



## The Challenge

In most computing environments, IT organizations must preempt lower priority jobs to accommodate higher priority ones. Traditionally job preemption is done by terminating the low priority job, resulting in wasted time and resources. Another approach is to temporarily suspend the job; however with this approach the suspended job(s) are still holding onto system memory and application licenses which limit the resources available to high priority jobs.

## The Jaryba SmartSuspend Solution

With SmartSuspend, when a low priority job is suspended, all related system memory is freed and the application license is relinquished. When the higher priority job completes (assuming no other waiting higher priority jobs), system resources (e.g. CPU, memory) are automatically reassigned to the lower priority job, the application license is reacquired and the job continues from where it left off. SmartSuspend ensures that no compute cycles are lost, thereby increasing job throughput while maximizing server utilization. In addition, SmartSuspend ensures organizations utilize application licenses as efficiently as possible.

## How It Works

Based on Jaryba's ground-breaking OS Abstraction Layer, SmartSuspend preempts a running job by suspending the application's CPU usage, paging out memory, and keeping only a minimal footprint, while still keeping socket connections alive. Unlike traditional job suspension (or preemption) methods, SmartSuspend relinquishes both the memory and licenses to enable a higher priority job to take advantage of these system resources. While SmartSuspend provides a stateful job preemption capability, it does not checkpoint the application. Therefore, it is not a high availability or job migration solution. To meet those requirements, we recommend Jaryba Availability Services.

## Lightweight and Transparent Solution

SmartSuspend is a lightweight solution with less than 1% performance overhead and minimal footprint. It is completely transparent to both applications and the operating system, requiring no code changes. SmartSuspend supports all serial applications, such as EDA applications, as well as CAE, CFD, and other MPI-based parallel applications.

## Easy Integration with Queuing Systems

SmartSuspend can be used with popular queuing systems, such as Platform LSF. SmartSuspend has a very simple command line interface enabling integration with 3rd party queuing systems with minimal effort. The command line utility can be used interchangeably with both parallel and serial applications, and can be run from anywhere on the network as long as ssh access is available.



# JARYBA

## SmartSuspend™

Achieve 100% Cluster Utilization

## Key Benefits

- Increases job throughput
- Maximizes server utilization
- Maximizes application license ROI
- Enables job priority management



## Key Highlights

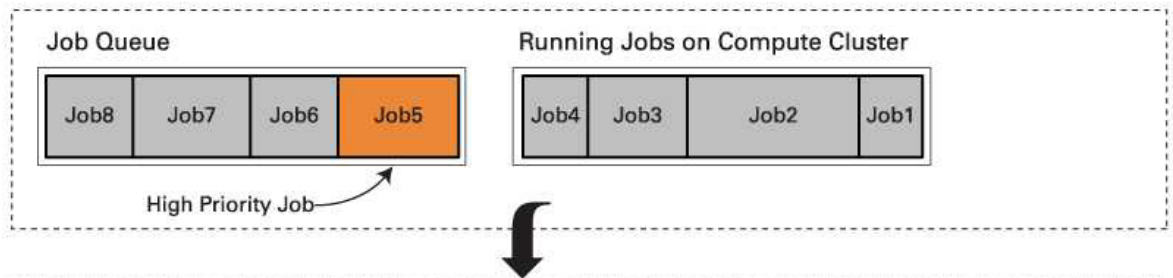
- Suspends executing job and frees CPU, memory and application licenses
- Completely transparent to the application and operating system
- Integrates seamlessly with the following popular queuing systems: Platform LSF, Oracle Grid Engine, Altair PBS Professional
- Virtually no performance overhead
- Support both serial and parallel applications
- Enhances existing features of queuing system to increase utilization and flexibility

**Jaryba LLC.**

P.O. Box 19064  
Reno, Nevada 89511  
775-384-8439  
Sales@Jaryba.com

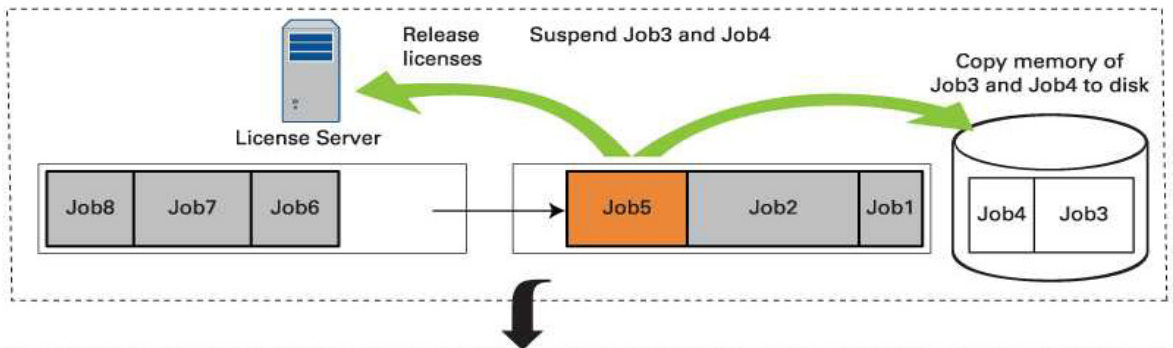
## SmartSuspend Example

The following diagram represents a grid with jobs 1-4 dispatched to and running on nodes, with jobs 5 entering into high priority job queue and 6, 7 and 8 waiting in the normal priority job queue for resources to become available

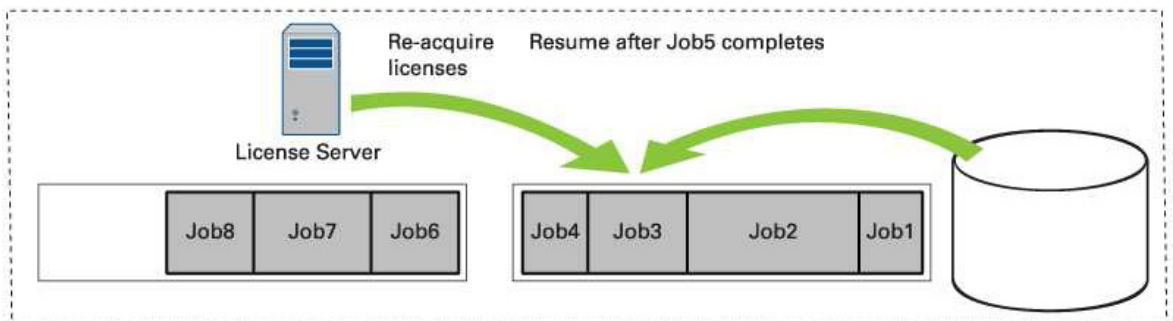


Normally one or more running jobs would be terminated to make space for the higher priority job. For example both jobs 3 and 4 may have to be terminated to make way for job 5. The termination results in lost work - both jobs 3 and 4 have to be restarted from the beginning.

Instead, with SmartSuspend, both jobs 3 and 4 can be suspended and saved to disk to temporarily make way for job 5. Any licenses used by jobs 3 and 4 are returned to the license server.



When job 5 completes, jobs 3 and 4 are resumed from where they left off:



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