The Business Case for Third-Party IBM i Job Schedulers

Automation Beyond the Native Scheduler

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WHITE PAPER:

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Executive Summary

While IBM i is a classic business processing system, IBM i job scheduling software is critical to running an organization's business. The i operating system provides native job scheduling software that organizations use to manage job scheduling, insuring their batch jobs run on time and in the correct processing sequence.

The native IBM i job scheduler is a basic product that offers limited capabilities for scheduling and managing batch jobs. It satisfies basic processing needs, but prevents organizations from using more advanced scheduling and management capabilities for business needs.

The native IBM i job scheduler is missing many critical capabilities. It cannot react to changing processing conditions, it requires programming and monitoring resources to schedule and run jobs, there are no recovery capabilities when problems occur, and it has no built-in compliance reporting.

Investing in a third-party IBM i job scheduling package helps companies efficiently and effectively process customer requirements. It provides substantial benefits over the native job scheduler in the following areas:

- Scheduling advantages, where the system can react to events happening at the current moment, rather than being limited to only scheduling stand-alone jobs. Event-driven scheduling, workflow scheduling, and dependency scheduling are available in third-party schedulers.
- Run-time advantages, where business processes can run on a fixed schedule while also being able to run on-demand, using flexible scheduling and configurable calendars
- More job processing capabilities: New options in how jobs run, including multi-step scheduling and the ability to change the job processing environment inside running jobs
- Automated recovery options, where the system can recover without programming or operational resources, keeping customer processing moving when errors happen
- Advanced administrative options, where you can control scheduled jobs running on multiple IBM i systems from one desktop
- Auditing advantages, where performance and auditing reports can quickly be produced without using programming resources
- Decreased need for programming and monitoring resources, where administrators or the system itself can perform functions that previously required programmers or dedicated monitoring personnel

Third-party scheduling software provides capabilities well beyond that currently available with the native IBM i job scheduling software (as shown in the side-by-side feature comparison for native versus third-party job schedulers in Figure 1).

Organizations would be well-advised to consider using a third-party IBM i job scheduler instead of the native job scheduler. Third-party packages can also easily migrate the existing native job scheduler environment to a new third-party package. A third-party scheduler will increase processing performance, satisfy unmet processing needs, decrease programming and monitoring resource utilization, and help meet auditing needs. It's a valuable upgrade for almost any IBM i environment.

Introduction

IBM's native job scheduling software is accessed through two interfaces: 1) the graphical Management Central Scheduler feature that comes with the IBM Navigator for i Web application; and 2) A series of green-screen commands for managing job scheduling, including the Work with Job Schedule Entries command (WRKJOBSCDE).

The native IBM i job scheduler is a basic product that only offers basic scheduling functions. It lacks many advanced functions needed by i shops, including scheduling complex multi-step workflows, changing job parameters at run-time, and managing scheduled jobs across multiple IBM i systems. The native job scheduler is an individual scheduling product, not a workflow manager, and many shops can benefit by switching to a third-party IBM i job scheduling package.

This white paper looks at the native IBM i job scheduler, its capabilities and limitations, and how a third-party job scheduling software can provide superior features and functionalities to IBM's native scheduler. For many organizations, a third-party IBM i job scheduling package is essential for their business needs. Based on our analysis, we believe most organizations should consider purchasing a third-party scheduler for managing business processing, rather than relying on IBM's native job scheduler. It's a valuable upgrade for almost any IBM i environment.

The Native IBM i Job Scheduler

The native IBM i job scheduler offers basic job scheduling. It's a single system solution, kicking off and running batch jobs on a single IBM i partition. The native scheduler doesn't control or kick off jobs on companion IBM i partitions, Windows servers, or Linux systems.

IBM has been offering the native job scheduler for decades. Being an older feature, the native scheduler provides a solid but limited product for IBM i users. Here is a brief rundown of what the native IBM i job scheduler consists of and the benefits it offers.

The Key Purposes of the Native IBM i Job Scheduler

The native IBM i job scheduler has two purposes:

1) It creates and maintains job scheduler entries in its own batch job scheduler

2) It submits individual jobs to job queues using the parameters listed in its job scheduler entries, submitting jobs at the dates and times specified in each entry.

IBM's Native Job Scheduler Limitations

The native IBM i job scheduler is a single job processing solution. Jobs are scheduled as entries in either the graphical Management Central Scheduler function that comes with the IBM Navigator for i Web site or by using green-screen commands such as the Work with Job Scheduler Entries command (WRKJOBSCDE). The scheduler submits jobs for execution at the times and dates listed in their job entries.

The native IBM i job scheduler provides the following features and limitations for an IBM i shop.

1. Automated job processing: Scheduled jobs are submitted to job queues automatically at the time and date listed in their job entries.

