24x7 Scheduler™ 6.1 Multi-platform Edition

User's Guide

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About This Guide

This user's guide describes features of 24x7 Scheduler Multi-platform Edition, an advanced cross-platform job scheduling and automation system. Information in this manual applies to 24x7 Scheduler v6.0 running on all supported operation systems. This manual contains information for both beginning and experienced users of 24x7 Scheduler. Both the print and the on-line documentation assume that you have a working knowledge of standard mouse and keyboard actions and understand basic concepts of your operation system. This manual is provided so that the reader can understand how 24x7 Scheduler functions. It also contains information on the following topics:

- Installation and configuration instructions

- Task-oriented guidelines to all interactive 24x7 Scheduler functionality

- A complete reference for the Job Automation Language including numerous samples

- Descriptions of supported programming interface methods for integrating 24x7 Scheduler with other applications and systems

24x7 Scheduler's documentation consists of this manual and a complete on-line interactive help system. The on-line help is available at any time when you are running 24x7 Scheduler. Depending on what you are doing, you can press F1, select Help from the Menu Bar, or select the Help button on a dialog.

Conventions Used in This Document

This section describes the style conventions used in this document.

Italic

An *italic* font is used for filenames, URLs, emphasized text, and the first usage of technical terms.

`Monospace`

A `monospaced` font is used for code fragments and data elements.

Bold

A **bold** font is used for important messages, names of options, names of controls and menu items, and keys.

User Input

Keys are rendered in **bold** to stand out from other text. Key combinations that are meant to be typed simultaneously are rendered with "+" sign between the keys, such as:

Ctrl+F

Keys that are meant to be typed in sequence will be separated with commas, for example:

Alt+S, H

This would mean that the user is expected to type the Alt and S keys simultaneously and then to type the H key.

Graphical marks

 - This mark is used to indicate product specific options and issues and to mark useful tips.

 - This mark is used to indicate important notes.

Abbreviations and Terms

This guide uses common abbreviations for many widely used technical terms including FTP, HTTP, RAS, SQL, DBMS, SSH and other.

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Chapter 1: Getting Started

Overview of 24x7 Scheduler Features

24x7 Scheduler is platform-independent tool, written in Java programming language, that enables you to schedule tasks (jobs) to run regularly, when it is necessary for you. 24x7 Scheduler functions are used to submit and manage jobs to be executed at a given computer at a given time or times in future or at a given event such as creation of one or more files, receiving of email messages, and other process interruptions. Jobs can be managed at remote and local computers provided schedule service is running at a given computer.

Schedule service functions were designed to extend basic functionality found built-in operation system scheduling functions and utilities as well as in many commercial programs. These utilities are relatively primitive when it comes to scheduling critical production jobs, because they are limited to a single machine, require cryptic instructions, and lack any error-handling, logging, or notification capabilities.

24x7 Scheduler enables you to:

- Schedule a job to run based on date and time, files arrival, and/or job dependencies (managed via semaphore files) such as job success, failure, missing file, etc.

- Change the schedule for or turn off an existing job.

- Customize how a job will run at its scheduled time.

- Monitor job execution progress in a real-time as well as forecast job start.

- Organize logically related jobs into logical groups represented by folders.

- Maintain list of exception dates such as holidays.

- Manage job interdependencies.

- Send notification messages about job execution status.

- Log job execution progress and status.

- Generate detailed reports on the job definitions, dependencies, and execution status.

- Use comprehensive fault tolerance features that ensure automatic server rollover in the event of a network/machine failure.

- Integrate 24x7 Scheduler with third-party applications.

24x7 Scheduler allows you to schedule a job to run at certain times or event. You can specify a condition that will trigger the job start. The following trigger types can be used:

- Time watch

- File watch

- Email watch

- Message watch

- User-defined triggers

Running on network

24x7 Scheduler is designed to run effectively in a network environment. However, it is not recommended to run shared 24x7 executables. The program automatically finds its home directory where it stores schedule database, creates log files and other working files.

Security issues

If you are running 24x7 Scheduler on a network server, on a computer where someone other than the system administrator may have access to, you should consider possible security risks when scheduling a program. If 24x7 Scheduler is running on a computer only accessible to the system administrator, security is not a concern. Otherwise, consider the following security steps:

- Whenever possible, run any scheduled programs non-interactively.

- If a program must be run interactively, run it under a user account that has only the minimum authority needed to run the program properly.

Changes to the System Time

24x7 Scheduler deals with changes to the system date/time in the following manner:

If the clock is set back (i.e., to an earlier date or time), 24x7 Scheduler will not run any jobs until the original or rescheduled time is reached. If 24x7 Scheduler is restarted (either manually, or because the system is restarted), it will adjust the scheduled time for all time-based jobs that run repeatedly.

If the clock is set forward (i.e., to a later date or time), 24x7 Scheduler will immediately run all jobs that were missed because of the time change and have the "Skip late job" option set to OFF. It will also run all jobs immediately that have the "Skip late job" option set to ON but the value of the "Maximum delay" parameter is greater then the time change interval. If 24x7 Scheduler is restarted (either manually, or because the system is restarted), it will adjust the scheduled time for the jobs that run repeatedly but will not run missed jobs.

Semaphore Files

A semaphore file is a type of synchronization object that can be used to effectively control the flow of processes. A data file or a log file created by one process can serve at the same time as a semaphore files for other processes. 24x7 Scheduler can use such semaphores as a reliable method of processing job interdependencies. No matter what occurs in the previous job, the next job in line will not start until all the necessary semaphore files have been created. The semaphore files mechanism guarantees that whether you restart 24x7 Scheduler, reboot the computer running 24x7 Scheduler, or a network failure occurred, a dependent job will start only when all the specified files exist.

There are two kinds of the semaphore files:

- **Input files**

- **Output files**

An **input file** is a "watch-file". 24x7 Scheduler checks whether all specified watch files are present so that the dependent job can start. Multiple watch files can be specified as a pre-condition for the job start. When you need to specify that more than one file should be checked, make sure that you use a list of semaphore files separated by commas or use a file mask.

When scheduling a job, you can use the **Polling Interval** property to specify how frequently you want 24x7 Scheduler to check the input semaphore files. Carefully consider the value for the polling interval. A short polling interval allows early detection of new semaphore files, thus the dependent jobs can start almost immediately after semaphore files arrived. On the other hand, a short interval causes 24x7 Scheduler to check for the semaphore files more often which leads to more network traffic and takes more CPU time, leaving less CPU time to other processes.

An **output file** is a file created by 24x7 Scheduler when certain events occur. You can use a list of semaphore files separated by commas when you need to specify that more than one file is to be created.

See also:

> [Job Execution Properties](#)
>
> [Semaphore files](#)
>
> [Job Wizard](#)

Accessing Help System

24x7 Scheduler supports context help, which can be used to get detailed information about the program. To display the Help window, press **F1** on the keyboard, or use the commands from the **Help** menu in 24x7 Scheduler main window. To get information about the elements of 24x7 Scheduler main window, first click on the toolbar and then click on the main window elements.

Help Window

The Help window contains a toolbar and the following two panes:

1. **Navigation pane** - a tabbed interface that allows switching between the table of contents and the full text search display.

2. **Content pane** - displays the selected help topic.

Table of Contents

The display of topics in the help system is collapsible/expandable. The TOC display is synchronized with the content pane - the topic displayed in the content pane is highlighted in the TOC.

Full-Text Search

The flexible full-text search engine can be used to find the topics containing specific words. Matches returned from searches are ranked for relevancy using "relaxation rules".

Toolbar

Toolbar contains the following buttons:

1. **Back** - performs move to the previously navigated topic.

2. **Forward** - performs move to the topic from which the Back operation was performed.

3. **Print** - opens the system default **Print** dialog.

4. **Page Setup** - opens the system default **Page Setup** dialog.

Getting Information In A Dialog Box

Each 24x7 Scheduler dialog box has the **Help** button, which invokes the Help window that explains the current dialog box functionality. The same window can be displayed with the help of **F1** hotkey.

Using The Search Tab

To initiate a search, enter a natural language query in the search navigator Find text box. The results are reported back in the following display:

The circle in the first column indicates the ranking of the matches for that topic. The more filled-in the circle is, the higher the ranking. There are five possible rankings (from the highest to the lowest):

The number in the second column indicates the number of times the query was matched in the listed topic.

The text specifies the name of the topic in which the matches were found.

Printing A Help Topic

To print a topic, use the **Print** and **Page Setup** buttons on the Help window toolbar.

Job Explorer Window

24x7 Job Explorer presents jobs, job queues, calendars, data profiles and agents as a hierarchical structure "System Tree" on the left pane. There are five root folders in this pane:

- Job queues - contains all defined queues

- Agents - contains all defined agents

- Auto-scaling Groups - contains all defined auto-scaling groups

- Reports – contains links to built-in and user-defined reports.

- Calendars - contains all defined calendars.

- Databases - contains all defined database interfaces and profiles.

- Messages - contains all defined message types.

- Templates – contains interactive job templates.

- Jobs - contains subfolders with jobs.

The right pane displays the properties of a selected folder or item. This pane is blank unless there is at least one item in the selected folder. You can use tabs displayed on the top of the pane to change the Properties view

Navigating through the various folders and jobs is usually accomplished by clicking individual folders and jobs with the mouse. For users more accustomed to keyboard navigation 24x7 Scheduler has been designed to make every feature available via the keyboard.

To change the size of either pane of the window, drag the bar that separates the two panes. Use scroll bars to navigate both panes of the Explorer window.

A context menu with available commands appears on the script when you right-click on any displayed item. This context menu shows most frequently used commands for that the selected item.

Job Explorer "System Tree"

If a folder has been expanded, and its contents displayed in the **Properties** view area, the folder will be represented by an open folder icon .

Collapsed folders represented by a closed folder icon .

Folders with a "+"symbol next to the folder name mean that there are jobs beneath the folder. Conversely, a "-"symbol next to a folder icon means that there are no further jobs beneath.

Property Pages

The first tab **Details** displays represents list of all items from a selected folder. The second tab **Properties** displays detailed information about the selected object. The **Properties** tab is disabled when there is no object selected. For example, when the current folder is empty, the third tab **Log** is available only in case a job is focused and displays available log records for the selected job. The job log provides a complete audit trail for all job runs. The Log tab is disabled when there is no job selected. For example, when the current folder is empty.

Status Bar

The status bar is a horizontal area that appears on the bottom of Job Explorer window. The status bar provides information about the current state of what you are viewing in the window and any other contextual information. The status bar is divided into three sections.

Left most section displays contextual information and descriptions of the program's activities during its various operations.

The middle section displays countdown timer for the next pending job. The text in this section displays "Off" if there are no jobs pending. You can rest the mouse pointer over this section for a moment to view additional information about this job. Double-click on this section to locate and highlight the first pending job.

The right most section displays current date time.

See also:

Drag & Drop Interface

24x7 Job Explorer supports standard drag and drop interface for managing logical job organization. When you drag a job icon in the Job Explorer tree and drop this job in another folder, 24x7 Scheduler moves this job to the targeted folder. When you drag a folder icon and drop it in another folder, 24x7 Scheduler moves all jobs from this folder to the targeted folder then removes dragged folder from the database. When you drag a job icon in the Job Explorer tree holding CTRL button and drop this job in another folder, 24x7 Scheduler copies this job to targeted folder. When you drag a folder icon holding CTRL button and drop it in another folder, 24x7 Scheduler copies all jobs from this folder to the targeted folder

Moving job to another folder

1. Click on the desired job.

2. While holding down the mouse button, drag (move) the mouse pointer to the desired folder.

3. Release the mouse button to drop the job.

Moving all jobs from one folder to another folder

1. Click on the desired folder.

2. While holding down the mouse button, drag (move) the mouse pointer to the desired folder.

3. Release the mouse button to drop the folder.

Copying a job to another folder

1. Click on the desired job.

2. Press CTRL button

3. While holding down the mouse button and CTRL button, drag (move) the mouse pointer to the desired folder.

4. Release the mouse button to drop the job.

Copying all jobs from one folder to another folder:

1. Click on the desired folder.

2. Press CTRL button

3. While holding down the mouse button and CTRL button, drag (move) the mouse pointer to the desired folder.

4. Release the mouse button to drop the folder.

See also:

Job Explorer Window

Job Execution Logs

24x7 Scheduler automatically performs job event logging. The log file provides a complete audit trail for all job runs. Log entries are created for the following job activities: job start, job finish, and job error. In addition, 24x7 Scheduler logs all unexpected system errors. The log shows the date and time a job had activity, the job number and name, the event severity, and the event description that may include error messages produced when an error occurred.

Use the Log Viewer to view all available entries in the log file. Choose **Tools / Log Viewer** command from the menu to start the **Log Viewer** (or use keyboard shortcut CTRL+L).

Tip: You may want to turn off **Load log on startup option** in the program Options if you want 24x7 Scheduler to start faster. This will also save some virtual memory and slightly improve the overall performance. However, you will not be able to see past log entries for the selected jobs in the Job Explorer Window.

Sending and Receiving Email Messages

24x7 Scheduler supports POP3/SMTP email protocols. 24x7 Scheduler uses POP protocol for handling email-watch jobs. 24x7 Scheduler uses SMTP protocol for sending various job notification messages and for sending user defined emails from script jobs.

Email watch jobs

If a job is setup to run when certain email arrives to your account inbox 24x7 Scheduler polls the POP3 server and checks the specified inbox. If finds emails matching parameters specified in the job properties it starts the job. The found email will remain on the POP3 server but it will not trigger the job second time until job properties are changed.

Email notification messages

A job may issue an email notification at a given event such as job start, job completion or job execution error. For this SMTP protocol is used.

Several important parameters must be configured in the scheduler's system options in order for the email notifications to work properly:

- **Message encoding** – Different email programs use different encoding. Use this parameter to configure encoding method compatible with the email program used by the message recipients.

- **Message content type** – Controls format in which SMTP email messages are generated.

- **SMTP email server** – Use this parameter to specify name or IP address of your SMTP server.

- **SMTP sender address** – Use this parameter to specify default SMTP message originator address. By default this parameter is set to 24x7_Scheduler@24x7automation.com. Change this parameter to a valid email address if your SMTP email server requires authentication.

Running Database Job

24x7 Scheduler allows you creating jobs accessing various databases and executing database commands. 24x7 Scheduler provides easy access to corporate information stored in a wide variety of databases. 24x7 Scheduler can connect to a database through the JDBC interface. 24x7 Scheduler software includes one JDBC-ODBC bridge driver. Before you can connect 24x7 Scheduler to your database, you need to do some preparing steps. The following are the basic steps you follow to prepare 24x7 Scheduler to work with your database:

1. **Install the JDBC driver** -- To connect 24x7 Scheduler to a database using database specific JDBC driver software, you must first install the JDBC driver. See your JDBC driver documentation for installation steps.

2. **Define the JDBC database interface –** In 24x7 Scheduler settings define where to find JDBC driver files

3. **Create database profile** -- In 24x7 Scheduler settings define where to find the database and which user credentials to use for the connection

4. (Optional) **Test the database connection**.

Note: 24x7 Scheduler includes one predefined Database interface that can be used to connect to databases through ODBC. Appropriate drive's parameters are hard coded for this interface.

See also:

[Database Interfaces](#)

[Database profiles](#)

Running JavaScript, VBScript, and JAL Jobs

24x7 Scheduler features several built-in scripting environments:

24x7 Scheduler supports jobs using cross-platform JavaScript to perform user-defined actions.

24x7 Scheduler supports jobs using VBScript for Applications scripts to perform user-defined actions.

24x7 Scheduler supports jobs using Job Automation Language (JAL) scripts to perform user-defined actions.

Script Editor

24x7 Scheduler incorporates a powerful editor that enables you to edit your JavaScript scripts efficiently. It includes important editing features, such as syntax highlighting, Paste script functions and their arguments, search and replace, virtually unlimited number of Undo and Redo levels, setting bookmarks, as well as other standard editing functions. Use the Editor to write JavaScript commands for the jobs of Script type. The editor automatically provides appropriate syntax highlighting.
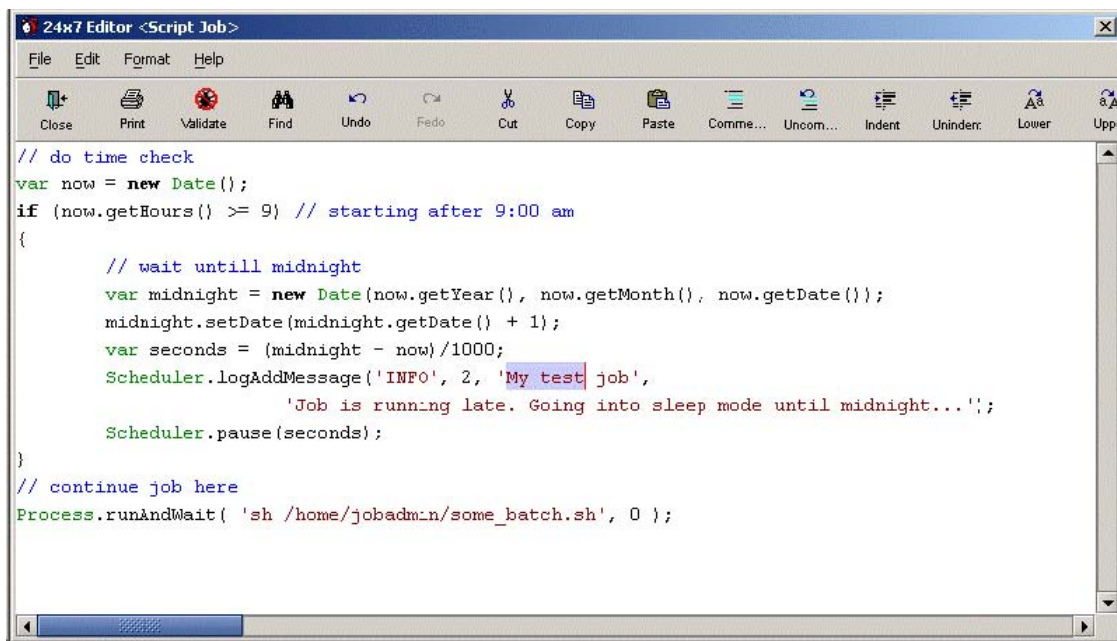
Searching in Scripts

1. Click the Find button on the Editor window toolbar or select Edit/Find command from the menu. The Find dialog opens.

2. Type your search string in the Find What edit box.

3. Specify the direction of the search operation by selecting either the Up or Down radio-button.

4. If you want to perform a case-sensitive search, then activate the Match Case check box.

5. If you want to search for whole words only, then activate the Match Whole Word Only check box.

6. Click the Find Next button to initiate the search. 24x7 Scheduler highlights the first instance of the search string that it finds. To continue searching, click the Find Next button again.

Replacing in Scripts

1. Select Edit/Replace command from the Editor's menu. The Replace dialog opens.

2. Type your search string in the Find What edit box.

3. Type the replacement text in the Replace With edit box.

4. If you want to perform a case-sensitive search, then activate the Match Case check box.

5. If you want to search for whole words only, then activate the Match Whole Word Only check box.

To initiate the search and replace operation: If you want to scroll through the script and examine each instance of the search string before placing it, click the Find Next button. 24x7 Scheduler highlights each instance of the search string that it finds. To replace the search string, you must click the Replace button. To continue searching and replacing, you must repeat the steps above for each search hit.

If you want to replace all instances of the search string without pausing, then click the Replace All button.

Go to Command

Use this command to jump to a specific line:

1. Select Edit/Go to Line command from the Editor's menu. The Go to Line dialog opens.

2. Type the line number in the edit box.

3. Click the OK button to jump to the specified line.

Importing and Exporting Scripts

24x7 Scheduler stores all scripts in the schedule database. You can use Import and Export features to save and read scripts as ASCII files.

To export a script:

1. Select File/Export command the Editor's menu. The Save As dialog appears.

2. Specify the name of the file in which you want to save the script.

3. Click the OK button.

To import a script:

1. Select File/Import command the Editor's menu. The File Open dialog appears.

2. Specify the name of the file from which you want to load the script.

3. Click the OK button.

Warning: The contents of the imported file replaces entirely the current script in the Editor.

Printing Scripts

To print a script:

1. Click the Print button on the Editor window toolbar. The Print dialog opens.

2. Select the Printer from the drop down list. It should contain a list of local and network printers that you can access. If you do not see any listed, then your computer is not configured for any printers.

3. Specify the desired print properties.

4. Click the OK button to print the script.

Copying, Pasting and Cutting Text

The Editor supports standard set of edit functions such as Cut, Copy and Paste commands that move selected text to and from the clipboard.

To copy and paste text:

1. Highlight the text inside of the Editor window.

2. Click the Copy button on the Editor's toolbar. This action causes the selected text to be copied to the clipboard.

3. Place your cursor at the position where you want to paste the text. Click the Paste button. The text is copied on to the script.

To cut and paste text:

1. Highlight the text inside of the Editor window.

2. Click the Cut button on the Editor's toolbar. This action causes the selected text to be copied to the clipboard and removed from the script.

3. Place your cursor at the position where you want to paste the text. Click the Paste button. The text is copied on to the script.

Undo/Redo Changes

The Editor supports undo/redo actions. The Undo action cancels the last edit, restoring the text to the content before the last change.

To undo a change:

1. Click the Undo button on the Editor's toolbar.

To repeat the last undone change:

1. Click the Redo button.

Pasting JavaScript Syntax

1. Click the Paste JavaScript button on the Editor's toolbar. The Paste JavaScript Syntax dialog opens.

2. Select the command that you want to paste from the drop-down list of available JavaScript commands. The syntax appears in the Syntax box.

3. Click the OK button. 24x7 Scheduler pastes the selected syntax into the script. You must complete the command by replacing the placeholders in the sample syntax and designating options, as applicable.
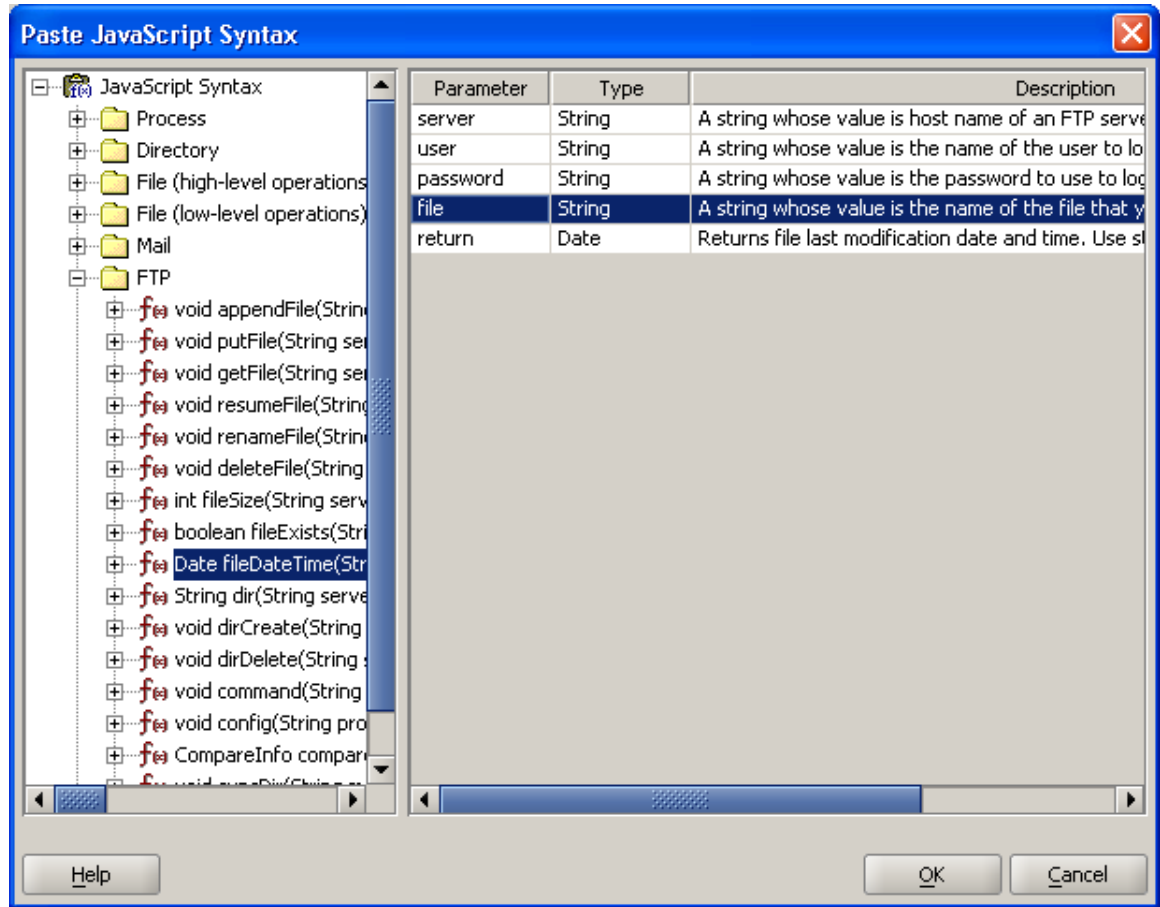
Important Note: 24x7 Scheduler provides syntax for all standard commands and some job specific proprietary extensions provided by 24x7 Scheduler. Be aware that the list of valid JavaScript commands is not limited by the commands shown in the tree-view. You can develop your own JavaScript functions and use them as needed.

SQL Editor

24x7 Scheduler incorporates a powerful editor that enables you to edit your SQL scripts efficiently. It includes important editing features, such as syntax highlighting, Paste SQL syntax, search and replace, virtually unlimited number of Undo and Redo levels, setting bookmarks, as well as other standard editing functions. Use the Editor to write SQL commands for the jobs of Database type. The editor automatically provides appropriate syntax highlighting.
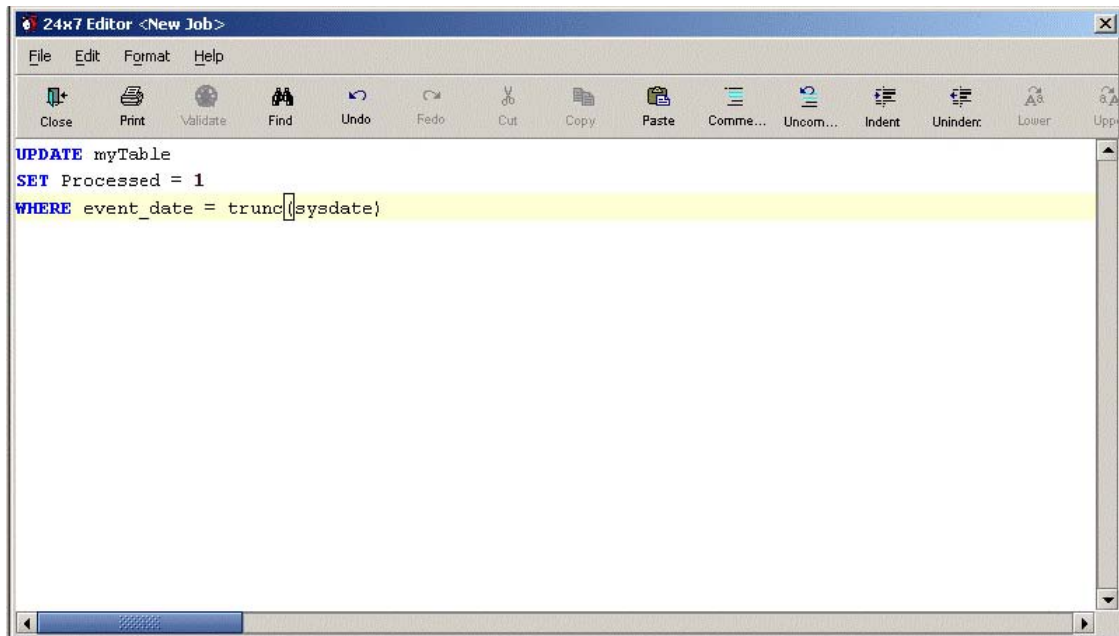
Most of the edition functions are identical to these available in the JavaScript Editor and already described in the JavaScript Editor topic. The following functions are specific to SQL Editor.

