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## Resource Management of PC Cluster System – An Efficiency Driven Methodology

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### Summary

*Mehsana tectonic block located in the western Indian state of Gujarat is a fairly well explored, productive block of North Cambay Basin. Exploitation in Mehsana block has attained a mature stage. Large sized pools are in Kalol Formation occurring at shallower depths in structural plays and operate under water drive while small sized pools are concentrated at deeper depths in Mehsana and Mandhali Members of Kadi Formation controlled by strati-structural entrapment operating under depletion drive. The problems in these reservoirs are of contrasting nature.*

### Introduction

Seismic data processing industry is one of the major consumers of computing power. A typical data processing centre will have a large number of computing nodes on which a number of users will run a suite of programs each of which may run across many nodes. A New Technology called PC Cluster is used for these types of high computing. Efficient management and utilization of these types of system requires the job monitoring and status of the compute nodes. Here this paper discusses a GUI based program Node Status Panel (NSP) which can monitor the activities on the nodes and interactively analyze them. Seismic jobs can run in single node or multiple nodes (parallel processing), this jobs are high CPU and memory intensive. For better resource utilization we follow one set of nodes for a specific parallel job. The job may hang if any other job is submitted in the same node or nodes. This kind of hang down can be avoided by verifying the proper status of resources available before submitting any job.

### Processing Environment

In a Seismic data processing centre mainly 2D, 3D, VSP data is processed. Every user or processor will have a project under which he will keep his data sets and run the data processing modules or jobs. A job is identified by the

project from where it was originated. At a given time many jobs pertaining to different projects will be under execution on various numbers of nodes. For a user, it is very difficult to find out how many nodes are free for his job. NSP gives him a complete analytical view of the nodes status.

NSP is a very useful tool for PSTM and PSDM (Geodepth) seismic data processing users. For PSTM and PSDM jobs are in very specific with resources (CPU and memory) in PC cluster. Once one set of resources are allocated to a job, this resources should not allocated to any other resource till the job is finished. If we share the resources the jobs may hang. Before submission any parallel jobs NSP gives a clear look of available resources in PC cluster system.

### NSP Functionality:

NSP is GUI based tool, which having features:

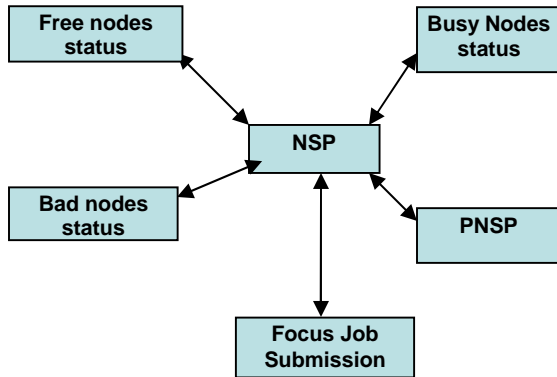
- NSP shows the users busy and free nodes so that they can submit their jobs on the free ones.
- Which projects are running on which nodes and from what time?
- Show the problematic nodes.
- Shows non execution process.
- Interactive cleaning the process.
- Interactive job submitting to the free nodes.



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- PNSP for SMP machine CPU status.

