THE IMPORTANCE OF SOFTWARE LICENSE SERVER MONITORING

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Introduction

In electronic design automation (EDA) and other areas of computer-aided design (CAD) that utilize expensive software tools, centralization of license servers has become the norm. High software asset utilization is achieved by sharing a common pool of licenses with a large group of engineers, regardless of their locations. While this model provides many advantages over maintaining license servers at multiple locations, it also has risks.

License availability becomes even more important once all your software licenses serving multiple sites are centralized. A license server failure of any kind has the potential to impact the entire company, as license servers provide licenses to mission-critical applications. Downtime may cost millions in schedule slippage. Tools that monitor the server, CPU load, file system, license daemons, and individual license features become essential. Five-nines uptime (99.999%) should be the goal. Anything less than that is expensive and unacceptable.

Redundant servers, multiple independent servers, redundant routers, and redundant network trunks all help minimize the risk. Still, hardware will always fail, file systems will fill to capacity, software bugs will bite, and human error remains our worst enemy.

Economic Impact of License Server Downtime

Centralized license servers not only provide software licenses to engineering, they also enable factories. Pin testers and manufacturing processes rely on stable access to software licenses. Downtime in a factory is measured in thousands of dollars per hour.

Engineering downtime can be equally expensive. With the fully loaded annual cost of a design engineer in the US reaching all-time highs, the cost of having a company-wide software outage can be devastating to productivity. Leaving 500 US engineers idle for just an hour can equate to over $100,000 in lost productivity, without considering lengthy simulation or multiple-day place-and-route jobs that need to be restarted. Consequently, lost cycle time plus frustrated or idle engineers can result in a sizable loss for the operation.

The actual hourly cost of license downtime will, of course, vary by company size, locations of engineers, and number of software licenses affected, but it’s always substantially more than the cost of an enterprise-grade license monitoring tool.

License Monitoring Requirements

The first step in creating a robust license server environment is to utilize redundant triads or multiple independent servers. Multiple independent servers have been found to be technically more reliable in a high-event-count environment.

Placing license servers in a high-availability computer center with clean power, adequate cooling, backup generators, redundant routers, and professional support staff is highly advisable. The final step to ensure uptime is to install a license monitoring tool with alarms to watch over your license servers and license processes.

In order to ensure 99.999% uptime, the license monitoring tool must watch the entire license serving infrastructure in real time and raise awareness of the following conditions:

1. **License Server Down or Unreachable** – A license server failure may occur due to loss of power, power supply, memory, network card, or disk failure. The license server may also become unreachable due to a failed router, network interruption, or mistyped entry in the routing tables. Such failures are most disruptive when a license server hosts multiple software vendor daemons, as the failure will bring down all the license daemons it hosts. Accordingly, the license monitoring tool must not only monitor the server itself but also ensure it can be seen on the network and notify the appropriate support person if any connection to the server is lost.

2. **License Daemon Down** – Each software vendor has a unique process or vendor daemon that enables software licenses to be served. This daemon checks licenses in and out and is responsible for recording usage events and errors. Like any computer process, a license daemon can crash or hang, resulting in failure of service. Unlike a server going down, when they fail, the failure is limited to the software tool vendor they enable. Monitoring tools must keep a close eye on these license daemon processes to ensure they are running and doing their job. They must immediately notify the appropriate support person to restart the daemon if any process fails.

	Tag	Type	Daemon	Server	Status	Features	Checkouts	Last Update
1	EDA	vovlmsim	rtdaemu	6306@mini	✓	6	39	10s
2	RTDA	reprise	rtdad	7070@mini	✓	12	9	29s
3	POOL	vovlmsim	rtdaemu	6306@mini	✓	1	8	3h4m
4	SC_MGC	flexlm	mgcld	1717@pluto,1717@jupiter...	✓	0	0	2m49s
5	SC_MGC	flexlm	unused	1717@pluto,1717@jupiter...	✓	16	0	2m49s
6	CADENCE	flexlm	cdslmd	5280@pluto	✗	0	0	n/a
7	MGC	flexlm	mgcld	1717@pluto,1717@jupiter...	!	0	0	21s
8	MGC	flexlm	unused	1717@pluto,1717@jupiter...	!	16	0	21s
9	SYNOPSYS	flexlm	snpslmd	1720@pluto	↻	0	0	31s
10	SYNOPSYS	flexlm	unused	1720@pluto	↻	40	0	31s

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3. **License Feature Down** – Most software vendor license daemons enable several CAD tools. Each tool has an associated feature line in the license file. License files can have as few as one feature or more than 300. If any of the associated license features fail, some functions of the tool, if not the entire tool, become unavailable. Two frequent causes for a license feature to fail are that its expiration date has arrived or that the vendor did not generate the feature line correctly. It is common to receive a bad license key from the vendor. License monitoring tools must be able to detect when a feature is not enabling the software it was meant to enable so corrective action can be taken.

