

Boeing-MSO.Software Campus License Server

There are several parts to this Boeing Enterprise Token-Based License server implementation.

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1. In 2002, Boeing reviewed the variety of MSC software which was currently licensed under the Boeing/MSO enterprise agreement, and the amount of annual contract renewals outside of the agreement that were being processed. Boeing looked at how they could reduce the amount of internal contractual work by reviewing the different licensing options MSC had to offer. Boeing made the decision to go with the token-based system, which included the majority of MSO.Software Licensed software being used at The Boeing Company. The token system has helped in reducing the amount of paperwork involved when adding new software and contracts. This reduced not only the internal costs to Boeing, but MSC's as well. The reduction in internal costs to MSC has allowed them to pass these savings on to Boeing. The flow time associated with additional requirements has been greatly reduced.

Boeing now has access to additional capability if needed, which could provide future cost savings by eliminating duplication. Transferring of licenses to support additional workload has been greatly reduced by eliminating the need for tracking of individual licenses. It also allows projects to use the system as needed and not carry the burden of an annual license renewal. The before mentioned also reduces MSC's costs as they no longer need to issue license keys every time an engineer needs to access software for their job. Prior to the Campus system, paperwork would have to be processed by the customer, passed to the procurement agent, then to MSC and then flowed down to the Boeing finance department for internal allocations. Here the customer is given an access code which serves to track usage and point to the correct department for costs. A very simple approach and the procurement agent need only to review reports generated by a Commercial Off-the Shelf (COTS) license accounting package to estimate costs for any given group.

2 and 3: Boeing formed a corporate management team and a technical working team to plan a nation-wide licensing strategy for this project. These teams established a plan, collected requirements, and coordinated all anticipated issues with site focals, system administrators, and Boeing networking departments. We also hosted corporate-wide user forums to keep our users informed of our plans and progress. Boeing purchased one new UNIX-based server and integrated two existing production Unix-based license servers to form a Triad of token servers. Boeing also set up "Cascade" license serving as a backup (fail-safe) system.

MSO played a major part in our preparations. Based on our requirements, MSO set up three test servers in three different states and simulated many operational scenarios, which included the master server crashing. Boeing took approximately three months to transition from traditional licenses to this "Triad" campus token server. Since transitioning to the Triad for production license-serving, we have had very few outages or other problems, although admittedly there were anxious moments during the transition from a test environment to production.

MSC.Patran and MSC.Nastran were the first two applications to be implemented using the nationwide triad of servers. Once these proved to be successful, other MSC products, including MSC.ADAMS, MSC.EASY5, SimDesigner and MSC.Robust Design have been added to the list of products licensed using this system.

Distributing license usage over a nationwide network requires that Boeing track license usage by divisions, sites, and sometimes by individual projects. This requirement is driven by the need to charge various business components for the proportion of overall usage they utilize from the entire license package. Boeing implemented a COTS license accounting package to track and report license usage by site, or project, throughout the company.

We assigned internal project codes to provide unique identities to projects and sites. These project codes are then assigned to every individual license request using a system environment variable. The COTS reporting package will yield periodic usage reports tallied by each individual assigned project code.

We also implemented scripts that run periodically (e.g., quarter-hour increments) and use home-grown PERL scripts to query the licenses that are currently checked out. These data are tallied separately and serve as a secondary (back-up and fill-in) monitoring source.

Not all of the licensing tokens are immediately available to all users nationwide. After an initial monitoring period of several months, it was agreed to place some tokens into a reserve account. These reserve tokens may be released at any time to cover surges in licensing demands, but only upon consensus and approval by the Management Team. Even though Boeing's team may make the change, the change is reported immediately to MSC for potential contractual implications. This flexibility permits a fast response to surges without having to go back to the vendor to get new licenses generated and mailed.

With a licensing system that supplies licensing to an entire corporation over a nationwide area, outages must be rare. Fortunately our outages have been rare occurrences when they have happened.

To minimize outage impacts, there are a small group of administrators who reside in different time zones, and who all have equal system-authority to stop and restart licensing. Success has been achieved by ensuring that all of the administrators get nearly immediate notification (by e-mail and by "sendmail" messages to beepers and cell phones). Such notifications are issued by the license servers when they sense outages or looming surges in license requests.

Reasons for stopping and restarting license serving have been both planned and un-planned. Implementing newly received licenses is typically done by West Coast personnel, at night, to preclude impacts to analysts in other time zones. Unplanned outages have occurred when: (1) one of the servers physically crashed, (2) unexpected IP-Address changes were made on a weekend, and (3) servers lost quorum communications and shut down their licensing daemon processes. In all of these instances, fast notification and the ability of administrators to log in from remote locations and restart licensing has precluded any long outages, over the lifetime of this system.

A support web page was created inside the Boeing firewall to support these activities. This page contains necessary information and instructions for site focals and system administrators as well as links to ISO images containing all applications supported by the license servers. These ISO images can be downloaded from a Boeing software depot, burned to CD, and used to install software at any Boeing site. The administrator team regularly updates the available software lists when images are made available by MSC. Patches to existing applications are also available from this software depot. Creating the software depot has alleviated the need to send CDs from site to site.

Maintenance of the software depot and the licensing schema has been more challenging than was originally anticipated. Problems have included: (1) having too little space to store all of the required application images, (2) requiring more technical support (education) for local application installers around the country than was expected, and (3) understanding the root causes for any licensing outages that did occur. The latter is difficult to reverse engineer since the problems may have been caused by great numbers of causes across a very wide network. We are strongly considering reducing the great distances between the Triad servers to eliminate this potential source of problems.

There have been lessons to be learned from this nationwide licensing experience. The management team has pondered over how interpret any apparent differences between the reports generated by the COTS application and the PERL scripts. Determining that the COTS application would be the primary source of data and that the PERL scripts would provide backup data was an important conclusion to be drawn.

Others who implement such large license serving systems should ensure that implementation guidelines provided for COTS applications are followed fully. Our initial implementation utilized servers spread over large distances. We are beginning to believe that although expedient at the time, the large distances may have been at least partial causes of several license outages, when quorum communications became too slow and daemons then stopped running.

We are also beginning to experiment with scripts that monitor licensing and automatically restart licenses when daemons stop running. This effort is in early stages, but will once robust replace rapid responses by administrators when problems do occur.

Monitoring tools that record usage data around the clock have given us an ability to take periodic snapshots of usage and parse the data in ways that previously were not attainable. Finally, having a reserve license pool has given management the ability to rapidly respond to sudden surges in license demand without having to rely on the vendor to cut and mail new licenses.

Overall, this has been a rewarding experience and a real shared value to The Boeing Company as a whole. As a group we feel that the greatest benefit to Boeing is that we now have a true account of license usage as a whole corporation. For many years we have relied on phone calls, spreadsheets, and local buffers of additional licenses at each site to ensure our internal customers had sufficient licenses to support the analyses that had to be done. Now we have real-time metrics to show whether we have enough licenses, how large our buffer is, and to project future needs based on trends in the metrics.