7th International Conference & Exposition
on Petroleum Geophysics

"HYDERABAD 2008"

P - 341

Corporate Wide Licensing of Geo-Data Interpretation Software - A Case Study on Methods, Implementation Strategy, Management & Administration in ONGC

Balu Lakavath*, Mukesh Kumar, Ajith C, P.Manoharan, R.K.Verma, S.K.Das
ONGC, Geopic, Dehradun, Email: lakvath_balu@ongc.co.in

Summary

Seismic and geological data interpretation is the backbone of petroleum exploration. Seismic interpretation is one of the major tools of Petroleum Geo-scientists. There are a number of software available in the market and the cost of licensing of these software are very high. In some cases, the utility and demand for a few modules in a suite of software is more, rather than the complete suite. In few cases the module will be used for a few days in a year at a given work center, whereas the licenses will remain under utilized in rest of the year. Making such a software tool available to more number of geo-scientists spread over the geographical extent of INDIA in ONGC at an optimum cost is made possible by the implementation of corporate wide licensing of geo-data interpretation software.

Introduction

Presently we have interpretation centers at geographically distributed locations where a variety of seismic and geological interpretation software are available. A Geo scientist has to move to these centers to use the interpretation software. Traditionally, UNIX based work stations are being used for this purpose. Now-a-days PC-based interpretation software like Petrel & GOCAD is available, which is facilitating the availability of these tools outside the interpretation center.

Now the LINUX based High-end interpretation work stations are available over the counter at affordable price. But the cost of interpretation software creates a good sized threshold against setting up new interpretation centers, limiting the accessibility of interpretation software.

Corporate licensing scheme provides a way to make the interpretation software available across geographically distributed work centers in a cost effective manner.

1. Theory and Method

Mostly the software vendors are providing 'flexlm' based network licenses and its usage are restricted by the vendor software license usage agreement. Very few software vendors insist on providing node-locked licenses. The license usage agreement mentions the likely users of software licenses. To expand the user base one need to re-negotiate with the vendor for a new license usage agreement. Technically, having a flexlm based network license is sufficient to make the software license available on the WAN. WAN like corporate intranet is a prerequisite for sharing licenses. The network license server comes as a standard package with every software distribution. Conceptually, establishing skeleton corporate license environment is very easy. Practically, there are issues that need to be resolved.

1.1. Issues Involved

Following are the major issues to be considered and resolved while considering this scheme.

- Renegotiating license usage agreement with the vendor.
- Reliable networking from the likely users to the corporate license server. Bandwidth is not a concern as

the license checkout and release entails data transfer of few hundred KB only.

- The security concern at the license server and client site as public network will be used to set up WAN. Protecting the access by putting the server and client behind firewalls.
- Reliable machine with sufficient space and network bandwidth, capable of handling sufficient amount of file descriptors as license server.
- Managerial and human resource issues
- Designing topology of license servers for redundancy and load sharing.
- License management software.

All the points except last two are self explanatory and these two points need further discussion:

1.2. Topology of License Servers

Having a single license server is practically unacceptable as all the production jobs will suffer due to license server failure or network failure. By deploying redundant servers we can overcome the server failure. In usual setup, three redundant license servers are used, all of which hosts the same image of the license file. In case of failure of one server, the other two servers shall continue issuing licenses. Technically, out of the three redundant servers one server becomes master and other two servers become slaves. It is the master server which issues or retrieves the licenses. All the three license servers synchronize the license status with each other using heartbeats. If, the master goes down, any of the two slave server assumes the role of master. At any given moment of time two servers must be running to issue licenses. The three redundant server configuration provides only hardware failure protection and it does not do the job of load sharing, since at a time only one (Master) is managing the issue/ retrieval of licenses.

The other scheme of redundancy is based on load sharing among the license servers. Under this redundancy scheme license file list is defined in the LM_LICENSE_FILE environment variable. With LM_LICENSE_FILE list redundancy, each one of a group of license servers serves a subset of the total licenses. The end user sets LM_LICENSE_FILE to a list of license files, where each license file refers to one of the license servers. The application then tries each server in the list, in sequence, until it succeeds or gets to the end of the list.