Pasting SQL Syntax

1. Click the Paste SQL button on the Editor's toolbar. The Paste SQL Syntax dialog opens.

2. Select the command that you want to paste from the drop-down list of available SQL commands. The syntax appears in the Syntax box.

3. Click the OK button. 24x7 Scheduler pastes the selected syntax into the script. You must complete the command by replacing the placeholders in the sample syntax and designating options, as applicable.
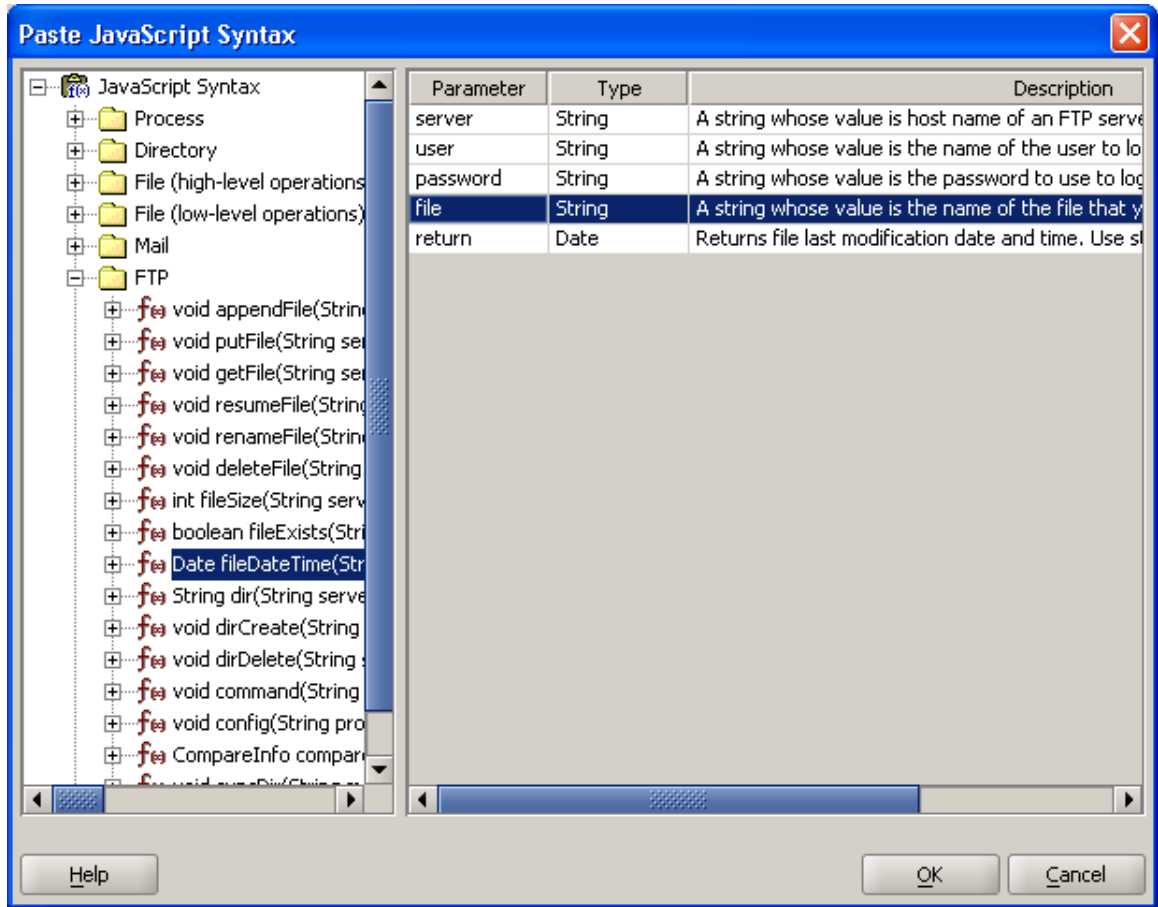
🖈 **Important Note:** 24x7 Scheduler provides syntax for commands available in most popular database systems. However, the list of valid SQL commands is not limited by the commands shown in the drop-down list. You can use any valid SQL commands supported by your database.

Database Interfaces and Profiles

24x7 Scheduler uses database interfaces and database profiles to help user organize access to different types of databases through different types of JDBC drivers. Each database interface may contain several Database profiles. Configured interfaces and profiles can be used with various database jobs to automate and schedule database side processing.

The following sample screenshot demonstrates 2 configured database interfaces "ODBC" and "Oracle 10g."
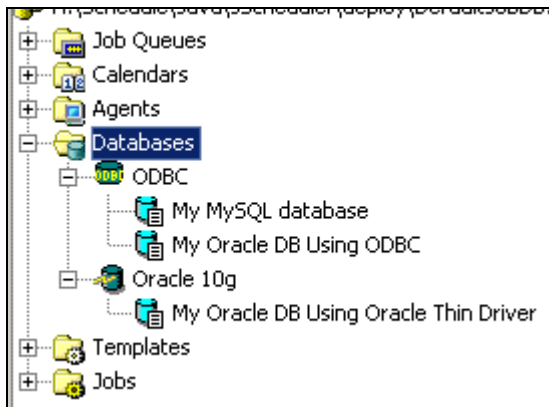
Database Interface defines path to JDBC driver's file(s) and driver's class. Information about driver's class and location can be found in the driver's documentation.

Note that the ODBC interface is present on all systems and it is installed and configured automatically with 24x7 Scheduler software while other interfaces need to be setup manually by users. Normally JDBC drivers are provided by the database vendors as part of the database client software installation procedures. Certain JDBC drivers are also available from third party vendors.

See also:

> Database profiles
> Database interfaces

Working with Database Interfaces

Use the **Database Interface** dialog to configure new database interface or modify an existing one.

To configure a new interface:

1. Click on the **Databases** node in the system tree. Use **File / New / Database Interface** menu to start the **Database Interface** dialog.

2. Enter descriptive interface name, path to the JDBC driver's file(s) and driver's main class name
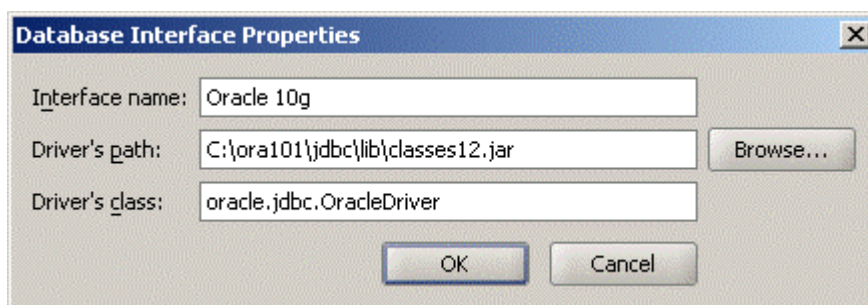
3. Click the **OK** button to save changes or click **Cancel** to close the dialog without saving.

To modify an already configured interface:

1. Expand the **Databases** node in the system tree.

2. Click on the interface node you want to modify.

3. Use **File / Properties** menu to start the Database Interface dialog or simply double-click the interface node.

4. Modify the interface name, path to the JDBC driver's file(s) and driver's main class name as required

5. Click the **OK** button to save changes or click **Cancel** to close the dialog without saving.

To delete an already configured interface:

1. Expand the **Databases** node in the system tree.

2. Click on the interface node you want to delete.

3. Use **File / Delete** menu to delete the selected database interface and all profiles contained in that interface.

Database Profiles

24x7 Scheduler uses database profiles when connecting to various databases.

A database profile is a named set of parameters stored in the scheduler preferences that defines a connection to a particular database. You must create a database profile for each data connection.

Creating and Configuring Database Profiles

1. In the system tree, click to expand the **Databases** node. The Databases node displays in the left and right panes all the **Database Interfaces** defined in the scheduler preferences.

2. Click the appropriate **Database Interface** node, which you want to use for the connection. Click the **File/New/Database Profile** menu. The **Database Profile Properties** dialog will appear.

3. Enter the following information:

    Profile Name - Enter a name for this profile. This name is saved in the configuration file (preferences.xml) and used throughout the scheduler whenever referring to this data source.

    Database URL - Enter a JDBC URL pointing to your database server.

    User Name and **Password** – Enter user and password required for the database connection.

4. Click the **Test Connection** button to test the connection. If the connection is successful, click the **OK** button to save the new profile.

Tip: Below are two sample profiles. First profile has been configured using ODBC Database Interface. Second profile has been configured using sample Oracle interface whose screenshot is available in Database interface setup dialog topic.

Database Profile Properties ☒ Profile name: Oracle 10g Database URL: jdbc:oracle:oci:@myhost:1521:inst1 User name: scott Password: ••••••• [Test Connection] [OK] [Cancel]	Sample profile for Oracle 10g using Oracle JDBC driver
Database Profile Properties ☒ Profile name: My Oracle DB Using ODBC Database URL: jdbc:odbc:My Ora ODBC Profile User name: scott Password: •••••• [Test Connection] [OK] [Cancel]	Sample profile for Oracle using ODBC JDBC driver.

Modifying Database Profiles

1. In the system tree pane (left pane), click to expand the **Databases** node. The Databases node displays in the left and right panes all the **Database Interfaces** defined in the scheduler preferences.

2. Expand the appropriate **Database Interface** node, which contains the database profile you want to modify.

3. Click the required database profile. Click the **File/Properties** menu or press *F4* keyboard shortcut. The **Database Profile Properties** dialog will appear.

4. Modify profile properties as required.

5. Click the **Test Connection** button to test the connection. If the connection is successful, click the OK button to save changes.

Deleting Database Profiles

1. In the system tree pane (left pane), click to expand the **Databases** node. The Databases node displays in the left and right panes all the **Database Interfaces** defined in the scheduler preferences.

2. Expand the appropriate **Database Interface** node containing the database profile you want to delete.

3. Click the required database profile. Click the **File/Delete** menu.

See also:

> [Database interfaces](#)
> [Database interface setup dialog](#)
> [Database profile setup dialog](#)

Calendars

About Calendars

Calendars allow you to define a range of dates available to jobs. Calendars are used as date filters for jobs having [time-based triggers](#). For example, if you create a calendar containing only 4 days, 1 for each quarter, and assign it to a job with [Daily Or Weekly](#) schedule and all week days selected, the job will run only 4 times a year, as defined in the calendar. This method provides you with a great flexibility allowing you to schedule jobs to run on any given set of dates.

24x7 Scheduler supports multiple calendars. Calendars can be shared between jobs. Same calendar can be assigned to different jobs as well as different calendars can be assigned to different jobs

Two types of calendars are supported:

- Exclusive

- Inclusive

Use **exclusive** calendars to define a set of exception dates such as a full year calendar with a dozen of holidays. In this case you only need to key dozen dates for every year as exclusions.

Use **inclusive** calendars to define a small set of dates, which are only dates applicable to a job. A good candidate for this type of calendar is Quarterly or Yearly calendar or a calendar defining first and last days of fiscal periods in a fiscal calendar.

See also:

> [Calendar Properties](#)

> [Job Schedule and Triggers](#)

Calendar Properties

Calendar Properties dialog allows you to create new or edit existing calendars.
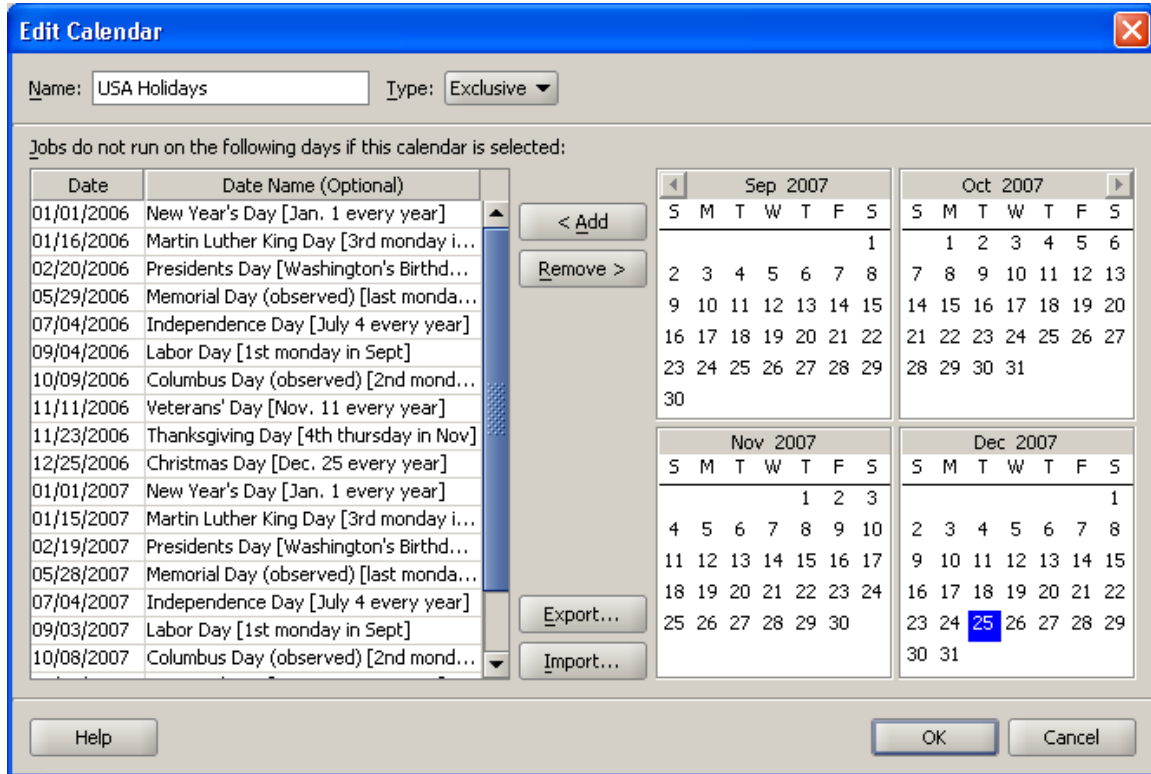
You can enter/modify following fields:

- **Name** – Calendar name. It is recommended that you use descriptive calendar names, for example, *North America Holidays*

- **Type** - Calendar type. See About Calendars topic for information on calendar types and when and how to use them.

- **Dates** - Dates selected for the Calendar. The meaning of dates depends on the calendar type. Date description is option by highly recommended

To add a new calendar:

1. Click the **File** menu and then click the **New** menu branch and then click the **Calendar** command in that branch. Alternatively you can right click the **Calendars** item in the system tree and then select **New/Calendar** command in the popup menu.

2. Enter calendar name and type.

3. Select calendar dates.

   To add a new date to the calendar, double-click on the date displayed in the monthly calendar area or select the date using keyboard navigation keys and then click the **Add** button (or use ALT+A keyboard shortcut).

   To scroll calendar months use ◄ and ► buttons available on top of the monthly calendar area or use PAGE UP and PAGE DOWN keyboard shortcuts.

To remove already defined date select that date in Dates area and click the Remove button (or use ALT+R keyboard shortcut)

To edit description of a selected date, double click on the description field and then type in what you want or use CTRL+C keyboard shortcut to paste text from the Clipboard.

4. Click the **OK** button to save changes.

To modify an existing calendar:

1. Expand the **Calendars** folder in the system tree.

2. Right click the calendar you want to modify and then select **Properties** command in the popup menu (or use F4 keyboard shortcut).

3. Follow instructions described in steps 3 and 4 for "To add a new calendar" section.

To delete an existing calendar:

1. Expand the **Calendars** folder in the system tree.

2. Select the calendar you want to delete and then click the **File** menu and then the **Delete** command.

Tips:

- An alternative way to define calendar dates is to use the **Import** button to load a tab separated file containing calendar dates and their descriptions.

- To quickly create a copy of an existing calendar, open the source calendar in the Calendar Properties dialog and use the **Export** function to save calendar definition in a tab-separated file. Close the dialog and create a new calendar as explained above. Use the **Import** button to load the previously exported file.

See also:

About calendars

Job Queues

About Job Queues

24x7 Scheduler supports multiple concurrent job queues. Each queue has its own Queue Processor that instantly scans the queue for new submitted jobs and executes them according to their priority, order in queue, and processing type. High priority jobs are executed first, then go jobs with normal priority, and then go low priority jobs. Jobs having same priority are executed in the order they were submitted to the queue, but before jobs having less priority. The Queue Processor executes jobs one-by-one as they become available in the queue. However, job processing maybe different depending on the job asynchronous property state. The Queue Processor executes synchronous jobs synchronously, meaning that other

pending jobs in the same queue wait for the Queue Processor to complete the current job before moving to the next one. The asynchronous jobs are spawned and executed by a separate processing thread created for every asynchronous job so that the Queue Processor and other jobs do not have to wait for the current job to complete.

On the other side, 24x7 Job Event Processor instantly scans jobs in the active job pool and checks their start conditions (i. e. schedule and events). The Job Event Processor evaluates these conditions and submits jobs whose start conditions are satisfied to the appropriate job queue.

The Job Event Processor and the Queue Processors operate independently so that the Job Event Processor can submit a job even while the Queue Processor is busy executing some other job. For more information about job processing see Job Processing Workflow topic.

24x7 Scheduler provides Queue Monitor interface, which gives the user a detailed insight into the Queue Processor's internal state. It should be stressed that the Queue Monitor can be connected to any active queue and it operates in a real-time. The Queue Monitor can be also used to manage already queued jobs.

Notes: There are several important features that you should know and carefully consider before setting the job queues:

- Every configured job queue requires additional resources for the Job Queue Manager. Every asynchronous job also requires additional resources for a dedicated copy of the job engine so that the job can run in its own virtual environment.

- Running asynchronous jobs is a resource "expensive" function. Whenever possible try to avoid asynchronous jobs. It is recommended that you use asynchronous jobs only for "non-stop" processing. For example, a job with a script implementing logical loop "forever", is a good candidate for an asynchronous job.

- If you don't want a job to block other jobs, setup it to run in another job queue. Or if you want a job to be always executed immediately without taking chances that it will be waiting sometime for the Queue Processor to become available, setup it to run in a dedicated job queue.

- 24x7 Remote Agents do NOT use job queues. They always execute submitted jobs immediately. All submitted jobs run concurrently as asynchronous processes.

- When you exit 24x7 Scheduler, all running jobs (if any) are forcedly terminated.

See also:

> Job Processing Flow
>
> Creating and Modifying Queues
>
> Job Queue Monitor

Creating and Modifying Queues

24x7 Scheduler supports multiple concurrent job queues. You can create as many queues as anticipated. Note that the **[default]** queue is required and cannot be deleted.

To add a new queue

1. Click the **File** menu and then click the **New** menu branch and then click **Job Queue** command in that branch. Alternatively you can right click the **Queues** item in the system tree and then select **New/Queue** command in the popup menu.

2. The **Job Queue Properties** dialog will appear.

3. Enter descriptive and unique **queue name**.

4. Choose queue capacity limits. Every queue has user-defined **disk space usage limit**. This limit is used to prevent a situation when jobs pile up in a job queue faster than the system can process them. In case a queue reaches the specified size, new jobs will not be added immediately and will wait for a free space in that queue to become available. The default space limit is 1MB that normally sufficient to fit many hundreds of jobs. When a job is processed, the job definition is removed from the queue and the released space can be reused for another job. You can adjust job queue size to meet your unique requirements. **Maximum number of jobs** allowed in a queue provides another method to control runaway jobs. If this value is set to zero, the scheduler does not check for the number of running jobs.

5. Choose email alerts option. **Send email alerts option** enables email alerts. The scheduler sends such alerts in case a queue is at or near its maximum capacity. By default, the scheduler checks and alerts on queue space utilization only. In case the maximum number of jobs parameter is set to a non-zero value, the scheduler also checks for the number of running and queued jobs.

6. If you have enabled email alerts for queue utilization, make sure to specify which **email account** can be used to send them and who should be receiving such alerts. You can specify multiple individual and group email addresses in the recipient property. Note that different settings can be used for different queues.

7. Click the **OK** button to save changes and close the dialog.

To modify an existing queue

1. In the system tree double-click the queue you want to modify or click it and press F4 keyboard shortcut

2. The **Job Queue Properties** dialog will appear.

3. Modify queue name and size as required.

4. Click the **OK** button to save changes and close the dialog.

To delete an existing queue

1. In the system tree select the queue you want to delete

2. Click the **File / Delete** menu to delete the selected job queue.

   Note: The **[default]** queue cannot be deleted

See also:

Job Processing Flow

About Job Queues

Jobs and Priorities

Messages

About Messages

24x7 Scheduler supports internal messaging interface that can be used for triggering job execution including multicasting. Message definitions are stored in the job database and settings. The run-time messages are pushed to the internal message queue where they can stay until they are deleted.

Message Properties

You can use the Message dialog to create new and updating existing message properties.

Enter message description into the **Description** field.

About **Message Type** property - This property is reserved for future use. As of 24x7 Scheduler version 6.0 the only supported value is Job Trigger.

Select the **Default Action** to be applied to the message when the message is about to be processed.

- You can choose to delete the message immediately before the scheduler executes the jobs that subscribe to this message. This ensures that it doesn't remain in the message queue and doesn't trigger the same jobs repeatedly. However, if the message gets deleted and the scheduler is restarted before it completes all related jobs, after restart it won't restart the incomplete jobs.

- You can choose to delete the message after the scheduler completes all related jobs. This can however in certain conditions lead to the message triggering the same jobs repeatedly.

- You can choose the Do Nothing action, if you have that message referenced directly in job properties to be monitored by the jobs and expect the job(s) to delete it explicitly.

  Important Note: If you use message subscription features, and in the message properties specify which jobs subscribe to it, set the schedule of these jobs to **[no schedule]** and in the message properties add them to the **Message subscribers** list. Using both subscriptions and direct monitoring may lead to duplicate job runs, these methods are **mutually exclusive**.

The **Action Required** property provides an alternative to **Do Nothing** action type. As of 24x7 Scheduler version 6.0 selecting this option and choosing Do Nothing action type leads to the same result.

Use the **Enabled** property to enable and disable messages. The enabled/disabled message behavior is similar to the enabled/disabled job behavior.

The **Owner Job** property is used mostly for documentation purposes to make it easier to see in the Message details which job is responsible for triggering that message.

Use the **Default Message** if you want to send some data to downstream jobs triggered by the message and that data is static and doesn't change. If you need to pass dynamic data, leave this property blank, and specify what to pass in the properties of the upstream jobs that are set to trigger this message. Multiple jobs can be set to trigger the same message and they can send different data to the downstream jobs. The downstream jobs can use **@V"data" macro-parameter** to obtain the message data. See the Macro-parameters topic for more details.

Use the **Message Subscribers** property to link the jobs. Typically you should use this list to create multi- job triggers.

Remote Agents, Auto-scaling Groups, And Remote Jobs

About Remote Agents and Remote Jobs

24x7 Scheduler supports remote jobs. This means that you can run the main 24x7 Scheduler on one computer and execute jobs on a different computer connected to it via local or global network. 24x7 Remote Agent provides a way to execute jobs on remote computers. The Remote Agent must be installed on each computer that you want processing to occur. Remote Agents are important parts of 24x7 Scheduler distributed features. 24x7 Scheduler distributed architecture allows a job created on the main scheduler computer to be executed by the Remote Agent on the remote computer. All job maintenance and event processing remain on the main 24x7 Scheduler computer. This allows you to have a single point of administration and scheduling for all distributed jobs.
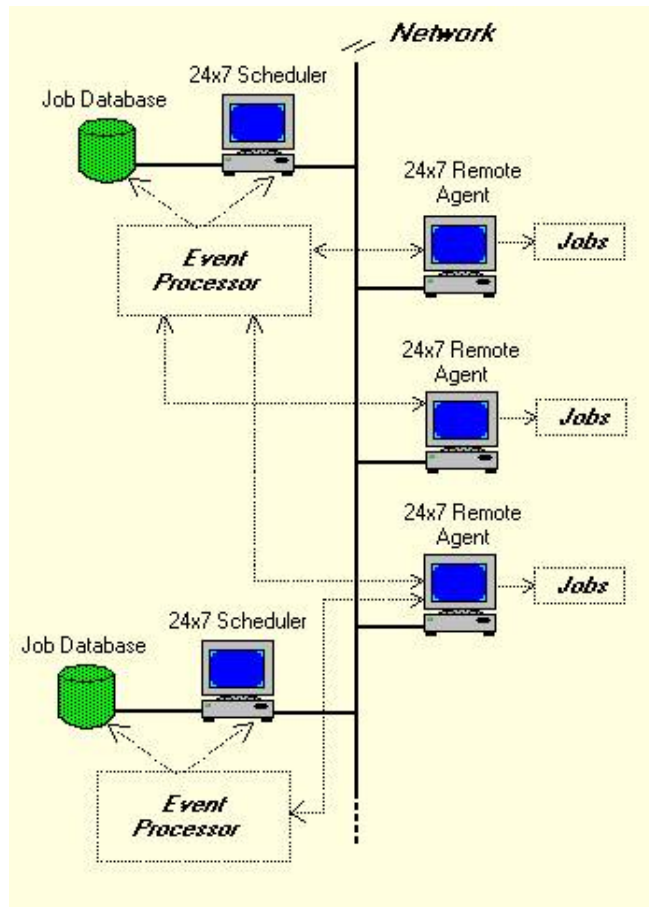
Important Note: Remote jobs can be also executed on computers running other 24x7 Master Schedulers or on computers running 24x7 Remote Automation Servers.

What happens on the Master Scheduler when it is the time to execute remote job?

The Scheduler reads properties of the Remote Agent profile specified in the job properties. It opens a new connection to the agent. It then send a copy of the job definition to the remote agent. If the job doesn't have the asynchronous mode enabled, the scheduler waits for the job to complete on the remote computer. If the job has the asynchronous mode enabled, the scheduler doesn't wait for the job completion, and immediately proceeds to running other scheduled jobs assigned to the same job queue. When the job completes or fails, the remote agent sends the job status back to the scheduler along with some other details.

What happens on the Remote Agent when it is time to execute remote job?

