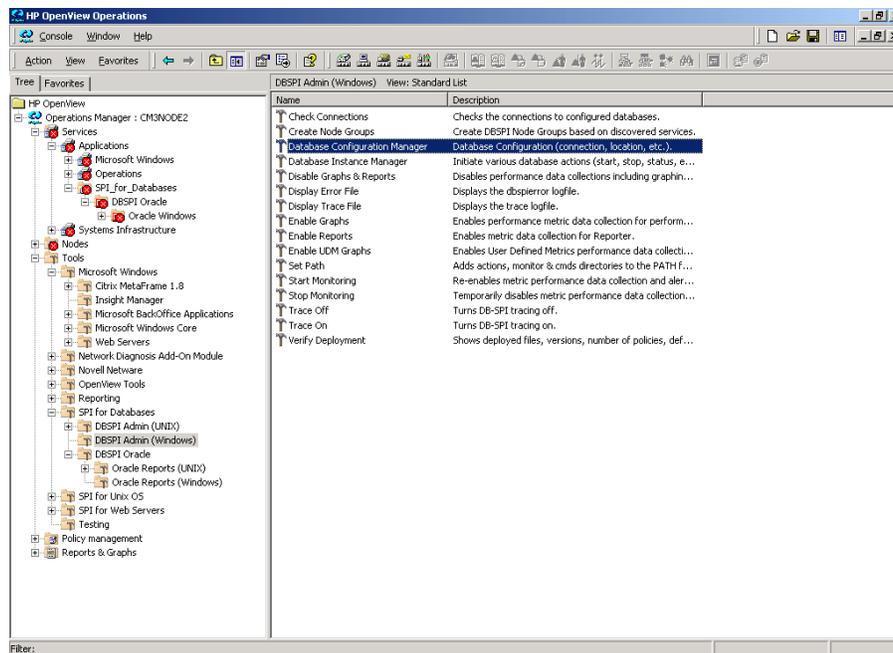
Name	Description	Version	Latest	Type
DBSPI-0001	Database status (E001_DbInstance...	6.0	6.0	Measurement Threshold
DBSPI-0004	# of users w/default tablespace set ...	6.0	6.0	Measurement Threshold
DBSPI-0005	# of foreign objects in SYSTEM tablesp...	6.0	6.0	Measurement Threshold
DBSPI-0007	# of tablespaces not ONLINE (E007...	6.0	6.0	Measurement Threshold
DBSPI-0008	# of tablespaces with high ratio of bloc...	6.0	6.0	Measurement Threshold
DBSPI-0009	# of tablespaces with high use of te...	6.0	6.0	Measurement Threshold
DBSPI-0016	# of segments that cannot extend (...	6.0	6.0	Measurement Threshold
DBSPI-0017	# of segments approaching max ext...	6.0	6.0	Measurement Threshold
DBSPI-0018	# of segments adding extents rapidl...	6.0	6.0	Measurement Threshold
DBSPI-0019	Disk sort rate (E019_SortDiskRate)	6.0	6.0	Measurement Threshold
DBSPI-0021	% of buffer busy waits to logical rea...	6.0	6.0	Measurement Threshold
DBSPI-0022	Total buffer cache hit % (E022_ToB...	6.0	6.0	Measurement Threshold
DBSPI-0023	Current buffer cache hit % (E023_C...	6.0	6.0	Measurement Threshold
DBSPI-0024	% of enqueue waits to enqueue req...	6.0	6.0	Measurement Threshold
DBSPI-0026	% of cache getmisses to gets in dict...	6.0	6.0	Measurement Threshold
DBSPI-0027	% of library cache misses to executi...	6.0	6.0	Measurement Threshold
DBSPI-0028	% of DML locks used to total configu...	6.0	6.0	Measurement Threshold
DBSPI-0029	# of sessions waiting for release of ...	6.0	6.0	Measurement Threshold
DBSPI-0030	Rate at which full table scans (long t...	6.0	6.0	Measurement Threshold
DBSPI-0031	# of users with % of open cursors t...	6.0	6.0	Measurement Threshold
DBSPI-0032	# of waits for redo log buffer space ...	6.0	6.0	Measurement Threshold
DBSPI-0033	% of redo allocation latch misses (EO...	6.0	6.0	Measurement Threshold
DBSPI-0034	% of redo copy latch misses (E034_...	6.0	6.0	Measurement Threshold
DBSPI-0035	Rate of background checkpoints com...	6.0	6.0	Measurement Threshold
DBSPI-0042	% of never analyzed tables and ind...	6.0	6.0	Measurement Threshold
DBSPI-0043	% of enqueue timeouts to enqueue ...	6.0	6.0	Measurement Threshold
DBSPI-0044	% of free pool memory (E045_ShrD...	6.0	6.0	Measurement Threshold
DBSPI-0056	# of archive logs that fit in archive d...	6.0	6.0	Measurement Threshold
DBSPI-0057	Avg time in minutes between archive...	6.0	6.0	Measurement Threshold
DBSPI-0058	% of free space on archive device (...	6.0	6.0	Measurement Threshold
DBSPI-0060	# of redo logs not yet archived (E06...	6.0	6.0	Measurement Threshold
DBSPI-0061	Status of auto archiving (E061_Auto...	6.0	6.0	Measurement Threshold
DBSPI-0062	% of space used on background_du...	6.0	6.0	Measurement Threshold
DBSPI-0064	% of space used on user dump devi...	6.0	6.0	Measurement Threshold
DBSPI-0065	% of space used on sys dump devi...	6.0	6.0	Measurement Threshold

## Oracle DBSPI tools

DBSPI tools include stop/start monitoring tools, configuration and report-generating utilities, and troubleshooting aids. After specifying the user and password in the Database Configuration Manager tool, you can use several of the DBSPI tools to manage your cluster. The following tools are available:

- Check Connections—Checks the connections to the database instances on the selected managed node.
- Database Configuration Manager—Configures each database instance on managed nodes. It provides a dialog for entering necessary configuration information such as instance name/user name/password to set up database connection and access.
- Disable Graphs & Reports—Stops DBSPI data collections for OVO performance graphs and reports.
- Display Error File—Launches a window that displays the dbspierror file.
- Display Trace File—Displays the contents of the DBSPI trace file.
- Enable Graphs—Starts DBSPI data collections for graphing using OVO Reports and Graphs.
- Enable Reports—Starts DBSPI data collections for generating reports using OVO Reports and Graphs.
- Start/Stop Monitoring—Temporarily disables or enables metric data collections and alarm capabilities.
- Trace On/Trace Off—Toggles tracing on/off for troubleshooting purposes.
- Verify Deployment—Shows deployed files, versions, number of policies, defaults file, and performs a connection check.

