

Sun StorageTek™ Business Analytics Concepts and Planning Guide

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Preface

Sun StorageTek Business Analytics software enables you to visualize and manage multi-vendor, multi-site storage environments. From one central location, you can discover storage assets, track storage utilization, recover lost capacity, and verify that data is protected, thereby reducing storage costs and improving operational efficiency.

The *Sun StorageTek Business Analytics Concepts and Planning Guide* helps customers to plan for their unqiue implementation of Sun StorageTek Business Analytics.

Typographic Conventions

Typeface*	Meaning	Examples
`AaBbCc123`	The names of commands, files, and directories; on-screen computer output.	Edit your `.login` file. Use `ls -a` to list all files. `% You have mail.`
`AaBbCc123`	What you type, when contrasted with on-screen computer output.	`% su` `Password:`
AaBbCc123	Book titles, new words or terms, words to be emphasized. Replace command-line variables with real names or values.	Read Chapter 6 in the *User's Guide*. These are called *class* options. You *must* be superuser to do this. To delete a file, type `rm` *filename*.

* The settings on your browser might differ from these settings.

Related Documentation

The documents listed as online are available at:

`http://www.sun.com/products/storage`

Application	Title	Part Number	Format	Location
Installation of the main product	*Sun StorageTek Business Analytics Installation Guide*	819-7181-10	Printed PDF HTML	Shipping kit Online
	Sun StorageTek Business Analytics Getting Started Guide	819-7190-10	Printed PDF HTML	Shipping kit Online
Use of the Management Console administrative menu	*Sun StorageTek Business Analytics Administration Guide*	819-7183-10	Printed PDF HTML	Shipping kit Online
Late-breaking information not included in the information set	*Sun StorageTek Business Analytics Release Notes*	819-7203-10	PDF HTML	Online
Use of standard reports and reporting wizards	*Sun StorageTek Business Analytics Management Console User's Guide*	819-7209-10	PDF HTML	Online
Use of the database tables	*Sun StorageTek Business Analytics Application Developer's Guide*	819-7182-10	PDF HTML	Online
Installation of agents	*Sun StorageTek Business Analytics Array Agents Installation Guide*	819-7184-10	PDF HTML	Online
	Sun StorageTek Business Analytics Backup Agents Installation Guide	819-7185-10	PDF HTML	Online
	Sun StorageTek Business Analytics Library Agents Installation Guide	819-7186-10	PDF HTML	Online
	Sun StorageTek Business Analytics Database Agent Installation Guide	819-7187-10	PDF HTML	Online
	Sun StorageTek Business Analytics Host Agent Installation Guide	819-7189-10	PDF HTML	Online
	Sun StorageTek Business Analytics Remote Host Agent Installation Guide	819-7201-10	PDF HTML	Online
	Sun StorageTek Business Analytics Fabric Agent Installation Guide	819-7205-10	PDF HTML	Online

Application	Title	Part Number	Format	Location
	Sun StorageTek Business Analytics NAS Agent Installation Guide	819-7206-10	PDF HTML	Online
	Sun StorageTek Business Analytics Host Statistics Agent Installation Guide	819-7207-10	PDF HTML	Online
	Sun StorageTek Business Analytics SRM Agent Installation Guide	819-7208-10	PDF HTML	Online
	Sun StorageTek Business Analytics Host and SRM Agent Release Note for Self Extracting Agent Install CD	819-7204-10	PDF HTML	Online

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Please include the title and part number of your document with your feedback:

Sun StorageTek Business Analytics Concepts and Planning Guide, part number 819-7188-10

Introduction to Concepts and Planning

The Sun StorageTek Business Analytics software enables companies to easily visualize and manage multi-vendor, multi-site storage environments from a central location. With Sun StorageTek Business Analytics, IT staff can discover storage assets, track storage utilization, recover lost capacity, and verify that data is protected. Comprehensive business analytics enable large organizations to drive storage costs down, drive operational efficiency up, and simplify backup management.

Note – Sun StorageTek Business Analytics was formerly called Global Storage Manager (GSM).

The *Sun StorageTek Business Analytics Concepts and Planning Guide* is organized as follows:

- Sun StorageTek Business Analytics Concepts
- Preparation and Planning for a Sun StorageTek Business Analytics Installation
- Sun StorageTek Business Analytics Installation and Implementation
- Sun StorageTek Business Analytics Post-Deployment

For concepts, the following sections introduce the Sun StorageTek Business Analytics software architecture and provide a high level explanation of important Sun StorageTek Business Analytics software components.

Software Architecture

FIGURE 1 illustrates the Sun StorageTek Business Analytics software architecture and is followed by brief descriptions of its major components.

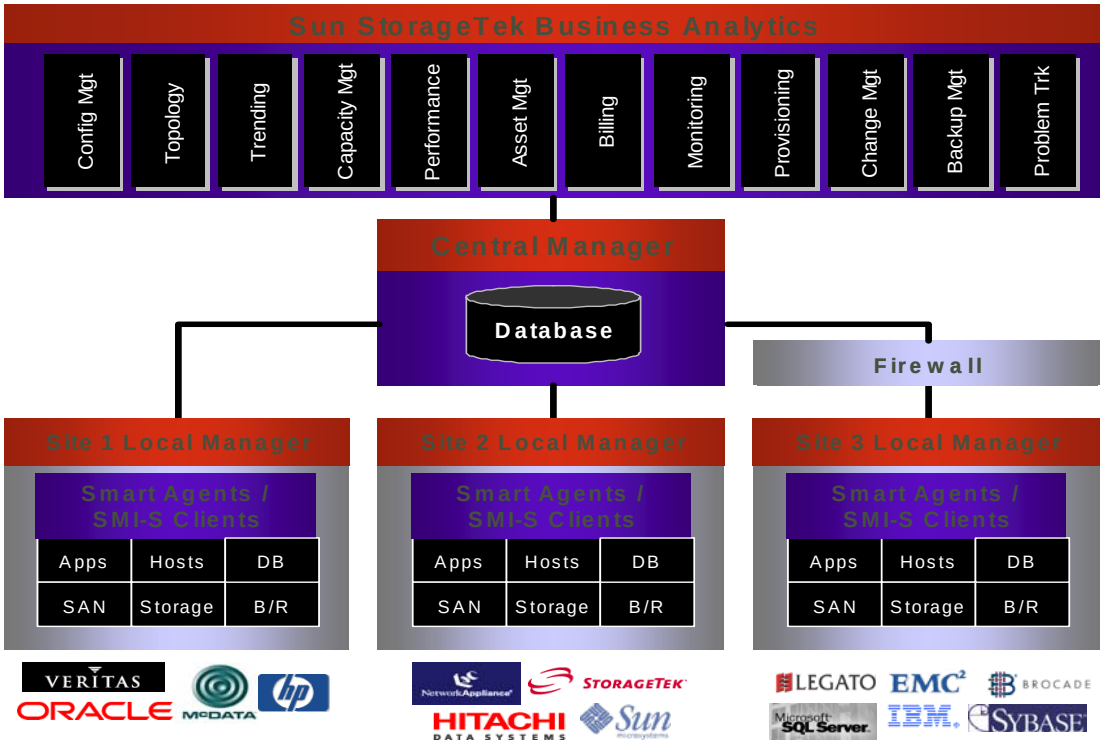


FIGURE 1 Software Architecture

Sun StorageTek Business Analytics Components

The Sun StorageTek Business Analytics software components include the Management Console, the Central Manager, Local Managers, and Smart Agents/SMI-S Clients.