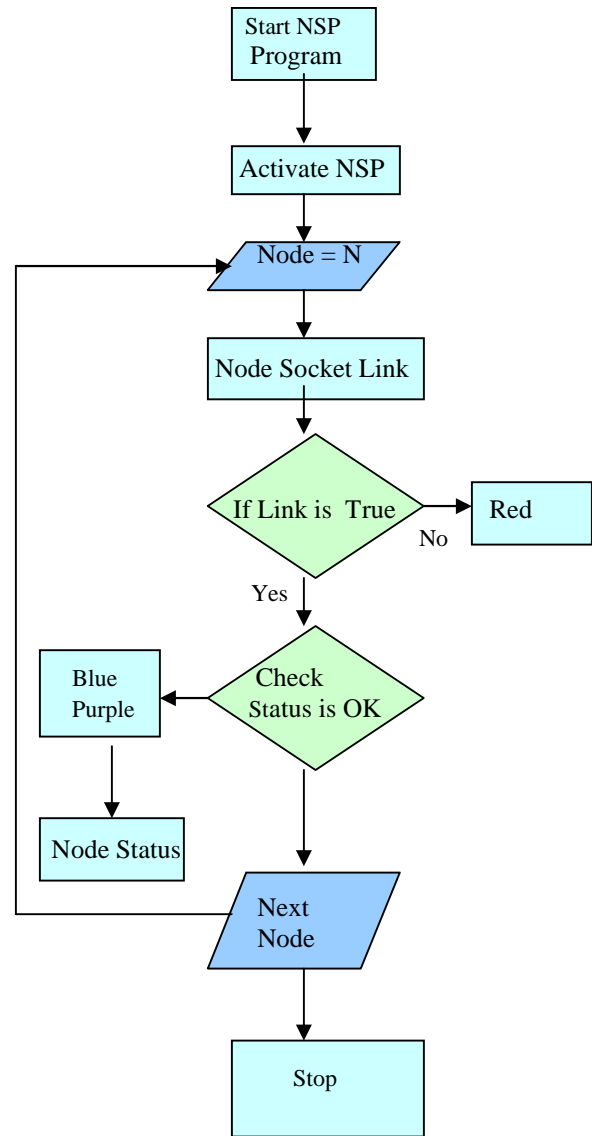
### NSP modules



### Development Platforms:

- Operating System : RHEL4
- Development S/W : TCL/TK
- H/W Platform : HP High Performance PC Cluster

### Flow Chart of NSP



### LINUX Cluster Description

With the fast-advancing low cost and high performance personal computer (PC) systems and high speed networks, the PC Cluster provides a cost-effective alternative for parallel/distributed computing solution. PC Cluster means to make a set of commodity PCs to be a coherent parallel cluster working as a supercomputer.

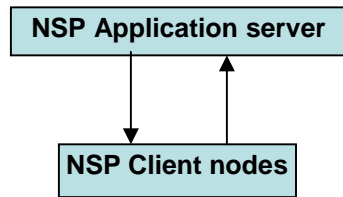


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In Regional computer centre, Chennai having 51 nodes and 4 front end server HP PC cluster with RHEL-4 operating system. Paradigm application EPOS (focus, Geodepth) is running on this cluster for basic processing, PSTM and PSDM. In this cluster NSP has been successfully implemented.

### How NSP works

NSP is on-demand line S/W. It means whenever user want to see the node status, he/she has to activate the NSP from his workstation. After activation NSP having some button pallet through user can see the free nodes, busy nodes, beside this user having the some facility to see the execution status, clear the hanging process, job submission etc. NSP has an addon module called PNSP which is used to see the number of CPU free and busy in SMP machine (like IBM P690).



### Implementation

NSP can be executed from any work station or server where user is logged in . Figure-1 shows the first interface of NSP. Here yellow buttons are cluster compute nodes icon.

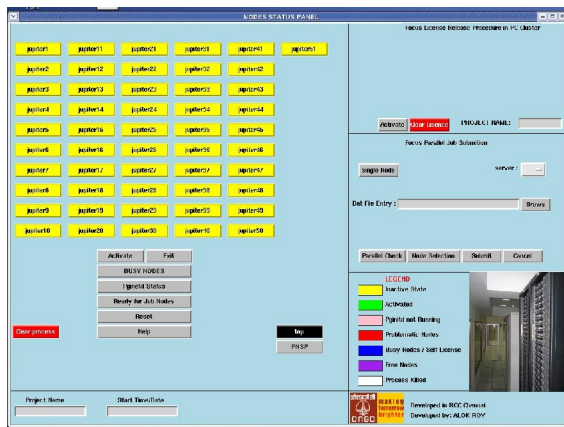


Figure-1: NSP interface

NSP can be activated by active button, which takes few minutes to communicate with all the nodes and then come back to active state. Fig-2 shows the active state of the NSP. After activation all yellow button pallet will become green.

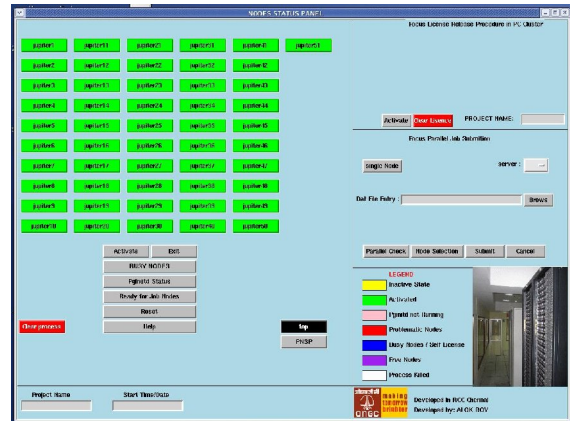


Figure-2: Active state of NSP

Activated NSP will be fully loaded with all information about nodes. Busy nodes status shown in the Fig-3. The blue button pallet shows the corresponding nodes are busy with job execution.