2. Stand-alone job processing: Individual jobs are added to the scheduler as job entries, with no interaction with other jobs. Job entries cannot be scheduled to run in sequence, as part of a workflow, or to run in reaction when another event occurs.

3. Daily, weekly, or date-specific run dates: Jobs can only be scheduled to run on a scheduled date or on specific week days each week. Omission dates can be entered to skip running on specific dates. Jobs cannot be submitted on an irregular schedule, such as on holidays or at fiscal month-end.

4. Single run times: Each job is scheduled to run at one specific time of day. Separate job entries must be entered for jobs that must run multiple times a day.

5. Single command processing: Submitted jobs can only run one command. Multiple commands cannot be run in the same job scheduling entry.

6. Submitted job location and run-time parameters – Parameters can be specified to submit jobs to a specific job queue, to run jobs using a designated job description and message queue, and to run jobs under a specific user profile.

On the green screen, scheduled jobs are controlled through a series of green screen commands including the Work with Job Schedule Entries (WRKJOBSCDE), Add Job Schedule Entry (ADDJOBSCDE), Change Job Schedule Entry (CHGJOBSCDE), and Remove Job Schedule Entry (RMVJOBSCDE) commands.

The Management Central Scheduler also creates and maintains the job scheduler and its entries, graphically using the same functions that are available in the green screen commands.

What IBM's Native Job Scheduler Doesn't Do

Many shops find that the native job scheduler falls short of meeting their business needs. Here are some of the things the native job scheduler cannot do that are critical for organizational job processing.

- It cannot create dependent job streams or workflows, where jobs are submitted based on what happened in another job entry. The native IBM i job scheduler is an individual job scheduler, not a job stream or workflow processing system. You can't execute a series of connected scheduled jobs using the native scheduler.

- It cannot perform multi-step scheduling where multiple program commands are executed in a single submitted job. To run two or more commands in sequence for a scheduled job, developers must create CL programs containing multiple commands or submit multiple job entries, where each entry processes one of the needed steps.

- It cannot run jobs on an irregular schedule. Jobs can only be scheduled for certain times during a week day or on certain dates. The native job scheduler can't process entries on moving dates, such as the third Thursday of the month, or Thanksgiving. The job scheduler has no calendar to use for job scheduling.

- It cannot view and manage jobs running on multiple servers. Native job scheduler users can use the Run Remote Command command (RUNRMTCMD) in job entries to schedule jobs running on different IBM i systems. However, there is no function within the native job scheduler to view and manage jobs running on IBM i partitions other than the partition that the native job scheduler is running on.

- It cannot run jobs with multiple job descriptions, where the job description and its associated library list can be changed for different parts of the job. Job steps requiring different library lists must have the library list programmed into the job entry's CL program or the steps needing a different library list must run in another job scheduling entry.

- It cannot prime scheduled jobs with instructions or alternative actions to take when a scheduled job fails or doesn't run as expected. Scheduled jobs either run or they don't run. There is no option for recovering when a submitted job error occurs.

- The native job scheduler has limited capabilities for producing printed output – It is difficult to subset and print portions of the job scheduler or the run-time history of a job entry or a group of job entries. Extracting and reporting job scheduler information for auditors or other parties often requires using programming resources, if it can be done at all.

Advantages of a Third-Party IBM i Job Scheduler

While the native IBM i job scheduler comes free with the i operating system, there are also third-party IBM i job schedulers sold by companies such as SEA. Third-party products provide the benefits of the native IBM i scheduler, along with more advanced features that provide greater flexibility and benefits for an organization, including solutions for the issues listed above.

Third-party job schedulers are not free. They are sold at different price points depending on the product, vendor, and IBM i system or POWER hardware the scheduler will run on. Some schedulers are relatively inexpensive, while others can cost tens of thousands of dollars or more. But why buy a third-party job scheduler? Most shops use them because they provide scheduling capabilities and benefits not available with the native IBM i job scheduler.

The Benefits of Using a Third-Party Scheduler

There are many benefits organizations enjoy when running a third-party IBM i job scheduler, including.

1. Running the same job multiple times per day – A third-party scheduler allows you to designate multiple run times and dates for a specific job entry. For example, consider a company that needs to produce pick tickets every hour between 6:00 AM and 11:00 PM six days a week. In the native scheduler, you would need to schedule multiple jobs to produce pick tickets at the designated times.In a third-party job scheduler, you would create one job entry that's scheduled to run once an hour between 6:00 AM and 11:00 PM.

2. Creating dependent jobs where job submissions are linked to the completion of another job – Job dependencies can be created between job entries, scheduling jobs to run based on whether another job completes correctly or not. During a backup job stream, for example, the backup could be held if there isn't any tape media present in your tape drive or a backup server is down.

