SYBASE®

# Adaptive Server® Enterprise 12.5.1 Job Scheduler

A Technical White Paper

technology

WHITE PAPER

## Table of Contents

## Executive Summary

There is a big push in the market today to cut the cost of database management and to make database servers self-managing. A facility to allow database administrators to automate routine tasks and ease the administration of Adaptive Server Enterprise (ASE) would reduce the operational costs of managing a database and enhance DBA productivity.

ASE's Job Scheduler addresses these needs with a centralized facility for defining, scheduling, and managing T-SQL-based database administration tasks (jobs) simultaneously across multiple ASEs. With Job Scheduler, jobs that would normally require interaction from a database administrator (e.g., a regular backup procedure, inventory reports, or system performance summaries) may be scheduled to run unattended at times appropriate to system needs, freeing the database administrator to attend to other issues. Additionally, jobs and schedules may be shared with other administrators, allowing for quick deployment of jobs on multiple servers.

Job Scheduler has an easy-to-use graphical user interface and a stored procedure interface that enables the user to:

- Create jobs manually, import them from a batch file, or generate them from predefined Job Scheduler templates
- Schedule, start and stop jobs based on date, time, day of the week, and frequency
- Assign jobs to be run on specific servers
- Monitor job execution
- Report job errors
- Display job history
- Purge out-of-date job history

The jobs created may be scheduled to run immediately, once, or at intervals on one or more ASEs. The job execution output is logged and available for viewing at a later time. The content of these jobs and their attributes (such as the user id and password under which to run the job) are stored in an ASE database and are protected using ASE's built-in security mechanisms.

ASE's Job Scheduler is a core component of Sybase's self-management and resource tuning initiative and architecture. It is designed to complement Sybase's growing self-management infrastructure, including future offerings such as self-healing (the ability to respond to internal conditions with corrective actions), Job Scheduler-programmable events, new Performance Monitor DB, Memory/Resource Management (centralized resource pool that can be shared and replenished), running non-SQL jobs (such as command line scripts and Java classes), Job Chaining (logic-based concatenation of jobs), and management of other Sybase and customer-built Open Server-based applications. Job Scheduler's strong yet flexible administrative support goes a long way in easing the burden on database administrators and lowering the total cost of ownership (TCO).

## Introduction

Customers have traditionally relied on UNIX CRON (or similar operating system-specific mechanisms) to run homegrown scripts to automate routine database administrative jobs. With ASE's Job Scheduler, many of these jobs can now be built and executed entirely within ASE. Jobs that would normally require interaction from a database administrator can be scheduled to run regularly and autonomously, and the results of each of the jobs are logged for viewing at a later time. For instance, a database administrator may now use Job Scheduler to dump a transaction log once an hour, perform a nightly dump of a production database, or run integrity checks every weekend as a part of preventative maintenance.

Any command that can be executed using an Open Client application (such as ISQL) can now be run automatically by Job Scheduler.

ASE's Job Scheduler is aimed at three main markets:

- Database Administrators — DBAs may use the feature to simplify the administration of ASE by scheduling routine and preventative maintenance tasks
- Self-Management — It is anticipated that Job Scheduler will serve as a core component of Sybase's future self-management and resource tuning offerings
- Third-Party Vendors — Database tool vendors, such as BMC and Embarcadero, may use this infrastructure to enhance their own product offerings