Management Console

The Sun StorageTek Business Analytics includes the powerful management application, the Management Console. The Management Console is a browser-based application that provides access to management information to users throughout the enterprise. It offers a wide range of views into the data stored on the Central Manager and offers drill-down capability, enabling the user to access everything from the broadest enterprise view to the lowest level of detail necessary.

Role-based views automatically filter the data to correspond to the user's particular role or task. For example, a CIO typically views the entire enterprise while the email administrator sees only the resources associated with that application. All reports start at the highest level the user has access to and then allow the user to drill down to the details. The CIO, for example, can start by viewing the entire storage infrastructure but then may drill down to sites, individual storage devices, and even Logical Unit Numbers (LUNs) on any device.

Managers can use the Management Console to analyze service level compliance, plan capacity, track charge-back costs, and allocate resources. It also provides easy access to a wealth of reports, eliminating the need for IT to manually generate reports.

Sun StorageTek Business Analytics Reporting Concepts

TABLE 1explains some important concepts related to how you design your reporting structure.

TABLE 1 Business Analytics Reporting Concepts

Concept	Description
User ID	A Management Console user account. The User ID is assigned one or more views. Each view filters the data that appears in Business Analytics reports to correspond to the assets (site, array, NAS, fabric, server, backup, library) assigned to that view. Additional administrative rights for the user account are used to turn on/off access to certain Management Console menu selections (e.g., Provisioning pull down menu).
View	A view is a collection of assets or views. Report security is controlled by what view is currently selected by a user. A Business Analytics report is what is generated when you select a menu item, such as Connection Exception or Capacity Allocation, in the Management Console application.
Dashboard	A dashboard (also called customizable home page) consists of a user-selectable set of panes. Its primary purpose is to provide high-level information on a specific asset (e.g., fabric switch) or application (e.g., Tivoli Storage Manager) over a specified interval (e.g., past twenty-four hours). The data is refreshed by a database batch job every four hours by default. An administrative user can manually refresh the data in the panes using the "Refresh Homepage Cache window accessed under Database Administration.
Site	A site is a location with storage and server equipment that has one or more Local Managers installed and collecting data. A new site is defined in Sun StorageTek Business Analytics using the Add New Site screen, accessed using the Tools selection of the Management Console. Each site must contain a minimum of one (1) Local Manager. In the Management Console reports (e.g., Detailed Host Configuration and Utilization), reporting of fabrics, hosts, and arrays that span multiple sites is not currently supported.
Asset	Assets include sites, arrays, hosts, backup clients and policies, NAS devices, NAS filesystem, tape library, and database. Assets are assigned to asset views.

TABLE 1 Business Analytics Reporting Concepts *(Continued)*

Concept	Description
Central Manager	Through the Aggregator and Local Managers, the Central Manager handles messaging, data aggregation, correlation, and the application engines. It collects vital information on day-to-day operations, monitors events, initiates automated responses, and notifies staff of unusual conditions.
Local Manager	The Local Manager serves as a local aggregation point for a single site. This allows all data for a given site to be accessed through a single TCP port. Once the Local Manager software has been installed, the administrator uses the Management Console's Add New Site screen to add it to the configuration.
Routing Agent	The Routing Agent runs on all Local Managers and performs several key functions in the overall Sun StorageTek Business Analytics implementation. First, the Routing Agents serve as the messaging infrastructure by which all data gets passed from Smart Agents to the Data Aggregator, which in turns inserts the data into the database. The Central Manager Routing Agent serves as the top-level Routing Agent in the messaging infrastructure. Second, the Routing Agent provides a basic way to correlate or group agents/assets. Each Routing Agent is configured with a unique Routing ID that gets pre-pended to all data being collected from the environment. By using this Routing ID, the application can determine which Routing Agent provided all collected agent data. These Routing IDs can be grouped (1 or more) together to create sites in the application.
Site	A site is a location with storage and server equipment that has one or more Local Managers installed and collecting data. A new site is defined in Sun StorageTek Business Analytics using the Add New Site screen, accessed using the Tools selection of the Management Console. Each site must contain a minimum of one (1) Local Manager. In the Management Console reports (e.g., Detailed Host Configuration and Utilization), reporting of fabrics, hosts, and arrays that span multiple sites is not currently supported.
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Dashboards

Sun StorageTek Business Analytics supports a customizable Home Page (or personalized dashboards). The Management Console Home Page is displayed after you successfully log in. The dashboard panes provide high-level information on a specific asset or application, as described below.

- **Host Filesystem Utilization** - This pane allows you to quickly identify hosts with the least amount of available storage capacity for file systems.
- **Database Management -** This pane summarizes how your databases are consuming storage.
- **Storage Capacity Allocation Overview –** This pane shows storage that has been allocated to SAN-connected host servers.
- **NAS Device Overview –** This pane shows summary-level information on the utilization of storage resources on NAS devices.

- **Backup Status Summary –** This pane allows you to quickly identify unsuccessful backups for the listed NetBackup or Legato backup clients in the last twenty-four hours.
- **Tape Library Overview** – This pane shows to what extent your tape library resources are being utilized.
- **Fabric Switch Utilization** – This pane summarizes the utilization of your fabric switches.
- **TSM Summary Report** – This pane allows you to quickly identify the status of TSM backup events.
- **NAS Filesystem Overview** – This pane displays summary information on utilization of NAS file systems over the past twenty-four hours.

Be aware that:

- Dashboard security is set to private or public. Public means any user can choose to use the dashboard, whereas private restricts its use to only the user who created it.
- Until you create and assign a dashboard to a user, their Management Console Home Page is empty when that user logs into the Management Console application.
- A default dashboard can be assigned to a user when that user is added to the Sun StorageTek Business Analytics application using the Management Console's Users Wizard.
- The administrator can manually refresh the data in the dashboard panes by using the "Refresh Homepage Cache" menu, which is accessed through the Tools-> Database Administration pull down menus.