When a job is received for remote execution, the agent requests operation system to authenticate user whose credentials are specified in the properties of the submitted job. If user is successfully authenticated, the agent creates new operation system process under the account of the job user. That process then executes the actual job.

See also:

Starting Remote Agent

[Remote Agent Profiles](#)

Starting Remote Agent

To start 24x7 Remote Agent in graphical mode:

1. **On Unix/Linux/Mac** - Run *agent.sh* file. 24x7 Remote Agent starts.

2. **On Windows -** Run *agent.bat* file. 24x7 Remote Agent starts.

To start 24x7 Remote Agent in non-graphical mode:

1. **On Unix/Linux/Mac** - Run *agent.sh nogui*. 24x7 Remote Agent starts in console mode.

2. **On Windows -** Run *agent.bat nogui*. 24x7 Remote Agent starts in console mode.

Auto-scaling Groups and Policies

Auto-scaling groups allow convenient logical grouping of remote agents that can be used for job execution. Remote agents are configured separately and refer to physical or virtual servers running 24x7 software. Not all servers in the group can be running all the time. Typically you would map an auto-scaling group in the 24x7 Scheduler setting to an auto-scaling group you created in your cloud provider's account. An auto-scaling group consists of a set of members such as EC2 instances in Amazon AWS or VMs in Microsoft Azure. You define an auto-scaling policy in the cloud for scaling out the group when more servers required for the processing. The 24x7 Scheduler detects automatically which server are up and available for running jobs.

It's up to you to how define the auto-scaling policy. For example, you can define a schedule-based rule in the auto-scaling policy for additional group members to be started up, and another one for when to stop unused members. For example, if you run most jobs between 7:00am and 10:00am and your need more servers during that time, you can create a schedule-based policy to scale out the group at 7:00am and then scale it back at 10:00am.

For a dynamic resource-usage based auto-scaling group you can define a resource based policy. The auto-scaling policy is set in the cloud. The scheduler will utilize whatever agents in the group are available at the time it needs to launch a new job instance and it will pick an agent using the [Least-busy] method. On each participating group member you need to have 24x7 Remote Agent software installed, as well as in the scheduler's settings you also need to define their Agent profiles, and add these profiles to the Auto-scaling group.

To add a new auto-scaling group:

1. Click **File / New / Auto-scaling Group** menu. The Auto-scaling Group Properties dialog will appear.

2. Complete group properties as descried in Auto-scaling Group Setup dialog

To delete an existing group:

1. In the system tree expand the **Auto-scaling Group** branch and select the group you want to delete.

    2.   Click **File / Delete** menu

To rename or modify properties of an existing group:

    1.   In the system tree expand the **Auto-scaling Group** branch and select the group you want to modify.

    2.   Click **File / Properties** menu or press F4 keyboard shortcut. The **Auto-scaling Group Properties** dialog will appear.

    3.   Complete group properties

Remote Agent Profiles

Before a job can be submitted to a remote agent or master scheduler, a remote agent profile must be created in the scheduler's settings. 24x7 Scheduler uses profile information when connecting to remote agents. Each agent requires a separate profile.

To add a new agent profile:

    1.   In the system tree select **Agents** branch

    2.   Click **File** menu, and then click **New**, and then **Agent** menu. The Remote Agent Properties dialog will appear.
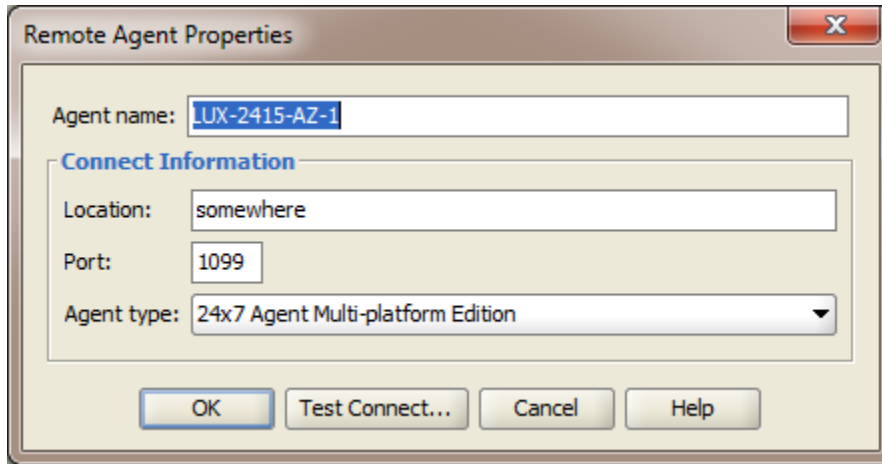
    3.   Enter descriptive agent name into the **Agent Name** field.

    4.   Enter computer name or IP address of the computer running the agent into the **Location** field.

    5.   Enter the required communication port number or leave the default 1096 number into the **Port** field.

    6.   If you are setting a profile for 24x7 Remote Agent for Windows or 24x7 Remote Master Scheduler for Windows check 24x7 **Scheduler/Agent for Windows** option.

       Important Note: Do not confuse 24x7 Scheduler Multi-platform Edition running on Windows platforms with 24x7 Scheduler Windows Edition. These are two different software products and they use internally different communication protocols. 24x7 Scheduler/Agent for Windows option is used with 24x7 Scheduler Windows Edition only. This option instructs 24x7 Scheduler Multi-platform Edition to use communication protocol compatible with 24x7 Scheduler Windows Edition.

    7.   If you are setting a profile for 24x7 Scheduler running on z/OS or OS/390 system check the **z/OS or OS/390 Agent** option.

8. Click the **Test Connect** button if the agent is up and running and you want to test the configured connection. Click the OK button to close the

To delete an existing agent profile:

1. In the system tree expand **Agents** branch and select the agent profile you want to delete.

2. Click **File** menu, and then **Delete** menu.

To rename or modify properties of an existing agent profile:

1. In the system tree expand **Agents** branch and select the agent profile you want to modify.

2. Click **File** menu, and then **Properties** menu or press F4 keyboard shortcut.

3. To properly complete agent's properties follow instructions provided above in the " To add a new agent profile" section.

See also:

About Remote Agents and Remote Jobs

Connection Options

Connection options

Location – this specifies the location of 24x7 Master Scheduler or 24x7 Remote Agent, one of the following values:

- The IP address of the remote computer (for example, 199. 99. 99. 91)

- The host name of the remote computer (network computer name in workgroup or domain)

- **Port –** Specifies the port number for 24x7 Master Scheduler or 24x7 Remote Agent (for example, 1099). Each server application requires a unique port number on the server machine. **Make sure you enter the port number selected in the remote 24x7 Scheduler/Agent system options.**

Chapter 2: Working With Job Database

24x7 Scheduler stores information on scheduled jobs in the Job Database. You should not attempt to edit job database files directly. If you have installed 24x7 Scheduler in more than one directory or on two or more computers and you wish to copy information on scheduled programs between them, you can simply copy the entire job database directory.

24x7 Scheduler also stores some configuration information in several xml files that are located in 24x7 Scheduler directory. This information includes all 24x7 Scheduler configuration options accessible through system tree displayed in the Job Explorer Window or the Tools menu including definitions of database profiles, remote agent profiles, job queues, and calendars. In case of a system recovery you may attempt to modify this information directly, but it is highly recommended to use 24x7 Scheduler GUI.

You can create, modify and save job databases much like the way you create, modify and save spreadsheet files in your favorite spreadsheet program. However, the last opened job database is always the active one.

When you add a new, delete/disable/enable or simply modify an existing job, your changes become visible for Event Processor immediately. But the changes are not saved in the file until you choose one of the **Save** commands by doing one of the following:

- Click the **File** menu then click the **Save** command.
- Press shortcut CTRL+S.
- Click the **Save** button on the toolbar.

On save 24x7 Scheduler saves all changes to the job database.

Adding New Job

To schedule a new job

1. In the system tree select the folder in which you want to create a new job.
2. Select the **File** menu then select the **New** command, and then choose the **Job** command (shortcut CTRL+N). Alternatively you can click the **New Job** toolbar button
3. Follow the instructions provided by the Job Wizard.
4. You must save changes in order to permanently apply them to the job database.

Note: Make sure that the system date and time for your computer are accurate. 24x7 Scheduler relies on this information to know when to run scheduled tasks.

See also:

Working with Job Database

Copying/Duplicating Job

You can use this method to quickly create a new job fro man existing job and copy all job properties.

To duplicate an existing job

1. In the system tree select the job you want to duplicate.

2. Right-click on the job and select the **Copy…** command,

3. Press F4 or double-click the new job to open the Job Wizard and to modify job properties as required. Follow the instructions provided by the Job Wizard.

4. You must save changes in order to permanently apply them to the job database.

See also:

> Working with Job Database

Deleting Job

To delete a scheduled job

1. In the system tree select the job you want to delete.

2. Select the **File** menu then select the **Delete** command. Alternatively you can click the toolbar button ✕

3. You must save changes in order to permanently apply them to the job database. Click the **Save** button 💾 on the toolbar or use the **File / Save** menu.

🦎 **Tips:**

- You can also right-click the job in the system tree then select the **Delete** command from the context menu.

- Deleting a job in the scheduler leads to the removal of the job definition from the job database. The executable file associated with the job is not removed from the system.

- If you deleted a job by mistake, you can quit 24x7 Scheduler without saving changes. After that start 24x7 Scheduler again and it will reload job database from the disk file. However, this trick will not work if the scheduler is configured to automatically save changes on exit.

See also:

> Stop running job
> Disabling job
> Working with Job Database

Disabling/Enabling Job

A job can be either in disabled or enabled state. Disabled jobs do not run on schedule. They can be started only manually using the **Run Now** feature or programmatically using one of the supported API methods.

You can toggle job state by setting on/off the **Disabled** property.

To temporarily disable a scheduled job

1. In the system tree select the job you want to disable.

2. Select the **File** menu then select the **Disable** command. 24x7 Scheduler will disable the job and a check mark will appear next to the **Disabled** menu item. Alternatively you can click the **Disable Job** toolbar button

3. You must save changes in order to permanently apply them to the job database.

To enable previously disabled job

Repeat steps described above. This will revert the job state back to enabled state.

Tips:

- You can also right-click on the job in the system tree then select the **Disable** command from the context menu.

- Disabling a scheduled job does not remove the job definition from the job database.

See also:

> Stop running job
> Deleting job
> Working with Job Database

Modifying Job Definition and Schedule

To rename a job

1. Right-click on a job in the system tree.

2. Select the **Rename** command in the popup menu or press the F2 keyboard shortcut.

3. Type the new job name; when done press Enter key.

To disable/ enable a job

See Disabling/Enabling Job topic for detailed instructions.

To change all other job properties and schedule

Use the Job Wizard to modify other job properties. To run the **Job Wizard:**

1. Double-click a job in the system tree

   or

Click on a job icon and then press F4 keyboard shortcut.

2. Follow the instructions provided by the Job Wizard.

Job Wizard

The Job Wizard is the tool you use to simplify process of scheduling a new job or updating properties of an existing job. The Job Wizard consists of series of dialog windows. The Job Wizard asks questions and then uses your answers to update job properties. 24x7 Scheduler uses different job properties for the different job types. That is why the Job Wizard shows the only dialogs appropriate for job type you selected. You can change any job property including job type at any time. To move between dialogs you can use the Next and the Back buttons displayed on the bottom of each dialog. To apply changes and close the Job Wizard, click the Finish button at any time. To cancel changes, click the Cancel button. Alternatively, you can use the following keyboard shortcuts:

- Next - ALT+N   -- this will advance the Wizard to the next dialog page.
- Back - ALT+B   -- this will revert the Wizard to the previous dialog page.
- Schedule - ALT+S   -- this will advance the Wizard to the Job Scheduler dialog page.
- Finish - ALT+F   -- this will close the Wizard and apply all changes made in the job properties.
- Cancel - Escape or ALT+C   -- this will close the Wizard and cancel all changes in the job properties.
- Help - ALT+H   -- this will popup the context help screen.

 Tips:

- You can use the Wizard to enter and modify JavaScript scripts and SQL commands in Script-type and Database-type jobs using the plain text edit box provided in the Job Wizard window. However you may find more convenient using the full-featured script editor. To access the editor click the **Edit Script** button on the toolbar or use the **File / Edit Script** menu.

- To copy and paste text while in one of editable fields, right-click on the field, then select the desired command from the pop-up menu.

See also:

> Job Types
>
> General Job Properties

Moving Job to Another Folder

Use drag-and-drop features to perform this operation. See Drag & Drop Interface topic for details.

See also:

> Working with Job Database

Testing Job Execution

You can use any of the following options to test a job or simply run a job immediately without waiting for the scheduled event to happen:

- In the system tree right-click the job you want to start, and then click the **Run Now** item in the popup menu.

- Click the job you want to start and then select **File / Run Now** command from the top-level menu (or use CTRL+R shortcut).

- Click the job you want to start and then click the **Run Now** toolbar button.

 Important Notes:

In certain configurations when a job is run in the **Run Now** mode and an error occurs 24x7 Scheduler may display interactive modal message boxes that require user intervention. You should always close such messages because they potentially can prevent other jobs from starting on time.

Normally, 24x7 Schedule displays only non-modal message boxes. The non-modal message boxes automatically disappear after a few minutes. This allows 24x7 Scheduler to work unattended. You can also close such messages manually.

In the system options you can set display time for non-modal message boxes. To change the settings click **Tools** menu, click **Options** menu, then specify the desired display time in minutes in the **Maximum Error Message Box Display Time** edit field. To disable the error message displays set the time value to zero.

Tips:

- Use the Queue Monitor to abort a running job.

- If a job should have run but did not, check the Job Log to see why or select the job in the system tree, click **Log** tab on the right hand side.

See also:

> Disabling/Enabling Job

Stopping Job Execution

Queued and already running jobs can be stopped from the Queue Monitor.

To stop a job:

1. In the **Queues** drop-down list select the queue to which the job is assigned.

2. Select the job you want to stop.

3. Click select **File/Delete Job** menu item. Alternatively click button ![delete icon]. If a job is queued it will be purged from the queue. If it is already running it will be forcibly terminated and then purged from the queue.
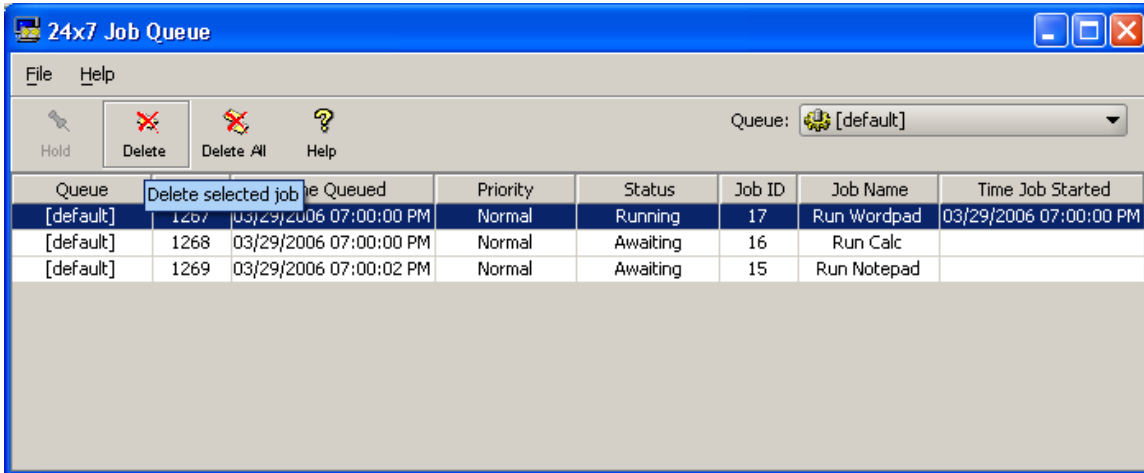
Tip: To stop all jobs from the same queue click the **Delete All** button

See also:

> Monitoring and Managing Job Queues

Deploying Jobs

Typically you develop and test new jobs in a separate development environment isolated from the production. In this setup, all development and testing tasks occur in the development environment, and then the job changes are promoted to the production environment. There are several methods available for deploying jobs

Using Simple File Copy – This is a simple 1-step solution but it is non-incremental. You simply copy your entire job database directory and your settings file preferences.xml from the development server to the production server overwriting the production files.

WARNING: This method can be used only if the source and target environments are identically confused and path to all files and account names are the same in both environments, or if all environment specific settings are abstracted and referenced via environment variables or using other dynamic data loading solution.

Using Job Compare and Deploy tool – This tool is available in the 24x7 Web-based Management Console only. It allows interactive incremental deployment of various changes. This method does not require direct access to development and production environments, plus it provides other helpful functions such as visualization of differences in jobs and settings. Two way deployment, and more. See 24x7 Web-based Management Console manual for more details.

Chapter 3: Scheduling Jobs

Job Processing Workflow

24x7 Scheduler provides maximum flexibility for scheduling and executing various jobs. Jobs can run in background (in other words, asynchronous jobs) and foreground (synchronous jobs); queued and immediately; local and remote. This topic outlines various options for job processing.

Most jobs are queued before they are executed. According to the job priority job can be added to the end, middle, or beginning of the assigned job queue. However, there are several exceptions to this rule. Jobs having "on start-up" trigger are executed out-of-queue because they cannot wait for the queue to become available and must be executed immediately. Also, when Start Now command is used to test a job, that job is also executed immediately and it also runs out-of-queue. Note that these out-of-queue jobs do not interrupt or explicitly affect already running queued jobs. If there are multiple jobs that must be executed in foreground and out-of-queue, the job engine executes them sequentially one by one. The execution order for such jobs is not determined, but in most cases they are executed in their ID orders, e. g. jobs with lowest IDs are executed first. Jobs launched from other jobs are executed as usual; they are added to the queue according to their priority and the assigned queue.

The following table describes processing flow within a job queue for locally executed synchronous and asynchronous jobs.

Synchronous local job processing

- Queued job is launched and monitored. The job queue manager waits for the job to complete before processing next queued job.

- New jobs **can** be added to the queue while this job is running.

- New jobs **cannot** be started in the same queue while this job is running. However, new jobs **can** be started in other queues while this job is running.

- New jobs **cannot** be also started while the notification actions (if any) are being executed.

- Already running jobs keep running uninterrupted.

Asynchronous local job processing

- Queued job is launched and monitored.

- New jobs **can** be added to the queue while this job is running.

- New jobs **can** be started in the same job queue while this job is running.

- New jobs **can** be also started while the notification actions (if any) are being executed.

- Already running jobs keep running uninterrupted.

The following table describes processing flow within a job queue for remotely executed synchronous and asynchronous jobs.

Synchronous remote job processing

- Queued job is launched and monitored. The job queue manager waits for the job to complete before processing next queued job.

- New jobs **can** be added to the queue while this job is running.

- New jobs **cannot** be started in the same queue while this job is running. However, new jobs **can** be started in other queues while this job is running

- New jobs **cannot** be also start while the notification actions (if any) are being executed.

- Already running jobs keep running uninterrupted.

	This processing type is similar to processing synchronous local jobs with the only difference that the job is executed on the remote computer.
Asynchronous remote job processing	
	• Queued job is launched and monitored. • New jobs **can** be added to the queue while this job is running. • New jobs **can** be start from the same job queue while this job is running. • New jobs **cannot** be started while the notification actions (if any) are being executed. • *On error* and *on finish* notification actions can be **delayed** if the Queue Manager is busy executing other job at the time of asynchronous remote job finish. These actions are executed whenever the queue manager is free to process them. • Already running jobs keep running uninterrupted.

Important Notes:

- Multiple job queues operate independently and asynchronously.

- Jobs are added to their queue as soon as their job trigger conditions are met, even if the Job Queue Manager is busy processing some already queued job.

- Although asynchronous jobs are supported, it is recommended that whenever possible you should schedule synchronous jobs. Asynchronous jobs by their nature are hard to manage or sequence. Create additional job queues if you often need to run multiple concurrent jobs.

- Semaphore file triggers and Message triggers can be used to built various job dependencies and synchronize jobs running in different job queues.

- 24x7 Scheduler forcedly terminates all running jobs if it is shutdown in the middle of the processing. New jobs cannot not be started while the shutdown is in progress.

See also:

> Job Queues
>
> Job Execution Properties
>
> Job Schedule and Triggers
>
> Notification Events and Actions
>
> Semaphore Files
>
> Messages

Job Execution Properties Overview

Job Types

24x7 Scheduler supports 3 distinct types of jobs:

- **Program Files and Shell Scripts** -- This job type includes jobs that execute operation system files and commands. Files than can be executed are binary program files or shell scripts files supported by your operation system such as SH files, BAT files, Perl scripts, Java scripts, etc.

- **Database Commands** -- This type includes jobs that execute database SQL commands or SQL batches. During job run, 24x7 Scheduler establishes a direct connection to the specified database and then executes the job SQL script.

- **Job Automation Scripts** -- This type includes jobs that can execute user-defined scripts. 24x7 Scheduler supports standard JavaScript scripting compatible with the JavaScript language originally developed by Netscape corporation and now widely used everywhere on the Internet. 24x7 Scheduler parses the script, checks syntax errors, then interprets and executes the script line by line. See JavaScript Help for more details.

Tips:

- 24x7 Scheduler provides a very sophisticated built-in script Editor and Debugger, which you can use to develop both SQL and JavaScript scripts.

- Different job properties are used for different job types. Some job generic properties such as job name, schedules and notifications are common and shared across all types.

General Job Properties

Job ID

The Job ID provides a unique descriptor for each job definition in the job database. 24x7 Scheduler automatically generates a new job ID for each new job added to the database. 24x7 Scheduler uses that ID to refer to the job in the job event log records.

Job Name

The Job Name provides a descriptive title for the job. For example, "Production Server Backup. " A unique name is not required for each job, however we highly recommend that you use unique job names. For complete job description and additional comments, you can use the Description property.

Description

This is the place where you enter job description, comments, and instructions. For your convenience, Job Explorer shows a few lines of the job description when you rest mouse pointer over the job. Double-click the job in the system tree to start the Job Wizard, which you can use to see and modify the full text.

Status

This property indicates job status. The status can be one of the following:

- Enabled - the job is enabled and waiting for the specified job start condition to be met

- Disabled - the job is disabled

See also:

> Job Execution Properties
>
> Job Schedule and Triggers
>
> Notification Events and Actions
>
> Semaphore Files
>
> Macro-parameters
>
> Remote Jobs

Program-type Job Properties

Program name

This is the full path and filename (or only filename) of the program to execute or a shell command. Program name can be followed by command line parameters.

Tips:

- **On Linux and Unix systems**, in order to run shell commands and scripts specify command starting with the shell name first following by the entire command line as a single parameter for the shell, for example,

  ```
  /bin/sh -c "ls /k > files. lst"
  ```

If any filename of parameter contains spaces you must use double quotes as name/parameter delimiters, for example,

```
"/user/local/24x7 Scheduler/myprog"  /x/k "param 1"
```

- **On Windows systems**, the name of an executable or batch file (. EXE, .COM, .BAT, .CMD) to run. Program name can be followed by command line parameters.

- **On Windows systems**, to run DOS shell commands such as copy, rename, dir and other specify command interpreter name first following by the entire command line as parameters to the command interpreter, for example,

```
cmd /C copy fileA fileB
```


- If any filename of parameter contains spaces you must use double quotes as name/parameter delimiters, for example,

```
"C: \Program Files\Daily Jobs\DataLoad. exe"  /x/k "param 1"
```

Start in

The Start In directory (e. g. working directory) is the directory where the program executable finds the associated files it needs to run the program. Most programs do not require an entry in this property. Occasionally however, a program will not run properly unless it is specifically told where to find other program files. 24x7 Scheduler will change to this directory when running the program or document.

Pictures below show execution shell command "dir" with output results into text file named 1.txt under Linux/Unix and Windows. The command will be executed in the directory /home/user under Linux/Unix and in the directory D: \Work under Windows.

Linux/Unix example:

Windows example

See also:

[Additional Options For Program-Type Job](#)

Additional Options For Program-type Jobs

Timeout

This is the time interval, in minutes, that the job is allowed to run before being terminated. When the timeout occurs, 24x7 Scheduler forcibly terminates the process. If zero is specified, the interval never occurs, therefore the process can run on to infinity.

Exit code condition

The exit code is the value returned by the scheduled program upon termination. The Exit Code Condition specifies exit codes designating that the job was a failure and this will lead to 24x7 Scheduler to treat it as a failed job. Upon failure, 24x7 Scheduler may be directed to rerun the job, disable the job or execute various "on error" notification actions as specified by the job properties. For details see Error Handling Control, Notification Events and Actions topics.

Valid expression can contain one of the following:

1. Single value, for example **0**

2. Comma separated list, for example **0,1,4**

3. Bound range of values, for example **1-4**

4. Unbound range of values, for example: **<4** The following logical operations can be used for unbound ranges: <,<=,>,>=

5. Empty value or **[any]** indicating that the job should not check the exit code

Database-type Job Properties

SQL

This is the text of SQL script that 24x7 Scheduler executes. This property applies to the "Database" job type only. .This property can be edited using both the Job Wizard and the SQL Editor.

DB Profile

The database profile name that refers to the pre-configured database profile describing database connection parameters. The specified profile must exist at the time that the job is run. This property applies to the "Database" job type only.

See also

Database jobs

Database Profiles

Script-type Job Properties

24x7 Scheduler allows you creating powerful jobs that use built-in scripting engines to perform user-defined actions. The following properties are specific to script type jobs:

Script type

Type of scripting engine

Script

This is the text of the script that 24x7 Scheduler executes when running the job. This property applies to "Script" jobs only. This property can be modified using both the Job Wizard and the Script Editor.

Job Queues, Priorities and Run-time Modes

Job queues and run-time modes are used to control job execution. 24x7 Scheduler supports multiple concurrent job queues. You can create as many queues as anticipated. Job Processing Workflow topic describes how jobs are queued and run in different run time modes.

Queue

This specifies job queue, which will run the job. For more information about job queues see About Job Queues topic.

Priority

This indicates job priority.

- For "program" jobs the priority property affects only priority of the job in the job queue.

- For SQL database jobs the priority property affects both priority of the job in the job queue and the priority of the started job thread within 24x7 Scheduler instance. It does not change the priority of 24x7 Scheduler process itself, nether it changes priority of the created database process.

- For script jobs the priority property affects both priority of the job in the job queue and the priority of the started job thread within 24x7 Scheduler instance. It does not change the priority of 24x7 Scheduler process itself, nether it changes priority of the created process.

  Caution: Changing the priority of a job can make it run faster or slower (depending on whether you raise or lower the priority), but it can also adversely affect the performance of other jobs that can spend more time waiting in the job queue before the queue becomes available.

Detached Process

Jobs launching external executable files and scripts always run as external "detached" processes. Script and database type jobs can run both as internal processing threads and as external processes depending on the value of the detached property. Detached jobs require more system resources as they use their own memory and CPU resources. However, separating jobs from the scheduler improves system stability and integrity and that is why detached job mode is the recommended mode for all jobs.

IMPORTANT: To run a script job in debug mode, it must be set to run non-detached so that the built-in script debugger can access job's memory and other resources.