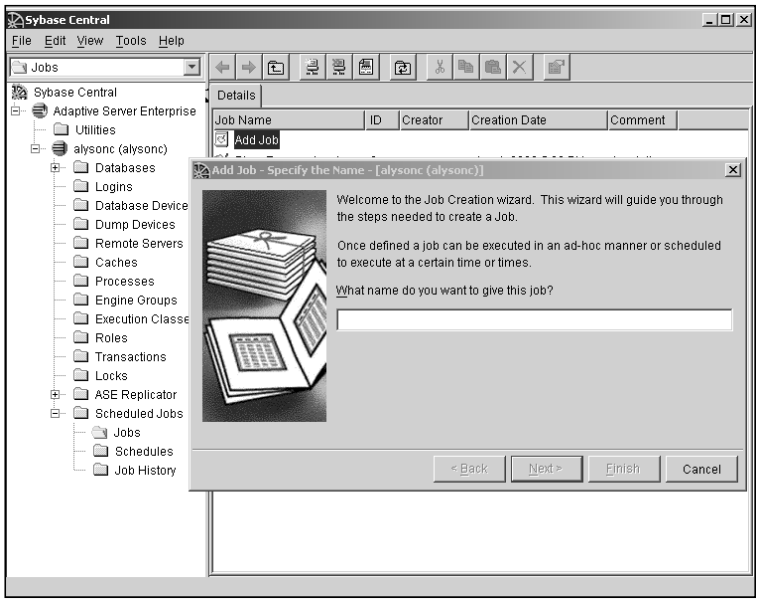
## Usage

Job Scheduler provides both a graphical user interface (GUI) and a stored procedure interface for initial and ongoing configuration and management of ASE Job Scheduler. The GUI, a plug-in to ASE Sybase Central, provides wizards that prompt the user for all configuration information necessary to define, schedule, and execute a job. It is also furnished with a panel for viewing the details of all running and completed jobs, including execution state and job output.

### Defining Jobs

The job creation wizard prompts for information about the job.
Job information includes:

- Job name
- SQL command (entered manually, loaded from a file, or supplied by a template)
- Security restrictions (e.g., if other users can run the job, if the job should always be run under the owner's user id)
- Job execution time limit




*ASE Job Creation Wizard*

## Job Templates

Included with Job Scheduler are templates that can be used to create jobs for several database management and self-tuning tasks. Templates play an important role in ASE self-management because they provide a shortcut to creating customized jobs. Each template includes Transact SQL (T-SQL), which performs a specific database tuning or maintenance task. Sybase-provided templates save DBAs the work of creating their own T-SQL, UNIX CRON or operating system-level scripts.

The templates provided with Job Scheduler address such common DBA activities as:

- Database back-ups
- Transaction log dumps
- Update and deletion of table statistics
- REORG/REBUILD and RECLAIM SPACE commands
- Configuration of ASE environment parameters
    - o Number of locks
    - o Number of user connections
    - o Metadata cache

Templates can be selected as the basis for creating a job in the Job Wizard. When the user chooses a template to create a job, the wizard will take the user through the template so that the user can supply job-specific values for template parameters. At run-time, the values the user has supplied for the parameters are merged with the T-SQL of the template.

## Defining Schedules

Schedules are created independently from jobs and are then available to be associated with one or more jobs. From the Job Scheduler GUI, one can easily create schedules that suit any number of user needs—such as daily every 2 hours, every Thursday at noon, Mondays and Wednesdays at 9:00 p.m., etc. The configurations are nearly endless. Additionally, schedules may be date-limited (e.g., "effective from today until October 31") or open-ended.

Schedules can be shared by all users or restricted for use by their creator. Once a schedule is defined (e.g., "every day at 10:00 p.m."), it may be applied to existing jobs or to a job created on the fly.

## Scheduling Jobs

With jobs and schedules defined, only a few more steps need be taken to marry the two and create a scheduled job. A scheduled job is the concrete object that is truly run-able, as it is composed of the job to be completed, the time to do the job, and the server on which to execute the job. When scheduling a job, the user must:

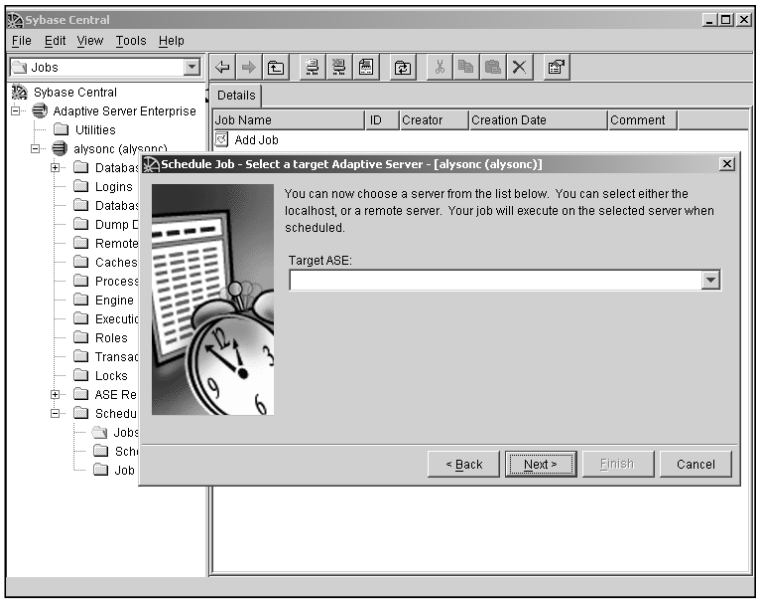
- Select the job
- Select the schedule
- Specify the server on which the job is to run

Additional required information, such as user id and password, are deduced at the job's run-time from the job's configuration information.