Views

Users are assigned one or multiple views. Some general characteristics are described as follows:

- There are two view types: Asset View and Composite View.
- An Asset View is assigned any number of monitored assets, such as servers, arrays, switches, NAS devices, databases, and tape libraries.
- An asset can be added to multiple views.
- A site is also considered an asset, and it provides visualization of all the resources (arrays, fabrics, servers, etc.) collected by the Local Managers assigned to that site.
- A Composite View is comprised of one or more Asset views.
- A default view can be assigned to a user when that user is added to the Sun StorageTek Business Analytics application using the Users Wizard.

Use Case

Consider the following simple implementation:

- There are three sites: NYSITE, CASITE, TXSITE.
- There are three arrays: EMCSYMM, LSIARRAY, and CLARARRAY.
- There are six servers: WIN01, WIN02, WIN03, SUN01, SUN02, SUN03
- There are two fabric switches: broc01, cisco01
- There are two database instances: DEPT1SAP and DEPT2PeopleSoft

The following types of views can be defined:

- Enterprise: Asset View: NYSITE, CASITE, TXSITE (making all assets within the Sun StorageTek Business Analytics deployment visible to the assigned user)
- WINSERVER: Asset View: WIN01, WIN02, WIN03
- SUNSERVER: Asset View: SUN01, SUN02, SU03
- Monthly_Maintenance: Composite View: WINSERVER, SUNSERVER
- SAP: Asset View: DEPT1SAP, cisco01, SUN03
- PeopleSoft: Asset View: DEPT2PeopleSoft, cisco01, SUN01
- Legal: Asset View: EMCSYMM, SUN01, broc01
- Marketing: Asset View: LSIARRAY, CLARARRAY, WIN02, WIN03, SUN01, SUN02
- App_Maintenance: Composite View: Legal, Marketing

The above examples are for illustrative purposes only; they do not constitute all the views possible.

Important Notes

After you have added all the sites to the Sun StorageTek Business Analytics application, it is recommended that you create an *enterprise-level view* that has the following characteristics:

- Contains all the sites in your entire Sun StorageTek Business Analytics application.
- Is an Asset View (not Composite View).
- Is assigned to the overall administrator(s) at your company.

The Management Console's **Site/Local Manager Administration** menus allow you to add all of your sites.

Users

Sun StorageTek Business Analytics provides a default user account, gsmuser. The Management Console's User Wizard allows additional users to be added to the application. To access the Management Console, you must have a valid user account. When you create users, you specify their user name and password to allow logging in to the Management Console application. You also specify what access to the **Tools** administrative menus will be provided. The Users Wizard provides several administrative rights that control what access to Tools, Workflow, and Backup/Library menu selections will be provided a user. It is recommended that you read the User Administration section of the *Administration* chapter to learn more about these administrative rights.

Using the Management Console, users generate reports on their monitored servers, storage arrays, fabrics, backup infrastructure, databases, and tape libraries. Report security is enforced according to the user's view. As previously described, each user should have a dashboard that appears on the home page.

Sample IT Infrastructure

The Sun StorageTek Business Analytics architecture is extremely flexible and allows the site administration to model just about any organization. To illustrate some important concepts related to a sample reporting structure, consider the company IT infrastructure depicted below.

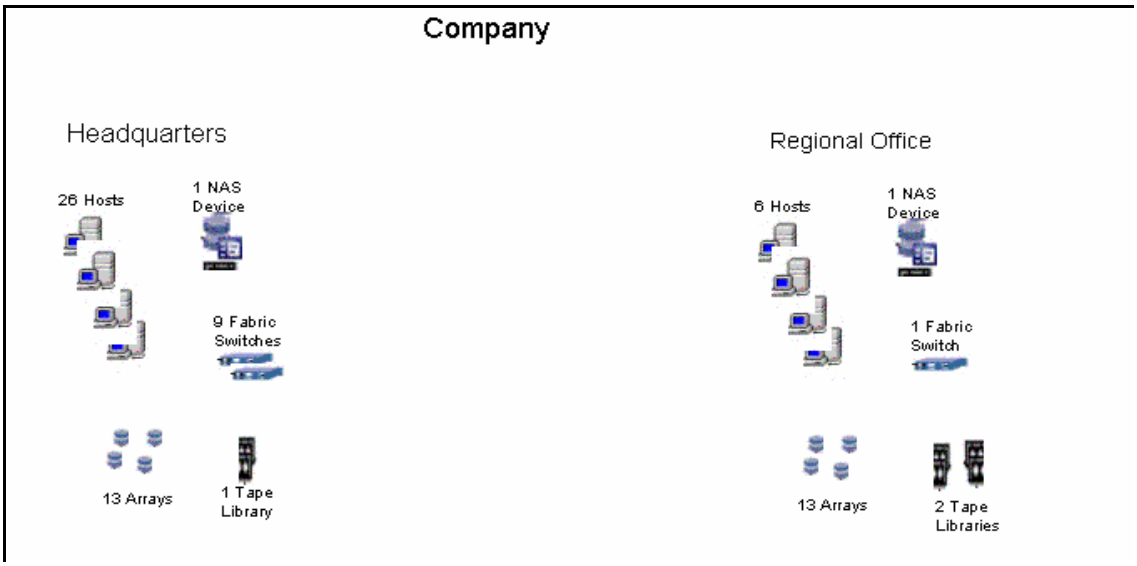


FIGURE 2 Company IT Infrastructure

Creating the Reporting Structure

Refer to the Administration manual for the details involved in each of the following steps. Refer to the definitions in TABLE 1 if any task confuses you.

1. When the Sun StorageTek Business Analytics software is first installed, rename the "Default Site" to Headquarters.
2. After the Local Manager and Smart Agents have been installed and configured, create the Regional Office site. Assign the Local Manager to that site.
3. Create your dashboards using Dashboard Administration:
   - You might create an *All Panes* dashboard that includes all the panes.
   - You may create application dashboards, such as a *TSM* dashboard assigned only the TSM Backup Product and Tape Library panes.
   - You may dashboards for administrators whose responsibilities are focused on specific assets, such arrays, fabric devices, or servers.
4. Create your views.
   - For the company's *Storage Admin* and *Backup Admin*, you might create an *All Assets* view, whose assets consists of the *Headquarters* and *Regional Office* sites.
   - For the IT Group, you might create a *UNIX* view whose assets are the UNIX servers and a *Windows* view whose assets are the Windows 2000/2003 servers at Headquarters.
5. Create your users, such as *Storage Admin*, *Backup Admin*, and *IT Director*. As you create each user (User ID), assign that user the appropriate default dashboard, default view, and additional administrative rights.