Figure 3. DBSPI tools



## Oracle DBSPI graphs

OVOW can generate graphs, using DBSPI-collected data, for monitoring the performance of your Oracle9i RAC cluster. Predefined graphs include:

- Checkpoints
- Limits
- Calls
- Redo
- Sorts
- Rollbacks
- Sessions
- Tablespace
- Waits

## Oracle DBSPI reports

OVOW can generate reports, using the DBSPI-collected data. Predefined reports available from the Reports and Graphs area of the OVOW console include:

- Availability
- Instance size
- Tablespace size
- Segment size
- Workload and I/O
- Logons
- Transactions

Figure 4. Reports for Oracle

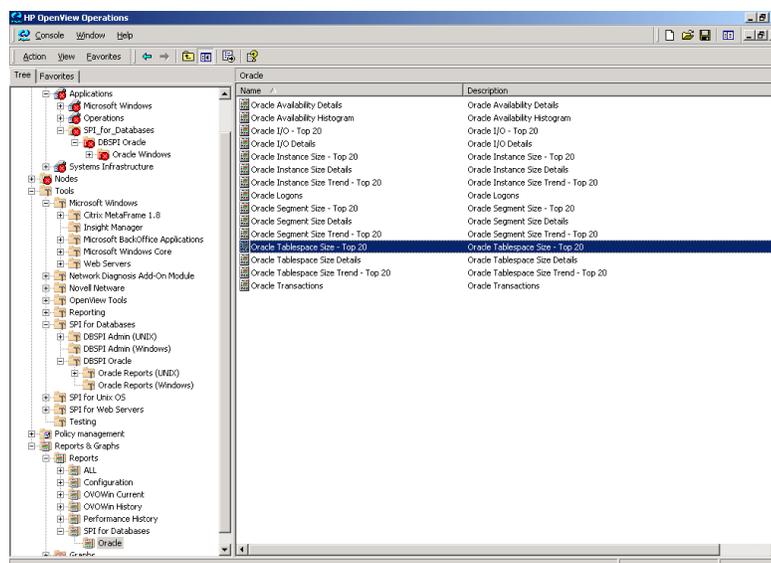
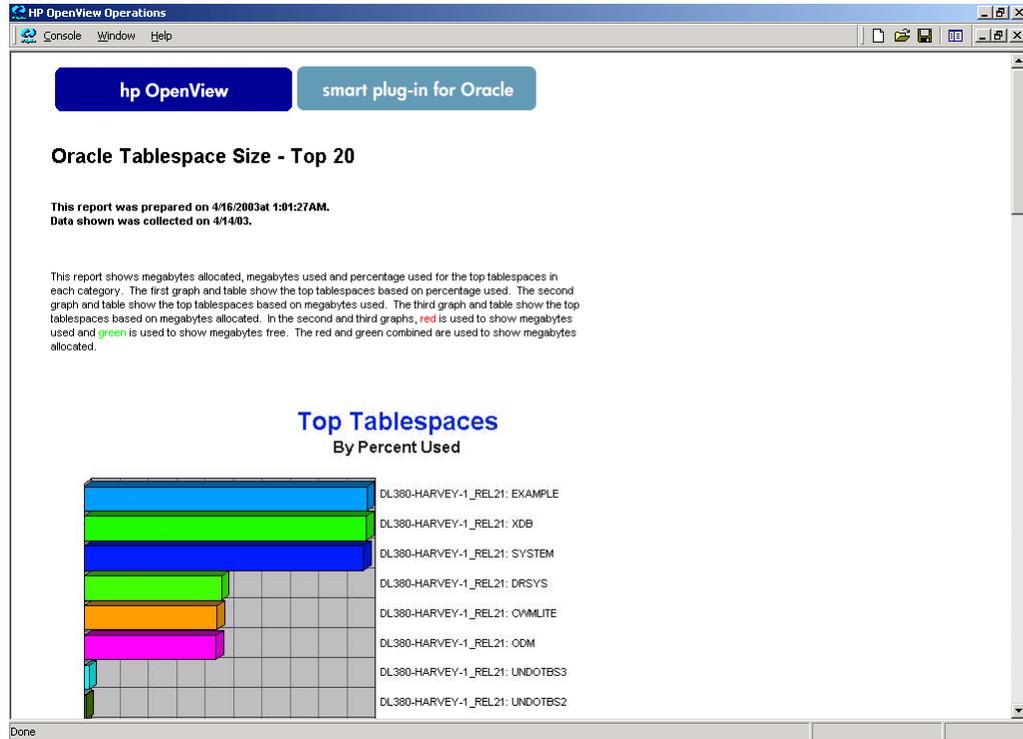


Figure 5. Oracle Tablespace Size report



## HP OpenView SAM

HP OpenView SAM is a software suite that enables you to centrally manage multivendor storage as a virtual pool of resources across distributed network storage environments. HP OpenView SAM allows you to effectively monitor and manage storage availability, performance, usage, and growth, helping you to gain control of your storage while optimizing resource utilization and cost. HP OpenView SAM 3.2 provides a capacity view of Oracle tablespaces, data files, log files, and dump spaces.

The HP OpenView SAM software suite consists of five components, enabling seamlessly integrated storage resource and infrastructure management:

- HP OpenView Storage Node Manager for device management
- HP OpenView Storage Builder for capacity management
- HP OpenView Storage Optimizer for performance management
- HP OpenView Storage Accountant for metering and billing
- HP OpenView Storage Allocator for access control and storage allocation

Each component functions either individually or together to enable integrated storage resource and infrastructure management. This highly flexible “building block” architecture and the out-of-the-box integration capabilities ensure rapid deployment and quick return on investment, while allowing an enterprise to address its most urgent management problems first.