Optionally, when creating a scheduled job, the user may limit the execution time. If the specified time expires before the job completes, Job Scheduler will abort the job. Job logging is on by default, but if the user chooses, logging may be turned off for any scheduled job. Post-execution instructions may also be specified.

Localization information can be modified from the default setting by issuing a command-line instruction.

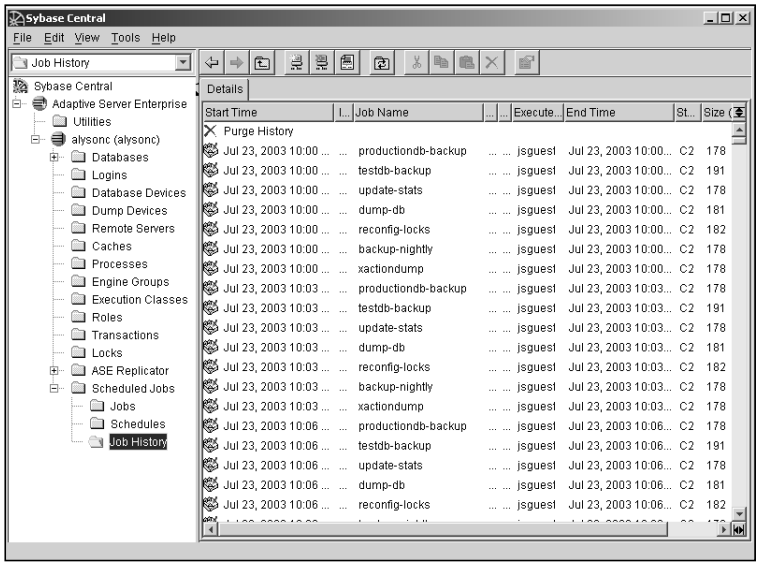
In this way, a job created once can be quickly and easily deployed on any remote ASE that has been defined as an external server to ASE's Component Integration Services (CIS).



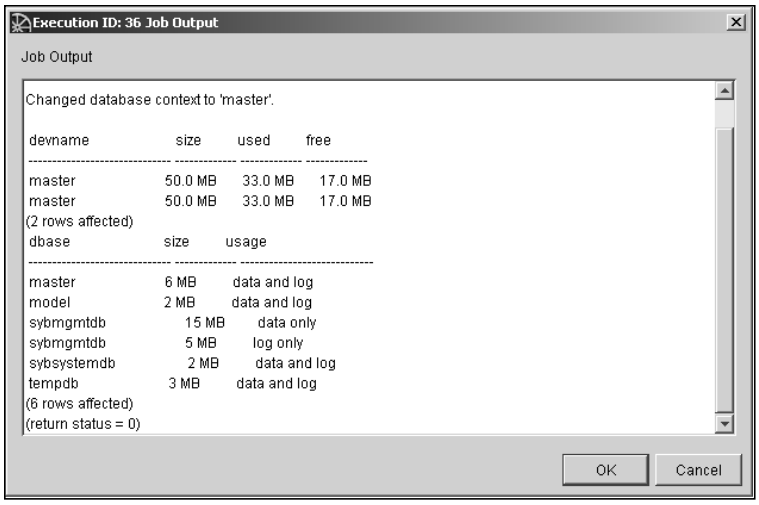

*ASE Job Scheduling Wizard*

## Monitoring Jobs

Completed jobs and jobs that are running can be monitored from the ASE Job Scheduler GUI. The Job History panel provides a summary view of each job, displaying the job's start and end times, name, and state, as well as the user name under which the job was executed. By selecting a completed job from the history panel, the job's output can be viewed.




*ASE Job History Panel*




*Job Output Viewer*

## Security

An important feature of Job Scheduler is job reuse. Job Scheduler distinguishes between the job owner (often the creator of the job) and the user id under which the job is to run (which may or may not be the same as the job owner). This allows a job to be centrally controlled, yet permit its execution in multiple contexts. The owner controls the basic definition of the job. However, job execution operations, such as stopping a job or deleting completed job output, are restricted to the user running the job. In this way, for example, the owner could alter the T-SQL commands of the job in only one place and the changes would automatically be propagated for execution under the job user id for all future executions.