Asynchronous Process

The 24x7 Scheduler executes asynchronous jobs in background using separate job thread for each asynchronous job. Asynchronous jobs leave their queue as soon as they are launched enabling the scheduler to run other jobs in the same queue while they are still running.

In comparison, 24x7 Scheduler executes synchronous jobs using main queue thread (e.g. in foreground), so that other jobs cannot start in the same queue until the current job processing is complete. Asynchronous run mode requires more system resources for additional job threads which in turn lead to higher CPU and memory usage. That is why synchronous job run mode is the recommended mode for running jobs. The synchronous mode allows easy job sequencing without using complicated job dependencies, allows controlling number of concurrent job instances and simplifies job management.

Because each job queue operates independently, you can setup multiple job queues to run concurrently any combination of synchronous and asynchronous jobs.

Timeout

The maximum amount of time a job is allowed to run. Job timeouts are only supported for detached jobs . If the timeout value is exceeded, 24x7 Scheduler forcibly terminates the process. If zero is specified, the interval never occurs, therefore the process can run on to infinity.

Instance Control

- Always submit new instance – Do not check if there are already instances of the same job running, always submit new instance to the associated job queue.

- If instances already exist in the queue, do nothing - Before submitting the job to the queue, check if there are already instances of the same job running, and if yes, do not submit a new instance.

- If instances already exist in the queue, raise error - Before submitting the job to the queue, check if there are already instances of the same job running, and if yes, do not submit a new instance, and log an error message for this condition.

- Terminate running and queued instances, submit new instance - Before submitting the job to the queue, check if there are already instances of the same job running, and if yes, abort existing instances and then submit a new one. If you choose this rule, make sure you set job property "Disable this job on error" to false, otherwise the job will disable itself as soon as it forcedly aborts the existing instances and it will not run again.

IMPORTANT: This multiple job instances control property works for time-based jobs only. Event based jobs and jobs triggered by job dependencies are not subject to this rule.

See also:

> Job Processing Workflow
>
> About Job Queues
>
> Creating and Modifying Queues

Remote Jobs and Security Properties

Apply Credentials

This is a dual use option.

For remote jobs it is used for:

1. Authenticating the user during connection to the remote agent computer

2.   Creating job processes in the context the specified user account.

For local jobs it enables secure job run mode and allows you to enter the required user account and password for the job. If checked, the local job is run as a separate process in the context of the specified user account.

Important Notes:

- **Unix/Linux/Mac:** 24x7 Scheduler must be run using *root* account in order to allow it running jobs using other user accounts.

- **Windows:** 24x7 Scheduler must be run using user account having "Act as part of the operation system" privilege.

  If that is a local account the required privilege must be given to the local user using Windows Local Security Applet. Do not forget to restart the server after making this change.

  If the user running the scheduler is a domain user, the privilege must be then given to the domain user. You can use the Active Directory to manage domain user privileges. After the change the user must logoff/logon to the system in order for the security changes to take effect. Users whose accounts are used to run jobs must be given "Logon as a batch job" privilege.

User

The user account to run the job and/or connect to remote agent as described above.

For jobs running on Linux, Unix, Mac OS, z/OS, OS/390 specify user id local to the system where the job is run. For jobs running on Windows systems specify user names in **domain \ user** format. For local users use dot for the domain name, for example, MYDOMAIN\MYN AME or for a local use account   **.**\MYN AME

Important Notes: For remote jobs you must specify user and password for the remote system.

Password

The user's network password. The password is stored together with the job properties in encrypted format.

Remote Agent

This specifies remote agent name that will run the job. If you choose **Local** value from the drop-down list or leave this property blank, the job will run locally on the scheduler's computer. No agents will be used in that case.

Important Notes:

- During remote job run 24x7 Scheduler automatically deploys job definition, properties and associated job scripts to the remote agent. The job data is deployed across the network in an encrypted non-readable format.

- External files associated with the job are not deployed. You must deploy such files manually or ensure they are always available on the agent's computer.

Backup Remote Agent

This specifies backup remote agent name that will run the job in the event the main agent is not available. You can specify multiple backup agents names for this property by simultaneously selecting several agents from the list. 24x7 Scheduler attempts to submit the job to the main remote agent first and if the remote agent is not available, it attempts to submit the job to the first available backup remote agent. Backup remote agents are tried in the order they appear in this property.

See also:

> About Remote Jobs
>
> Remote Agent Profiles

Error Handling Control

24x7 Scheduler supports automatic job error monitoring an error handling. It can automatically retry jobs if they fail and stop jobs from starting again if the job failure is not resolved. You can also use "on error" notification actions to make the scheduler generate various "error" alerts.

Restart job if it fails

This instructs 24x7 Scheduler to retry the job if it fails. The job will be restarted after the specified Retry Interval. You should use the Number of Retries property to specify how many times you want 24x7 Scheduler to retry the job before it considers that job as unsuccessful. If the job continues to fail, it will be restarted again and again until it is successful or the maximum number of retry attempts has been reached.

Retry Interval

This parameter is the number of seconds that 24x7 Scheduler will wait before restarting the failed job. This parameter makes sense only if the job has **Restart this job if it fails** property enabled.

Caution: For jobs with time-based schedules, the total retry interval should not exceed the time interval between regular job runs. For jobs having file, process, or email watch schedules, the total retry interval should not exceed the polling interval. To calculate the total retry interval, multiply **Number of Retries** by sum of **Retry Interval** and the estimated job run time.

Number of Retries

This is the maximum number of attempts 24x7 Scheduler makes to run the job. The job is considered as failed only after all attempts fail. This parameter makes sense only if the job has Restart job if it fails property enabled.

Disable On Error

This instructs 24x7 Scheduler to disable the job if it fails. Automatic job disabling on error ensures that the job does not restart until you find and fix the cause of the error and manually re-enable the job.

Caution: Disable On Error and **Restart job if it fails** options are NOT mutually exclusive! If the restart option is enabled, the job is not considered as failed after the first failed run. On the other hand, **Ignore Errors** and **Disable On Error** options are mutually exclusive, because if the **Ignore Errors** option is enable, the job is never considered as failed no mater how and whether it completes.

Ignore Errors

This instructs 24x7 Scheduler to continue job execution regardless of job run-time errors.

Examples:

- A "job finished" notification action will be attempted even if the database job itself failed while executing SQL script.

- A semaphore file assigned to the job will be deleted (using "delete after run" rule) even if the launched program terminated abnormally.

Caution: This option supersedes and disables all other "Error" handling options, as the job is never considered as failed.

Capture and Archive Job Output

This instructs the 24x7 Scheduler to capture messages from job's standard output and error streams and archive them to text files The archived files are stored within Output subfolder. Archived files are named after job d and job run start date and time.

Delay

This is the maximum allowed delay for a late job. If the actual delay is greater than this parameter, then 24x7 Scheduler will skip a late run.

> **Caution:** When scheduling daily tasks, make sure that the value of start time + maximum delay falls on the same day as the start time. If this condition is not satisfied a late job may be skipped because of the day shift.

Skip Job if Delay is Over <n> minutes

This instructs 24x7 Scheduler to skip the late job whose delay is longer than the specified **Delay** interval. You can use the **Delay** property to specify maximum allowed delay (see above).

Logging Disabled

This instructs 24x7 Scheduler not to log job execution statuses. Use this option with frequently running jobs having "All day" schedule or event-based trigger so that such jobs do NOT require a lot of log space and do not create a lot of "noise" allowing you to clearly see important log messages generate by other jobs.

Job Schedule and Triggers

A job schedule can be based on a condition that must be met before the job is executed. 24x7 Scheduler supports four predefined types of conditions:

1. Time watch – a time condition tests for a specified time.

2. File watch – a file condition tests for the presence of a specified file or group of files.

3. Email watch – an email condition tests for the presence of a specified email message.

4. 24x7 Scheduler startup event

Time-based Triggers

The following parameters are used to specify job conditions:

Repeat Every

Use this property to specify recursion interval for the job execution. It's also possible to define a time window for recurring job runs, for details see All Day Schedule – Daily Start Time. and All Day Schedule – Daily End Time

Start Date

This is the first date you want the job to run. This property is used in combination with the Start Time. 24x7 Scheduler will not allow an invalid date such as 1/32/95. The required format is mm/dd/yy. 24x7 Scheduler considers 2-digits year as 20xx year. While on this control you can use arrows up and down to increment / decrement the days, month, and years.

Start Time

This is the first time you want the job to run. This property is used in combination with the Start Date. The required format is hh: mm. You must use 12-hour time format with AM/PM markers. While on this control you can use arrows up and down to increment / decrement the hours and minutes.

End Date

This is the last date after which you do not want the job to run. This property is used in combination with the End Time. 24x7 Scheduler will not allow a invalid date such as 1/32/95. The required format is mm/dd/yy. 24x7 Scheduler considers 2-digits year as 20xx year. While on this control you can use arrows up and down to increment / decrement the days, month, and years.

End Time

This is the last time after which you do not want the job to run. This property is used in combination with the End Date. The required format is hh: mm. You must use 12-hour time format with AM/PM markers. While on this control you can use arrows up and down to increment / decrement the hours and minutes.

All Day Schedule – Daily Start Time

This property can be used to specify run-time limits for jobs having All Day schedule. This property is used in combination with the Daily End Date. To specify Daily Start and End Time click the Advanced button. The

Specify Day-time parameters dialog will appear. The required format for the time properties is hh: mm: ss. You must use 12-hour time format with AM/PM markers. While on this control you can use arrows up and down to increment / decrement the hours, minutes and seconds. By default Daily Start Time is set to 12:00:00 AM

All Day Schedule – Daily End Time

This property can be used to specify to run-time limits for jobs having All Day schedule. This property is used in combination with the Daily Start Date. To specify Daily Start and End Time click the Advanced button. The Specify Day-time parameters dialog will appear. The required format for the time properties is hh: mm: ss. You must use 12-hour time format with AM/PM markers. While on this control you can use arrows up and down to increment / decrement the hours, minutes and seconds. By default Daily End Time is set to 11:59:59 PM.

All Day Schedule – Fixed Time List

This property can be used to specify fixed times for a job having All Day schedule. If the fixed time list is specified the schedule is not recursive during day-time interval. The job starts only at the specified times. Time values in the list must be specified in either hh: mm or hh: mm: ss 24-hour time format. Example: 9:00,9:20,10:00,10: 20,11:00,11:20

> **Caution:** If you want a job to run just once a day, use Daily or Weekly schedule type instead of All Day schedule type because Daily or Weekly schedule type is better optimized for such processing.

Daily and Weekly Schedule – Days of Week

These are the days of the week when the job is scheduled to run. Select the desired days of week by placing checkmarks in the appropriate boxes.

Monthly Schedule – Days of Month

This is the day of the month when the job is scheduled to run. Choose the desired day of month by day number (for example, the 2nd day of every month) or by day name (for example, 1st Monday of every month) or by day type (for example, last weekday of every month).

Monthly Schedule – Fixed Day List

These are the fixed days when the job is scheduled to run. You can enter multiple days as a comma-separated list (for example, 1,3,7,15.)

Skip Job On Holiday

This property indicates whether 24x7 Scheduler must skip the job on the scheduled day if that day is a non-business day.

Slide Job On Holiday

This property indicates whether 24x7 Scheduler must skip the job on the scheduled day if that day is a non-business day and then execute the job on the following business day.

Semaphore File

This is the name of the semaphore file that the job will "watch", in other words, it is a file-based file condition. A file condition tests for the presence of the specified file or group of files. The job starts after 24x7 Scheduler finds the file. You may specify more that one file. Use comma to separate multiple semaphore files. For example, you could specify the following file names securities. dat, holdings. dat, accounts. dat. You may also use standard wildcard characters in file names.

For example: `c:\data\*.tbc, c:\data\an??b.rb?`

Polling Interval

Use this property to specify how often you want 24x7 Scheduler to check for the specified file, or email message. You can specify this parameter in minutes See Semaphore Files parameter described above.

> **Caution:** 24x7 Scheduler can check for a file or group of files every second. If you specify short polling intervals you can improve file detection accuracy. However, frequent checking may cause high CPU utilization and heavy network traffic when verifying network files. Use balanced approach when choosing appropriate polling intervals.

Monitor Semaphore File Size Stability

This property allows you to specify whether you want 24x7 Scheduler to monitor sizes of found semaphore files and how often to check and compare file size changes. Use this property in jobs that process the monitored semaphore files. This can help to avoid situations when the job starts before the process that created them is done writing the files. To disable the checking and have the job to start as soon as the specified files are found, leave the **Check Interval** field blank or enter zero.

Semaphore File Action Rule

This property allows you to specify post-execution or pre-execution action for a "file watch" job. Nine actions are supported:

1. **Delete** the semaphore file (or group of files) before actual job run.

2. **Delete** the semaphore file (or group of files) after actual job run.

3. **Do not Delete** the semaphore file (or group of files). 24x7 assumes that the job itself takes care of the semaphore files. If the job leaves those files alone, 24x7 Scheduler starts the same job next time it checks for the files again. The file check frequency is specified by Polling Interval parameter (see above).

4. **Move** the semaphore file (or group of files) before actual job run

5. **Move** the semaphore file (or group of files) after actual job run

6. **Rename** the semaphore file (or group of files) before actual job run

7. **Rename** the semaphore file (or group of files) after actual job run

8. **Move and Rename** the semaphore file (or group of files) before actual job run

9. **Move and Rename** the semaphore file (or group of files) after actual job run

    Caution: The actual job run time is the time between the moment job execution starts in the queue and the moment it completes, which differs from the time of the *file-found* event occurrence. The job first goes to the queue and waits there to be executed according to job priorities and queue utilization.

This parameter can be used only in "file watch" jobs.

Account

This is the email account name that 24x7 Scheduler will use to check an email message. This parameter is only valid for the "email watch" jobs.

Password

This is the email password that 24x7 Scheduler will use to check for email messages. This parameter is only valid for "email watch" jobs.

Message Text

This is the email message text that 24x7 Scheduler uses for comparison when checking an email message. It is only valid for "email watch" jobs only.

Subject

This is the email message subject that 24x7 Scheduler uses for comparison when checking an email message. It is only valid for "email watch" jobs only.

Save Attachments

This instructs 24x7 Scheduler to save attachments found in the email message that triggered the job. This parameter is only valid for "email watch" jobs.

See also:

General Job Properties

Job Execution Properties

Notification Events and Actions

Semaphore Files

Macro-parameters

Remote Jobs

Run Job Daily Or Weekly

This schedule type allows job to be executed once or several times a day on specified days of week at the time specified.

The following properties can be used with this schedule type:

Start Date

This is the first date you want the job to run. This property is used in combination with the Start Time. 24x7 Scheduler will not allow an invalid date such as 1/32/95. The required format is mm/dd/yy. 24x7 Scheduler considers 2-digits year as 20xx year. While on this control you can use arrows up and down to increment / decrement the days, month, and years.

Start Time

This is the first time you want the job to run. This property is used in combination with the Start Date. The required format is hh: mm. You must use 12-hour time format with AM/PM markers. While on this control you can use arrows up and down to increment / decrement the hours and minutes.

Daily and Weekly Schedule – Days of Week

These are the days of the week when the job is scheduled to run. Select the desired days of week by placing checkmarks in the appropriate boxes.

Skip Job On Holiday

This property indicates whether 24x7 Scheduler must skip the job on the scheduled day if that day is a non-business day. The calendar, the job is assigned to, defines which days are business days and which are not. For more information about calendars see About Calendars topic.

Repeat at

This property allows you specify recursion times for the selected days. You can enter times as a comma-separated list in 24-hour time format.

Calendar

This property assigns the job to a specific calendar. The calendar defines which days are business days and which are not. For more information about calendars see About Calendars topic.

See also:

> Run Job One Time Only
>
> Run Job All Day

Run Job Monthly

Run Job One Time Only

This schedule type allows job to be executed once.

The following properties can be used with this schedule type:

Start Date

This is the date you want the job to run. This property is used in combination with the Start Time. 24x7 Scheduler will not allow an invalid date such as 1/32/95. The required format is mm/dd/yy. 24x7 Scheduler considers 2-digits year as 20xx year. While on this control you can use arrows up and down to increment / decrement the days, month, and years.

Start Time

This is the time you want the job to run. This property is used in combination with the Start Date. The required format is hh: mm. You must use 12-hour time format with AM/PM markers. While on this control you can use arrows up and down to increment / decrement the hours and minutes.

See also:

Run Job One Time Only

Run Job Daily or Weekly

Run Job Monthly

Run Job All Day

This schedule type allows job to be executed many times a day with the specified recursion interval. The job runs every day as defined in the associated job calendar.

The following properties can be used with this schedule type.

Start Date

This is the first date you want the job to run. This property is used in combination with the Start Time. 24x7 Scheduler will not allow an invalid date such as 1/32/95. The required format is mm/dd/yy. 24x7 Scheduler considers 2-digits year as 20xx year. While on this control you can use arrows up and down to increment/decrement the days, month, and years.

Start Time

This is the first time you want the job to run. This property is used in combination with the Start Date. The required format is hh: mm. You must use 12-hour time format with AM/PM markers. While on this control you can use arrows up and down to increment/ decrement the hours and minutes.

End Date

This is the last date after which you do not want the job to run. This property is used in combination with the End Time. 24x7 Scheduler will not allow a invalid date such as 1/32/95. The required format is mm/dd/yy. 24x7 Scheduler considers 2-digits year as 20xx year. While on this control you can use arrows up and down to increment / decrement the days, month, and years.

End Time

This is the last time after which you do not want the job to run. This property is used in combination with the End Date. The required format is hh: mm. You must use 12-hour time format with AM/PM markers. While on this control you can use arrows up and down to increment / decrement the hours and minutes.

Repeat Every

Use this property to specify how often you want 24x7 Scheduler to repeat job execution. It's also possible to define a time window for recurring job runs, for details see All Day Schedule – Daily Start Time and All Day Schedule – Daily End Time

All Day Schedule – Daily Start Time

This property can be used to specify run-time window for jobs having All Day schedule. This property is used in combination with the Daily End Date. To specify Daily Start and End Time click the **Advanced** button. The Specify Day-time parameters dialog will appear. The required format for the time properties is hh: mm. You must use 12-hour time format with AM/PM markers. While on this control you can use arrows up and down to increment / decrement the hours, minutes and seconds. By default Daily Start Time is set to 12:00:00 AM

All Day Schedule – Daily End Time

This property can be used to specify to run-time limits for jobs having All Day schedule. This property is used in combination with the Daily Start Date. To specify Daily Start and End Time click the **Advanced** button. The Specify Day-time parameters dialog will appear. The required format for the time properties is hh: mm. You must use 12-hour time format with AM/PM markers. While on this control you can use arrows up and down to increment / decrement the hours, minutes and seconds. By default Daily End Time is set to 11:59:59 PM.

All Day Schedule – Fixed Time List

This property can be used to specify fixed times for a job having All Day schedule. If the fixed time list is specified the schedule is not recursive during day-time interval. The job starts only at the specified times. Time values in the list must be specified in either hh: mm or hh: mm 24-hour time format. Example: 9:00,9: 20,10:00,10: 20,11:00,16:20

> **Caution:** If you want a job to run just once a day, use Daily or Weekly schedule type instead of All Day schedule type because Daily or Weekly schedule type is optimized for such type of processing.

Calendar

This property assigns the job to a specific calendar. The calendar defines which days are business days and which are not. For more information about calendars see About Calendars topic.

> **Caution:** If you want this job to run every day 365 days a year, create an empty calendar having "Exclusive" type and assign it to the job. This will instruct 24x7 Scheduler that the job has no exception days.

See also:

> Run Job One Time Only
>
> Run Job Daily or Weekly
>
> Run Job Monthly

Run Job Monthly

This schedule type allows executing job once or several times a month on the day(s) specified.

Start Date

This is the first date you want the job to run. This property is used in combination with the Start Time. 24x7 Scheduler will not allow an invalid date such as 1/32/95. The required format is mm/dd/yy. 24x7 Scheduler considers 2-digits year as 20xx year. While on this control you can use arrows up and down to increment / decrement the days, month, and years.

Start Time

This is the first time you want the job to run. This property is used in combination with the Start Date. The required format is hh: mm. You must use 12-hour time format with AM/PM markers. While on this control you can use arrows up and down to increment / decrement the hours and minutes.

Monthly Schedule – Days of Month

This is the day of the month when the job is scheduled to run. Choose the desired day of month by day number (for example, the 2nd day of every month) or by day name (for example, 1st Monday of every month) or by day type (for example, last weekday of every month).

Monthly Schedule – Fixed Day List

These are the fixed days when the job is scheduled to run. You can enter multiple days as a comma-separated list (for example, 1,3,7,15.)

Slide Job on Holiday

This property indicates whether 24x7 Scheduler must skip the job on the scheduled day if that day is a non-business day and then execute the job on the following business day. The calendar, the job is assigned to, defines which days are business days and which are not. For more information about calendars see About Calendars topic.

Calendar

This property assigns the job to a specific calendar. The calendar defines which days are business days and which are not. For more information about calendars see About Calendars topic.

See also:

> Run Job One Time Only
>
> Run Job All Day
>
> Run Job Daily or Weekly

Run Job Quarterly, Yearly or With Any Other Recursion or Date Pattern

You can schedule jobs to run virtually with any recursion interval or date pattern. This type of scheduling is achieved using Daily or Weekly schedule type and a custom Calendar. Calendars allow you to define a range of dates available to the job. For example, if you create a calendar containing only 4 days, 1 for each quarter, and assign it to a job with Daily Or Weekly schedule and all week days selected, the job will run only 4 times a year, as defined in the calendar. This method provides you with a great flexibility allowing you to schedule jobs to run on any given set of dates.

Email Trigger

This event type allows job to be executed when certain email arrives to the specified email inbox.

Polling Interval

Use this property to specify how often you want 24x7 Scheduler to check for the specified email message.

> **Note:** 24x7 Scheduler polls POP3 server. If specified email message is found it is marked as "checked" and it is left on the POP3 server. The message can be later retrieved using any email client program.

Account

This is the email account name that 24x7 Scheduler will use to check for incoming email messages. This parameter is only valid for the "email watch" jobs.

Password

This is the email password that 24x7 Scheduler will use to check for email messages. This parameter is only valid for "email watch" jobs.

Message Text

This is the e-mail message text that the 24x7 Scheduler uses for comparison when checking an e-mail message. It is only valid for "e-mail watch" jobs only. 24x7 supports 3 methods for subject text matching:

- Exact text match.

- Match using wildcards: use asterisk symbol * in the email trigger properties to indicate occurrence of any text. For example, "cats *" can be used to match messages beginning with word "cats", such as "cats and dogs", "cats 12" and so on. Multiple wildcards can be used together, for example "* and *" to match "cats and dogs" and also "hats and socks."

- Match using regular expressions: begin subject text in the email trigger properties with a special @REGEX: suffix following the regular expression which you

want 24x7 to use for messages text matching. For example, regular expression "[0-9].+" can be used to match messages beginning with a single digit and following by any text.

Subject

This is the e-mail message subject text that the 24x7 Scheduler uses for comparison when checking an e-mail message. It is only valid for "e-mail watch" jobs only. 24x7 supports 3 methods for subject text matching:

- Exact text match.

- Match using wildcards: use asterisk symbol * in the email trigger properties to indicate occurrence of any text. For example, "cats *" can be used to match subjects beginning with word "cats", such as "cats and dogs", "cats 12" and so on. Multiple wildcards can be used together, for example "* and *" to match "cats and dogs" and also "hats and socks."

- Match using regular expressions: begin subject text in the email trigger properties with a special @REGEX: suffix following the regular expression which you want 24x7 to use for subject text matching. For example, regular expression "[0-9].+" can be used to match subjects beginning with a single digit and following by any text.

Save Attachments

This instructs the 24x7 Scheduler to save attachments found in the e-mail message that triggered the job. This parameter is only valid for "e-mail watch" jobs. Note: All found email attachments are saved in the system temporary directory. On Windows systems the location of this directory is typically referenced in the %TEMP% environment variable.

When this option is selected, 24x7 also saves the text of the message in a file named message.txt.

Caution: If attachment file names match names of existing files in the system temporary directory, the attachments from new email messages overwrite existing files.

Caution: Attachments are saved during the email check that occurs before the job is run. That is why it is highly recommended that email-based jobs are assigned to a separate queue and allowed to start immediately after the email check. Such jobs should immediately rename or move the associated attachment files to a different file folder. Failure to do so may cause the next incoming email message(s) to overwrite previous attachments. It is also recommended not to set the email check frequency to very short time intervals in order to allow more time for the attachment processing.

See also:

Semaphore file trigger

Scheduler start up trigger

Message Trigger

This event type allows job to be executed when certain type of message is sent to the message queue . The job either has to be setup to monitor that type of message, or be added to the message subscribers property.
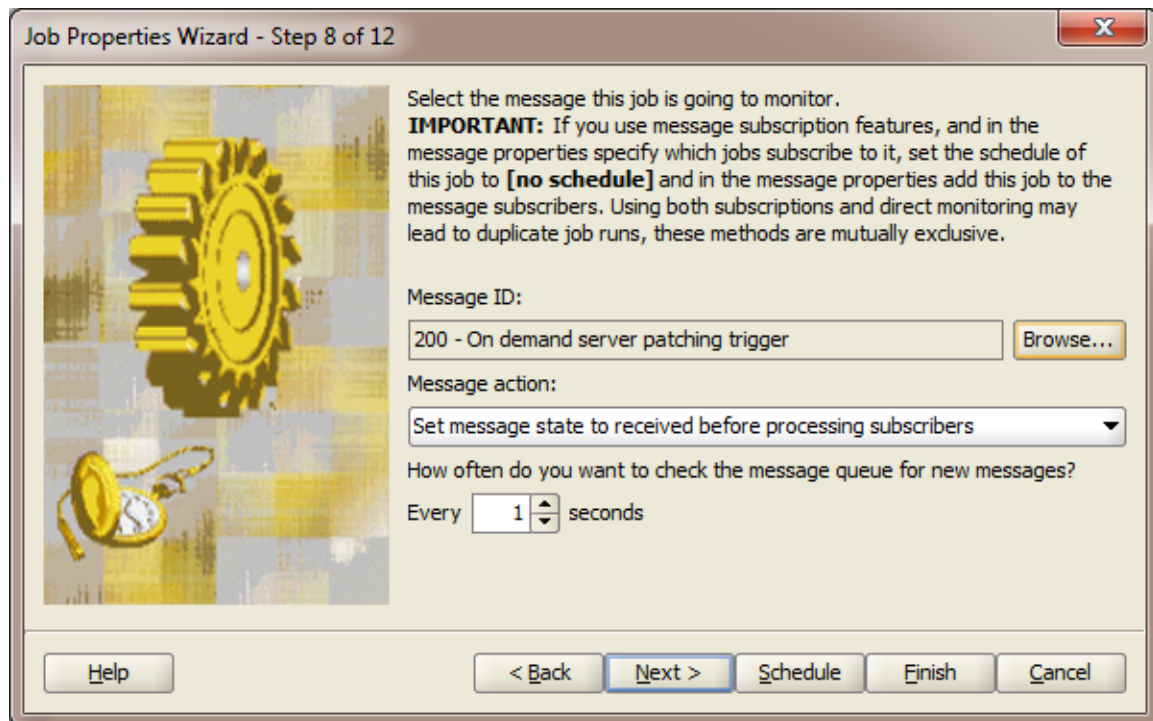
Message ID

Use this property to specify the message type to be monitored by the job. Use the Browse… button to the right of that property field to select the actual Message.
.