# Using HP OpenView SAM to manage Oracle9i RAC clusters

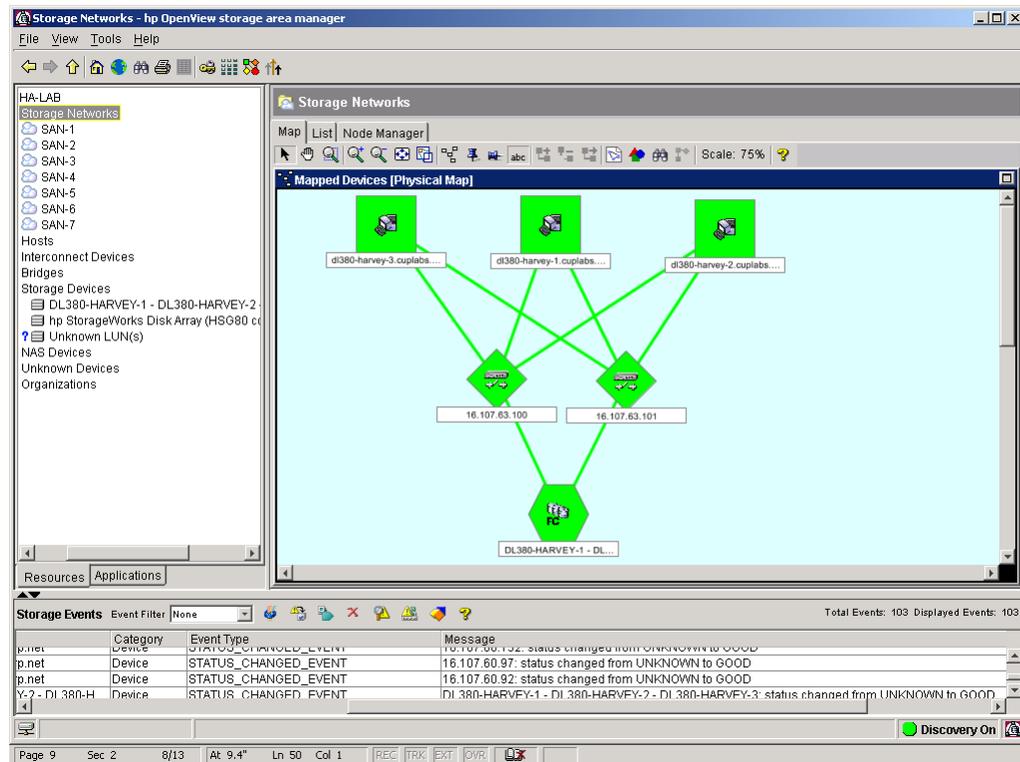
## Storage Node Manager

Storage Node Manager helps you understand, control, plan, and manage direct attached storage (DAS) and network attached storage (NAS) across the distributed enterprise. Storage Node Manager provides the central management console for HP OpenView SAM. It provides storage network status and event monitoring through an easy-to-read topology map that displays devices and their physical and redundant connections.

Storage Node Manager features include:

- Centralized single interface that can launch multivendor device management tools, monitoring, and troubleshooting
- Automatic discovery and mapping of NAS and DAS
- Easy-to-read topology map that displays devices and their connections
- Continuous status and event monitoring for proactive problem isolation through visible alerts and alarms that display storage system health

Figure 6. HP OpenView SAM device map of Oracle9i RAC cluster



## Storage Builder

Storage Builder provides comprehensive inventory management and lets you easily identify free or inefficiently used storage that you can reallocate to improve overall utilization. Automated capacity thresholds provide early warning of potential capacity shortfalls, enabling administrators to allocate additional storage before your business is affected.

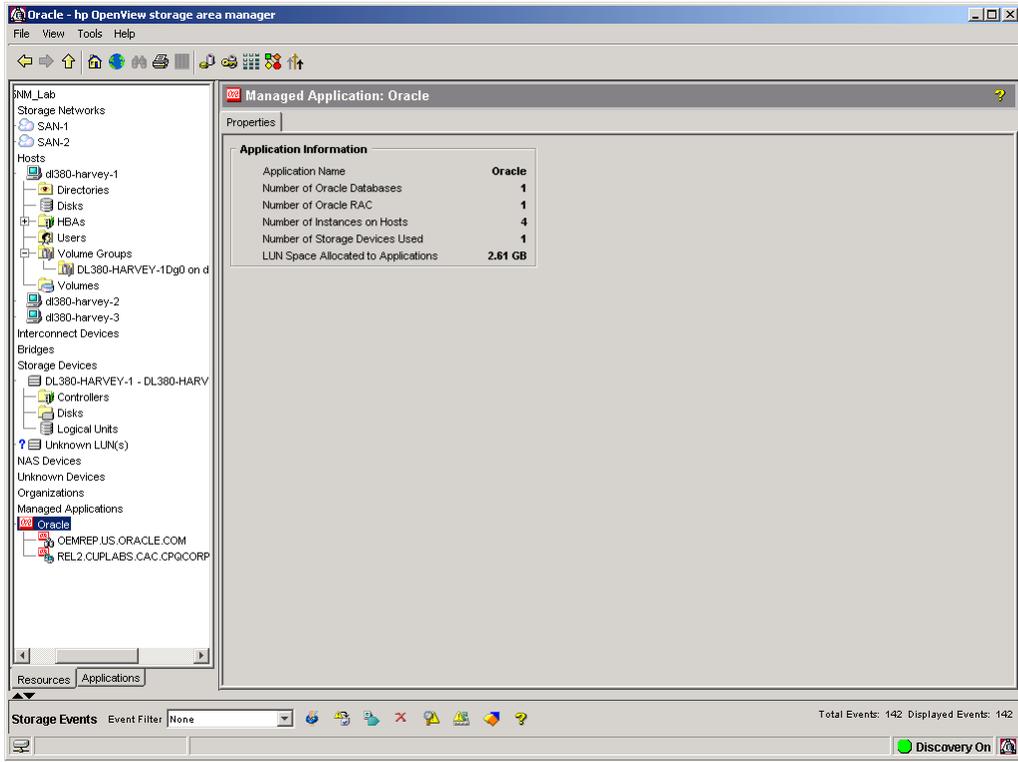
Storage Builder features include:

- Automated identification of junk and stale files for potential deletion or secondary storage to increase utilization rates of existing storage
- Automatic threshold warning and notification system to identify and isolate capacity shortfalls before they impact operations
- Historical planning and future extrapolations to predict storage growth

Storage Builder provides a view into the storage usage of Oracle 9i RAC. Application Management Plug-Ins running on each server in the cluster gather storage usage data that is sent to the HP OpenView SAM Management server and presented to the user in the Application View Capacity panels and reports. Storage Builder collects information about LUNs and volumes used by Oracle database tablespaces, datafiles, redo logs, and archive log destinations. The collected data includes Oracle instance properties such as instance state, archive mode, alert log size, and dump space used. This information is typically collected several times a day and can be saved for as long as it is needed provided there is space for the growing database. The capacity views provide a view of storage usage by Oracle 9i RAC including the used, free, and total storage capacity as well as historical information on capacity.