Additionally, jobs and schedules can be made visible to other users by setting a "shared" property. This allows users to create their own scheduled jobs using shared jobs and schedules. Sharing is read only; sharing jobs and schedules allows multiple users to create scheduled jobs, but does not give users permission to modify or delete jobs or schedules not owned by them.

All of the job, schedule, scheduled job information, and related data, are stored in a database residing on the ASE running Job Scheduler. Access to this data and use of the Job Scheduler stored procedures is restricted to certain ASE Job Scheduler roles. ASE users must have at least one of the Job Scheduler roles to obtain privileges to configure jobs and schedules, run jobs, or administer Job Scheduler and its underlying database.

## Architecture

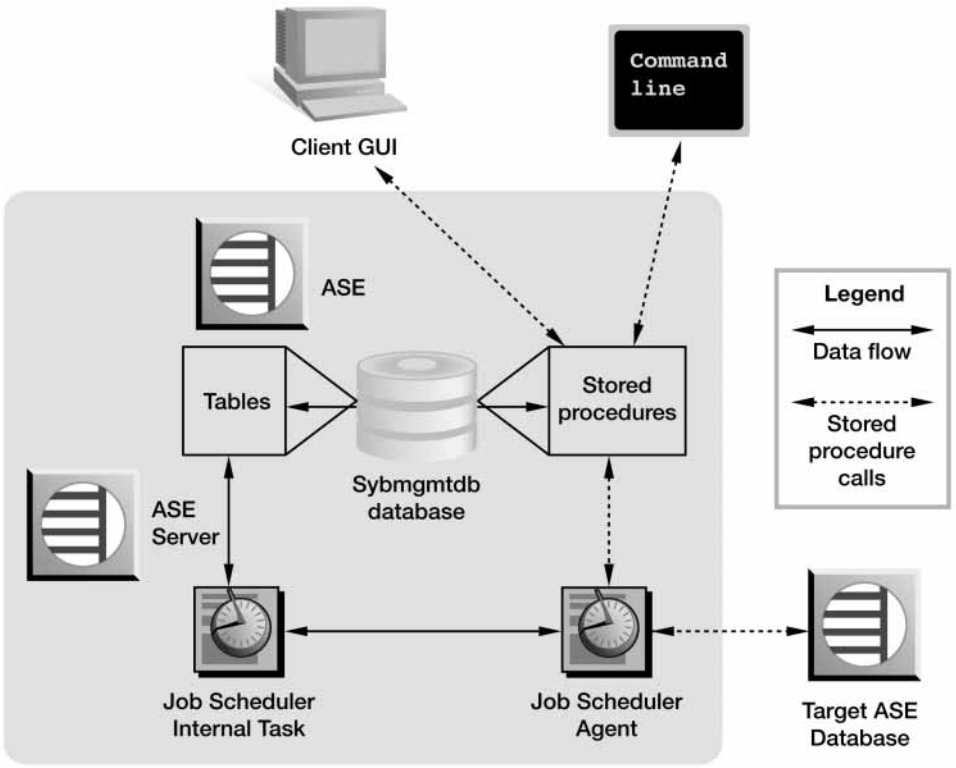
Job Scheduler is comprised of the following components:

- **The *sybmgmtdb* database and stored procedures**
  All of the job, schedule, and scheduled job information are stored in the *sybmgmtdb* database that resides on the ASE running Job Scheduler. Most access to data in the *sybmgmtdb* database is via stored procedures. The stored procedures make the data available to the GUI, the Job Scheduler Agent and the command-line interface (i.e., isql) for those with Job Scheduler administrator privileges. (For additional security, the user passwords under which the jobs are to be run are stored encrypted.)

- **An internal ASE task and an external process called the JS Agent**
  The Job Scheduler Internal Task reads the job and schedule information from the *sybmgmtdb* database tables and determines when a scheduled job needs to be executed. At the appropriate times, the Job Scheduler Task informs the Job Scheduler Agent of the job that needs to be run. The Job Scheduler Agent then retrieves the job information from the Job Scheduler *sybmgmtdb* database and executes it on the target ASE database. The Job Scheduler Agent collects and stores the job output in the appropriate tables in the Job Scheduler *sybmgmtdb* database.