Polling Interval

Use this property to specify how often you want 24x7 Scheduler to check for the specified email message.

Message action

Specify how you want to handle new messages

Caution: If you use message subscription features, and in the message properties specify which jobs subscribe to it, set the schedule of this job to [no schedule] and in the message properties add this job to the message subscribers. Using both subscriptions and direct monitoring may lead to duplicate job runs, these methods are **mutually exclusive**.

**See also:**

> Semaphore file trigger
>
> Scheduler start up trigger

Semaphore File Trigger

This event type allows job to be executed when certain files found in the specified location.

Semaphore File

This is the name of the semaphore file that the job will "watch", in other words, a file condition. A file condition is used to test for the presence of the specified file or group of files. The job is triggered after 24x7 Scheduler finds the file. You may specify more that one file. Use comma to separate multiple semaphore files. For example, you could specify the following file names securities. dat, holdings. dat, accounts. dat. You may also use standard wildcard characters in file names.
For example: `c:\data\*.tbc, c:\data\an??b.rb?.`

Polling Interval

Use this property to specify how often you want 24x7 Scheduler to check for the specified file, or email message. You can specify this parameter in minutes See Semaphore Files parameter described above.

> **Caution:** Using short polling intervals improves file detection accuracy. However, frequent checking may cause high CPU utilization and heavy network traffic when checking for network files. Use balanced approach when choosing appropriate polling intervals.

Monitor Semaphore File Size Stability

This property allows you to specify whether you want 24x7 Scheduler to monitor sizes of found semaphore files and how often to check and compare file size changes. Use this property in jobs that process the monitored semaphore files. This can help to avoid situations when the job starts before the process that created them is done writing the files. To disable the checking and have the job to start as soon as the specified files are found, leave the **Check Interval** field blank or enter zero.

> **Caution:** Too short check interval can lead to premature job start.

Semaphore File action rule

This property allows you to specify post-execution or pre-execution action for a "file watch" job. Nine actions are supported:

1. **Delete** the semaphore file (or group of files) before actual job run.

2. **Delete** the semaphore file (or group of files) after actual job run.

3. **Do not Delete** the semaphore file (or group of files). 24x7 assumes that the job itself takes care of the semaphore files. If the job leaves those files alone, 24x7 Scheduler starts the same job next time it checks for the files again. The file check frequency is specified by Polling Interval parameter (see above).

4. **Move** the semaphore file (or group of files) before actual job run

5. **Move** the semaphore file (or group of files) after actual job run

6. **Rename** the semaphore file (or group of files) before actual job run

7. **Rename** the semaphore file (or group of files) after actual job run

8. **Move and Rename** the semaphore file (or group of files) before actual job run

9. **Move and Rename** the semaphore file (or group of files) after actual job run

Caution: The actual job run time is the time between the moment job execution starts in the queue and the moment it completes, which differs from the time of the *file-found* event occurrence. The job first goes to the queue and waits there to be executed according to job priorities and queue utilization.

See also:

Semaphore File Trigger

Email Trigger

On Scheduler Start-up trigger

On Scheduler Start-up trigger

This event type allows job to be executed on 24x7 Scheduler start up

No additional parameters are required for this schedule type

Notification Events and Actions

A job may issue a notification at a given event such as job start, job completion or job execution error. This option may be used to:

- Notify system administrators and operators of events. This is especially convenient for controlling critical processes and may be used to page operations personnel in the event of a

job failure. That will allow the operations personnel to rapidly respond to and correct any production issues.

- Create conditional email reminders.

- Log job events to centralized corporate database.

- Create job inter-dependencies so that a job can trigger other pending jobs a given event. This allows linking multiple jobs in one logical batch process as well as invoking jobs on demand such as "fix it" jobs. 24x7 Scheduler allows very flexible job interdependencies. It even allows you to link jobs on multiple local and remote computers provided 24x7 schedule service is running at a given computer.

- Send SNMP traps to enterprise network monitoring and management console such as HP Open View, Microsoft MMC and other.

- Run external programs to perform advanced correction actions.

- Trigger other jobs to perform advanced correction actions and also to perform advanced job notification processing.
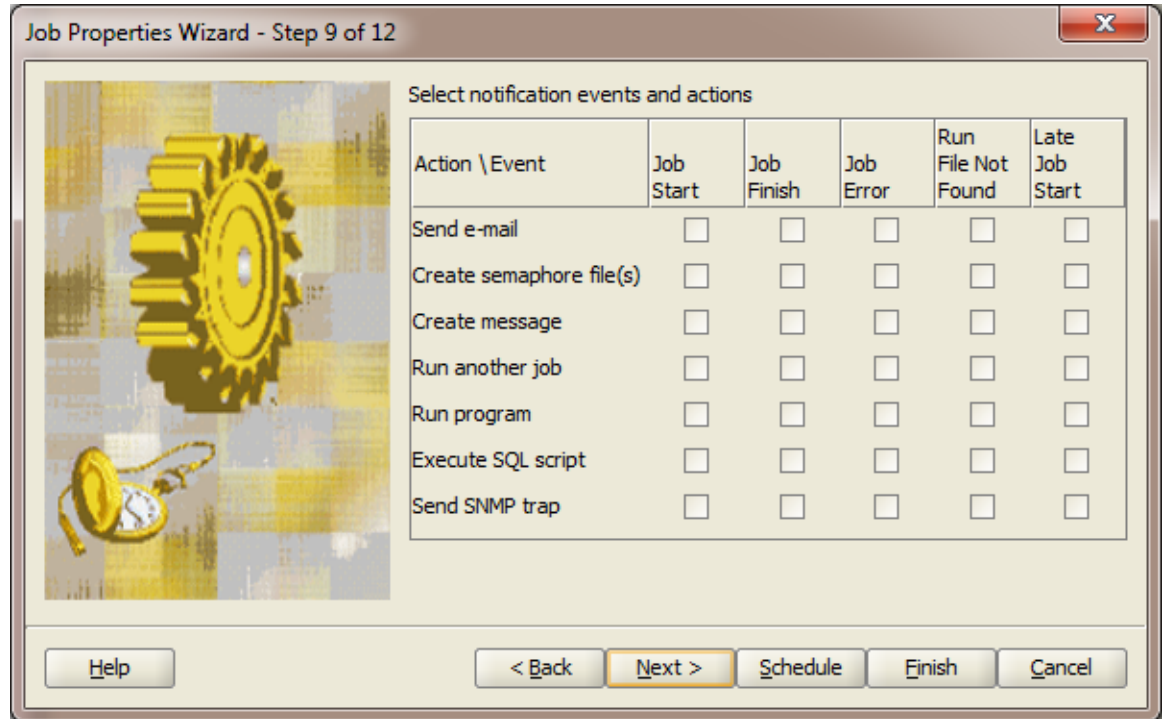
Notification Events

The following notification events are supported:

- Start – occurs just before a job is started.

- Finish – occurs immediately after a job is successfully finished.

- File Not found – occurs when program file specified in job properties cannot be found leading to the situation when a job cannot start. This event occurs after the Start event.

- Error – occurs when a job fails.

- Late job – occurs if a job was started later than it was scheduled to start. This event occurs immediately after the Start event. Note that if the Skip Late Job option is enabled, the job is never started if it is late and Late Job event is generated. The Maximum Delay job parameter defines what is a late job.

Tips: You can specify more than one event to be processed. You can also specify same type or different type notification actions for different events of the same job.

Notification Actions

The following notification actions can be performed in the notification events:

1. **Send email** – Sends an email message to the specified email address. The message subject is fixed - "Message from 24x7 Scheduler". The message text depends on the triggered notification event and may be one of the following:

   - "Job <name> started. "

   - "Job <name> finished. "

   - "Job <name> execution error: <error description>. "

   - "Job <name> execution error: Program not found. "

   - "Job <name> started late. Delay is <xxx> minutes. "

   The <name> parameter is substituted with the actual job name that the job was given. The <error description> parameter is substituted with the actual error text. In case if an error occurs and logging is enabled, the error is automatically written in the log file. For more information on error types and the error log, see Job activity log topic.

   For this action type you must specify:

   - **Email account** to use for sending the notification message.

   - **Email password** to use for authentication with the email server.

   - **Email recipient** – this is email address(s) of the message recipient(s). Use comma to separate multiple recipients.

2. **Execute SQL command(s)** – Executes SQL commands using the specified database profile. For this action type you must specify:

   - **Name of database profile** to be used when executing the notification message.

   - **SQL script** to send to the back-end database. In the SQL script you can specify any valid SQL statement(s) supported by your JDBC driver and database.

3. **Create semaphore file(s)** – Creates semaphore files. The file contents depend on the triggered notification event and can be one of the following:

   1. "Job <name> started. "
   2. "Job <name> finished. "
   3. "Job <name> execution error: <error description>. "
   4. "Job <name> execution error: Program not found. "

5.   "Job <name> started late. Delay is <xxx> minutes. "

The <name> parameter is substituted with the actual job name that the job was given. The <error description> parameter is substituted with the actual error text. In case if an error occurs and logging is enabled, the error is automatically written in the log file. For more information on error types and error log, see Job Activity and System Events Logs topic. For this action type you must specify full name of the file to be created, including path to the file. Use comma (,) to separate multiple files.

4.   **Run program** – Runs an external program. For this action type you must specify:

- **Program name.** This is the command line for program that you want to start. The program name may be followed by optional command line parameters. If the program name includes spaces enclose the name in double quotes, for example,
  `"c: \Program Files\program. exe" parm1 parm2.`

- **Timeout** - This is the time interval, in minutes that the program is allowed to run before being terminated. When the timeout occurs, 24x7 Scheduler forcibly terminates the started process. If zero is specified, the interval never occurs, therefore the process can run on to infinity.

5.   **Run job** – Runs another job. For this action type you must specify:

- **Job ID** of the job that you want to run.

See also:

> General Job Properties
>
> Job Execution Properties
>
> Job Schedule and Triggers
>
> Semaphore Files
>
> Remote Jobs

Macro-parameters

Macro-parameters provide a way to replace specific values at run time. In other words, macro-parameters allow you to pass various computed values to your jobs without having to resort to writing code.

Macro-parameters can be used in the following areas:

- Semaphore file names

- Program names and directories

- SQL commands

- Job scripts

- Notification messages

@ sign is used as an escape character for macro-parameters. If you need a literal @ sign (for example, in a program name specification) you must double the @ sign.

Parameter Substitution

24x7 Scheduler always substitutes Macro-parameters before checking the job conditions and executing the job. There are two parameter types: time-dependent parameters and general-purpose V parameters that simplify job design. Some macro-parameters consist of two parts: The parameter identifier and the format mask. You must use double quotes around masks in order for parameter to be interpreted correctly. See the following tables for supported parameters and masks. 24x7 Scheduler supports two types of macro-parameters:

- Time-dependent parameters

- V-parameters

- Include SCRIPT directive

Time-dependent parameters

The following time-dependent macro-parameters are supported in all places:

Identifier	Meaning
@W	Returns an integer (1-7) representing current day of the week. Sunday is day 1, Monday is day 2, and so on.
@T"<mask>"	Returns current date and time. The actual representation depends on the mask.
@Q	Returns an integer (1-4) representing current quarter.
@D<number>"<mask>"	Returns date for the specified day number of the current week. The actual representation depends on the mask. The number can be any from 1 to 7, where Sunday is day 1, Monday is day 2, and so on.
@DP"<mask>"	Returns date for the previous calendar day. The actual representation depends on the mask.
@DN"<mask>"	Returns date for the next calendar day. The actual representation depends on the mask.
@DL"<mask>"	Returns date for the last business day. The actual representation depends on the mask.
@DB"<mask>"	Returns date for the next business day. The actual representation depends on the mask.
@ML"<mask>"	Returns date for the last calendar day of the month. The actual representation depends on the mask.
@MF"<mask>"	Returns date for the first calendar day of the month. The actual representation depends on the mask.
@ME"<mask>"	Returns date for the last (ending) business day of the month. The actual representation depends on the mask.
@MS"<mask>"	Returns date for the first (starting) business day of the month. The actual representation depends on the mask.

Format Masks

Character	Meaning	Example
d	Day number with no leading zero	9
dd	Day number with leading zero if appropriate	09
ddd	Day name abbreviation	Mon
dddd	Day name	Monday
m	Month number with no leading zero	6
mm	Month number with leading zero if appropriate	06
mmm	Month name abbreviation	Jun
mmmm	Month name	June
yy	Two-digit year	04
yyyy	Four-digit year	2004

Colons, slashes, and spaces used as entered in the mask. Two-digit yearsIf you specify a two-digit year in a mask, 24x7 Scheduler assumes the date is the 21st century. Examples: The following table shows how the date Friday, Jan. 30, 1998, displays when different format masks are applied:

Format	Displays
mmddyy	013004
mmyyyyy	012004
d-mmm-yy	30-Jan-04
dd-mmmm	30-January
mmm-yy	Jan-04
dddd, mmm d, yyyy	Friday, Jan 30, 2004
dddd	Friday

V-parameters

The V macro-parameters are similar to other macro-parameters described above. The scope of each macro-parameter is specified in the parameter description. V-parameters are case-sensitive. You can use the following V macro-parameters in your jobs:

Identifier	Meaning
@V"subject"	This parameter can be used in scripts for email-watch jobs. It returns the full subject of the email message that triggered the job.
@V"message"	This parameter can be used in scripts for email-watch jobs. It returns the full text of the email message that triggered the job.
@V"sender"	This parameter can be used in scripts for email-watch jobs. It returns sender 's email address from the email message that triggered the job.

@V"attachments"   This parameter can be used in scripts for email-watch jobs. It returns comma-separated list of files attached to the email message that triggered the job. If there is no file attached, it returns empty string

@V"user"   Returns user id of the user currently logged on. This parameter can be used in any script, notification event or job trigger.

@V"computer"   Returns name of computer on which the job is running. This parameter can be used in any script, notification event or job trigger.

@V"job_id"   Returns id of the job whose script is referencing this macro-parameter. This parameter can be used in any script, notification event or job trigger.

@V"job_name"   Returns name of the job whose script is referencing this macro-parameter. This parameter can be used in any script, notification event or job trigger.

@V"24x7_home"   Returns name of 24x7 Scheduler installation directory. This parameter can be used in any script, notification event or job trigger.

@V"file"   This parameter can be used in scripts and notification events of jobs that have "file-watch" triggers. This macro-parameter returns comma-separated list of files that triggered the job.

@V"event"   This parameter can be used in scripts and properties of job notification actions. Depending on the notification event that triggered the action, the returned value can be one of the following: · START· FINISH· ERROR· NOT FOUND· LATE

@V"err_code"   This parameter can be used in scripts and properties of job notification actions. The returned value is the error code of the last top-level error occurred in the current job. Note that errors are typically "bubble up." This process makes error codes associated with the root cause of the error getting replaced with the top-level error codes indicating job failure.

@V"err_message"   This parameter can be used in scripts and properties of job notification actions. The returned value is the error code of the last top-level error occurred in the current job. Note that errors are typically "bubble up." This process makes multiple level error messages getting appended to each other, starting with the root cause of the error and ending with the top-level message indicating job failure.

@V"env:[name]"   Returns value of the specified environment variable. If the specified environment does not exist, it returns empty string. For example, to return value of the PATH environment variable you can use @V"env:PATH"

                     WARNING: It is not recommended to use this variable in job scripts as it enables dynamic code injection. People without access to the scheduler and jobs might be able to modify values of system environment variables, which in turn may modify the code and behavior of job scripts.

@V"data"   Returns data value from the Message that triggered the job. This parameter can be used in job scripts and properties and enables you to dynamically pass some data between the jobs.

Include SCRIPT directive

The @SCRIPT macro is a bit different from other macro-parameters described above. This macro allows inclusion of content of an external text file, in other words, it is an "include" directive that is similar to #include directive in C/C++ and other programming languages and which is used to include commonly used script files that can be shared between job scripts.

This macro must be the only text appearing on a text line within job script, the line must end with a carriage return (or new line) character, for example

@SCRIPT: C:\Scripts\Common\CommonFunctions.js

...The rest of job script goes here ...

WARNING: The use of @SCRIPT enables dynamic code injection. People without access to the scheduler and jobs might be able to modify behavior of job scripts if they can alter the text of script files referenced via @SCRIPT macro. Be sure to protect such scripts using the available operation system file access controls so that only the authorized personnel can modify them.

Using Job Templates

Job templates provide a quick way to create new jobs. Some templates are installed by default with 24x7 Scheduler files, other are created by users. Additional templates are also available on SoftTree Technologies' web site.

To Schedule a New Job from a Template

1   In the system tree, select the folder in which you want to create a new job.

2   Select the **File** menu then select the **New** command, and then choose the **Job** command (shortcut CTRL+N). Alternatively you can click the **New Job** toolbar button.

3   Click the **Create from template** link. The **Select Template** dialog box will appear.

4   Select the desired template, and then click **OK** button. The **Template Wizard** will appear. Follow the instructions provided by the **Template Wizard**. When finished click the **OK** button. The Template Wizard will setup a new job based on your instructions. If necessary complete other job properties

5   Follow the instructions in the **Job Wizard**.

See also:

Working With Job Database

Job Wizard

Creating and Modifying Job Templates

Creating and Modifying Job Templates

Job templates are flat text files with .INI extension stored in the Template subdirectory. They can be created and edited using any text editor such as Unix's **vi**, Windows' **Notepad** and other.

Tips:

- Variable names must be enclosed in % signs. When applying the template for a new job, 24x7 Scheduler replaces variable names appearing in the template definition with the values entered in the Prompt/Value column.

- Names of variables can be used for values of variable job properties. When entering such values into the Prompt/Value column, make sure the specified variable is already defined above. Enter the name exactly as it appears in the variable definition including the % signs.

- When applying template properties to a new job, 24x7 Scheduler replaces variable names appearing in the job properties with the values entered in the Prompt/Value column in the **Template Wizard**.

- You cannot specify different notification scripts for different notification events, as there could be only one notification script created for a job. To differentiate actions for different notification events implement appropriate logic in the notification properties based on the notification event type. You can use the **@V macro-parameter** to find out event, which triggered the notification action. For example, if

- It is a good idea to study templates provided with 24x7 Scheduler to find out how you can build your own job templates using the most advanced features of 24x7 Scheduler.

Notes:

- Job Templates are not stored in the job database. They are stored in separate .INI files, which are located by default in the Template subdirectory. The template names and group definitions are stored in the TEMPLATE.INI file. You can find this file in 24x7 Automation Suite installation directory. When backing up or copying 24x7 job database and configuration files to another computer do not forget to copy templates that you want to use on that computer.

- If your templates contain sensitive information like passwords use Operation System security features to limit access to these template files. It is also a good idea not to hard-code such sensitive information and design your templates such that the sensitive information must be entered by the user in response to the **Template Wizard** prompt.

See also:

Program-type Job Properties

Database-type Job Properties

Script-type Job Properties

Notification Events and Actions

Chapter 4: Job Dependencies

Job Dependencies Overview

In certain situations you may have a need to setup jobs whose start depends on success or failure of other jobs. The most reliable and proven mechanism is using file-based dependencies, as so-called semaphore files. Coupled job and file dependencies provide flexible and reliable methods for job automation and linking.

24x7 Scheduler includes graphical Job Dependencies Editor, which allows you to easily create and edit job dependencies using standard drag-and-drop capabilities. Dependencies Editor's graphical representation of complex job environments with intuitive diagrams makes following complex job chains easy.

See also:

Job Dependencies Editor

Job Dependencies Editor

To start the Dependencies Editor:

1. From the **Tools** menu, select the **Job Dependencies Editor** command or simply click the **Dependencies** toolbar button. The Dependencies Editor will appear.

The Dependencies Editor presents all available jobs as a hierarchical structure "Tree View" on the left side. This side is filled with folders and jobs. The right side displays the dependencies diagram. This side is blank unless there is at least one created dependency.

The Dependencies Editor automatically recognizes all already existing dependencies

To change the size of either side of the window, drag the bar that separates the two sides. Use scroll bars to navigate both sides of the Dependencies Editor window.

"Tree View"

An open folder icon represents expanded folder. A closed folder icon represents collapsed folder. Folders with a "+" symbol next to the folder name mean that there are jobs beneath the folder. Conversely, a "-" symbol next to a folder icon means that there are no further jobs beneath. Navigating through the various folders and jobs is usually accomplished by clicking individual folders and jobs with the mouse. Click the plus signs (+) to expand a folder or alternatively, you can double-click the folder. Click the minus signs (-) to collapse a folder alternatively, you can double-click the folder.

Dependencies Diagram

All "child" and "parent" jobs are represented by rectangles with a number and a text in it where the number is the job ID and the text is the job name. Blue lines ending with arrows going from "parent" jobs to depended "child" jobs represent job dependencies.
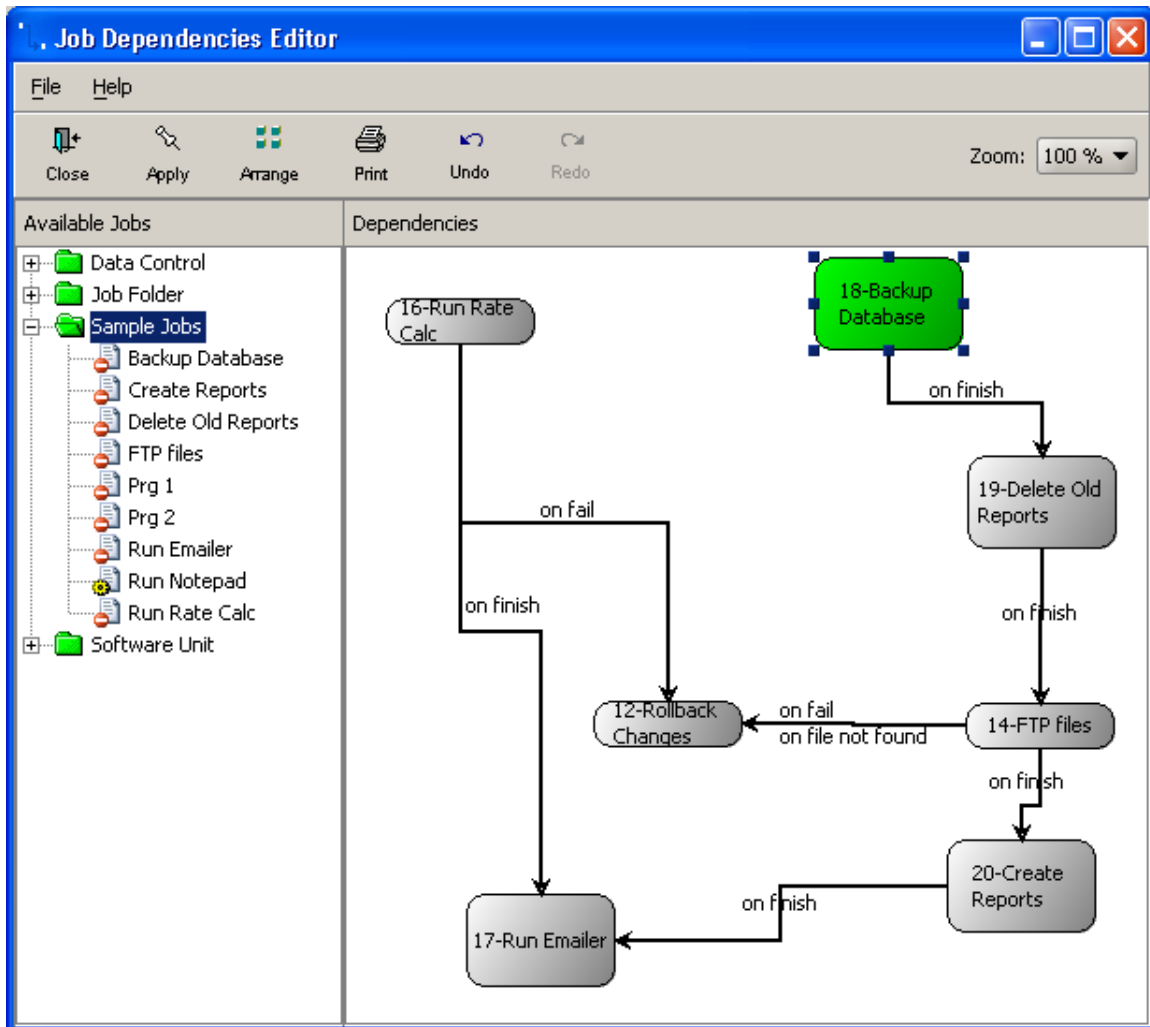
The Job Dependencies Editor supports standard drag and drop interface for moving jobs inside the diagram and arranging in the order representing job processing workflows.

Important Note: After you make changes to the dependencies diagram, you should click the Apply button to save them in the job database.

See also:

Job Dependencies

Adding New Job to Dependencies View

Deleting Job from Dependencies View

Arranging Jobs on Dependencies View

Adding New Dependency

Deleting Dependency

Printing Dependencies

Using Zoom Tool

Adding New Job to Dependencies View

To add a job to the diagram double-click the job icon in the Dependencies Editor's tree displayed on the left hand side. If the job is not yet on the diagram 24x7 Scheduler will add it and draw a rectangle representing the right on the diagram

Deleting Job From Dependencies View

To delete a job from dependencies view:

1. Open Dependencies Editor.

2. Click on the job object rectangle.

3. Press the Delete button on the keyboard. A message box appears asking you to confirm this operation.

4. Click Yes to confirm the deletion.

Arranging Jobs in Dependencies View

To relocate job object rectangle in the job dependencies view:

1. Click on the desired job object.

2. While holding down the mouse button, drag (move) the mouse pointer to the desired location on the dependencies view.

3. Release the mouse button to drop the job object. 24x7 Scheduler updates object position and arranges all the lines that represent this object dependencies, if any.

Adding New Dependency

To add a new job dependency:

1. Open Dependencies Editor.

2. On the right side of the Dependencies Editor window point mouse to the center of desired "parent" job object rectangle. You will see a "hot spots" represented by a small rectangle in the center of the job rectangle.

3. While holding down the right mouse button, move the mouse pointer from the "hot spot" towards the desired "child" job rectangle.

4. Release the right mouse button to complete this operation. 24x7 Scheduler adds the new dependency to the dependencies view.

Tips: By default the newly added dependency has on "On job finish" type. You can change modify dependency type using the following method:

1. Double-click the dependency line

2. In the popup **Edit Dependency** dialog select notification events you would like to use for the dependency. Note that you can select multiple dependencies.