The Properties panel lists a summary of information about a selected root node.

Figure 7. Oracle Application Properties panel



The Map panel shows the Instances, Redo Logs, Archive Logs, and Tablespaces for the selected Oracle database. Users can click the plus signs to drill down into each object.

The following map shows a drill down into the database instances to find detailed information about each instance as well as information about the host where the instance is running. These map views show how the Oracle database is using storage across hosts and storage devices.

**Figure 8.** Oracle Instance map

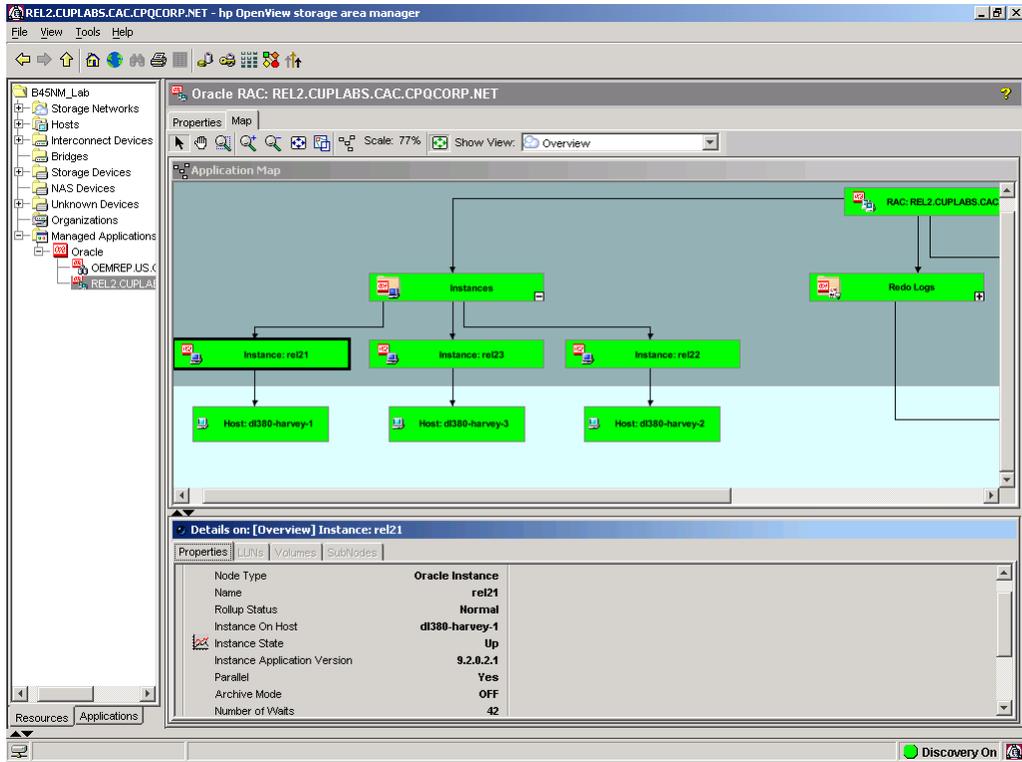
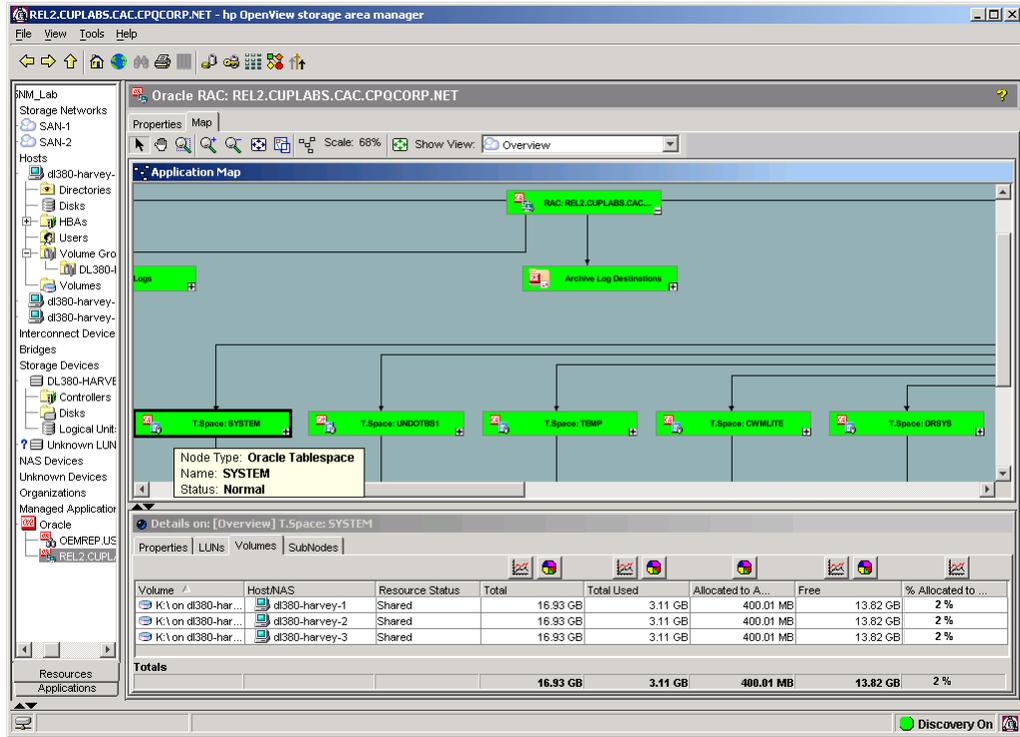
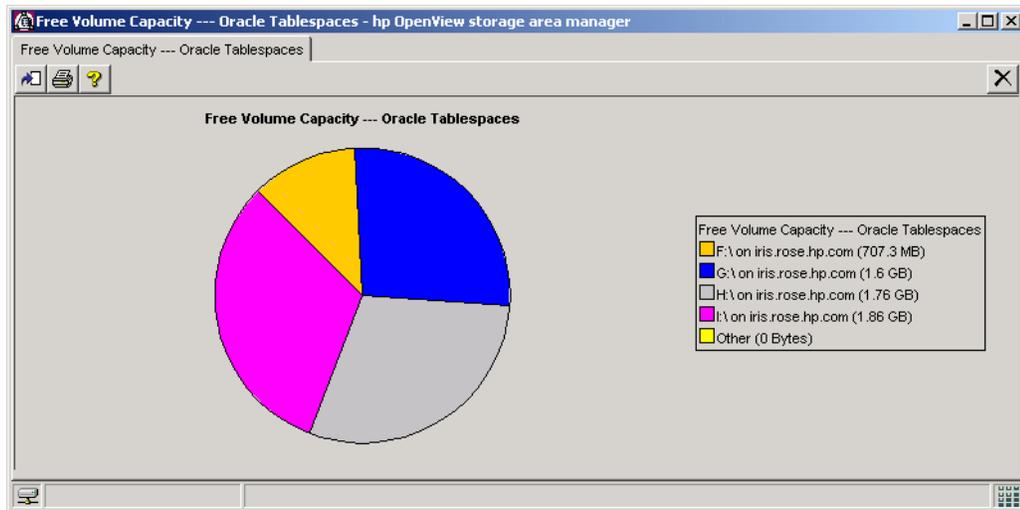