Time Zone Implementation in Business Analytics

It is a fundamental assumption of Sun StorageTek Business Analytics that the application will report on assets that are located in multiple time zones. In order to "normalize" input from applications and devices around the world, reports generally present the information to the user in their equivalent GMT time. For example, parts of Australia are on GMT Time plus 10 hours. That means that data collected at 6:00AM on May 13 would be presented on as 8:00 PM on May 12 report in Sun StorageTek Business Analytics. Examples of reports presenting information in GMT time are:

- Asset, Storage, Fabrics, Servers, and Databases menu options.

- Tape Library reports.
- Scheduled reports assume that the time entered is GMT time.

There are some exceptions to this rule, as defined below:

- Data polling and policy alerting schedules are defined in Central Manager local time. For example, if you define a schedule to collect Host Configuration data at 4:00AM each morning, that data collection will be launched when the system clock on the Central Manager machine reads 4:00AM. The collection is launched at this time, even if a host is physically located in a different time zone.
- Backup job reports are in the local time on the client being backed up. This includes the Job Report and Backup Success wizards, Backup/Restore Job Summary, Backup Exceptions, Backup Exposure, and Real Time Events reports.
- Backup server reports are in the local time of the Backup Server. This includes the Media Report wizard, Media Trending, Backup Schedules, and Meta Database Capacity

Network Time Protocol and Sun StorageTek Business Analytics

While using NTP to ensure time is synchronized on all servers running Sun StorageTek Business Analytics software is a good practice, running NTP is by no means necessary for Sun StorageTek Business Analytics to work properly and is not required to understand reports.

Although Sun StorageTek Business Analytics collects data at specific points in time, the collection of data is not simultaneous because of factors such as data load, data caching, available threads and network latency/speed. In addition, the Data Aggregator functionality includes a field, agg_gmt_timestamp, which ensures that there is a common time context for each collection. This common time context is independent of the actual time at the source agent's host.

NTP should not affect the data collection itself in any way unless the Scheduler Agent host's system clock suffers from extreme drift due to a hardware problem and the NTP server is constantly adjusting the time by more than a second. In such an unusual case, an occasional collection may get skipped.

To summarize, Sun StorageTek Business Analytics can deal with hosts that are not synchronized with regards to time.

Central Manager

The Central Manager includes the data repository (assurent database). This standard MS SQL Server database stores configuration, performance, usage, and operational data in a central repository. This enables the administrator to perform in-depth reporting and historical trending, which is essential for tasks such as capacity planning.

Besides the Routing Agent, the Central Manager agents are briefly described as follows:

- **Scheduler Agent -** The Scheduler Agent works with the Data Polling Agent to support the polling schedule (agent data collection) and policy-based management (policy alerting) functionality of Sun StorageTek Business Analytics. These actions can be configured with a start date and time and frequency. The frequency can be specified (Collect Now) as once or on a recurring basis (e.g., every four hours).
- **Data Polling Agent -** The Data Polling Agent retrieves polling schedules related to agent data collection upon initialization and validates polling schedules before they are saved to the Sun StorageTek Business Analytics database. It interacts with the Scheduler Agent to set and retrieve data polling schedules. The Data Polling Agent itself does not handle the persistence of data polling schedules; these are stored in the Sun StorageTek Business Analytics portal database.
- **Data Aggregator Agent –** The Data Aggregator Agent is responsible for initiating and handling the collection of agent data. Within the messaging infrastructure, the Data Aggregator interacts only with the Central Manager's Routing Agent. The Data Aggregator can be configured to update a single or multiple Sun StorageTek Business Analytics databases.

  The Data Aggregator uses a default timeout of 1200 seconds to collect the agent data that it has requested. The Management Console's **Polling Schedule** menu allows you to adjust the data collection timeouts without editing the database.
- **Policy Agent** – The Policy Agent works in conjunction with the **Policy Alerting** functionality of the Management Console to check and enforce threshold-based policies, such as "send an email to designated recipients when a file system is becoming full".
- **License Agent** – The License Agent provides the mechanism for implementing the License Report. This Management Console report allows the customer to see their license details and determine their compliance (e.g., number of agents licensed and number of agents currently in use). The License Agent uses an ODBC System DSN to communicate with the Sun StorageTek Business Analytics databases.

Aggregator Data Collection and Memory Utilization

The Central Manager's Aggregator has been enhanced as follows to minimize memory utilization during agent data collection:

- **All Sites** – When the Aggregator receives an "All Sites" collection of an object, it collects one Local Manager (rid) at a time.
- **Collecting Objects on Agent-by-Agent Basis** – A list of data obejcts can be configured to be handled by the Aggregatoron an agent-by-agent basis. This special modeis designed to collect objects using a minimum of memory.

To illustrate "All Sites" data collection, consider the following deployment:

- **Central Manager** – Includes the Aggregator, the data repository (assurent database), Routing Agent (rid=300), and an array agent registered to the Central Manager.
- **Local Manager** - Includes Routing Agent (rid=301) and an array agent registered to the Local Manager.

In this messaging and aggregation infrastructure, assume that each array agent publishes one thousand rows for a particular object. If an "All Sites" collection is requested, the Aggregator handles a maximum of one thousand rows for that array object becuase the Aggregator collects one Local Manager (rid) at a time. It should be noted that adding a Local Manager can minimize the virtual memory utilized by the Central Manager Routing Agent, Local Manager Routing Agent, and Aggregator.

Sun Microsystems recommends that "data collection of objects using a minimum of memory" is used only after (a) the Central Manager Routing Agent, Local Manager Routing Agents, or the Aggregator have previously reached the virtual memory limit of a 32-bit application and (b) all other measures to alleviate the problem have been exhausted. It should not be used in normal messaging and data aggregation infrastructures as the Aggregator is not being efficiently utilized and, therefore, its performance will suffer. Your support representative will instruct you on how to configure "collecting objects on an agent-by-agent basis" if this special agent data collection is necessary at your implementaton.

Sun StorageTek Business Analytics Central Manager Databases

During Sun StorageTek Business Analytics Central Manager installation, the Database Setup creates two databases, schemas, and stored procedures:

- **assurent database** – Stores all the data collected from the deployed Sun StorageTek Business Analytics agents and reported using the Management Console.
- **portal database** – Stores user information as well as data polling schedules.

It is highly recommended that the SQL Data, Log, and tempdb database files/devices for these databases reside on distinct, high performance disk file systems/devices. In addition, we require installing Sun StorageTek Business Analytics on a stand-alone instance of SQL Server.

Sun StorageTek Business Analytics Smart Agents

Sun StorageTek Business Analytics Smart Agents run on platforms, dedicated or used for other tasks, attached to the storage infrastructure. Residing at each storage site, smart agents are based on standards (FibreAlliance MIB, SNIA HBA API, SNMP and CIM) whenever available. The platforms are identified in the Sun StorageTek Business Analytics Support Matrix, located on your Documentation CD.