3. Click the OK button to close the dialog.
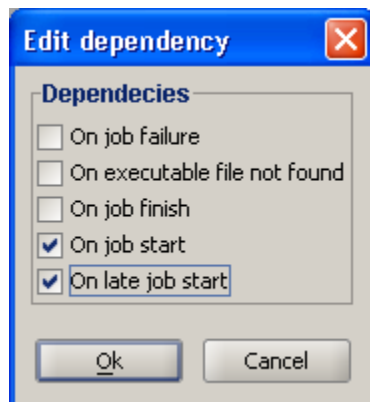
Deleting Dependency

To delete a job dependency:

1. Open Job Dependencies Editor.

2. Click on the line that represents the desired dependency.

3. Press the Delete button on the keyboard. A message box appears asking you to confirm this operation.

4. Click Yes to confirm the deletion.

Using Zoom Tool

The Zoom drop-down control available on the Job Dependencies Editor toolbar allows viewing the dependencies diagram at different magnification levels. This can be useful in situations when you are working with a complex diagram containing many jobs and when certain jobs or their dependencies that you want to see together cannot fit a single page view.

Using View Tool

The View drop-down control available on the <u>Job Dependencies Editor</u> toolbar allows partial display views of the dependencies diagram limited to a single job folder. In this mode, only the jobs belonging to the selected folder appear on the diagram.

Important Note: Only dependencies linking jobs in the selected folder appear on the diagram. If you have a dependency linking 2 jobs from 2 different folders and choose a single folder view, the cross-folder dependencies will not be rendered in the partial display view.

Printing Dependencies

To print the job dependencies diagram:

1. Open <u>Job Dependencies Editor</u>.

2. Click the Print button.

Important Note: The Print function is tied to the current display view. In a partial display view, only the rendered content is printed.

Chapter 5: Security

Because the data and settings you have in your jobs may be confidential, 24x7 Scheduler supports several important security features for protecting this information. These features are described in details below.

Job Database Security

The job database stores definitions of all jobs. This job database data is encrypted using AES/CBC/NoPadding strong encryption algorithm in order to protect job properties from unauthorized access. All user names, passwords, command lines, scripts and other job properties you enter using 24x7 Scheduler graphical interface or Web console are stored encrypted in the job database. The encryption is complete and applied to all data files, the transaction log file, as well as any temporary files used internally for data indexing and sorting operations.

The embedded JavaDB job database server authenticates internal processes using application-defined functions to protect unauthorized access to the job database. The credentials for the application user are stored encrypted in the preferences.xml settings file.

Job Access Password Protection

You can use job access password protection security access to individual jobs inside the job database file. Different access levels can be set for different jobs.

To protect a job:

1. In the system tree select the desired job.

2. Click **File / Protect Job** menu to setup protection level for the selected job. You can also right-click on the job icon and then select **Protect Job** item from the popup menu. The Job Protection Dialog will appear.
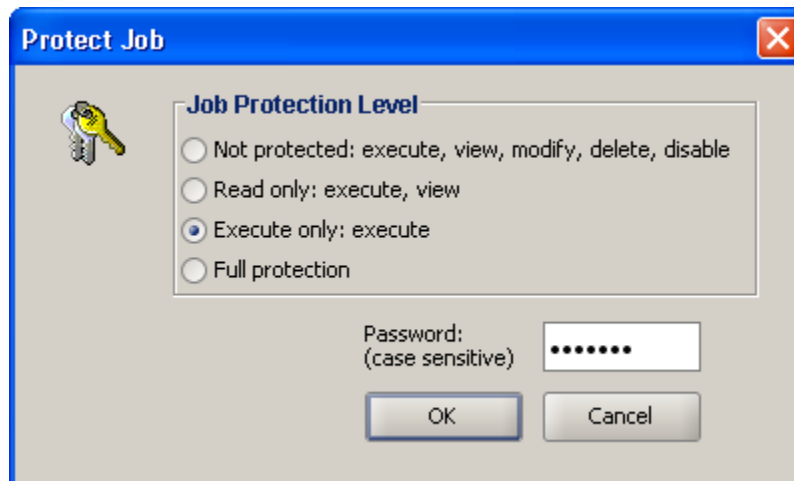
3. Select the required protection level in the **Job Protection Level** options group.

4. Type job password into the **Password** field.

5. Click the **OK** button.

To remove previously set protection:

1. In the system tree select the desired job.

2. Click **File / Protect Job** menu to setup protection level for the selected job. You can also right-click on the job icon and then select **Protect Job** item from the popup menu. The Job Protection Dialog will appear.

3. Type job password into the **Password** field.

4. Select **Not Protected** level in the **Job Protection Level** options group.

5. Click the **OK** button.

For more information about job protections see Protecting/Unprotecting Jobs topic.

Run Job As Another User

Run As User set of job properties can be used to specify the user whose credentials and security settings should be used to run the job. The process created by the job runs in the security context of the specified user. If no user name is specified the job runs in the security context of the user currently logged to the system and running the scheduler or agent process.

Run As User option are supported on all operation systems except Windows 95/98/Me systems.

For more information see descriptions of security-related job properties in Remote Jobs and Security Properties topic.

Remote Access Security

Remote access to 24x7 Schedulers and agents is based on the native system security. Every user attempting to connect to an agent or a scheduler must be authenticated with the operation system.

In addition, list of users who can connect and their privileges can be restricted using **Users** tool available in the **Tools** menu or directly modifying the **users** file in the 24x7 Scheduler installation directory. The users file is a tab separated file containing user names and their groups. Multiple group membership is not supported. Each user can be a member of a single user group. Group membership controls what users can do using the 24x7 Web-based Management Console. Four groups are available:

-   **Administrators** – members of this group can view and change any job as well as view change any system wide settings.

-   **Power Users** – members of this group can create new and modify their own jobs, view job logs and use job monitors. They cannot view and modify other user jobs or change system settings.

-   **Operators** – members of this group can view jobs, can run jobs, can view job logs and use job monitors.

- **Guests** – members of this group can view the job log

Important Note: If the **users** file is not created, 24x7 Scheduler assumes that every user, who can be successfully authenticated with the operation system, has **Administrators** privileges.

Remote Job Security

Remote jobs run by 24x7 Schedulers and agents are first verified with the operation system security. This means that in the remote job properties you must specify valid user name and password that exist in the target system. The remote job will be executed with privileges of the specified user. To enable remote job security you must check "Apply credentials" check box in the Job Wizard and complete user and password properties as described in Remote Jobs and Security Properties topic. Note that enabling security is mandatory for all remote jobs.

See also:

Job Database Security

Protecting/Unprotecting job

24x7 Scheduler provides several ways to restrict access to a job. You can do any of the following:

- Assign a password to modify the job, which prevents unauthorized users from modifying, deleting or disabling the job, but allows them to view job properties and scripts as well as execute the job.

- Assign a password to view and modify the job, which allows others to execute the job but not to modify, delete or disable/enable the job.

- Assign a password to execute, view, and modify the job, which does not allow others to execute, modify, delete or disable/enable the job.

Caution: If you assign password protection to a job and then forget the password, you can't remove protection from it, or recover data from it. It's a good idea to keep a list of your passwords and their corresponding job names in a safe place.

To protect / unprotect a job:

1. Select the desired job in the Job Explorer.

2. Select **File/Protect Job** command. The job protection dialog appears.

3. Choose required protection level.

4. Type your password then click the OK button.

Notes:

- "Execute" protection level does not prevent the job from starting on schedule or from being invoked from another job. It simply does not allow unauthorized users to execute the job by clicking on the **Run Now** button or by clicking **File/Run Now** menu item.

- Jobs copied using Job Database Manager tool remain their protection features.

See also:

> Job Database Security
>
> Working with Job Database
>
> Run Job As Another User

Chapter 6: Activity Monitoring

Job Activity Logs

Job Activity is optional; however, it is highly recommended that you enable logging options for mission-critical jobs. The job log provides a complete audit trail for all job activities. You can use the information stored in the log to troubleshoot incorrect or not on-time job execution, to resolve scheduling conflicts between different jobs. 24x7 Scheduler writes to the log date and time when an event occurred, event severity, job id, job name, and event description. For an error event, the description includes job status, error code and complete error message. All errors fall into 3 categories:

- Database errors – errors that occur while performing database operations. These errors are reported by the DBMS. Refer to your database documentation for complete description of database errors.

- Program errors – errors that occur while running external programs and documents. The scheduled programs report these errors. Refer to the program documentation for description of program errors.

- Scheduling errors – errors that occur because of incomplete or invalid job definition. These errors are detected and reported by 24x7 Scheduler job execution engine. Check and correct job definition if such error occurred.

See also:

>Execution Logs
>
>Log Viewer
>
>Advanced Logging Options

Log Viewer

Log Viewer is the tool you can use to monitor job-specific events and scheduler-specific events. Using the Log Viewer, you can also troubleshoot various job execution problems. The logging for the job execution is performed automatically.

To start the Log Viewer, click the **Tools** menu then select the **Log Viewer** menu, or simple press *Ctrl+L* shortcut.

You should periodically review the main job event log to check for possible job execution problems. The depth of the job history in the log is limited by the maximum number of entries in the log parameter that you can change in 24x7 Scheduler preferences. For performance reasons Scheduler keeps the log loaded and cached in the computer memory. Therefore, the amount of memory required depends on how many records you have in that log. This will allow you to view the historical status of your jobs. The default value is 3000 log records. When maximum number is reach 24x7 Scheduler automatically performs log rotation, deleting oldest records when new records are added. Under normal circumstances, you should let 24x7 Scheduler to capture the job history for at least a week. However, if you created jobs running frequently, such as once each minute, you should not allow large logs, so that you may set the maximum number of log records parameter to a more reasonable value or disable logging for such jobs.

Purging Job Logs

The log can be clearing using any other following methods:

You can clear log on start up. For this click **Tools**/**Options** menu, activate **Log** tab, check the "Clear log on start up" option. The next time 24x7 Scheduler restarts it will automatically purge the log file.

You can manually purge the log using the Log Viewer tool. In the Log View click the **Clear Log** button.

Tips:

- The Log Viewer displays oldest log entries first. To see the newest entries, scroll to the end or simple click anywhere inside of the log text aria then press the Ctrl+End shortcut.

- If you would like to search for a text in any particular log described above, you may want to open this log file using any text editor then use the Search command to search for the desired text. The main log data is stored in schedule.log file in 24x7 Scheduler home directory.

Job Monitor

24x7 Scheduler includes a real-time monitor that you can use to monitor currently running jobs and produce a forecast of the processing scheduled over the next 24 hours. Use the Time Scale option if you would like to customize the length of the forecasted period.
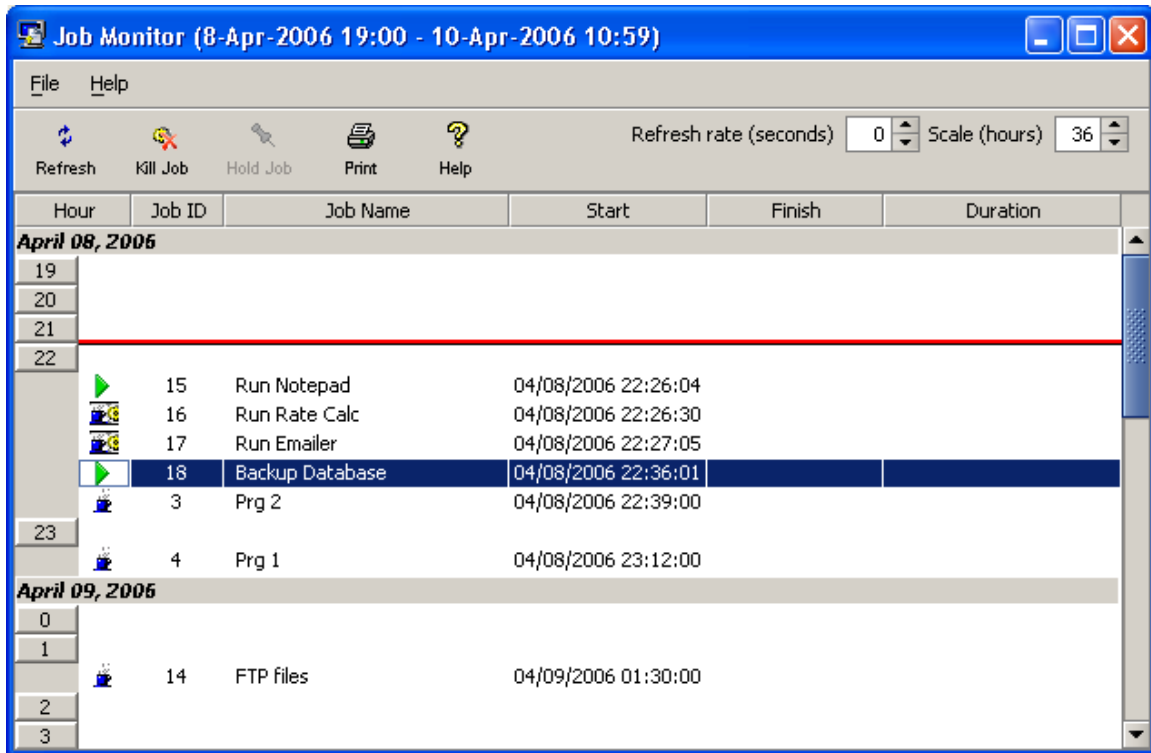
By default, the monitor refreshes automatically in a real-time (Refresh rate value is set to zero). You can change the refresh rate by using the Refresh Rate field. You can also force a manual refresh using the **Refresh** button on the toolbar.

To open the Job Monitor:

From the **Tools** menu, select the **Job Monitor** item or simply click button the **Monitor** button 🖼 in the toolbar.

Job Monitor uses the following icons to indicate current job status

Icon	Description
🖼	Forecasted job run
🖼	Job is already queued and waiting to start as soon as other predecessor jobs clear the queue
🖼	Job is queued but placed on hold; job may start only when it is manually released from the "job held" state
▶	Job is running
🖼	Job completed successfully
❌	Job failed

🖼 **Notes:**

- The Job Monitor cannot forecast jobs having non-time based schedules such as "file watch", and "email watch", as it does not know when these events may occur.

- Job Monitor is an interactive tool to aid in job tracking and troubleshooting. Do not keep Job Monitor window open all the time because the monitor accumulates data for already completed jobs, and this may slow down the job processing especially if you have scheduled lots of job. To reset the Job Monitor, close and re-open it.

See also

Queue Monitor

Job forecast report

Status report
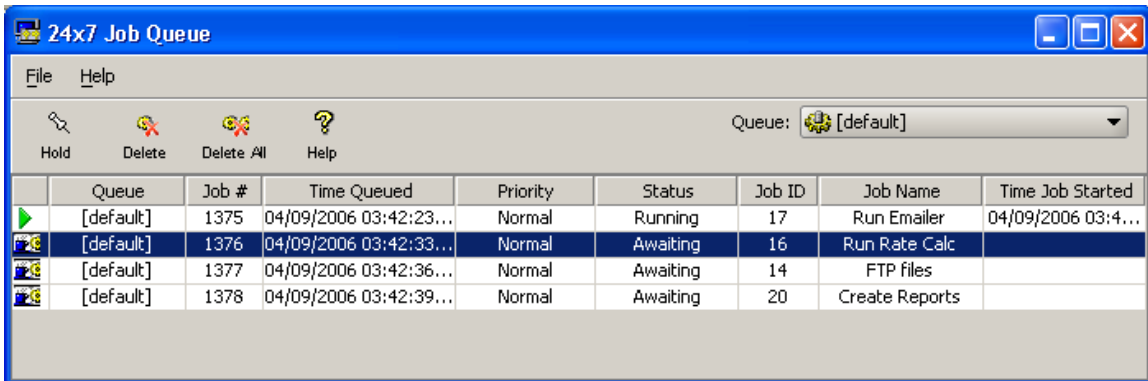
Job Queue Monitor

Jobs can pile up in a job queue without anyone knowing about it. The Job Queue Monitor utility, which is provided with 24x7 Scheduler, will let you know if that happens.

Job Queue Monitor is used to monitor and, if necessary, make modifications to jobs that have been submitted to the job queue. All-important information about scheduled jobs is stored in the job queue.

To open the Job Queue Monitor:

From the **Tools** menu, select the **Queue Monitor** command or simply click the **Queue** button in the toolbar. The Job Queue Manager will appear.

Each job in the queue is listed separately with detailed information. You can view/modify the following fields:

1. **Queue** – Name of the queue the Queue Monitor is connected to.

2. **Job #** - Job number in queue uniquely identifying job instance in the queue. The Queue Processor assigns unique number to each job submitted to the queue.

3. **Time Queued** – This is the date and time when the job was added to the queue

4. **Priority** – The job priority.

5. **Status** - A job will have one of the following types of status:

   - RUNNING - The job is currently running.

   - AWAITING - The job is ready to be executed and waiting for the Queue Processor to become available.

   - HELD - The job is held by operator or because of an error and it will not be run until it is released by operator.

6. **Job ID** – Job ID in the Job Database. You can also see that number in the job properties view in the Job Explorer.

7. **Job Name** – Job ID in the Job Database.

8. **Time Job Started** – This is the date and time when the job has been started. This applies only to jobs having RUNNING status.

To pause a queued job:

1. In the Queue Monitor select the queue containing the job.

2. Select the job you want to pause.

3. Click the **Hold** button on the toolbar or use **File/Hold Job** menu (CTRL+H keyboard shortcut). This will place the selected job on hold and allow the following jobs to run.

To release a paused job:

1. In the Queue Monitor select the queue containing the job.

2. Select the job you want to release and which was previously put on hold.

3. Click the **Hold** button on the toolbar or use **File/Release Job** menu (CTRL+H keyboard shortcut). This will release the selected job. The job will be reinserted to the queue according to the

job priority. If the queue contains other jobs with the same or higher priority the selected job will be inserted after these other jobs.

To remove a job from queue and/or kill the active process:

1. In the Queue Monitor select the queue containing the job.

2. Select the job you want to remove.

3. Click the **Delete** button ![delete icon] on the toolbar or use **File/Delete Job from Queue** menu (or press DELETE keyboard shortcut). This will remove the selected job from queue.

   ![note icon] **Important Note:** If the job is already running this action will kill the job process and trigger "on error" notification actions associated with the job.

To kill all jobs at once and clear the queue:

1. In the Queue Monitor select the queue you want to clear.

2. Click the **Delete All** button ![delete all icon] on the toolbar or use **File/Delete All Jobs from Queue** menu (or press ALT+DELETE keyboard shortcut). This will remove all queued and running jobs from queue.

   ![note icon] **Important Note:** If the queue contains already running jobs the associated job processes will be also killed trigger "on error" notification actions associated with running job will be triggered.

To change job order in the queue:

You can control job positions within queues using job priorities. To change a priority within the queue for already queued jobs do the following:

1. In the Queue Monitor select the queue containing the job.

2. Select the job whose position you want to change.

3. Click the **File** menu button on the toolbar or use **Job Priority** submenu and then select either **High**, **Normal** or **Low** priority. This will change job order within the queue. The new order depends on the priorities of other jobs.

   ![note icon] **Important Note:** Priorities of already running jobs cannot be changed nether other jobs can be moved in front of already running jobs. If you have a need to run a job immediately and the job is already queued you can do one of the following:

   a. Delete all other jobs in the queue that are in front of this one or put them on hold.

      or

   b. Delete this job from the queue and then modify it and assign to some other empty queue. After changing the queue use the **Run Now** command to start the job.

 Tips:

- You can use the Queue Monitor to change job priorities after they were added to the queue, put jobs on hold or release them, and delete all or some queued jobs that you don't want to run. Modify priority, Hold/Release Job, and Delete options are available under the Queue Monitor's File menu.

- Modifying jobs in the queue does not affect job definitions.

- Deleting a job from the queue, does not delete that job from the Job Database and that job can run again later if the job scheduling conditions will be satisfied again. The only exception is deletion job in "running" state. In this case job is disabled.

- Use the Queue drop-down list available on top of the Queue Monitor window to attach the monitor to a different queue.

See also:

Job Processing Workflow

About Job Queues

Creating and Modifying Queues

Message Monitor

The Message Monitor is a real-time monitor that you can use to monitor currently queued messages. The monitor refreshes automatically.

To open the Message Monitor:

From the **Tools** menu, select the **Message Monitor** command or simply click the **Messages** button in the toolbar. The Job Queue Manager will appear.
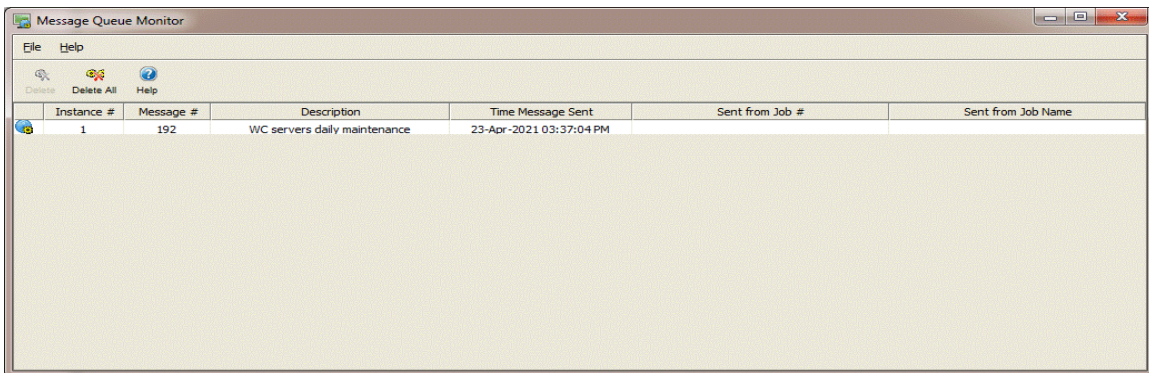
Status Report

24x7 Scheduler allows you to generate real-time HTML reports that you can use to check historical job activity and monitor statuses of currently running jobs. Moreover, you can configure 24x7 Scheduler to automatically update and upload status reports to a Web server (via Intranet). Then you can use a Web browser to view these reports virtually from anywhere. To enable generation of the Status Reports:

1. Select the **Tools** then the **Options** menu.

2. Activate **Log** tab page

3. Check the **Generate real-time status report** option.

4. Type the destination directory in the **Report directory** field. Alternatively, you can click the **Browse** button to select the desired directory using the "browse for directory" dialog. If you leave this field blank, 24x7 Scheduler will save reports in the installation directory, which is not recommended.

5. Click the **OK** button

Tips:

- For the Status Report directory, you can choose the directory on your Web server. In this case, all status report changes will be available immediately (real-time) to all users who have access to the web server.

- You should setup some security restrictions on your Web server if you do not want the report to be available to all Internet users.

Chapter 7: Reports

Reports Overview

24x7 Scheduler provides several statistical built-in reports that can be used for job performance analysis. Each report can be viewed and printed from the Report window. Reports include data from the job database and from files containing the already collected job performance data. The following statistical reports are available:

- Job Forecast

- Job Queue Utilization

- Server Load Balancing

- Job Database Summary

Use can use them to forecast job runs; estimate queue and agent loads, and provide others with information through printing. Click on the report name in the list above for more information about each report.

Important Notes: Job Queue Utilization and Server Load Balancing reports use collected job performance data for the job analysis. This data is not available automatically. To allow job performance data collection you must enable **Job Execution Statistics** option in system options. Do not run repots immediately after you enable this option. Wait as long as necessary for each job to run at least several times. This will allow 24x7 Scheduler to gather sufficient amount of job performance data for an accurate job analysis. Do not force/trigger jobs manually for the purpose of performance data collection, as it will lead to inaccurate reports. The accuracy of job reports is proportional to the volume of gathered data. More job runs lead to more accurate report.

Job performance data is stored in JPD files located in the Performance Data subdirectory. 24x7 Scheduler creates separate performance file for every job. JPD files are regular ASCII text files. Size of each JPD file is proportional to the number of job runs and so it grows faster for jobs that run frequently. If the reports become very, very slow and take a long time for the analysis and charting, it may indicate that you have large volume of job performance data collected. Check size of files in the Performance Data subdirectory. If there are files over several hundreds Kbytes large, you should either delete them completel,y or purge old data from these files to make them smaller.

In addition, the 24x7 Scheduler provides you with the options for creating custom user defined reports. See User-defined Reports topic later in this chapter for more details.

Job Forecast Report

This report calculates 7-day job forecast for time-based jobs. The forecast is based on job schedule settings. Frequently running jobs with less than 15 minutes recursion interval are not shown on this report in order to improve the report's readability. You would know about these jobs anyway. The report presents data by day of week, sorted by forecasted job start time.

The following columns are displayed on the report:

Job ID – The job ID in the job database

Job Name – The job name in the job database

Folder Name – The name of the folder in the job database where the report is stored

Start Time – Job forecasted start time

Schedule Type – The job schedule type such as "daily job", "monthly job", and so on

HTML Report

This report is described in detail in <u>Logging and Debugging Options</u> topic.

Job Queue Utilization Report

This report is based on statistical analysis of job performance data. The report contains two types of queue utilization charts:

1. Average time jobs wait in queue before they are executed as a function of time

2. Number of queued jobs as a function of time

Both charts show differently utilization of each active job queue over a selected period of time. The main purpose of this report is to help you identify overloaded queues causing jobs to wait long time before they are executed. Each chart is scaled to fit the selected report period. You can try different report periods.

Important Note: Be aware that selecting large reporting periods allows more job runs analyzed which in turn improves the report accuracy but it also increases the report calculation time.

The following values are displayed on the report:

Time – System time

Average Time in Queue – The average number of minutes queued jobs have to wait before being executed.

# of Queued Jobs – The number of jobs in the queue. This number includes both pending and running jobs.

Legend – The chart legend shows active job queues and their assigned colors. Active queues are these that were used during the chosen report period.

Server Load Balancing Report

This report is based on statistical analysis of job performance data. This report can be helpful if you use multiple <u>Remote Agents</u>. The Server Load Balancing Report can help you identify 24x7 Remote Agents that carry more load than other. You should run this report on the main scheduling system, which is used to submit jobs to these Remote Agents.

The report contains two types of load charts:

1. Average load by day of week

2. Average load by time of day.

Both charts show utilization of each active Remote Agent as percent of all jobs executed during the chosen reporting period.

The main purpose of this report is to help you identify overloaded and underutilized Remote Agents. You can use this information to better balance your system load. Each chart is calculated using job performance data for the chosen report period. You can try different report periods.

Important Note: Be aware that selecting large reporting periods allows more job runs analyzed which in turn improves the report accuracy but it also increases the required report calculation time.

The following values are displayed on the report:

Time – System time

% of All Jobs – The relative number of concurrent jobs running in a given point of time on a given computer. This is calculated as a percent value using the following formula: "number of concurrent jobs" divided by "total number of jobs that were run during the chosen report period."

Legend – The chart legend shows active 24x7 Remote Agents and their assigned colors. Active 24x7 Remote Agents are these that were used during the chosen report period.

Important Note: In the current version, the Server Load Balancing Report does not take into account jobs that were submitted to 24x7 Remote Agents from other computers. If this situation applies to your environment, the produced report can be inaccurate.