Figure 9. Oracle Tablespace map



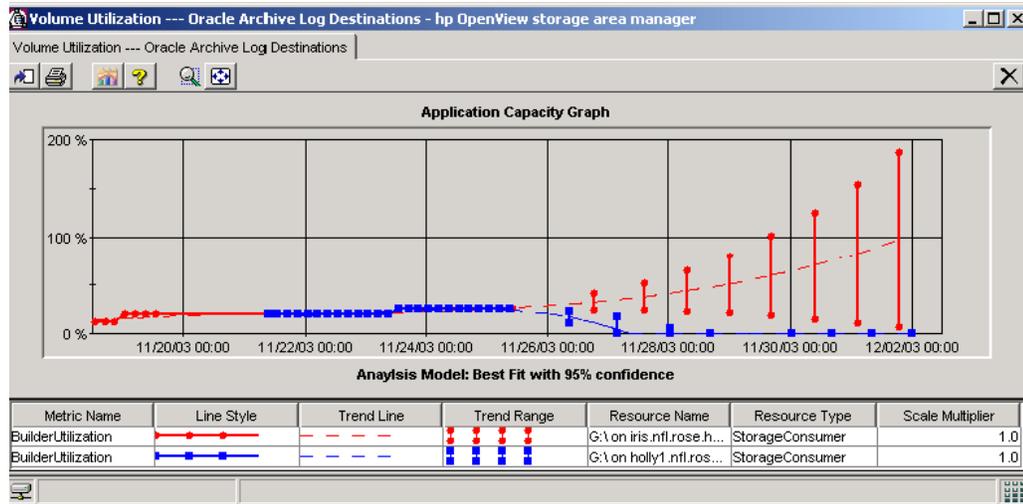
Detailed graphs and charts showing allocation of volumes can help users see how their storage is being used.

Figure 10. Oracle Tablespace: Free Volume Capacity



Trending charts show predicted usage of storage over time based on current growth rates. The following chart predicts the growth of archive logs over the next week. Charts can be easily customized to meet individual user requirements.

**Figure 11.** Oracle Archive Log trending chart



Storage Builder provides thresholding capabilities for Oracle including Domain and Resource Level Thresholds. Events are generated when thresholds are exceeded. Domain thresholds include:

- LUN consumption of each database
- LUN consumption of each group of redo logs
- LUN consumption of each group of tablespaces
- LUN consumption of each group of archive logs
- LUN consumption of each datafile in all databases

Resource thresholds include:

- LUN consumption of each redo log
- LUN consumption of each tablespace
- LUN consumption of each archive log
- LUN consumption of each datafile

### Storage Optimizer

Storage Optimizer enables performance monitoring and reporting for all storage components in the network. When storage systems fail to operate at optimal performance levels, data and application access may be slowed, resulting in an unsatisfied user community and lost revenue potential. The performance management capabilities in Storage Optimizer enable administrators to evaluate, monitor, and manage storage performance and help ensure optimum performance and data accessibility. The comprehensive baselining and over-baseline notification allow administrators to identify and isolate performance bottlenecks before they impact operations. Historical trending supports proactive planning for growth and maintenance.

Storage Optimizer features include:

- Historical planning and reporting to plan for future demands
- Baselining, automated threshold determination, and over-baseline notification to plan for upgrades and maintenance

### **Storage Accountant**

Storage Accountant provides a toolset to measure storage service usage for financial analysis, budgeting, and charge-back, which helps control storage costs and increase storage-associated revenues. Automated calculation of storage cost and billing makes it possible to charge for storage services provided, and the ability to differentiate storage service offerings helps to better meet customers' demands.

Storage Accountant features include:

- Automated usage metering, calculation of storage charges, and billing based on storage consumption and service usage
- Account and service level management, for example, alignment of service offering with tier-pricing
- CSV, HTML, and XML output to integrate with billing and financial applications
- Seamless adaptation to growing storage networks

### **Storage Allocator**

Storage Allocator provides a centralized, uniform mechanism with a drag-and-drop interface to dynamically add, remove, or assign multivendor storage to one or more hosts without system downtime. Storage Allocator allows multivendor storage to be treated as a virtual pool and assigned to any host, ensuring flexibility and increasing utilization rates. Centralized control ensures that only authorized hosts have access to assigned storage, ensuring data integrity and avoiding data loss.