The Sun StorageTek Business Analytics data collectors are specifically engineered to generate very low overhead as well as simplify support for new devices. Designed to be passive, they do not take action until and unless they are commanded to do so by the Central Manager. This pull approach keeps overhead low. The agents themselves don't need to contain any knowledge about the application — they simply respond to requests for information.

- **Agent Types** – The data collectors (i.e., Sun StorageTek Business Analytics Smart Agents) can be classified according to the type of data collected.
- **Host** – Host agents, smart agents for the servers themselves, access storage utilization and configuration data as well as HBA information. Host agents enable administrators to measure actual storage usage rather than simply allocation. Through the collection of configuration data, host agents also make it easy to determine, for instance, where a vendor patch must be applied. In addition, they

allow administrators to map hosts across the two different networks on which they reside (the storage network and the Ethernet network) by correlating the Worldwide Node Names with the IP addresses.

- **SRM** – SRM agents run on servers themselves and access information about volumes, files, directories, and users. SRM agents identify data importance factors based upon data access patterns, the highest consumers of filesystem space, as well as email archives, unauthorized files, and user-specific files (e.g., tar archives).
- **Array** – Array agents access to the storage array. These agents collect data on array controllers, rmware, raw capacity, congured capacity, volume congurations, array utilization, RAID levels, and performance.
- **NAS** – NAS agents collect filesystem statistics that include total capacity, capacity used, capacity available, snapshot used, snapshot reserved, and total snapshot over a specific time interval.
- **Backup Application** – Backup agents collect information on backup jobs, media information, metadata utilization, backup policies, backup schedules, job duration, backup throughput, backed-up GB, status codes, event logs.
- **Fabric** – The Fabric agent accesses information on switch ports, port types, rmware, zoning conguration, port status, port performance, and Interswitch links (ISLs).
- **Tape Library** – The Library agents collect information on the Library conguration, slot utilization, tape drive conguration, resident media, status, and events.

SMIS Agents

SMI-S is based on the Common Information Model (CIM) and Web Based Enterprise Management (WBEM) standards developed by the Distributed Management Task Force (DMTF). Sun StorageTek Business Analytics 5.1 provides the SMIS Array Agent, the SMIS NAS Aget, and the SMIS Tape Library Agent. In general, SMIS agent and non-SMIS agent collecting information from the same device is not supported.

SMI-S defines profiles for both physical and logical entities. Physical objects include disk arrays, switches, Host Bus Adapters (HBAs), and more. Logical entities include files, volumes, and zones within a SAN. A profile exposes data about an object that are important from a management standpoint as it can be used to actively manipulate objects under management.

Profiles are divided into two major categories: clients and providers. At its most basic level, SMI-S defines software management tools, such as our SMIS agents (e.g., SMIS Array Agent), as “clients,” and networked storage devices as “providers. SMI-S clients and providers communicate with one another using standard protocols.

SMIS specifies a protocol stack consisting of CIM-XML to describe object and management actions, http to manage session traffic, and TCP/IP as the transport and interconnect media.

For EMC, the CIM provider limitations are listed as follows:

- For arrays with metaLUNs, the CIM provider does not furnish detailed information on metaluns regarding the parity space used. This results in an inaccurate calculation of RAW configured space in the reports.
- The CIM provider does not supply information on the hyper components of a meta LUN. This results in inaccuracies in reports regarding meta LUN details. The CIM provider does not report individual meta members but does report the meta head with the capacity of the entire metavolume.
- The CIM provider does not report that a device is a metaLUN. Therefore, our agent will not distinguish between a meta and a normal volume.
- The CIM provider does not report every "type of volume. Some administrative volumes, such as, BCV, SFS, VCM, DRV, etc. are not reported by the provider. As a result, the agent does not report these volumes.
- BCV assignments are not reported and the reports will incorrectly report the total storage allocated as well as remaining free space.
- FC4700 private LUNs are not furnished by the CIM provider.
- The CIM provider does not give information on RAID-S raid groups. As a result, the agent will not populate the component_2 column in the storage_unit_config table for RAID-S devices. In addition, this limitation means the agent does not correlate RAID-S devices that are in the same raid group.
- The CIM provider does not provide detail disk information for RAID-S devices. This results in incorrect totals in our reports for RAW configured space.
- Raid-S devices report incorrect parity information in the storage_unit_config table.
- The CIM provider does not provide the agent with scsi vbus information so addr 4 of storage_unit_config table will be "-1".
- This version of the agent does not support any of the array performance tables.
- This version of the agent does not populate the gsa_local_unit_mapping and gsa_remote_unit_mapping tables.
- Cache size data is not reported by the CIM provider.
- Disk address prefixes, such as "DA & DF" for a Symmetrix, are not provided by the CIM Provider.
- The reports derived from this agent show the total of all controllers in the Front End Controllers field.

For Engenio/LSI, the array_hba_config ports are not being provided correctly due to an Engenio CIM provider anomaly.

Agent Ports

The ports listed in TABLE 2 are used by the Smart Agents to communicate to the Local Manager.

TABLE 2 Agent Port Numbers

Agent	TCP Port Number
Local Manager/Central Manager	17130
Storability ACSLS Agent	17157
Storability Celerra Agent	17162
Storability Clariion Agent	17141
Storability COM Agent	17170
Storability Compaq Agent	17140
Storability Compaq EVA Agent	17143
Storability Data Aggregator Agent	17147
Storability Data Polling Agent	17165
Storability Database Agent	17148
Storability EMC Agent	17135
Storability ESS (Shark) Agent	17154
Storability Fabric Agent	17166
Storability HDS Agent	17142
Storability HiCommand Agent	17144
Storability Host Agent	17132
Storability Host Stats Agent	17168
Storability IBM 3494 Library Agent	17164
Storability Legato Agent	17149
Storability License Agent	17167
Storability LSC Agent	17145
Storability LSI Agent	17151
Storability NetApp Agent	17150
Storability NetBackup Agent	17133
Storability Policy Agent	17169
Storability Remote Host Agent	17173

TABLE 2 Agent Port Numbers *(Continued)*

Agent	TCP Port Number
Storability Routing Agent	17146
Storability Scheduler Agent	17171
Storability SRM Agent	17152
Storability STK Library Agent	17155
Storability TSM Agent	17156
Storability XP Agent	17158
Storability SMIS Array Agent	17159
Storability SMIS Library Agent	17161
Storability SMIS NAS Agent	17174

Configuring Smart Agents

All Smart Agents read their individual configuration settings defined in the storability agent initialization file (storability.ini) when started. Although agent configuration settings differ depending on the agent, some common configuration details are summarized as follows:

- How often to refresh configuration information in agent cache
- How often to refresh performance information in agent cache
- Whether the agent will automatically register to a specified Central Manager/Local Manager

When an agent is configured in the storability.ini file depends on the agent's installed platform.