4. **License Feature Expiring** – The most common reason for feature failure is the license feature expiring. Medium to large enterprises can easily have two or three thousand individual license features to track. Since a replacement feature must come directly from the software vendor, a license may be unavailable for hours or days. That's why a report that details all the licenses that are set to expire in the next 14 days or 30 days is so important, giving administrators have plenty of time to react.

5. **Redundant Triad Health** – License triads provide redundancy as long as two out of three servers in the triad are healthy. If the master fails, another server assumes the process of serving licenses. But what if one of the three servers has already failed or the triad process on a server has lost connection to the other two systems? Under very high utilization the communication load between the three servers can overwhelm the process and cause the triad to fail or one of the servers to drop out. The triad itself then becomes less reliable than a single independent license server, as a failure on either of the remaining servers brings the triad down — two points of potential failure instead of one. For this reason, all three systems must be monitored to ensure they are operational, that vendor daemons are up, and that the triad process is communicating with all three servers.

6. **File System Utilization** – The vendor daemons continually write a log file to the license server disk. This log file records license check-outs, check-ins, and denial events, along with a plethora of other information. These log files fill up the disk over time, causing the system itself or the license daemons to crash or hang. Therefore, it is important to monitor disk utilization and remove files before they fill the disk. The license monitoring tool must report the file system utilization of every server, every day.

	Fs Id	File Server Host	File System	FS Type	Clock Offset	Quota	Total Space (MB)	Free Space (MB)	Free Space (%)
1	000188695	centos	/dev/mapper/VolGroup00-LogVol00	ext	0s	No	30625	24118	79%
2	000188698	centos	/dev/hda1	ext	0s	No	98	63	64%
3	000290805	rtdaimac		ntfs	0s	No	953541	664925	70%
4	000188704	winders	c:/	ntfs	0s	No	31988	18090	57%
Σ							Σ 1016252	Σ 707196	Σ 70%

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7. **License Server CPU Load** – Since most license servers host multiple license daemons, the load on the CPU will vary depending on how many license events it needs to process. Placing too many license daemons on a server can overwhelm the CPU, making it unable to respond to the system, licensing requests, or network transactions. When this happens, the system can slow down, hang, or crash. The CPU load must be monitored to ensure it has plenty of headroom for additional processing.

Preventative measures like the above are important in order to help prevent downtime. Monitoring these items is useful when historical data is needed to understand the root cause of the failure and determine a corrective action to prevent future failures.

A SAM Monitoring Tool Must See It All

When it comes to ensuring license server uptime, a software asset management (SAM) tool must do it all. It must see, monitor, and report on all license serving processes and systems. With so many possible points of failure, a partial solution that leaves users at risk of extended downtime isn't acceptable.

Altair Monitor™

Altair Monitor provides a complete set of monitoring functions, meeting all seven requirements for a robust, enterprise-grade license monitoring solution.

Monitor's expiring license report provides advance warning of any licenses that are about to expire. It gives the support team the lead time required to obtain new licenses in advance of contract renewal. The expiring license report ensures no one is blindsided when a license expires. Upcoming expirations are also proactively emailed to a configurable list of license administrators and other stakeholders.

Intelligent system alerts not only detail system status but also indicate the severity of the message. Not all alerts require urgent attention. Monitor's alert reports can act as a "to do" lists for day-to-day system maintenance.

Monitor provides a status color code and links, allowing users to drill down to more details including license daemons, tokens, and tool features affected.

Summary

The centralization of concurrently served EDA software licenses serving multiple sites around the globe has raised the requirements for robust license availability. License server infrastructure must be fault-tolerant and redundant. Server and license process monitoring

must be dependable, not only to prevent system failure but also to enable restoration of service as quickly as possible in the event of a failure.

Small, single-site companies are not immune to the financial impact of license server failure. They may be less able to recover from an outage, resulting in a greater productivity loss. Monitor is essential for all companies, regardless of size, because it not only provides notification that a system or process has failed but also detailed information regarding the point of failure. This complete system view includes early warning of areas of potential future failure. The more information provided, the more quickly an issue can be avoided or corrected and license access restored.

The economic benefits of Altair Monitor for optimizing capacity utilization of expensive software tools and reducing the risk of downtime can be substantial. The cost of the solution is miniscule compared to the cost of tools and downtime, particularly in large enterprises.