Storage Allocator features:

- Enables users to visualize storage configurations and manage multivendor storage as a virtual pool
- Adds, removes, or reassigns storage without impacting operations
- Provides virtualized access control to ensure data integrity and authorized data access
- Broadly supports multivendor storage devices and operating systems
- Offers volume management to enable mapping of host utilization to LUN consumption

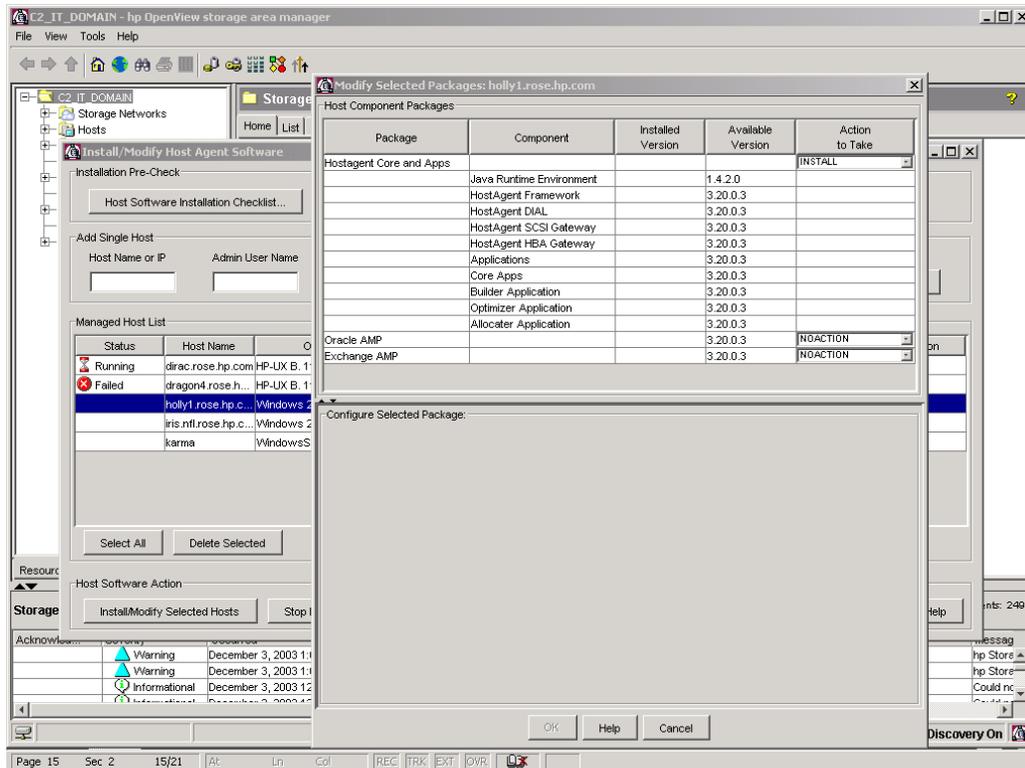
## **HP OpenView SAM Smart Plug-ins (SPI) for OVOW**

HP OpenView SAM integrates seamlessly with OVOW utilizing the HP OpenView SAM SPI to enable management of storage services as a fundamental component of the overall enterprise IT service delivery. Integration with OVOW extends the HP OpenView SAM support for centralized automated health monitoring and fault management, integrated storage service reporting, storage service mapping, and enhanced SLA management. In addition, the SPI allows integration into other HP OpenView products, such as HP OpenView Reporter and HP OpenView Service Desk.

## Configuring HP OpenView SAM to monitor an Oracle9i RAC cluster with an HP StorageWorks Modular Smart Array 1000 (MSA1000)

To configure HP OpenView SAM to monitor Oracle9i RAC clusters, follow the Storage Area Manager Installation guide. This guide leads you through the installation wizard that configures your database, adds licenses, and starts the Setup Assistant wizard. The Setup Assistant wizard helps you set the storage domain name, set the discovery range, and deploy the Host Agent software and Oracle AMP on all hosts in your cluster.

**Figure 12.** Install Host Agent and Oracle AMP on managed nodes



HP OpenView SAM uses SNMP to discover interconnect and storage devices. Since most of the data for the MSA1000 comes from the SNMP agents on the attached servers, you must include the IP addresses of all the cluster servers in the discovery range as well. Note that you must connect and configure IP addresses for your switches for your cluster to be mapped correctly. Several different hardware configurations exist for Oracle9i RAC clusters. Follow the instructions provided with your hardware to connect and configure IP addresses for your embedded or external switches. Storage Allocator is not yet supported for the MSA1000. Do not enable Storage Allocator for clusters using the MSA1000. The last step in the Setup Assistant wizard will start the device discovery. After the devices have been discovered, select **Configure** under **Tools** and select **Performance Data Collection** to set up data collection for your Oracle9i RAC storage devices and switches.

Figure 13. Configuring SNMP discovery range for HP OpenView SAM

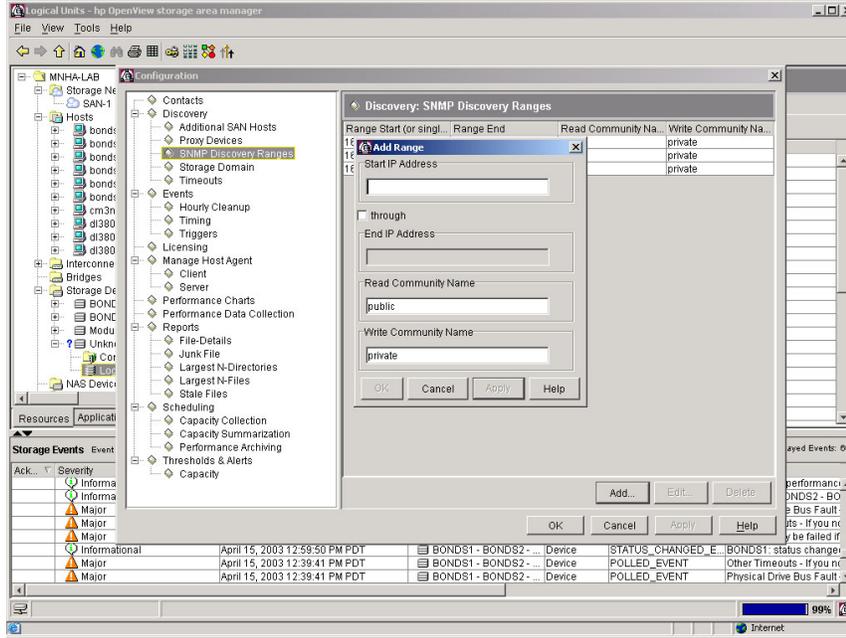
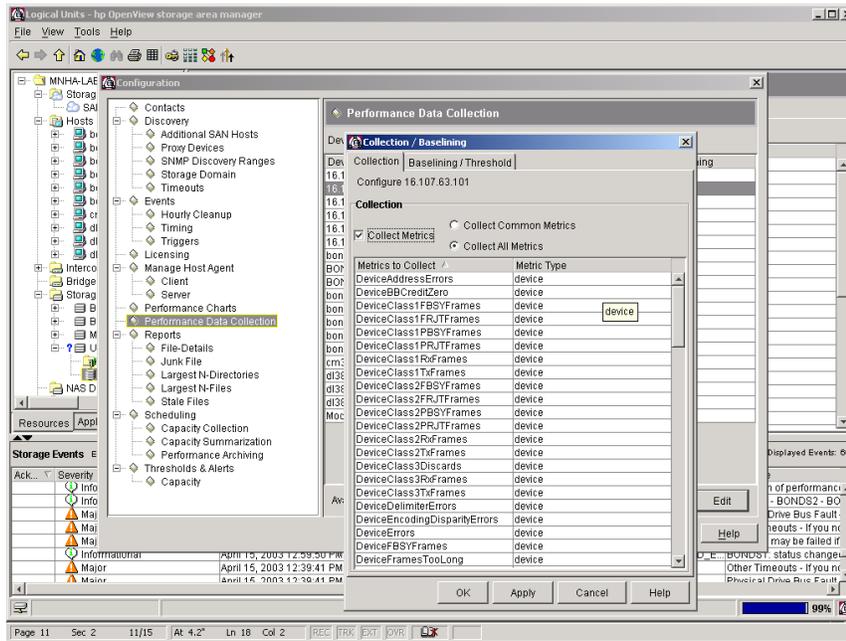