1.3. Comparison of Three-Server Vs License-File List Topology

There are some drawbacks in using license-file list for redundancy. By default, once a license job has successfully checked out a license from one host, all subsequent checkouts must be satisfied from the same host. If the application requires more than one license, this could result in a license denial when the license is available on another server. An application bypasses this restriction if it is coded with the use of multiple FLEXlm license jobs. Only the application vendor knows whether the application is programmed in this manner. If the application supports license queuing, all licenses are queued only from the first host on the list rather than the request moving to another server on the list. Finally, if one server becomes unavailable, some licenses shall become unavailable.

When is it recommended to use a LICENSE-FILE LIST for redundancy rather than THREE-SERVER REDUNDANT servers?

• When there's less system administration available to monitor license servers.
• When load-balancing is needed for FLEXlm-licensed applications located far apart, e.g., Dehradun and Chennai, make servers available locally, with remote servers available as backup.
• License-file list is more forgiving if you lose quorum.
• License-file list is not limited to three servers (any number will work).

2. License Management software

Another area of concern for corporate licensing is license management software. Once the license files are hosted there may be issues of usage accounting and license requirement contention, monitoring the status of license servers etc. FlexNet Manager from Macrovision OEM of the flexlm license server is the license management software. But this is a priced product. Developing own license management software is a difficult job as the REPORT log generated by flexlm server is in binary format. What we are left with is only the standard messages issued by the license server on the console and the some basic query commands available with license server. The whole management techniques are to be developed from these two. This basic license server model can be seen in figure 1.

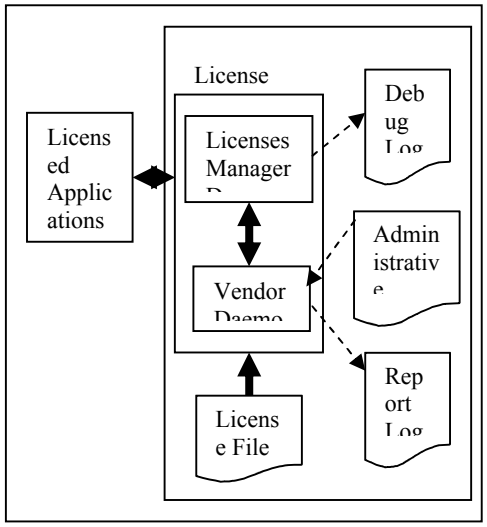

Figure: 1 Basic License Server Model

2. 1. Development Methodology

Despite these difficulties we have developed policies and software for license management, code named as CLAP (Corporate wide License Access project) Portal.

1. Corporate License Access project (CLAP) Portal has been developed, to meet the organization goals. The goals are as follows:

- Monitoring the License Utilization.
- License Utilization Accountability
- Minimize the IT Cost
- Maximize the Throughout.
- Future planning

The portal has web based interface. So, a client from anywhere in the organization can access and view the status of license server at any time using a web browser. This portal has been developed using the following open source technologies:

- LAMP (Linux Apache Mysql PHP).
- JavaScript
- SAJAX (Simple AJAX)
- HTML, DHTML

2.2. CLAP Portal Design

The model of portal design is shown in figure 2. The portal software is modularized into the following modules:

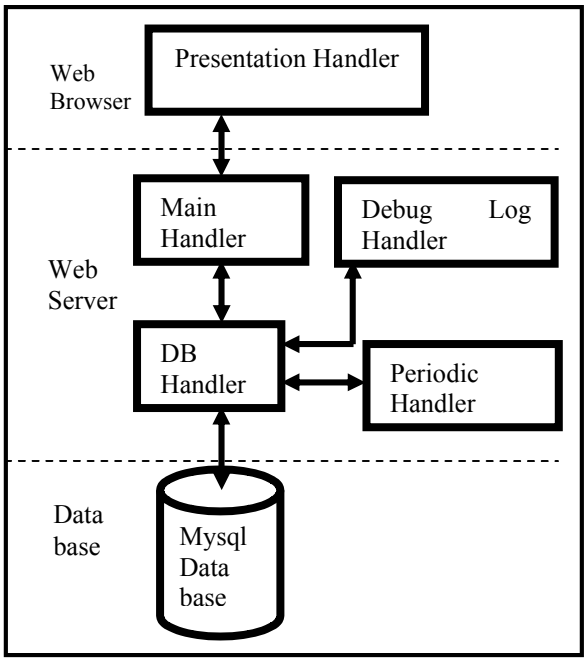

Figure: 2 Model of CLAP portal design

2.2.1. Presentation Handler

It is web based interface to the clients for accessing the portal. It provides different types of web pages for clients like web user creation, workstation and license server registration, report generation, chart generation, denial information, current status, current utilization, alert about license expiry and license utilization. It provides downloads for application software, patches and up gradation. It communicates with the main process for data retrieval and updation.