Job Database Summary Report

This report provides summary information about your job database. It consists of the report header and the report body. The header contains various totals by job type, job state and schedule type, and the body contains job list by job owner.

The following columns are displayed on the report

Job ID – The job ID in the job database

Job Name – The job name in the job database

Disabled – This indicates whether the job is disabled

Protected – This indicates whether the job is protected

Schedule – The job schedule type such as "daily job", "monthly job", "file-watch", and so on

Run under account – This indicates OS account name under which job runs

Job Folder – The name of the folder in the job database where the report is stored

User-defined Reports

Using Built-in Custom Reports Interface

Prerequisites:

- **Repository Database:** A relational database must be available. It is used as a repository for storing job log and report related data.

- **Event Logging:** The database log adapter must be enabled to log job and scheduler events to a database table in the repository database. See topic Advanced Logging Options for more information.

- **Permissions:** The database account used with the database log adapter must have CREATE TABLE privilege.

The Custom Reports interface is accessible from **Reports -> Custom Reports** menu in both graphical and web-based interfaces. The menu opens **Custom Reports** dialog pictured below.
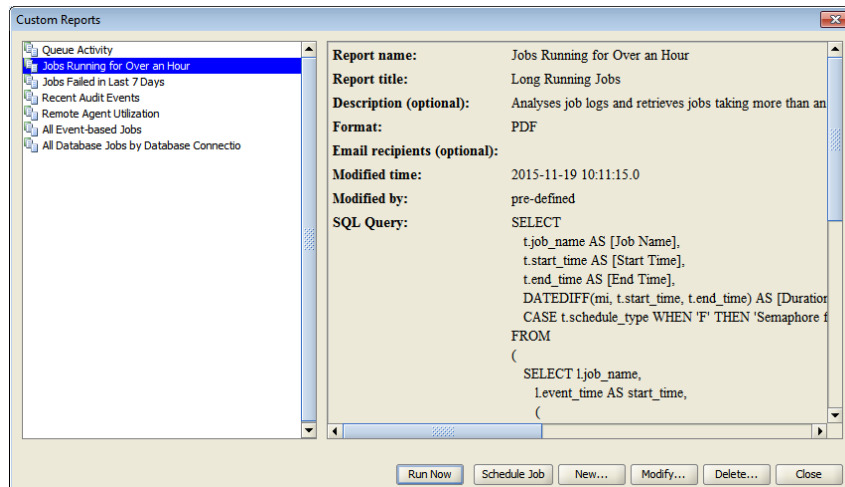
Note: When you open the Custom Reports interface first time, the scheduler automatically creates seven sample reports and saves them in the repository database. The sample report definitions differ for different repository databases types. Sample reports are available for Oracle, SQL Server, and MySQL database types.

Custom reports can be also accessed from the Reports branch in the Job Explorer tree using right-click menus.

Reports can be generated in the following data formats:

- PDF
- CSV
- Excel
- HTML

The report output files are generated in a temporary folder or temporary directory, which is a directory used to hold temporary files for the current user on the computer running the scheduler. By default each report run generates unique file name starting with report name prefix and system time-based name suffix, having standard file extension associated with the selected report output format. For example: *All Event-based Jobs 5-MAY-2015 10-30-58.PDF.*

Reports can be run on demand interactively, as well as run automatically as regular scheduled jobs.

The report delivery method depends on the report definition.

- If there are email recipients specified in the report properties, the report is delivered as an email attachment.

- If there are no email recipients, and the report is kicked off from the scheduler's graphical interface, the report is displayed on the screen using the default program associated with the selected report output format.

- In all other scenarios, the report files are generated and left in the temporary directory for the current user on the computer running the scheduler.

To run a report on demand – run the scheduler in graphical desktop mode, select the required report in the System Tree. Click the **Run Now** button. Alternative, if using the 24x7 web console, select the report in the system tree, and then click the **Run Now** button available above the report definition. Another option is to use the scheduler's command line console. In the console type help report-run to see specific instructions.

Important Note: Before launching a report using 24x7 web console, make sure the report definition has email recipients property populated with valid email addresses and your email is in the list too.

To schedule a report for one-time run or for a periodic run – open Custom Reports dialog and select the required report. Click the **Schedule Job** button. This will create a scheduled job in the special Scheduled Reports folder. The Scheduled Reports folder does not exist yet, the scheduler creates it automatically. You can then modify the schedule of the new job as needed.

To create a new custom report: open Custom Reports dialog and select the required report. Click the **Run Now** button.

The **New Custom Report** dialog will appear. One of the sample custom reports is pictured below in the **New Custom Report** dialog.
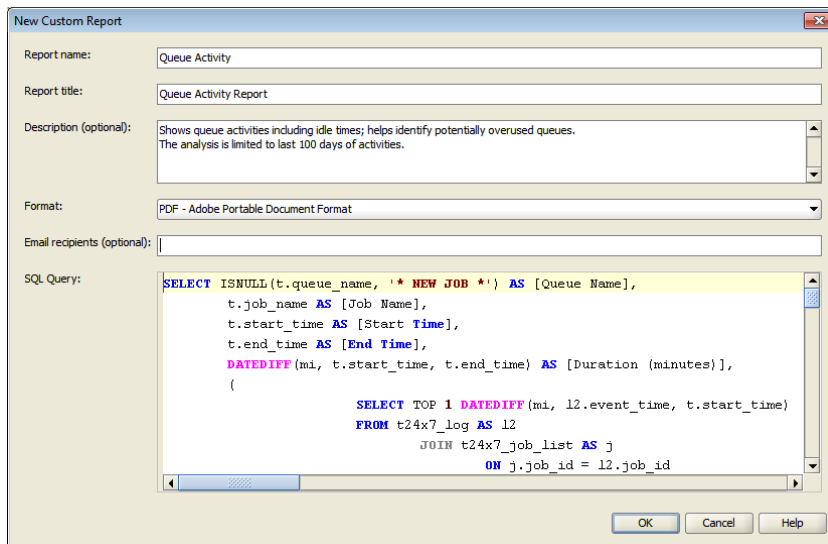
The following report properties are available for customization:

Report name – A unique report name associated with the report. This name is used as a report identifier.

Report title – A friendly descriptive title appearing in PDF based reports.

Report description – An optional description of the report purpose and working.

Format – A report output format.

Email recipients – An optional semicolon separated list of email recipient addresses. In the simplest case, a single email address. If specified, the report is delivered to the recipients by email.

SQL Query – A SQL query used to retrieve report's data.

Tip: It is a good idea to develop and test report queries outside of the report properties dialog. You can use any preferred development tool of your choice. Once full tested, simply copy and paste your query into

the report properties dialog and save it. For information on the repository database schema, read Repository Database Schema topic.

Using External Reporting Tools

The following method is recommended for creating user-defined scheduled and on-demand reports

1. Configure database log adapter to enable job event logging to a database table. See topic Advanced Logging Options for more information.

2. Create a maintenance job using the pre-installed **Export Job Properties** job template. This template can be found in Templates/24x7 Maintenance template group. Double-click to create a new job. Schedule this job to run as often as needed. For more information about creating jobs from templates, see To Schedule a New Job from a Template topic. This job will periodically export job properties to a table in your database or refresh the existing jobs and properties. Choose the same database profile for this job and for the job logging.

3. Use any reporting tool of your choice to create report queries for retrieving data from job logs and joining this data with job properties by job id and/or name. For more information on job properties and the supported property values, see **Job Properties in JDL format** chapter available in **24x7 JavaScript Reference** guide.

Using the described method, you can create reports for

- Analyzing job historical run-time patterns and trends

- Analyzing job anomalies, conflicts and scheduling collisions

- Reporting various types of job summaries

- Many other purposes

Repository Database Schema

The following tables are created in the repository database.

t24x7_log

	Column Name	Condensed Type	Nullable
	event_host	varchar(100)	Yes
	event_time	datetime	Yes
	event_severity	int	Yes
	job_id	int	Yes
	job_name	varchar(255)	Yes
	message_text	varchar(2000)	Yes

t24x7_reports

	Column Name	Condensed Type	Nullable
🔑	ReportId	int	No
	Name	nvarchar(255)	No
	Header	nvarchar(255)	Yes
	Description	nvarchar(2000)	Yes
	ModifiedBy	nvarchar(128)	Yes
	ModifiedTime	datetime	Yes
	SQLQuery	nvarchar(MAX)	No
	EmailRecipients	nvarchar(255)	Yes
	OutputFormat	char(3)	No

t24x7_job_list

	Column Name	Condensed Type	Nullable
🔑	job_id	int	No
	job_type	varchar(50)	Yes
	job_name	varchar(255)	Yes
	schedule_type	char(1)	Yes
	folder_name	varchar(255)	Yes
	queue_name	varchar(255)	Yes
	calendar_name	varchar(255)	Yes
	db_profile	varchar(255)	Yes
	job_enabled	char(1)	Yes
	logging_enabled	char(1)	Yes
	detached	char(1)	Yes
	async	char(1)	Yes
	agent_name	varchar(255)	Yes
	retry_on_error	char(1)	Yes
	disable_on_error	char(1)	Yes
	ignore_errors	char(1)	Yes
	skip_late	char(1)	Yes
	job_priority	varchar(6)	Yes

t24x7_report_instances

	Column Name	Condensed Type	Nullable
🔑	ReportInstanceId	int	No
	FileName	nvarchar(2048)	No
	ReportState	nvarchar(25)	Yes
	Message	nvarchar(2000)	Yes
	ExecutedBy	nvarchar(128)	Yes
	ExecutedTime	datetime	Yes
	ReportId	int	Yes
	ReportName	nvarchar(255)	Yes

Notes:

- **t24x7_log** table stores job and scheduler event records. This table doesn't have a primary key but it has an index on the event_time column.

- In a centralize environments with a single scheduler and multiple remote agents it's recommended that both the scheduler and agents are configured to write log records to the same repository database. The event_host column in **t24x7_log** table indicates on which system the event has been generated.

- **t24x7_job_list** table is populated by a special "SYSTEM: Custom Reports Helper Job" scheduled job, which by default is set to run once every day. If you do not see a recently created or modified job in the list, simply rerun that job manually.

- **t24x7_job_list** table lists all defined jobs and a subset of their basic properties. It is assumed that all properties referenced in that table do not contain any sensitive information and so the data can be stored unencrypted. For your convenience the internal job property values are converted to a report friendly format.

- **t24x7_reports** table stores report definitions.

- **t24x7_report_instance** table is used internally for report processing. It enables report queuing and processing. It also provides an audit trail of all executed reports and their completion statuses.

Chapter 8: Management Interfaces

Overview

In addition to the graphical desktop mode you can use two additional management interfaces to manage jobs and settings in the job database.

- **24x7 Web-based Management Console** - A separate manual is provided for the Web-based Management Console.
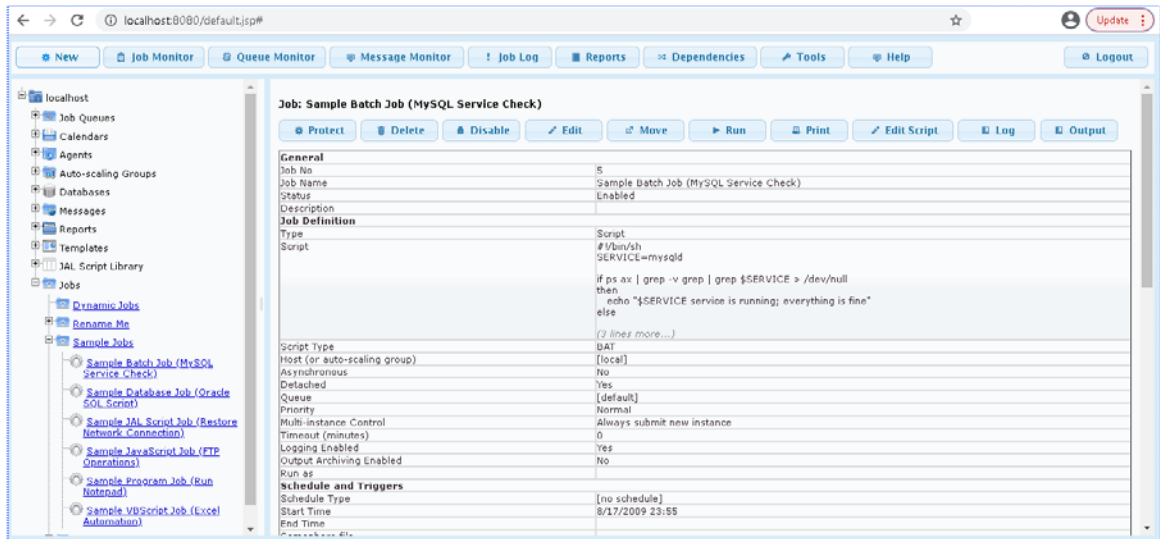
- **24x7 Command Line Console** – To start the command console, run **cons.sh** on Linux or Mac systems, or **cons.bat** file on Windows systems. The file is located in the scheduler's home directory. The command line console contains built-in help system which can be activated after starting the console by typing the **help** keyword and pressing the Enter key.
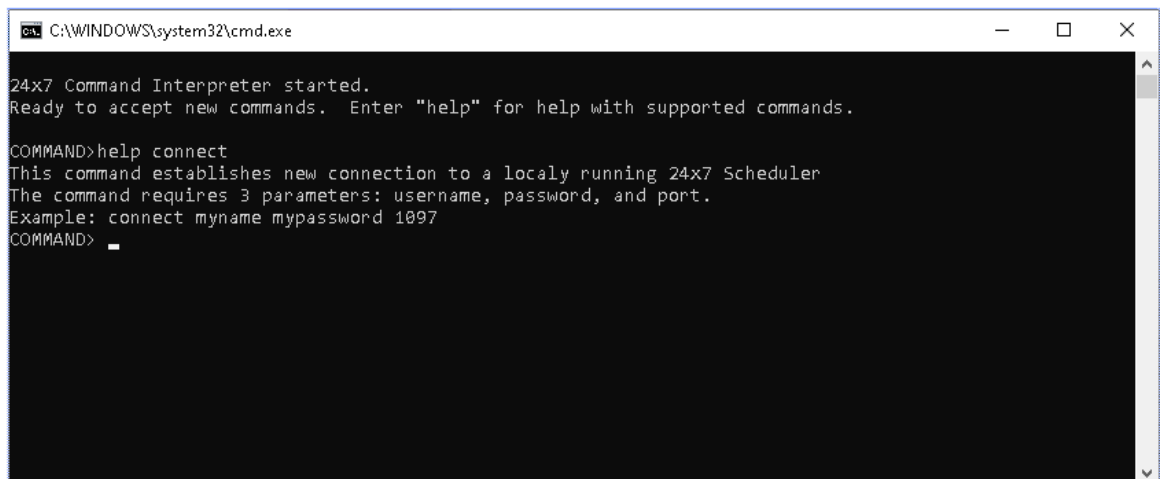
To learn how to use the command console, start it and activate the help system. Follow on-screen instructions.

Chapter 9: Troubleshooting Scheduler

Disabling Timer

In case if you have difficulties starting 24x7 Scheduler or modifying job schedules while jobs are running, you can start 24x7 Scheduler with /NOTIMER option. This will disable the timer used by the Event Processor and as a result it will halt all job processing until 24x7 Scheduler is restarted without this option. All other 24x7 Scheduler features and functions will continue to operate normally.

The /NOTIMER option can be combined with other command line options.

Below are examples for how to use /NOTIMER option

On Unix/Linux/Mac

./master.sh /NOTIMER
./master nogui /NOTIMER

On Windows

master.bat /NOTIMER
master.bat nogui /NOTIMER

On z/OS and OS/390

./master_zos.sh /NOTIMER
./master_zos nogui /NOTIMER

Using Log Viewer

Log Viewer is the tool you can use to monitor job-specific events and scheduler-specific events. Using the Log Viewer, you can also troubleshoot various job execution problems. The logging for the job execution is performed automatically.

You should periodically review the main job event log to check for possible job execution problems.

Scheduler Debugging Options

In case if you have difficulties running certain jobs or experience anomalies in 24x7 Scheduler performing certain functions you may want to enable additional debug-level logging. When this option is enabled 24x7 Scheduler writes lots of debugging events and all internal exceptions to the debug.[n] log files where [n] is replaced with the "log" extension for the current log and a numeric extension for archived logs. When the current log reaches about 10 KB the scheduler automatically renames it with a unique numeric extension and starts new debug.log file.

Debug logs are regular text files that can be viewed or printed using any text editor.

To turn on the debug-level logging click **Tools/Options** menu, activate **Log** tab, check "Trace Enabled" option.

Troubleshooting Job Start and Execution

If a job you scheduled did not run when you expected it to run, check the following conditions:

- Verify the job state is not set to disabled.

- If the job depends on one or more semaphore files, verify that all specified files exist.

- Make sure the job schedule is set correctly and job start date/time are set correctly.

- Make sure the calendar associated with the job schedule has all required business days.

- Using the Queue Monitor verify the job is not stack in the queue waiting for completion of some other job which was first inserted to the same queue.

If a scheduled program did not run correctly, verify in the job command line properties you have supplied all required command arguments. To find out more about a program and its arguments, try one of the following: If the program has online help, look in that help. Try typing the following at a command prompt, where "program" is the name of the program you want to run:

program /?

If a scheduled database command did not run correctly, verify setting for the database profile and JDBC driver. Make sure the database is available. Try to connect to the database from other programs and execute the same job SQL script.

Chapter 10: High Availability and Fail-over

Overview

24x7 Scheduler is an enterprise class scheduling system designed to handle thousands of jobs. It can be configured as a High Availability system.

High Availability?

High Availability (HA) means access to data, jobs and applications whenever needed and with an acceptable level of performance. HA deals with the service aspect of the "scheduling system" as an unbroken whole and as perceived by its end-users. In this context, reliability (of hardware and software components) and performance (response-time/through-put, tpm, etc.) are parts of system availability.

HA is the proportion of time a system is productive and is usually expressed as a percentage. In the spectrum of system availability, HA systems usually fall between 99.9% and 100% availability.

24x7 Scheduler supports 2 fail-over levels:

- Job fail-over can be implemented using built-in job processing redundancy features.

- Scheduling system fail-over can be implemented using clustering solutions.

Job Fail-over

24x7 Scheduler can run both local and remote jobs using remote agents deployed on other computers. Each job can be assigned to a primary agent and a list of backup agents. In case the primary agent is not available the job is automatically submitted to the first available or least busy backup agent.

Scheduler Fail-over

Several solutions can be used for the system fail-over. We recommend Linux High Availability Project (Linux HA). This is a kind of inexpensive clustering solution based on heartbeat method which is easy to install and configure. For more information about Linux HA please read http://linux-ha.org/download/GettingStarted.html

Linux HA heartbeat system (active/passive configuration) can be setup to monitor TCP port 1097 (this is the default port used by 24x7 Scheduler for TCP requests.. Each node in a cluster needs to have 2 network cards - one for the regular network and another for the private network. Nodes can be then linked by Cat-5 crossover cable. Using private network allows excluding all common network dependencies (such as routers, switches, disconnects) and avoid false fail-over caused by other component failures.

Important Note: The Linux High Availability Project method can be used and run on any other Unix system, including Sun Solaris, HP-UX and other. It is not specific to Linux operation system!

Job Database Fail-over

The embedded JavaDB job database server supports replication of all job database changes. It supports many different replication options which are described in detail here
https://db.apache.org/derby/docs/10.4/adminguide/cadminreplication.html

To setup the job database replication you may need to obtain additional 24x7 Scheduler licenses or obtain a site license if the replication is to be run in the same data center.

Job Database Backups

1. You can use the preinstalled "Daily - Backup Job Database and Preferences" job template to schedule daily backups.

2. You can also use external backup solutions to backup 24x7 Scheduler files and the job database. It's recommended to backup the entire directory in which 24x7 is installed.

Note: The job database backup automatically backups all system settings in addition to the job database. A copy of the preferences.xml file is saved to the backup directory with every backup.

System Settings Backup

On startup 24x7 Scheduler automatically creates a reserve copy of the main settings file preferences.xml file and saves it to *preferences.bak*. If it detects that preferences.xml file is corrupted, it automatically recovers it from the previously saved *preferences.bak*

If both files are lost, you need to restore them from last successful job database backup of file level backup before you can start the 24x7 Scheduler.

Chapter 11: Installation and Configuration

System Requirements

24x7 Scheduler and agents can be installed on computers running any of the following:

Linux 32-bit version 2. 1 and later

Sun Solaris 32-bit (i386) version 5. 6 and later

Sun Solaris 32-bit (spark32 and spark64) version 5. 6 and later

Digital UNIX 64-bit version 4.0B and later, including Tru64 UNIX

FreeBSD (i386 and Alpha) version 3. 1 and later

IBM AIX version 4. 1 and later

IBM z/OS and OS/390

Mac OS X Tiger and later

Windows 7 and later

other UNIX systems running JDK version 1.8 and later

On **Unix/Linux/Mac** PAM has to be installed and configured to apply native security.

Installation

The installation program is packaged in 2 formats. Windows package is available as a ZIP archive file, while Linux/Unix/Mac package is available as compressed TAR file, i.e. as TGZ archive file.

Installation on Unix/Linux/Mac systems

1.   Install Java 2 Platform, Standard Edition v 1.4.x or better if you don't have it already installed on the system.
2.   Install 'perl' and 'perl-Authen-PAM' packages for your system if you don't have them already installed. **(*)**
3.   Login as root. **(**)**
4.   Create a temporary directory.

```
mkdir /scheduler_install
```

5.   Untar 'jscheduler.tgz' to the created directory.

```
cp jscheduler.tgz /scheduler_install
cd /scheduler_install
gtar xvfz jscheduler.tgz
```

6.   Make sure your $JAVA_HOME variable points to the correct JDK/JRE installation.
     NOTE: If $JAVA_HOME is missing you must define it before you continue
7.   Run scheduler installation wizard.

```
chmod a+x setup.sh
```

```
./setup.sh
```

8.   For console mode installation you can use.

```
./setup.sh nogui [installation_dir]
```

9.   `If you are planning to use PAM security`, add 'jscheduler' service configuration to system PAM files directory or configuration file.
Here is an example for RedHat Linux:

```
cp <path to installed scheduler>/pam/jscheduler /etc/pam.d/
```

For details see "Configuring PAM security" topic below.

10. Test start 24x7 Scheduler or agent

- For master scheduler mode start './master.sh'.
- For master scheduler mode without GUI start './master.sh' nogui'.
- For agent mode start './agent.sh'.
- For agent mode without GUI start './agent.sh nogui'.

NOTES:
- If you are not going to use Linux/Unix native system security you can install 24x7 Scheduler in your home directory under your usual system rights. Also you can skip the step marked with (*).
- Perl-Authen-PAM packages are available for most systems. PAM packages are free and can be download using the following links:

RPM for Linux   http://dag.wieers.com/packages/perl-Authen-PAM
DEB for Linux   http://packages.debian.org/stable/interpreters/libauthen-pam-perl
For Solaris, FreeBSD, OpenPAM, HP-UX, Darwin, Mac OS 10 do the following:

1.   Download the Perl Authen::PAM module (Authen-PAM-0.12.tar.gz) It is available at
http://www.perl.com/CPAN/authors/id/N/NI/NIKIP/

2.   Run the following commands:
```
cd /tmp
tar -zxvf Authen-PAM-0.15.tar.gz
cd Authen-PAM-0.15
perl Makefile.PL
make
make install
```

Installation on Windows systems

1.   Install Java 2 Platform, Standard Edition v 1.4.x or better if you don't have it already installed on the system.

2.   Make sure your %JAVA_HOME% environment variable points to the correct JDK/JRE installation.

3.   Unzip 'jscheduler.zip' to a new empty directory and execute 'setup.bat' to run installation wizard. **(**)**
NOTE: if you don't have %JAVA_HOME% defined right-click on My Computer icon displayed on Windows Desktop. Click Properties in the popup menu and then click the Advanced tab on the Computer Properties dialog. Click the Environment button and add JAVA_HOME variable to the System variables section. Set value of this variable to the path to your JDK/JRE installation.

4.   Test start 24x7 Scheduler or agent:

1.   For master scheduler mode start 'master.bat'.
2.   For master scheduler mode without GUI start 'master.bat nogui'.
3.   For agent mode start 'agent.bat'.
4.   For agent mode without GUI start 'agent.bat nogui'.

Installation on z/OS or OS/390 systems

1. Install Java 2 Platform, Standard Edition v 1.4.x or better if you don't have it already installed on the system.
2. Check that Unix services are started on your system.
3. Login under your account to z/OS Unix console. **(**)**
4. Create a temporary directory.

    ```
    mkdir /scheduler_install
    ```

5. Untar 'jscheduler.tgz' to the created directory.

    ```
    cp jscheduler.tgz /scheduler_install
    cd /scheduler_install
    tar xvfz jscheduler.tgz
    ```

6. Make sure your $JAVA_HOME variable points to the correct JDK/JRE installation.
    NOTE: If $JAVA_HOME is missing you must define it before you continue.
7. Run console mode installation with:

    ```
    chmod a+x setup_zos.sh
    ./setup_zos.sh nogui [installation_dir]
    ```

8. Test start 24x7 Scheduler or agent:
    Run scheduler in master mode:

    ```
    ./master_zos.sh nogui
    ```

9. Now, you can connect from a remote Web Console to the started scheduler. You should enter your z/OS hostname and choose Unix/Linux 24x7 Scheduler type on the Web Console login page.

See also:

> [Starting 24x7 Scheduler](#)

24x7 Scheduler Run-time Modes

24x7 Scheduler can run in 4 different modes:

1. Master Scheduler desktop mode with graphical user interface (GUI)

2. Master Scheduler mode without GUI.

3. Remote Agent desktop mode with GUI.

4. Remote Agent mode without GUI.

The following paragraphs describe each mode and when and why you should use them.

Master Scheduler desktop graphical mode

This is the most feature-rich mode. In this interactive mode 24x7 Scheduler can be used simultaneously to run scheduled job, check job events, execute job notifications, run remote jobs submitted by other 24x7 Schedulers, and also display advanced graphical user interface for creating new jobs, modifying existing jobs, managing scheduler settings, auditing and monitoring job execution. The presence of the graphical interface in no way affects the scheduler's ability to run jobs and monitor job events. Because the graphical interface is local and attached directly to the scheduling engine all interactions with the scheduler take shortest possible time. While the scheduler is running in this mode it is also possible to manage it remotely and concurrently using web-server based interface. ***The web-server can run on the same or different computer, but because the graphical interface is not attached directly to the scheduler we will use here and in the following paragraphs terms remote and remotely when referring to this interface type.*** See 24x7 Web-based Management Console User's Guide for more information on how to install and use the web based interface.

Pros & cons:

   Pros: This mode provides both easy of use and low resource utilization.

   Pros: This mode can be used to manage and run job on all systems supporting graphical interfaces, such as Windows, X-Windows, Motif and other.

   Cons: Only one user at a time can use the graphical interface.

   Cons: This mode cannot be used on systems without graphical interface, such as Unix systems running in command-line interface modes.