Figure 14. Configuring Performance Data Collection for HP OpenView SAM



For each host running Oracle, select **Tools>Configure>Managed Application Setup>Oracle** to configure the Oracle Managed application. Add the hosts and configure the Oracle database information. Verify that the connection to the database completes successfully. Configure the collection schedule for Oracle by selecting **Configure** under **Tools**. Under **Scheduling**, select **Managed Application Selection**. Click **Set Schedule** to configure the collection schedule for Oracle, and then click **Start Collection** to begin data collection.

Figure 15. Configuring Oracle on selected hosts

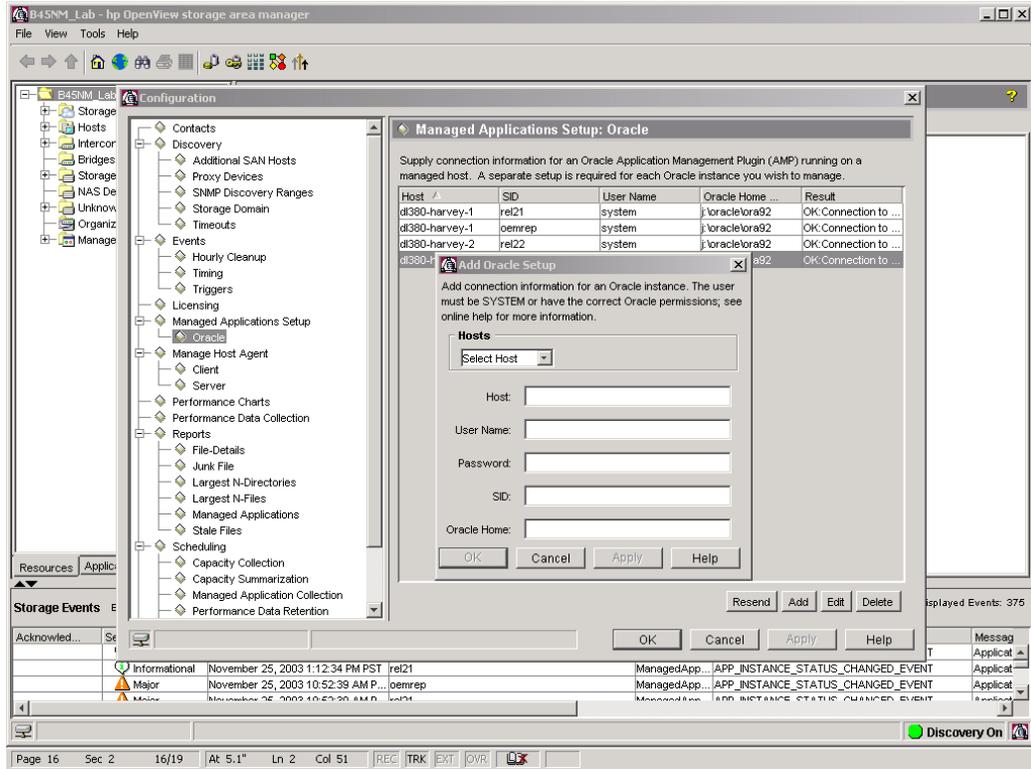
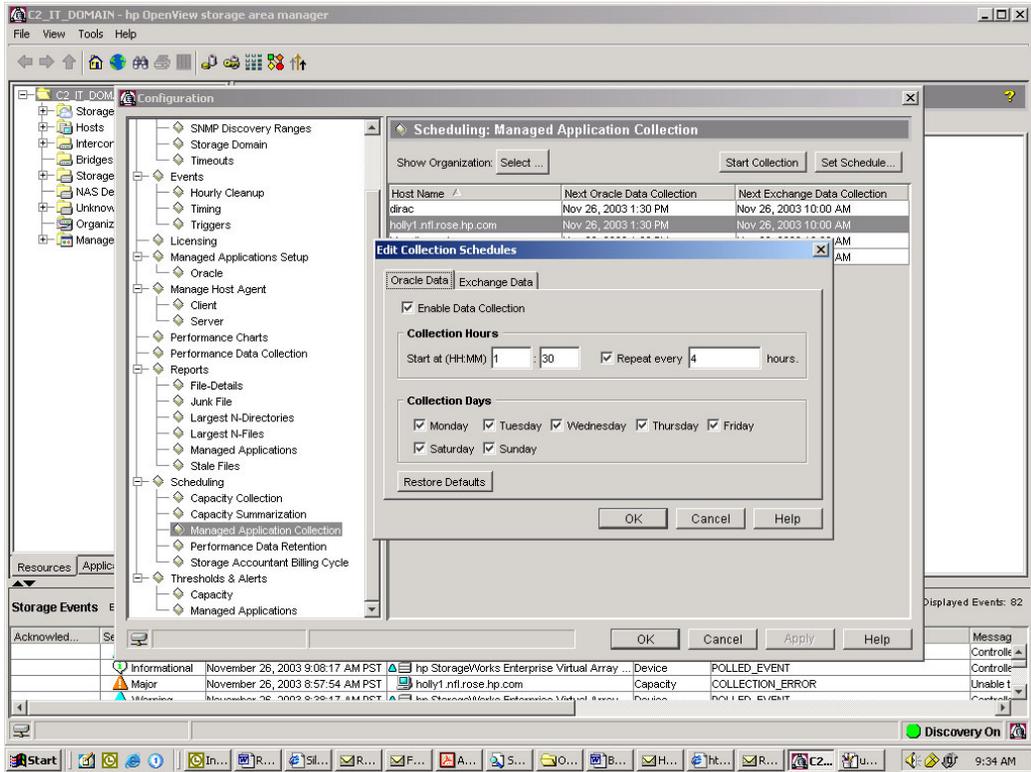
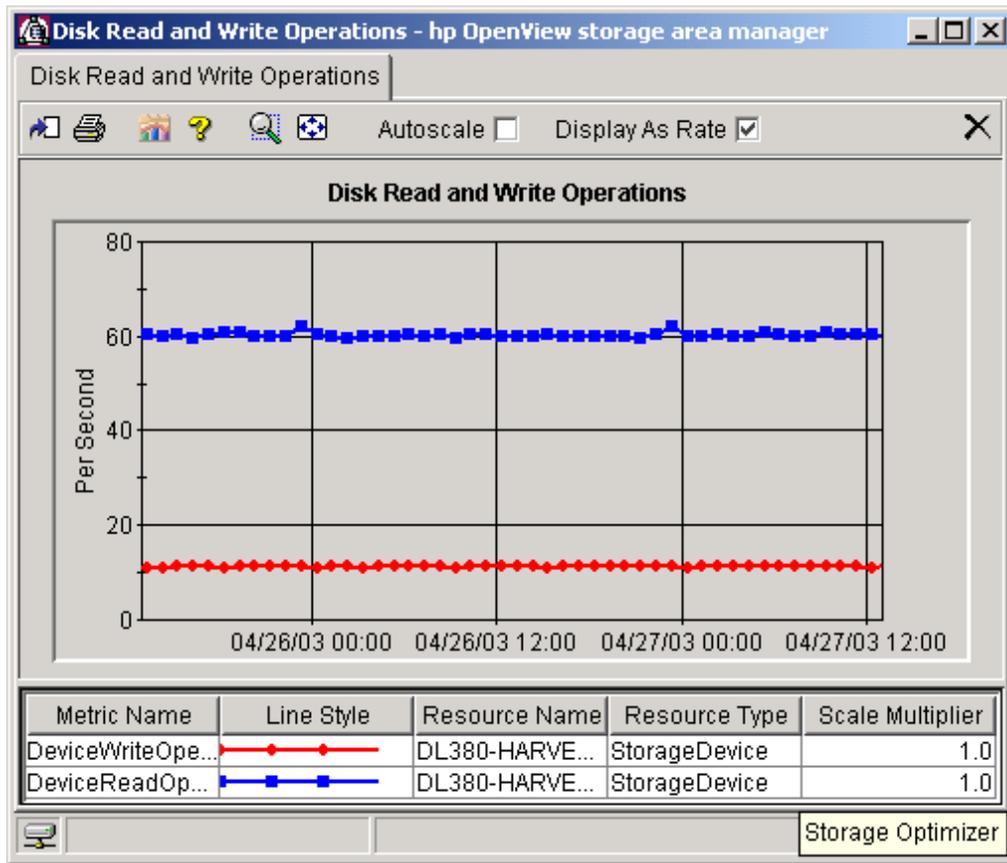