3. Triggering alternate actions when a job misfires – Many organizations configure third-party schedulers to automatically trigger alternative actions when a job starts or ends late or abnormally ends. Third-party job schedulers can automatically alert on-call responders or launch other actions when a job cannot complete processing, such as starting a remedial CL program, skipping a dependent job in the same job group, or alerting an on-call responder. Recovery instructions can also be included with submitted jobs to tell operations personnel how to recover from a job failure.

4. Decreasing operational monitoring on your IBM i – Third-party schedulers can alert on-call responders when a problem occurs. This means you no longer need to have operations personnel monitoring batch job processing. Personnel who were previously dedicated to watching the system can be redeployed to other functions, reducing operations responsibilities.

5. Scheduling jobs, running jobs, and viewing jobs on other IBM i systems – Third-party schedulers often allow you to schedule jobs on different IBM i systems. Many products provide a graphical dashboard view of covered IBM i systems, where you can see the status and history of jobs running on different IBM i systems. One dashboard can centralize job scheduling monitoring, and control for jobs running on different IBM i partitions.

6. Running jobs with different parameters – Many third-party schedulers use variables to submit jobs with different parameters each time they are run. A general ledger job entry, for example, could be scheduled to run over several different entities, just by submitting it with different run-time parameters. The native IBM i job scheduler would require a company to create different job scheduler entries for each entity the report would be run for. A third-party job scheduler could run the same job entry multiple times with different parameters for each entity they want to run the ledger for. This feature saves time and prevents errors in setting up multiple runs for different entities.

7. Changing program attributes inside a running job – The native job scheduler can only run using one job description. Many third-party job schedulers can submit jobs with job descriptions that can be changed during job execution. This means you could change job parameters or library lists as a scheduled job is running.

8. Increasing programmer productivity through multi-step job scheduler entries– Unlike the native i job scheduler, third-party schedulers can run multiple commands inside a single job entry. Using multi-command jobs, an organization can schedule entire processing streams, such as nightly invoice production, in a single job entry, without needing a programmer to write code or create multiple scheduled jobs to perform an entire process.

   Third-party job schedulers require less programming than using the native job scheduler. Organizations can free up some programming resources when using a third-party product to schedule jobs.

9. Satisfying auditing and management requirements for job scheduler reporting. Most third-party IBM i job schedulers collect comprehensive information and produce pre-written reports on scheduled job performance and maintenance history (job entry creation, modification, deletion, and run history). This information creates an historical record for your scheduler. Pre-written reports provide a forensic audit trail for auditors and other personnel needing to understand the history of a scheduled job.

10. Increasing programmer productivity by providing job scheduling reporting. Because third-party schedulers provide pre-written historical reports, organizations can free up programming and change control resources that were previously used to create and install scheduled job audit reporting.

A comparison table showing the features and benefits of using a third-party IBM i job scheduler versus using IBM's native IBM i job scheduler is shown in Figure 1:

The Drawbacks of Using a Third-Party Scheduler

There are some drawbacks to using a third-party job scheduler versus using the native IBM i job scheduler. The most obvious costs involve capital and complexity.

Third-party solutions require a capital outlay in the year they are purchased, and yearly maintenance fees for software support every year after that. Maintenance costs generally run 20-25% of the purchase cost every year, meaning an organization generally rebuys the software every four-to-five years. The native IBM i job scheduler is included with the operating system at no cost and any fixes are provided as part of a PTF or IBM Technology Refresh package.

Third-party job scheduling packages generally require more effort to learn, as they provide more capabilities than the native IBM i job scheduler. A third-party package may require training to getfull benefits out of its usage.

Third-party schedulers also require more configuration and administration. An administrator must spend more time setting up job entries for multiple commands, job stream creation, running entries with different parameters, creating responses for job errors, etc. While an organization greatly reduces programming and monitoring time using a job scheduler, there will be an initial uptick in time spent administering the system.

The ROI of a Third-Party Scheduler

It is possible to estimate a rough return on investment (ROI) for buying a third-party job scheduler. You can do this by calculating the amount of time and expense you would save each year in the following areas:

1. Programming to create job entries – Programmers no longer must write CLs to perform multi-step functions in a job entry. Multiple steps for a job function can be entered a single job entry, rather than having to create an all-purpose CL program for that job or bundling several different job entries together. This function can be off-loaded to your operations and administrative personnel.

2. Programming to extract job scheduler performance and use it to produce reports – Third-party job schedulers contain built-in reports that can be used for job auditing. Administrators can be trained to submit and create these reports, rather than wasting valuable programming time creating them.

3. Dedicated resources monitoring running jobs– You no longer must assign dedicated personnel, such as your operators, administrators, or Help Desk personnel, to monitor running jobs and alert on-call resources when a job doesn't complete correctly. Responders can be alerted directly via text, email, tweet, or other method when a problem occurs. The system can also be configured to respond to errors by running commands or taking other actions.