- Windows server – Post agent installation using the Configuration Tool
- Solaris server – During the agent installation through the installation script (setup)
- Other UNIX server – Manual configuration using a system editor post agent installation

Refer to the Installation manual to obtain additional information on the Configuration Tool and the Solaris installation script.

Verifying Smart Agent Functionality

The Sun StorageTek Business Analytics Agent Diagnostic Tool (gsmdiag.exe) is installed in the Storability Local Manager **Utilities** folder as part of the Local Manager and Central Manager for Windows installation procedures. It represents the primary tool to verify agent functionality once it is configured and started.

You can use this tool to:

- Communicate directly with a Smart Agent by specifying its IP address/nodename and TCP/IP port Number.
- Communicate directly with a Local Manager or Central Manager.
- Collect any object that the Smart Agent publishes.
- Save a file if requested by a support representative.

Refer to the Installation manual to obtain additional information on the Sun StorageTek Business Analytics Agent Diagnostic Tool.

Agent Data Collection from Devices/Applications

All Smart Agents use an access method (API, CLI, and SNMP) to collect device/application data and populate its relational objects. After collecting application/device information, when data is collected, how much data is cached, and how long that data is retained depends on agent-specific configuration settings for that agent. These configuration settings are stored in the common agent configuration file, named storability.ini.

Most agents collect data from the device/application at start up. However, there are exceptions as TABLE 3 illustrates.

TABLE 3 Agent Polling Behavior

Agent Type	Parameter	Description
Host	CONFIG_CACHE_REFRESH_ INTERVAL	How long (in seconds) to cache configuration data.
SRM	Scan on agent start up	Yes/No.
SRM	Scan schedule	crontab format; every Sunday at 00:00:00 is default setting.

TABLE 3 Agent Polling Behavior *(Continued)*

Agent Type	Parameter	Description
NetBackup	DBIMPORT_SCHEDULE	Specifies how often the dbimport job is run. This job launches NetBackup commands used to collect backup data.
NetBackup	NBU_REPORT_PERIOD	Specifies the number of hours to report on.
NetBackup	EVENT_CACHE_DURATION	Specifies how long the SNMP events in the event cache are valid for.
TSM	TSM_EXEC_INTERVAL	Specifies the frequency (in seconds) in which the TSM agent queries the Data Source Name (DSN) list for TSM data. The default value is 14400 seconds (i.e. 4 hours). If not specified, the agent will poll the DSN list every hour.
Array	PERF_SAMPLE_INTERVAL	Specifies how often the array is queried for performance information.
Array	CONFIG_CACHE_REFRESH_INTERVAL	Specifies how often the array is queried for configuration information.
Fabric	CONFIG_CACHE_REFRESH_INTERVAL	Specifies how often the fabric switch management interface is queried for configuration information.
Fabric	PER_SAMPLE_INTERVAL	Specifies the interval to collect performance data.
Database	DBA_COLLECTION_INTERVAL	Specifies how often the database server is queried.
Library	TLIB_CONFIG_AGE	Specifies how long configuration data is cached.
Library	TLIB_STATUS_INTERVAL	Specifies how long status information is cached.
Library	TLIB_STATS_RETENTION	Specifies how long status information is cached.

Automatic and Static Agent Registration

To implement the messaging infrastructure, a Routing Agent must be configured to collect agent data from some number of Smart Agents. Automatic agent registration is a Sun StorageTek Business Analytics configuration option for agent data collection. In the storability.ini file, automatic agent registration is configured as follows:

- Local Manager – Specify the IP address or host name of the Local Manager to be contacted to activate agent registration; the default value is localhost..
- Local Manager Registration Port – Specifies the TCP port number used by the Local Manager for agent auto registration. The default port number is 17146.
- Enable Auto Registration – Turns agent auto registration on (default) or off; is enabled by default.

Agent auto registration works as follows:

- Routing Agent is configured to process agent auto registration requests.
- Smart Agent (e.g., array agent) is started and reads what Local Manager to connect with and request registration.
- The Routing Agent processes the request and activates agent data collection for the Smart Agent.

To register an agent statically, proceed as follows:

- Enter false in the Enable Auto Registration field.
- Modify the Routing Agent static agent configuration to include an entry (port number|<agent IP address/name>)
- Restart the Routing Agent
- Restart the companion Central Manager agents

To summarize, a Routing Agent only knows what Smart Agents it will collect data from through either the agent's auto registration to that Local Manager or through static subagent registration configured in the Local Manager Routing Agent's section of the agent initialization file (storability.ini).

Polling Schedules

The Sun StorageTek Business Analytics Administrator can add, modify, delete, enable, and disable polling schedules using the Management Console Polling Schedules menus. Data polling schedules have the following characteristics:

- Are stored in the Portal database versus the agent configuration (storability.ini) file.
- Are viewed and/or updated using the Management Console Polling Schedule menu.
- Are enforced by the Scheduler Agent.
- Are assigned to agent collection types (e.g., Fabric) and metrics (not simply agent-specific configuration setting)

Each data polling schedule defines the following parameters:

- **Collection Type** – Host, SRM, Database, NAS, Fabric, Array, Library, General (agent version and alerts tables), Backup (General, Veritas, TSM), Performance, Data Aggregator Statistics.
- **Collection Metric** – Depends on Collection Type. For arrays, the collection metrics are configuration, allocation, and performance, for example.
- **Site** – May be set to "All sites" or to a specified site. If all sites are requested, the data is collected from one Local Manager (rid) at a time.
- **Schedule** – How often to perform the data collection (i.e., recurring or once), the frequency (e.g., every eight hours), and when the schedule starts (date/time).
- **Collection Timeout** – Specifies how long the Data Aggregator Agent waits for collected agent data. The default timeout is 1200 seconds (twenty minutes). Collection Timeout for a collection type can be changed using the Management Console's Polling Schedules window under Tools.

Some recommended guidelines for scheduling agent data collection are listed as follows:

- Stagger data collection for the various "collection types".
- Use the **Collect Now** button associated with a polling schedule for an on-demand (immediate, one-time) collection request when testing/verifying data collection functionality.

Refer to the *Administration* chapter for detailed information on viewing, enabling, and changing polling schedules. For convenient reference, you can click the **Print** button on the **Polling Schedules** menu to print the polling schedules to a local or network-attached printer.