Figure 16. Configure collection schedule for Oracle



After the performance data collection occurs, you can use the predefined default performance charts or create your own charts to monitor your switches and storage. Predefined charts include read and write statistics and total operations. Devices support various metrics and any of the metrics collected can be used to create a custom chart. When designing your own chart, you can select the metrics and time period, and specify whether you want to chart using the baseline statistics or show historical trends.

**Figure 17.** Performance data for MSA1000



## Summary

Managing an Oracle9i RAC environment is a complex task. Many things can go wrong and the costs associated with these errors can be significant if left undetected. OVOW and HP OpenView SAM are powerful tools that can assist in the successful operation of an Oracle9i RAC environment. OVOW and HP OpenView SAM provide information about the reliability, performance, and predictability of Oracle9i RAC allowing administrators to minimize or prevent most conditions that might cause an error. OVOW can be used not only to detect errors but to automatically respond and take corrective actions and enhance the continuous availability of your Oracle9i RAC database.

## Glossary

**AMP:** Application Management Plug-in, used in conjunction with HP OpenView SAM to provide additional application information. AMPs for Oracle and MS Exchange are available.

**DBSPI:** Database Smart Plug-In, used in conjunction with OVOW.

**DPI:** Device Plug-In, used in conjunction with HP OpenView SAM to provide integration with disk arrays, interconnects, and tape libraries. DPIs are interim releases of support for new devices, which will be integrated into future releases of HP OpenView SAM.

**Insight Manager:** A management platform used to manage HP servers, clusters, desktops, workstations, and portables using Insight Management Agents. It monitors third-party devices instrumented with Simple Network Management Protocol (SNMP) or Distributed Management Interface (DMI).

**Insight Management Agents:** Agents running on HP ProLiant servers that provide status for subsystems on <https://<devicename>:2381>, the System Management Homepage.

**OVOW:** HP OpenView Operations for Windows

**OpenView SAM:** HP OpenView Storage Area Manager

**SPI:** Smart Plug-Ins are fully integrated, out-of-the-box solutions that extend the HP OpenView managed domain to include industry-leading business, database, Internet, e-commerce, and management applications.

## For more information

HP OpenView homepage:

<http://www.openview.hp.com/>

HP OpenView Operations for Windows homepage:

<http://www.openview.hp.com/products/ovowin/index.html>

HP OpenView Operations for Windows Smart Plug-ins homepage:

<http://www.openview.hp.com/products/spi/index.html>

HP OpenView Storage Area Manager homepage:

<http://h18006.www1.hp.com/products/storage/software/sam/index.html>

HP OpenView Device Plug-ins (DPis):

<http://www.openview.hp.com/products/dpi/index.html>

© 2004 Hewlett-Packard Development Company, L.P. The information contained herein is subject to change without notice. The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

Microsoft and Windows are U.S. registered trademarks of Microsoft Corporation. UNIX is a registered trademark of The Open Group.

5982-6299EN, 05/2004