2.2.2. Main Process Handler

It is intermediate between Presentation Handler and DB Handler. It processes the requests of the clients and gets the necessary data from database and updates the database while processing, if required. It also generates the data required for reports and charts and authorizes the web user while they login to the portal.

2.2.3. DB Handler

It generates database queries for data provided by different handlers like main process handler, periodic handler and debug log handler. It takes query result from database and handover to the respective handlers.

2.2.4. Periodic Handler

It takes the status/utilization information from License Server with the help of LMSTAT command with a cycle period of 5 minutes. The accuracy of status or utilization of data is 5 minutes at the worst case and minimal at best case.

The period of 5 minutes is kept to maintain the constant load on License server irrespective of load on web server. It processes the LMSTAT output and updates the database with help of DB Handler. It provides confirmation mail service to the client for the work station and license server registration and also for web user creation.

2.2.5. Debug Log Handler

It processes the debug log file for license denial information. It retrieves denial information from the debug log file and updates the database with the help of DB Handler. This process runs daily once.

2.2.6. MYSQL Database Design

The database design model is shown in figure 3. ONGC has a number of work centers in different locations in India. Each work center has number of workstations to run the vendor specific interpretation application software. Each vendor provides a variety of products with different license count. Some work center has its own local license server for some vendor products. The workstation can take license from local as well as corporate server depending on the availability of licenses.

To map this scenario in the form of a relational database, a number of schema, as discussed below, have been designed to handle different part of CLAP data and relation between each schema, were made.

Server Detail: This schema stores license server details like port, IP address, vendor details, information of local or corporate server.

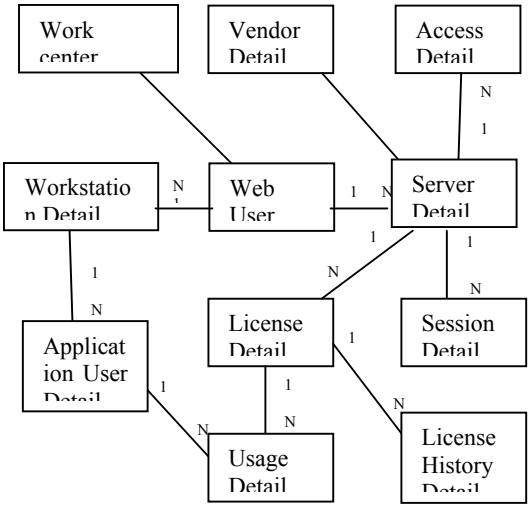

Figure: 3 Database Design Model

Access Detail: This schema stores authorization detail of license server like who can view the license server details & it is applicable only for local license server.

Session Detail: This schema stores session data of license server like start & stop timestamps.

Application User Detail: this schema stores information of application software user.

License Detail: This schema stores license related information like feature name, quantity of licenses, expiry date, and type of license.

License History Detail: This schema stores license related information like change in quantity, discontinuity.

Workstation Details: This schema stores workstation information like host name, IP address, software type.

Web User Detail: This schema stores credential of web user. This information is used to authenticate the user while logging into the portal.

Usage Detail: This schema store the information of license utilization like license check out & check in time stamp, who was used the license, which license was used, from where the license was checked out.

Work center Detail: This is a meta data table that stores about work center information.

Vendor Detail: This is also a meta data table that stores about software license vendor information.

2.2.7. Features of CLAP portal are as follows

- This is in house developed & used only internally in the organization.
- It is web based, and it is available only with Intranet of ONGC.
- Cost Effectiveness.
- Accuracy of utilization data is about 5 minutes.
- Provides variety of reports, analysis useful for decision making.

A sample user interface and reports of usage statistics generated by CLAP can be seen in figures 4, 5 & 6.