Verifying Polling Schedules

The Data Aggregator collection statistics can be collected once or on a recurring basis like other agent data. The Data Aggregator populates the gsa_data_collection_stats table with statistics on data collection through the messaging infrastructure, including requested table, request timestamp, arrival timestamp, number of rows inserted, and database insertion timestamp.

There is currently no Sun StorageTek Business Analytics report that allows you to view the data loaded in this table in the assurent database. However, you can use any SQL-compliant query tool, such as SQL Query Analyzer, to extract and view records in the table. The table columns are documented in the Sun StorageTek Business Analytics Application Developer's Guide.

Preparing and Planning

This section describes how you work with your Sun StorageTek Business Analytics personnel to prepare for a Sun StorageTek Business Analytics implementation. In addition, standard pre-deployment documentation is described.

Note – Because this documentation is continuously being updated and refined, there may be additional/modified documents not described here available when you actually prepare for your Sun StorageTek Business Analytics deployment. Your Sun Storagetek/Partner representative will provide you the most up-to-date Sun StorageTek Business Analytics Implementation Road Map documentation.

The Sun StorageTek Business Analytics Implementation Road Map spread sheet provides an excellent summary of the individual events within the pre-deployment, deployment, and post-deployment stages of a Sun StorageTek Business Analytics implementation.

Step 1 (Pre-Deployment): Kickoff Conference Call/Meeting

This event kicks off the Sun StorageTek Business Analytics deployment. The purpose of the meeting is to:

- Review the general implementation process.
- Review and explain Sun StorageTek Business Analytics Implementation Road Map, Prerequisites, Verification Manuals, and Worksheets.
- Discuss the Sun StorageTek Business Analytics pre-deployment training requirement, which specifies at least one customer attends the Sun StorageTek Business Analytics Administrator course offering prior to the deployment.

During this activity, your Sun StorageTek Business Analytics representative will seek to:

- Obtain a general understanding of your environment, requirements and restrictions by reviewing a completed Sun StorageTek Business Analytics Device Inventory Worksheet
- Identify your personnel resources required to obtain a detailed understanding of your environment, including device types, Operating Systems, Service Packs, firmware versions, and all other necessary information required to the Sun StorageTek Business Analytics Implementation List.

Note – The **Sun StorageTek Business Analytics Implementation List** and the **Sun StorageTek Business Analytics Implementation Diagram** represent the only required documents; other documents described below may also be used. The documentation is organized into packets as briefly described below.

- **Sun StorageTek Business Analytics Device Inventory Worksheet** – Is an Excel spreadsheet that is optionally used to collect customer contact information, number of sites, number of data centers, number of storage systems/models, number of NAS systems/models, number of fabric switches/models, number of hosts (by OS), database server platforms and database software versions, backup application versions and installed platforms, and the number of tape libraries/models.
- **Sun StorageTek Business Analytics Support Matrix** – Describes the vendor devices/applications that Smart Agents can monitor as well as the support prerequisites for individual Smart Agents. Always use the latest version you may obtain from your Sun StorageTek Business Analytics representative.
- **Sun StorageTek Business Analytics Infrastructure Planning Guide** – Describes the operating system, third party software (where applicable), and hardware configurations (CPUs, RAM) required to support the Local Manager, Central Manager (database server), Management Console, and Sun StorageTek Business Analytics Client.
- **Sun StorageTek Business Analytics Training Schedule** – Provides course descriptions, pricing, and dates for Sun StorageTek Business Analytics course offerings.
- **Sun StorageTek Business Analytics Implementation Road Map** – Is an Excel worksheet that summarizes the events, purpose, participants, information provided to/from the prospect or customer, and the documentation pertaining to each activity within the overall Sun StorageTek Business Analytics deployment.
- **Sun StorageTek Business Analytics Prerequisite Verification Manual** – Provides commands used to verify agent requirements specified in the Sun StorageTek Business Analytics Support Matrix, database access rights necessary for the Storability Database Agent, as well as network connectivity requirements to deploy agents.
- **Sun StorageTek Business Analytics Implementation List –** Is a detailed inventory of customer resources on which Sun StorageTek Business Analytics components will be implemented. To obtain information like server IP addresses, user names/passwords, locations of devices, etc.), the customer resources who provide information include the Project Owner, Project Manager, Administrator for Sun StorageTek Business Analytics, Storage, Server, Network, Backup, Database, and Network Security personnel.

- **Sun StorageTek Business Analytics Implementation Diagram –** Is a Visio diagram depicting the customer resources (SANs, servers, arrays, backup servers, libraries, etc.) identified in the Sun StorageTek Business Analytics Implementation List.

Step 2 (Pre-Deployment): Detailed Technical Discovery Conference Call/Meeting

The purpose of this event is to identify and assign roles and responsibilities within the Sun StorageTek and customer teams for the project tasks. You will need to provide the names and availability for the Sun StorageTek Business Analytics Administrator, Storage administrators, Server administrators, Network administrators, Backup administrators, Database administrators, and Security personnel who can assist in gathering the required detailed information to complete the **Sun StorageTek Business Analytics Implementation List** and **Sun StorageTek Business Analytics Implementation Diagram**.

Step 3 (Pre-Deployment): Preparation of Statement of Work

The goal of this step is to prepare document the Sun StorageTek Business Analytics SOW (Statement of Work) from information collected during previous Conference Calls/Meetings and the following documents:

- Sun StorageTek Business Analytics Device Inventory Worksheet
- Sun StorageTek Business Analytics Implementation List
- Sun StorageTek Business Analytics Implementation Diagram

After the Sun StorageTek Business Analytics SOW (Statement of Work) has been completed it will be verified to ensure the project is within the scope of the Sun StorageTek Business Analytics proposal and or Professional Services quotation.

The documentation used for this event is briefly described as follows:

- **Sun StorageTek Business Analytics Proposed Statement of Work** – This document is used for Sun StorageTek Business Analytics production implementations. It introduces the project as well as details the project scope, approach, key project assumptions, project associated products, project deliverables, shipment of customer-owned equipment, customer responsibilities, primary customer contacts, project schedule, project reporting and performance, and fees and payment terms.

Step 4 (Pre-Deployment): Finalization Conference Call/Meeting

The purpose of this step is to review with you the Sun StorageTek Business Analytics SOW (Statement of Work) as well as discuss and resolve gaps if any, between the SOW and the Customer Sun StorageTek Business Analytics proposal and/or Professional Services quotation. After resolution of any project scope issues, you will be requested to sign the Sun StorageTek Business Analytics SOW (Statement of Work). In addition, your Sun StorageTek Business Analytics representative will verify that:

- You have a trained Sun StorageTek Business Analytics Administrator.
- You have received your Sun StorageTek Business Analytics Media Kit and License.