An ROI can be created from the reduction in programming and monitoring hours by calculating the number of hours saved each year and associating a cost with those hours. Organizations that have an IT time-tracking and chargeback system may be able to retrieve the costs for time your programmers and operations staff spend in job scheduling activities every year.

The hours saved must be offset by the hours spent in administration each year, plus the cost of the package (capitalized per year, if necessary) and the yearly maintenance fees charged for the package. A simple equation for calculating the ROI of a third-party IBM i job scheduler might be:

ROI = (Programming & Monitoring costs saved per year)/(Acquisition,maintenance, & administrative costs per year)

Conclusion

There are many benefits to using a third-party IBM i job scheduler versus using the native job scheduler that comes with the IBM i operating system. These benefits include:

- Scheduling advantages: More flexibility in scheduling jobs, including event-driven scheduling, workflow scheduling, and dependency scheduling
- Run-time advantages: More options for how often and when jobs can run, including daily recurring jobs and jobs that run on an irregular schedule. Calendar scheduling is also available.
- More job processing capabilities: New options in how jobs run, including multi-step scheduling and the ability to change the job processing environment inside running jobs
- Automated recovery options: More options in error processing, where job streams can be altered on the fly, corrective actions can automatically be kicked off, and on-call responders can be automatically alerted when an error occurs
- Advanced administrative options: Better options in administering, monitoring, and controlling scheduled jobs running on multiple IBM i systems. One job scheduler can control jobs on many i partitions.
- Auditing advantages: Job schedule reporting is a standard feature in third-party packages and pre-written reports can be quickly produced for auditors and management, versus having to custom write audit reports with the native product
- Decreased programming and monitoring resources: Third-party job schedulers decrease the need for programmers to create programs for running jobs. Operations staff no longer must manually monitor the system to insure business processing is running smoothly.

In all areas examined, a third-party IBM i job scheduler offers capabilities far beyond what's available in the native IBM i job scheduler. Based on our analysis, we believe most organizations should consider purchasing a third-party scheduler for managing business processing, rather than relying on IBM's native job scheduler.

Figure 1: Comparing Benefits/Features for IBM's Native Job Scheduler Versus a Third-Party Job Scheduler

This is a comparison of the features and benefits you would find in the native IBM i job scheduler versus what you would find in a typical third-party IBM i job scheduler. This table lists features and benefits that are typically included in third-party schedulers. Job scheduling products from different companies may have somewhat different capabilities but listed here are the standard features you could expect to find in most third-party IBM i job scheduling products.

Feature/Benefit	IBM i Native Job Scheduler	Third-Party Job Scheduler
Job Scheduling		
Stand-alone job scheduling: Jobs run at certain dates and times	●	●
Workflow scheduling: Jobs run in sequence based on completion of prior job in workflow		●
Event-driven scheduling: Jobs submitted based on pre-requisites occurring, such as files being created or changed		●
Dependency scheduling: Jobs run based on the status of other jobs (completion, error, etc.)		●
Run-time and Date Scheduling		
Jobs run on one or more days of the week or on a specific date	●	●
Jobs run multiple times per day, at specific times or at regular intervals between runs (i.e., every half hour, every three hours, etc.)		●
Jobs run based on dates set up in a calendar (holidays, business days, fiscal month and year-end dates, etc.)		●
Jobs run on irregular dates each month (ex., third Tuesday, third Thursday, etc.)		●

Feature/Benefit	IBM i Native Job Scheduler	Third-Party Job Scheduler
Error processing		
Running jobs can alert personnel when a problem occurs (error message, late start, late end, abnormal end, etc.)	●	●
Scheduled jobs can kick off remedial action--such as executing commands, ending jobs, flagging jobs for attention--when an error occurs		●
Attachments, including stream files, spooled files, and notes/instructions can be sent to personnel for troubleshooting and correction		●
Administration		
Green-screen administration	●	●
GUI administration	●	●
Centralized job management and scheduling across multiple IBM i systems		●
Automatic conversion of existing native IBM i job scheduler entries to third-party job scheduler		●
Ability to group jobs according to common attributes for review and update		●
Creating and modifying shared templates, where job entry attributes can be shared among multiple jobs. A template change will change each job using the template.		●

Feature/Benefit	IBM i Native Job Scheduler	Third-Party Job Scheduler
Auditing & Reporting		
Produce reports on job scheduler and individual job performance, for regulatory compliance or review		●
Forensic analysis for tracking/reporting who created, changed, or deleted a scheduled job		●
Centralized monitoring of status on completed, scheduled, and failed jobs on all IBM i systems		●
Analysis capabilities that show trends for executing jobs		●

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