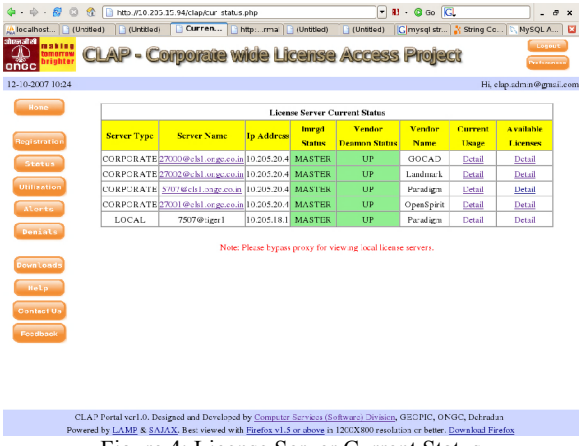

Figure 4: License Server Current Status

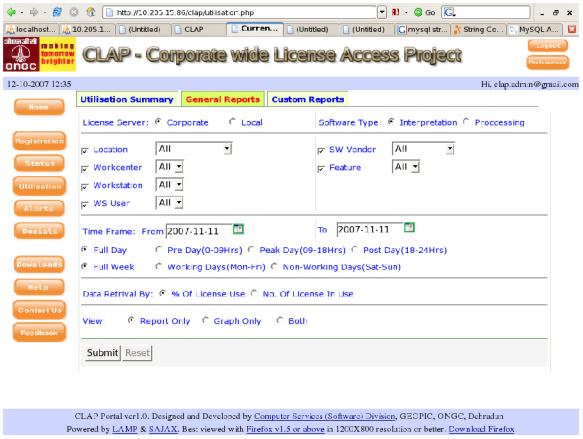

Figure 5: Report Selection Page

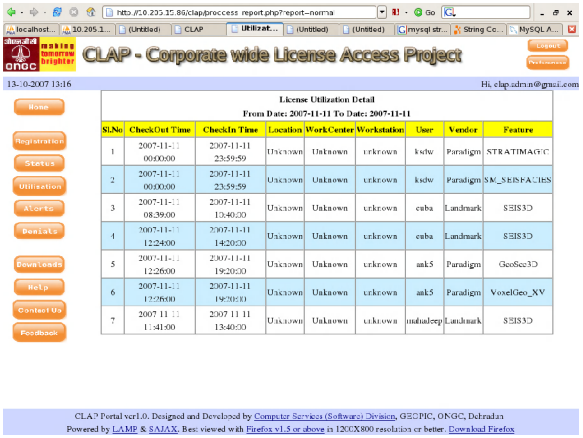

Figure 6: Sample Utilization Report

3. Implementation in ONGC- A Case Study

Implementation effort in ONGC started with the directive of Management to go for corporate licensing. Various sessions were held with the vendors to evolve a consensus on the scheme of corporate licensing.

During the interactions with the vendor the options like unlimited licenses, seat-based licensing, and meter rate based licensing and licenses shared over the network for organization wide access schemes had been discussed. Currently we have vendors with one or other licensing scheme as mentioned above.

3.1. Setup of Corporate wide Network

On the networking side we have one corporate wide intranet. But, the interpretation work stations are kept on separate networks for security reasons. We planned to have separate and dedicated network for license sharing. Several network layer switches and other equipments were purchased to make this happen. The electronics engineers looking after the network were entrusted to carry out this job. This project has covered 27 locations. The three license server's setup has been carried out at Dehradun. Some work center has its own local server to provide load balancing & license file list redundancy.

3.2. Monitoring and Management of Corporate wide Licenses

The setting up of license servers, resolving network issues and development of software for management and administration of license servers were undertaken simultaneously.