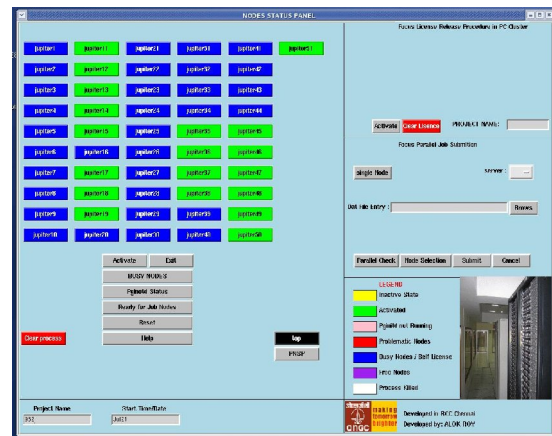


Figure-3: Showing nodes status

Figure-4 shows the free nodes for job submission. The purple button pallets correspond to the free nodes. If any node is down then corresponding button will become red colour.



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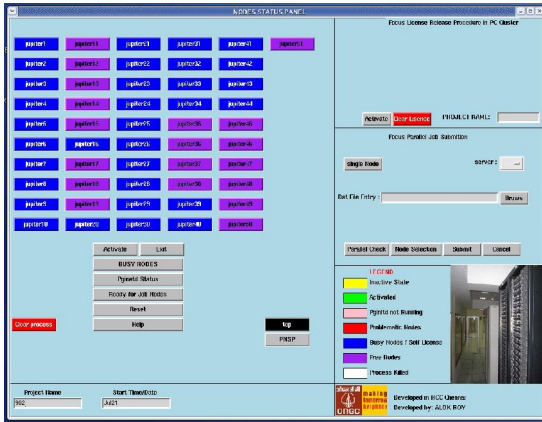


Figure-4: Ready Nodes status

In a cluster environment it is found that some process is hanging in the nodes, which are not in execution mode. User can clear this type of process by clear button.

Beside these users can submit their focus parallel job by interactive selection of nodes.

Through NSP users can call PNSP which will give the P690server 32 CPU status (Fig-5) about how many CPU are busy on job execution. PNSP helps to avoid overload on P690server.

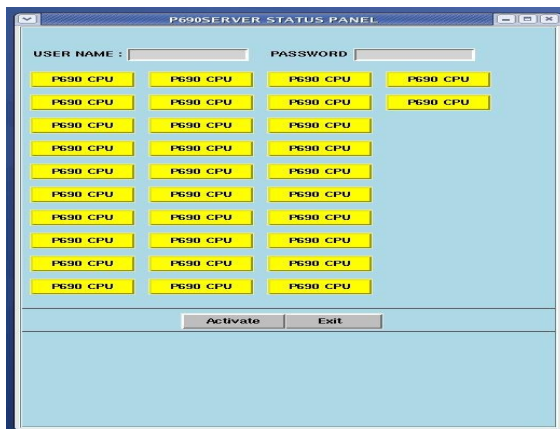


Figure-5: PNSP interface

Here we are discussing about HP PC-cluster which is having Ganglia web based application by which we can see the resource utilization, but we can not see the user based utilization. NSP is a value addition to this cluster monitoring system to increase the production with optimum utilization of the resources.

## Conclusion

Any production system should work in a cost and time effective manner. In a Seismic data processing system requires a continuous improvement in technology to meet the exploration objectives. Now a day's most of the seismic application modules are coded Linux Cluster systems. This means a user submits the jobs in various nodes to get faster results. Since the environment is multi user and multi task based, many users can submit their jobs using different nodes at same time. If there is no load labeler for jobs then there will be a bottle neck for a common user to know the free available resources in terms of nodes where he can submit his job. In present scenario (no load labeler) a seismic user has to be dependent on a system personal for knowing the status of resources and submitting parallel jobs. At the same time it becomes difficult to the system personnel to handle many users.

To overcome this, a necessity was felt to develop a user friendly GUI based software which can help user as well as system personnel in knowing the status of resources, submitting the jobs and saving submit time through this software.

## References

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