At this point, the Sun StorageTek Business Analytics deployment is scheduled to confirm the Sun StorageTek and customer resources will be available.

Step 5 (Deployment): Installation and Implementation

The goal is to deploy the Sun StorageTek Business Analytics software. The assigned customer resources, Sun StorageTek Business Analytics administrators, Storage administrators, Server administrators, Network administrators, Backup administrators, Database administrators, and Security administrators will need to provide permissions and privileges, (User IDs, Passwords, IP firewall issues, etc.) to install and configure the Sun StorageTek Business Analytics software. The installation procedure is summarized as follows:

1. Install and verify the Central Manager.
2. Install and verify the Management Console.
3. Install and verify Local Managers (if applicable).
4. Install and verify the Smart Agents in the **Sun StorageTek Business Analytics Implementation List**.

The **Sun StorageTek Business Analytics Implementation List** and the **Sun StorageTek Business Analytics Implementation Diagram** are the primary documentation used during the installation, configuration, and verification of the Sun StorageTek Business Analytics software. Your implementation engineer typically installs one Host Agent and/or SRM Agent per server platform. You will be asked to

have an appropriate server administrator on hand to observe the installation procedure in order that your administrator may perform installation of these agents on additional servers at your site.

Step 6 (Deployment): Customer Signoff

The Sun StorageTek Business Analytics Project Manager will review engagement activities with you and request your sign off for the implementation. Besides the previously described Sun StorageTek Business Analytics Implementation List, Sun StorageTek Business Analytics Implementation Diagram, and Sun StorageTek Business Analytics SOW, the following documentation is used during this event.

- **Sun StorageTek Business Analytics Post-Implementation List** – Identifies any implementation task that was not completed. Where applicable, it specifies any software anomaly identifier related to the incomplete task.
- **Sun StorageTek Business Analytics Implementation Acceptance Certificate** – Is the document used to confirm acceptance of the Statement of Work and/or Services and Deliverables specifications.

Upon completion of the Sun StorageTek Business Analytics software installation, the **Sun StorageTek Business Analytics Post-Implementation List** is completed and reviewed with you. To formally accept the completion of the Statement of Work and/or Services and Deliverables, you will be request to sign the **Sun StorageTek Business Analytics Implementation Acceptance Certificate**.

Step 7 (Post-Deployment): Post-Deployment Follow-Up

All items that are listed in the StorageTek Business Analytics Post-Implementation List will be reviewed and classified as an implementation issue, product issue, or product enhancement request and will document the reason, item owner and completion date.

Step 8 (Post-Deployment): Transfer to Customer Care

At this point, your StorageTek Business Analytics software has been installed and verified. You will be provided information about the problem reporting procedure, escalation process and contacts along with a copy of the **StorageTek Support Quick**

Reference Guide. You may also receive a copy of the latest quarterly training schedule for StorageTek Business Analytics user training and additional administrator training.

Besides the previously described training brochure, the documentation for this step is described as follows:

- **StorageTek Support Quick Reference Guide –** Describes the support contact information and problem escalation process.

Sun StorageTek Business Analytics Documentation Set

To help you locate more information on topics introduced within **Concepts/Planning**, the Sun StorageTek Business Analytics documentation set supplied on the Documentation CD is briefly described as follows:

- **Installation Guide** – Covers in detail the installation, configuration, and verification of the Sun StorageTek Business Analytics Central Manager, Management Console, and Local Manager.
- **Getting Started Guide** – Summarizes the steps to install, configure, and verify the StorageTek Business Analytics Central Manager, Management Console, and Local Manager; is intended for experienced Sun StorageTek Business Analytics administrators.
- **Agent Installation Guides** – Explain the steps to install, configure, and verify Storability Smart Agents. The guides are organized by agent type (i.e., Host, SRM, Array, etc.) for all server platforms applicable to the particular Smart Agent.
- **Management Console User's Guide** – Describes the Management Console's standard reports, report wizards, and charting wizards.
- **Administration Guide** – Explains the administrative functions, such as adding views and users, that you access through the Management Console's Tools pull down menu.
- **Application Developer's Guide** – Documents the schema and columns of the tables used to collect agent data.
- **What's New in Sun StorageTek Business Analytics? –** Summarizes the new functionality that the current Sun StorageTek Business Analytics software version offers.

Glossary

Agent Configuration File	Is the storability.ini file for all supported servers.
API	Acronym for Applications Program Interface.
Asset	Assets include sites, arrays, hosts, backup clients and policies, NAS devices, NAS filesystem, tape library, and database.
Central Manager	Through the Data Aggregator and Local Managers, the Central Manager handles messaging, data aggregation, correlation, and the application engines.
CIM	Acronym for Common Information Model that is composed of a Specification, which defines the details for integration with other management models, and a Schema providing the actual model descriptions.
Dashboard	Consists of one or more user-selectable panes that display on the Management Console home page.
Data Aggregator Agent	Is responsible for initiating and handling the collection of agent data. Within the messaging infrastructure, the Data Aggregator interacts only with the Central Manager's Routing Agent.
Data Polling Agent	Retrieves polling schedules related to agent data collection upon initialization and validates polling schedules before they are saved to the database.
User ID	A Management Console user account.
HBA	Acronym for Host Bus Adapter.
License Agent	Provides the mechanism for implementing the GSM License Report.
Management information base (MIB)	In conjunction with SNMP, a MIB is a collection of managed objects residing in a virtual information store. Collections of related managed objects are defined in specific MIB modules.

Policy Agent Works in conjunction with the Policy Alerting functionality of the Management Console to check and enforce threshold-based policies, such as "send an email to designated recipients when a file system is becoming full".

Routing Agent Installed on all Central Managers and Local Managers, the Routing Agent collects data from registered Smart Agents.

Scheduler Agent Works with the Data Polling Agent to support the polling schedule (agent data collection) and policy-based management (policy alerting) functionality of Sun StorageTek Business Analytics.

Simple Network Management Protocol (SNMP) Is an application-layer protocol designed to facilitate the exchange of management information between network devices.

Smart Agents Interface with storage devices, switches, HBAs, hosts and applications. The data they collect is converted into a common data model to permit administrators to see the data from multiple devices in the same way.

SMI-S Acronym for Storage Network Industry Association (SNIA) Storage Management Initiative (SMI) Specification.

SNIA Acronym for Storage Network Industry Association.

SRM Acronym for System Resource Monitor.

Sun StorageTek Business Analytics Is a software application that enables companies to easily visualize and manage multi-vendor, multi-site storage environments from a central location.

View A view is a collection of assets or views. Sun StorageTek Business Analytics report security is mainly controlled by a user's current view when he/she generates a report.

XML Acronym for Extensible Markup Language.