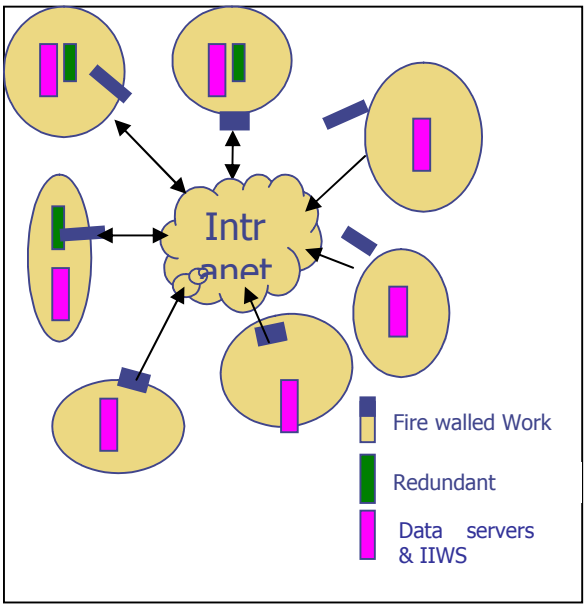

Figure 7: Networking scheme for corporate wide licensing access

Initially, the software was completed to show that server status, license usage details and the license server current status. The software is web-based and hosted on our corporate intranet. The statistics captured by our software was in-complete due to the constraint of information available in readable form generated by flexlm server. We were having statistics by workstation and the user of that work station. We could not generate report correctly until we have complete information about workstation, its location and users.

To overcome this problem another scheme of shared license access is being implemented. Under this scheme only the users registered at the license server will be able to

access shared licenses. At the time of registration all the information about workstation, its location, concerned work centers and user's information is being captured. By mapping this information with the usage statistics already completed in earlier phase we can generate accurate reports.

At the time of release of shared licenses all the users were informed about configuration details, the web-site to see the license server status and given licenses feature users and availability at a particular moment of time. The availability of software was ensured by visiting and assisting the sites in installing new software, resolving configuration, networking & accessing issues.

Technically our scheme of redundancy is a combination of both, i.e. three server redundancy and file list redundancy. The licenses at corporate server are under three server redundancy whereas the sites follow file list redundancy. Sites in their file list first mention their local license server and then the corporate license server, so that they come to corporate server only after exhausting local licenses.

After initial teething problems the license server setup has been stabilized with seamless access of the shared licenses to the sites.

3.3. Further Steps

After analyzing, the cost benefit of the present model in future similar software in the area of exploration and drilling operations can also be brought under similar scheme. Different schemes may also be thought over.

4. Benefits

The benefits of corporate wide licensing scheme are multifarious:

a) Increasing user base and Man Hours:

Many smaller and remote work centers have been brought under the intranet and have started using the shared software licenses without practically making any investments in software purchase. Currently such centers may not have any license and high initial overhead cost is deterrent for these centers to induct them. This also increases sufficient cumulative man hours available for production jobs, rather than spending time in scouting, procurement and maintenance process of software by all locations.

b) Procurement planning and cost savings:

Logical estimation of corporate wide requirements of licenses of different modules through systematic monitoring of usage

Mostly, licenses are procured as site specific and each center justifies its own need. It is difficult/ impossible to judge whether some licenses could have been spared from other centers, even temporarily. Even if 50% of future license purchase can be avoided (which is likely), through systematic monitoring and demand analysis, this will lead to great savings to the organization, due to less procurement and subsequent AMC's etc,.

c) Improved Expertise Utilization:
Expertise gained from one center can be readily utilized in any other center due to transfer of people.

This will be the most direct benefit from corporatisation of existing licenses. Cost benefit from this is substantial, though intangible. This also will nurture a highly desirable corporate culture.

d) Inhouse developed management portals facilitates the continuous improvement and takes care of the recurring needs.

5. Conclusions:

The periodic usage of variety of geo-data interpretation software by a given work center combined with associated AMC's (Annual Maintenance Contract) involves high recurring cost in an organization like ONGC, which is geographically spread through the length and breadth of the country. To optimize the utilization of highly expensive software and to reduce the total cost of ownership, a new scheme of licensing the software viz., corporate wide licensing scheme was implemented in ONGC, successfully and benefits are being reaped.

Acknowledgments

The authors express their sincere gratitude to Shri D.K.Pande Director (Exploration), ONGC for guiding and permitting to publish this paper. Sincere thanks are due to ED-CGS, MAP section, Members of Central software core group of ONGC, Officers of Hardware & Software groups of Geopic, ONGC. LAMP Open Source, SAJAX is highly acknowledged for providing directly or indirectly to complete this paper.

Views expressed in this article are solely of the authors only and do not necessarily reflect the views of ONGC.

References

- FlexLM end user Manual.
- www.mysql.com
- www.php.net
- www.modernmethod.com/sajax
- www.microvision.com