- **The graphical user interface using Sybase Central**
  The GUI assists the user in creating and scheduling jobs, viewing job status and job history, and controlling jobs. The GUI also provides an administration feature to turn on and off the ability of Job Scheduler to process and execute scheduled jobs.

- **Predefined templates from which the database administrator may create customized versions of commonly used jobs**
  A template is a generic precursor to a job and enables the user to create multiple jobs without having to write a completely new instance of a job each time. They are implemented as batch T-SQL commands for common operations (such as database backups, reorg rebuilds, modification of configuration parameters, and statistics updates and monitoring) and then customized with parameter values appropriate to the needs of the user. Sybase is providing some templates for the initial Job Scheduler release.




*Job Scheduler Architecture*

## Summary

The total cost of ownership of database systems is increasingly dominated by personnel costs. Often, administrators are strapped with repetitive tasks across multiple servers, limiting the administrators' availability to focus on new applications. ASE's Job Scheduler lowers the total cost of ownership for Sybase ASE customers by providing a centralized, easy-to-use, and secure solution for the creation, easy deployment, and execution of T-SQL-based database administration tasks.

## International Contacts

**Argentina**
+5411 4313 4488

**Australia**
+612 9936 8800

**Austria**
+43 1 504 8510

**Belgium**
+32 2 713 15 03

**Brazil**
+5511 3046 7388

**Bulgaria**
+359 2 986 1287

**Canada**
+905 273 8500

**Central America**
+506 204 7151

**Chile**
+56 2 330 6700

**China**
+8610 6856 8488

**Colombia**
+57 1 218 8266

**Croatia**
+385 42 33 1812

**Czech Republic**
+420 2 24 31 08 08

**Denmark**
+45 3927 7913

**Ecuador**
+59 322 508 593

**El Salvador**
+503 245 1128

**Finland**
+358 9 7250 200

**France**
+33 1 41 91 96 80

**Germany**
+49 69 9508 6182

**Greece**
+30 1 98 89 300

**Guatemala**
+502 366 4348

**Honduras**
+504 239 5483

**Hong Kong**
+852 2506 6000

**Hungary**
+36 1 248 2919

**India**
+91 22 655 0258

**Indonesia**
+62 21 526 7690

**Israel**
+972 3 548 3555

**Italy**
+39 02 696 820 64

**Ivory Coast**
+225 22 43 73 73

**Japan**
+81 3 5210 6000

**Kazakstan**
+7 3272 64 1566

**Korea**
+82 2 3451 5200

**Malaysia**
+603 2142 4218

**Mexico**
+5255 5093 8500

**Netherlands**
+31 20 346 9290

**New Zealand**
+64 4473 3661

**Nigeria**
+234 12 62 5120

**Norway**
+47 231 621 45

**Panama**
+507 263 4349

**Peru**
+511 221 4190

**Philippines**
+632 750 2550

**Poland**
+48 22 844 55 55

**Portugal**
+351 21 424 6710

**Puerto Rico**
+787 289 7895

**Romania**
+40 1 231 08 70

**Russian Federation**
+7 095 797 4774

**Slovak Republic**
+421 26 478 2281

**Slovenia**
+385 42 33 1812

**South Africa**
+27 11 804 3740

**South Korea**
+82 2 3451 5200

**Spain**
+34 91 749 7605

**Sweden**
+46 8 568 512 00

**Switzerland**
+41 1 800 9220

**Taiwan**
+886 2 2715 6000

**Thailand**
+662 618 8638

**Turkey**
+90 212 325 4114

**Ukraine**
+380 44 227 3230

**United Arab Emirates**
+971 2 627 5911

**United Kingdom**
+44 870 240 2255

**Venezuela**
+58 212 267 5670

**Asian Solutions Center**
+852 2506 8700

**For other Europe, Middle East, or Africa inquiries:**
+33 1 41 90 41 64 (Sybase Europe)

**For other Asia Pacific inquiries:**
+852 2506 8700 (Hong Kong)

**For other Latin America inquiries:**
+925 236 6820

**Sybase, Inc.**
**Worldwide Headquarters**
One Sybase Drive
Dublin, CA 94568-7902 USA
Tel: +800 8 SYBASE
www.sybase.com



This Technical White Paper was prepared by Sybase, Inc. LO2417 MIL5911