Master Scheduler mode without GUI

In this mode 24x7 Scheduler runs without local graphical interface. The scheduler can run scheduled job, check job events, execute job notifications, run remote jobs submitted by other 24x7 Schedulers, and also can be managed remotely using web-based interface. While the scheduler is running in this mode you cannot interact with it using local graphical interface. Indeed you cannot do much locally other then to stop and restart it. See 24x7 Web-based Management Console User's Guide for more information on how to install and use the web based interface.

Pros & cons:

   Pros: This mode provides low resource utilization.

   Pros: This mode can be used to manage and run job on all systems regardless of their support for graphical interfaces.

   Cons: The scheduler requires either usage of a web server to provide the web-based interface or occasional run in the Master Scheduler mode with the local GUI attached in order to manage local jobs, job queues and other settings.

Agent desktop mode with GUI

In this mode 24x7 Scheduler runs as a processing agent without local scheduling engine activated. In this mode it can only execute jobs submitted by other 24x7 Schedulers and Agents running on other computers connected to the same network. Agent mode should be used to create distributed job processing configurations supporting centralized job scheduling, management and monitoring. For more information about 24x7 Remote Agents read Remote Agents topic. The local graphical interface can be used to change agent's settings and view/print agent processing logs. Because the graphical interface is local and attached directly to the agent all interactions with the agent take shortest possible time.

Pros & cons:

   Pros: This mode provides both easy of use and low resource utilization.

Cons: This mode cannot be used on systems without graphical interface, such as Unix systems running in command-line interface modes.

Agent mode without GUI

In this mode 24x7 Scheduler runs as a processing agent without local scheduling engine activated and without local graphical interface. In this mode it can only execute jobs submitted by other 24x7 Schedulers and Agents running on other computers connected to the same network. Agent mode should be used to create distributed job processing configurations supporting centralized job scheduling, management and monitoring. For more information about 24x7 Remote agents read Remote Agents topic. In this mode the agent is non-interactive and you cannot do much with it rather then stop and restart it.

Pros & cons:

Pros: This mode provides both easy of use and low resource utilization.

Pros: This mode can be used to run job on all systems regardless of their support for graphical interfaces.

Cons: This mode requires occasional run in the Agent mode with the local GUI attached in order to change agents settings.

Upgrading Existing Installation

If 24x7 Scheduler was installed in console mode:

1. Backup your job database and *.xml settings files.
2. If you use JAL script library, also backup JAL\library.dat file.
3. Remove your installation directory with all the subdirectories.
4. Make the steps marked with (**) for your own operating system to install new version
5. Restore the job database and *.xml files from the backup to the new version installation directory.
6. If you use JAL script library, also restore JAL\library.dat file.

Otherwise:

1. Execute 'uninstall.sh'/'uninstall.bat' manually or using the Uninstall shortcut if that is available in the program menu.
2. This will delete all files and directories from the existing installation directory with the exception of job database subdirectory and *.xml settings files.
3. Continue from the step marked with (**) in the installation section for your own operating system

See also:

Starting 24x7 Scheduler

Starting 24x7 Scheduler

Windows specifics

To start 24x7 Scheduler on a Windows computer in Master mode execute master.bat file. To start Scheduler in Master mode without GUI execute master.bat file with **nogui** command line parameter. To start Scheduler in Agent mode with GUI execute agent.bat file. To start Scheduler in Agent mode without GUI execute agent.bat file with **nogui** command line parameter.

Unix/Linux/Mac specifics

To start 24x7 Scheduler on a Unix computer in Master mode execute master.sh file. To start Scheduler in Master mode without GUI execute master.sh file with **nogui** command line parameter. To start Scheduler in Agent mode with GUI execute agent.sh file. To start Scheduler in Agent mode without GUI execute agent.sh file with **nogui** command line parameter.

Automatically starting 24x7 Scheduler on system startup (Unix/Linux)

Automatic application startup depends on your Window Manager (KDE/Gnome/etc.)

Read 'Adding applications to startup' topic from your Window Manager documentation.

Automatically starting 24x7 Scheduler on system startup (Windows)

- If you want to run 24x7 Scheduler as a standalone server simply add shortcut for master.bat (or for the agent mode, add shortcut for agent.bat) to the Startup folder of your Windows 'Startup' menu.

- If you want to run it as a Windows service use **24x7srv.exe** utility provided with the scheduler. To install the server, execute **24x7srv.exe /install** from DOS command prompt in the directory where the scheduler is installed. This utility will install and register 24x7 as a Windows service under LocalSystem account. To create it using other account execute **24x7srv.exe /install [user] [password].** For agent mode add **/agent** switch to the command line. For additional details and options please execute **24x7srv.exe /?** command.

System Options

To configure system options using graphical console click **Tools / Options** menu. Note that system options can be also configured using 24x7 Web-based Management console as well as edited manually using text editor. The last is not recommended and should be used only as a last resort when other methods are not available.

General Options

Maximum message box display box display time - Specifies the maximum display time (in minutes) for non-modal error message box. Value 0 prevents non-modal message box appearance.

Ask confirmation on exit - Confirmation message appears on 24x7 Scheduler exit in case the parameter is on, otherwise 24x7 Scheduler quits without confirmation.

Automatically save changes on exit - Job database changes are automatically saved in case the parameter is on, otherwise message box that reads "Would you like to save change?" appears.

Reset job queues on startup - In case the parameter is on all queued jobs continues execution after 24x7 Scheduler is started up.

Email Options

Message encoding - Email message encoding type.

Message content type - Email message format type, one of the following: plain text, html or xml.

SMTP (email) server - Specifies name or IP address of your SMTP email server.

SMTP sender address - Specifies default email sender address used for sending alerts.

Logging and Debugging Options

The **Log** tab in the Options dialog contains options that define 24x7 Scheduler logging behavior:
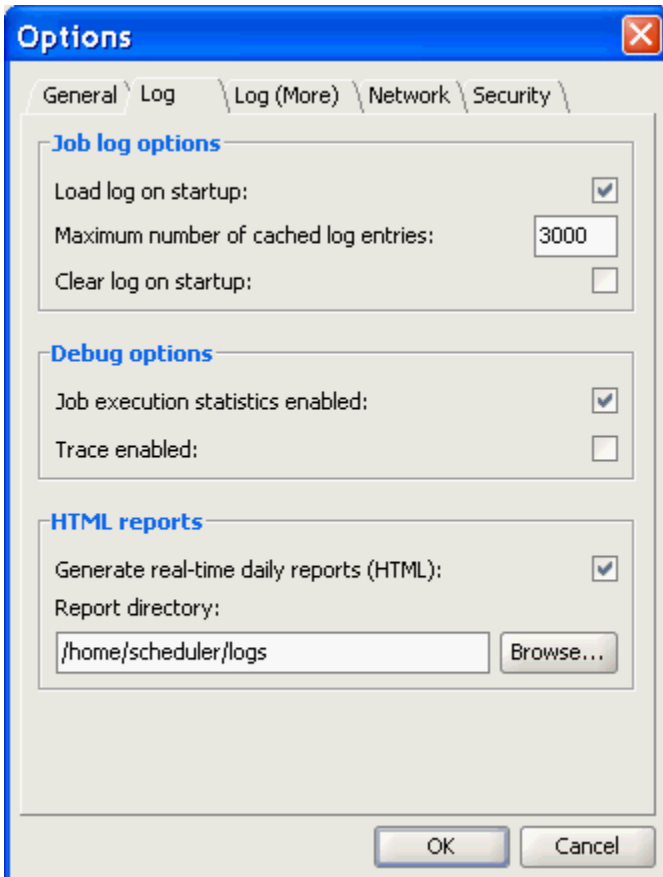
Load log on startup - The log is loaded on 24x7 Scheduler on startup if the parameter is on. Log is not loaded otherwise.

Clear log on startup - The log is cleared on 24x7 Scheduler on startup if the parameter is on. Please note that parameters "Load log on startup" and "Clear log on startup" are mutually exclusive.

Maximum number of entries in log - Defines number of maximum number of records in the log. When the specified number is reached the oldest records are replaced with the newest records.

Job execution statistics enabled - Enables collecting of Job Execution Statistics. You can use collected execution statistics to better understand behavior of scheduled programs, such as memory usage, run-time duration and delays. The collected information also may help you in troubleshooting job anomalies.

Generate real-time status HTML reports– Allows generation of HTML formatted log reports after each job run. The 24x7 Scheduler can generate job execution log entries in elegant HTML report format and automatically update HTML reports each time a new entry is added to the log file. Specifies the destination directory for HTML reports. You can click the **Browse** button to select the desired directory. If you leave this field blank, the 24x7 Scheduler will save reports in the installation directory. If your company Web server is running on a different system, you can specify network share name pointing to a directory on your Web server to allow 24x7 Scheduler automatically upload reports to the web server.

Report directory - Specifies the destination directory for the Status Report. Alternatively, you can click the Browse button to select the desired directory. If you leave the field blank, the 24x7 Scheduler will save reports in the installation directory. If your company Web server can be accessed via Intranet, you can specify the destination directory on the Web server to have the 24x7 Scheduler automatically upload the Status Report.

Advanced Logging Options

The **Log (More)** tab in the Options dialog provides configuration options for advanced logging methods using optional log adaptors.
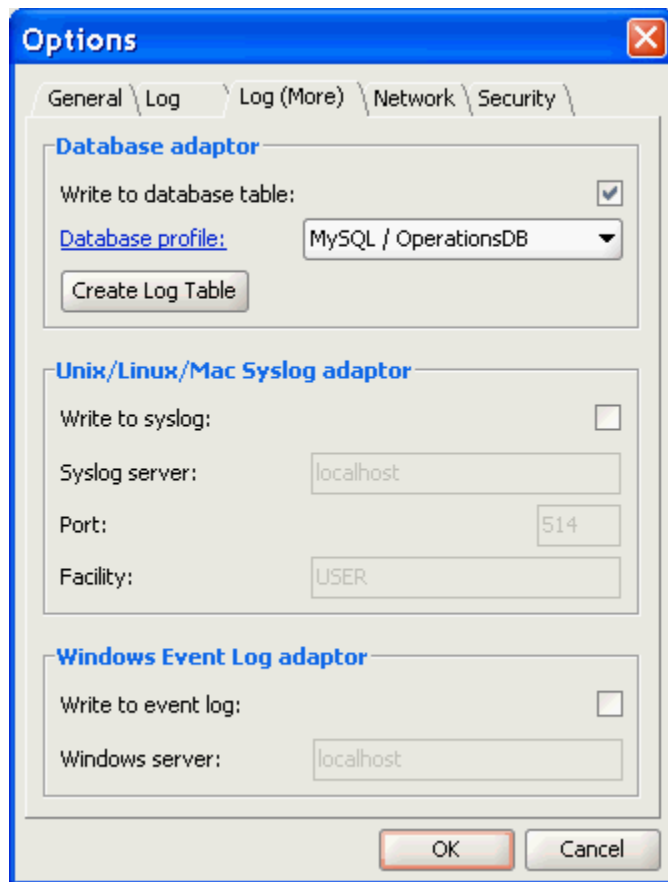
Database adaptor - this log adaptor allows forwarding of job and system log events to an external database system of your choice.

Before this type of logging to a database table can be used, you must configure database connection settings and use the **Create Log Table** button to create the log table in that database. The name of the log table is **t24x7_log**. This table is created in the default schema associated with the user specified in the database connection properties. See Creating and Configuring Database Profiles topic for more information about database connection profiles and settings.

Syslog adaptor - this log adaptor allows forwarding of job and system log events to a local or remote syslog server. Use Server, Port, and Facility properties to configure connection to the syslog server.

Windows event log adaptor - this log adaptor allows forwarding of job and system log events to a local or remote Windows server and write forwarded events to the server's event log

 Important Note: This adaptor can be used only if 24x7 Scheduler/Agent is running on a Windows based system.

Network Options

The **Network** tab in the Options dialog contains options that control 24x7 Scheduler network –related settings.

Distributed Server mode enabled - When the parameter is on 24x7 Scheduler running as a Master is able to work concurrently as an Agent and execute remote jobs.

TCP/IP service port - Specifies listening port for remote job execution

Remote control options - When the parameter is on it's possible to connect to connect to Scheduler running as Master using remote API.

Remote control port - Specifies listening port for remote API

Security Options

The **Security** tab in Options dialog contains options that control 24x7 Scheduler network –related settings.

 Notes:

Two alternative user authentication methods are supported by 24x7 on Unix and Linux systems:

PAM method relies on Perl-Authen-PAM packages which are available for most systems. PAM packages are typically preinstalled on all modern Unix and Linux systems. PAM packages are free and can be download using the following links:

RPM for Linux http://dag.wieers.com/packages/perl-Authen-PAM

DEB for Linux http://packages.debian.org/stable/interpreters/libauthen-pam-perl

For Solaris, FreeBSD, OpenPAM, HP-UX, Darwin, Mac OS 10 do the following:

1. Download the Perl Authen::PAM module (Authen-PAM-0.12.tar.gz) It is available at

http://www.perl.com/CPAN/authors/id/N/NI/NIKIP/

2. Run the following commands:

```
cd /tmp
tar -zxvf Authen-PAM-0.15.tar.gz
cd Authen-PAM-0.15
perl Makefile.PL
make
make install
```

FTP method relies on the local ftp daemon for user authentication. If you choose this method, make sure ftpd daemon is enabled and running on your system.

System Options

The **System** tab in the Options dialog contains various options related to the internal working of 24x7 Scheduler job database. See below notes for more details

The job database requires periodic maintenance for its optimal performance. Use the maintenance schedule options to specify how often to run the maintenance. During the maintenance the database is in read-only mode and new jobs cannot be launched until the maintenance is complete.

The message queue options can be used to setup how frequently the scheduler polls the message queue table in the job database to check for pending messages, and for how long messages remain in the job queue until they are purged.

The **Polling frequency (seconds)** option controls the frequency. The option value must be a positive number. The default value is 15 seconds.

The **Message max life time (days)** option defines when to delete queued messages that haven't been deleted by the jobs. Messages having their Action type property set to "Do Nothing" remain in the queue until they are purged. Messages having their **Action type** property set to "Delete before job execution" or "Delete after job execution" get deleted from the queue before or after execution of jobs they are associated with.

The job database options control encryption methods and settings applied to the job database and the TCP/IP port number the job database listens on for incoming connections.

Theme Options

The **Themes** tab in the Options dialog enables you to choose user interface theme for the graphical Desktop mode. That is the mode for launching 24x7 Scheduler with graphical UI shown on the user's Desktop. The default theme is **Plastic**.

Chapter 12: Tools

Preferences Manager

You can use the Preferences Manager to copy Remote Agents, Queues, Calendars or Database Interfaces (here and later "objects") between different 24x7 Schedulers. To start the Preferences Manager click the **Tools/Preferences Manager** menu.
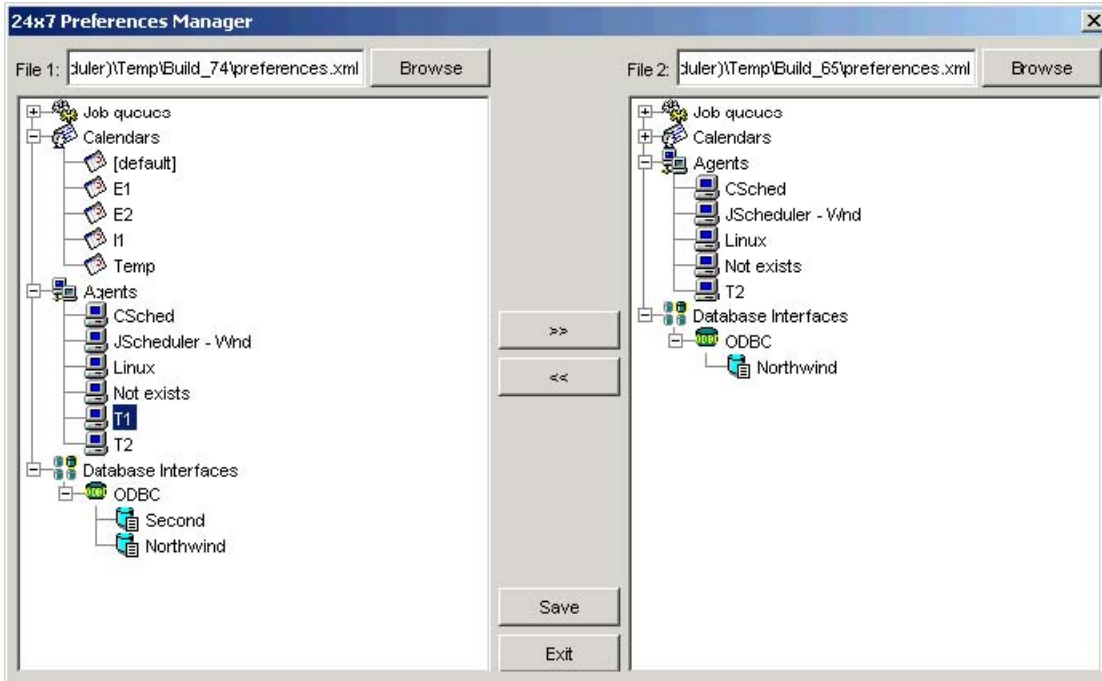
To copy an "object" from one preferences file to another

1. Use the left Browse button to find and open the source or target preferences.xml file.

2. Use the right Browse button to find and open another preferences.xml file.

3. In the source find and select the "object" to be copied.

4. Click the **>>** button to copy the selected "object" from the file displayed on the left side to the right side file or click the << button to copy the selected "object" from the right side file to the left side file. If necessary repeat steps 3 to 4 to copy additional jobs.

5. Click the **Save** button to save changes.

Important Note: The copied "object" is always added to the target file. If the target file already contains an "object" of appropriate type with the same name you get a prompt asking you to confirm the replacement. If you choose YES, the target object is replaced with the source "object."

Copying of a Database Interface causes all Database Profiles associated with this Database Interface be also copied.

Copying and Importing jobs

Importing Cron Jobs

During the first start up on a **Unix, Linux, or Mac** operation system, 24x7 Scheduler suggests to import the existing cron jobs into 24x7 Job Database. Cron jobs are imported from the system default crontab file. it's possible to specify custom crontab directory (see Import Cron jobs dialog topic for more details).

Notes:

- 24x7 expect to find only crontab files in the selected directory and will attempt to import all of them.

- All imported jobs are disabled by default so that after the import you have a chance to decide which jobs to enable and active and which not.

- All imported jobs are executed under default account used to run 24x7 Scheduler software. To use a different account, modify job security settings and enter appropriate user account and password into the job properties. See Job Wizard, Agents topic for more details.

- Theoretically some types of crotab jobs may have schedules that cannot be mapped directly to 24x7 Scheduler job recurrence patterns. Such jobs cannot be imported automatically and require manual input for correcting their schedules. You will be notified about specific jobs requiring your attention at the end of the import process.

See also:

Copying and Importing jobs

Importing Windows Tasks

Import Cron Jobs dialog allows you to select *cron* directory and system *passwd* file.

You can either type the directory and file names manually or you can the browse buttons (…) to browse and select the required names. Click the **OK** button to start the import process or click **Cancel** to abort.

Importing Windows Tasks and AT Jobs

During first start up on a **Windows** based operation system 24x7 Scheduler suggests to import existing windows Tasks into 24x7 Job Database.

Notes:

- All tasks scheduled with the Windows Scheduler service and jobs scheduled with the DOS AT command and their scripting interfaces such as WMI interface are imported in one go.

- The utility imports all found scheduled tasks and jobs into a new folder named **Windows Tasks**. If such folder already exists, the import utility creates a new folder with a similar name and date-time based suffix.

- All imported jobs are executed under default account used to run 24x7 Scheduler software. To use a different account, modify job security settings and enter appropriate user account and password into the job properties. See Job Wizard, Agents topic for more details.

- In case tasks from the Windows Tasks service are associated with multiple schedules, each schedule is imported as a separate job in 24x7.

See also:

Copying and Importing jobs

Importing Jobs from Remote 24x7 Schedulers

You can import jobs from remote 24x7 Scheduler instances running on the same network including other versions, such as 24x7 Scheduler Windows Edition.
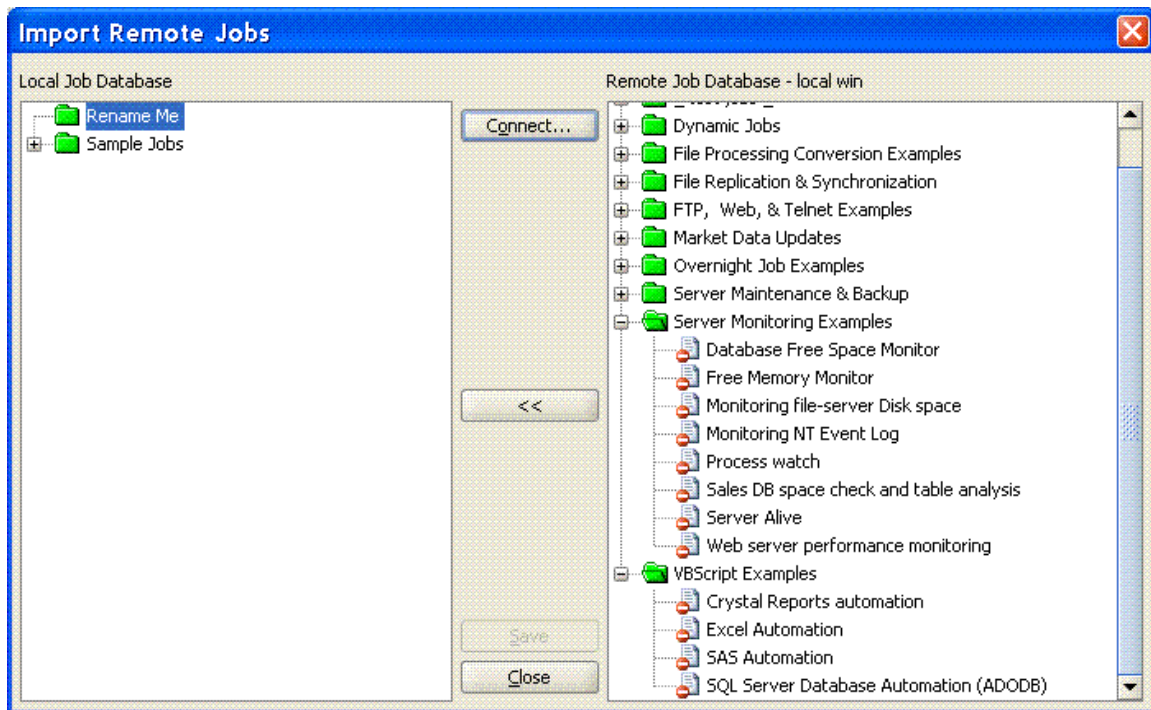
To copy jobs from remote scheduler

1. Use the Connect button to connect to the remote scheduler.

2. In the source job database (displayed on the right hand side of the dialog) find and select the job you want copy.

3. In the target job database (displayed on the left hand side of the dialog) find and select the target folder.

4. Click the << button to copy the selected job from the source to the target. If necessary repeat steps 2 to 4 to copy additional jobs.

5. Click the **Save** button to save changes.

Important Note: All copied jobs are always added to the target job database. If the target folder already contains a job with the same name, you will get two jobs with the same name but different job IDs. The ID of the added job will be changed to a unique number in the target job database. To delete duplicate jobs, close the Job Database Manager, open the job database using File/Open menu, and then delete these jobs.

Exporting Jobs and Logs

Manual Export

To export jobs and their properties to a relational database table you can use Tools / Export Job Properties menu. Before you begin, make sure you have configured a database connection profile for the database you want to export the data to. See Database profiles topic for more information on how to set a database profile.

The export process will automatically create the 2 tables t24x7_jobs and t24x7_log if they are not already available in the target database. Below are the table definitions for both tables using SQL Server compatible SQL syntax:

```sql
CREATE TABLE [dbo].[t24x7_jobs]
(
        [job_id] [int] NULL,
        [property_name] [varchar](50) NULL,
        [property_value] [varchar](4000) NULL
)


CREATE TABLE [dbo].[t24x7_log]
(
        [time] [datetime] NULL,
        [status] [int] NULL,
        [status_icon] [varchar](28) NULL,
        [job_id] [varchar](4) NULL,
        [job_name] [varchar](50) NULL,
        [message] [varchar](203) NULL
)
```

Note that for backward compatibility reasons the data in t24x7_jobs table is stored row-wise. For each job the export generates as many rows as many job properties are available in the current version.

Here is an example demonstrating how the how exported data can be used in custom reports

This example shows job runs by job queue, their timing and duration

```sql
SELECT t.queue_name  AS queue_name,
       t.start_time,
       t.end_time,
       DATEDIFF(ss, t.start_time, t.end_time) AS duration_seconds,
       t.job_name,
       t.is_async_job
FROM  (
          SELECT j.property_value      AS queue_name,
                 l.job_name,
                 l.[time]              AS start_time,
                 (
```

```
                SELECT MIN(l2.[time])
                FROM   t24x7_log AS l2
                WHERE  l2.job_id = l.job_id
                       AND l2.[time] >= l.[time]
                       AND l2.[message] LIKE '%completed%'
            ) AS end_time,
            CASE
                WHEN a.property_value = 'Y' THEN 'YES'
                ELSE ''
            END AS is_async_job,
            l.job_id
     FROM   t24x7_log AS l
            LEFT JOIN t24x7_jobs AS j
                ON  j.job_id = l.job_id
                AND j.property_name = 'QUEUE'
            LEFT JOIN t24x7_jobs  AS a
                ON  a.job_id = l.job_id
                AND a.property_name = 'ASYNC'
     WHERE  l.[message] = 'Job started.'
) AS t
```

Scheduled Export

To schedule periodic job properties export, use "Export Job Properties" job template that can be found in "24x7 Maintenance" template folder.

Note that dumping job logs can be accomplished without manual or scheduled job exports. Simply enable the Log to Database feature in 24x7 Scheduler Options.

See also:

Database Interfaces

Database profiles

Advanced Logging Options

Appendix A: Technical Support

Your questions, comments, and suggestions are welcome.

For technical support, e-mail to mailto:support@softtreetech.com or use the on-line support form at http://www.softtreetech.com/Support.htm.

When reporting problems, please provide as much information as possible about your problem. Be sure to include the following information:

1   Is the problem reproducible? If so, how?

2   What version of Operation System are you running? For example, Windows XP, RedHat Linux 9, etc.

3   What version of the 24x7 Scheduler are you running?

4   If a dialog box with an error message was displayed, please include the full text of the dialog box, including the text in the title bar.

5   If the problem involves an external program, provide as much information as possible about this program.

6   Make sure you include the license key for your copy of 24x7 Scheduler. Use the **Help/About** menu to look up the correct numbers. Registered users have priority support.

For general information, software updates, the latest information on known problems and answers to frequently asked questions, visit the 24x7 Scheduler home page on the Web: http://www.softtreetech.com/24x7/.

We are happy to help in any way we can, but if you are having problems, please check the troubleshooting section first to see if your question is answered there.

Appendix B: License

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