A.4: Disaster recovery setup for Layer-1 of Indus control system

Accelerators in Indus Accelerator Complex are operating in round the clock mode and thus it is highly desirable that the control system for monitoring and control along with data logging and presentation remains available most of the time and should be recovered to normal operation in shortest possible time in case of any eventuality. Considering the dependency of control systems on IT infrastructure, the development and deployment of disaster recovery setup for Layer-1 of Indus control system was taken up and successfully accomplished.

Indus control system has a three-layer distributed architecture. Layer-1 consists of SCADA functionality along with data logging, web servers and operator consoles. Layer-2 and Layer-3 are VME based controllers. Layer-3 functionality is distributed and spread all over the Indus complex while Layer-2 and Layer-1 functions are concentrated in the server and control rooms. The disaster recovery setup (DRS) is aimed to facilitate quick recovery for various functions of Layer-1 of Indus control system viz. SCADA system, GUI operation, data logging, domain services, web services, data retrieval, and presentation over web etc., in case of the non-availability of the existing primary Layer-1 of the control system due to any reason.

The DRS has been set up at an alternate location, away from the Indus Accelerator Complex. The system is designed in such a way that most of the functions are available in hot standby mode and some other functions in the manual switching mode, allowing the operation of Indus machine from DRS. Data logging, domain authentication and network access functions are available in hot redundancy mode while SCADA and web based data retrieval and presentation functions are available in warm standby mode. The complete architecture of DRS setup is shown in Figure A.4.1.

The work involved installation and configuration of servers, network switches, firewall, and access control mechanism. The work also addresses security considerations and modifications in SCADA GUI panels and control scripts for its operation from DRS.

Major activities completed include:

- Configuration of VLANs in switches for proper communication between servers at both the sites.
- Addition of rules in firewall for inter VLAN communication for access of various servers from both the sites and ensuring security of servers.
- Testing the complete network setup for access of web servers and database servers.
- Software and hardware installation and configuration.
- Installation and configuration of domain controller, database servers, SCADA server and web servers with required operating systems, applications, tools and packages.
- SCADA project providing control and monitoring functions for various sub-systems of Indus has been ported, GUI panels have been modified for proper running from this new project.
- API managers communicating to the Layer-2 VME systems have been ported and tested for proper operation.
- SCADA scripts of data logging have been modified for hot redundancy operation of data logging.

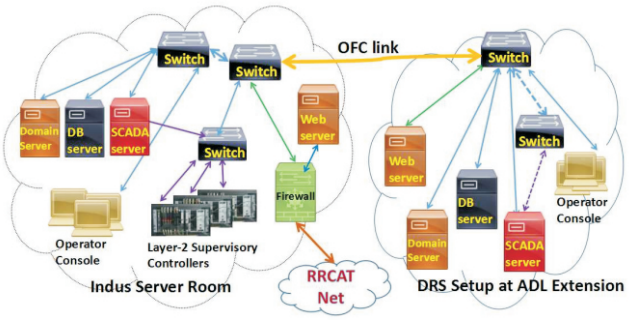

Fig. A.4.1: Architecture of DRS for Indus control system.

Extensive system testing was carried out involving server fail-over and domain functions for required authentication and various services. SCADA functionality was tested from main server and DRS site server. GUI panels of MPS system were thoroughly tested for all control and monitoring operations of power supplies. File loading, saving, cycling and ramping operations have been tested. Serial devices were converted to Ethernet interface with server based access for access from DRS site. GUI panels of other sub systems were tested for proper operation. Web server was tested by putting down main web server at Indus and making required configuration to put the alternate DRS site web server online. Various pages for history data access have been tested including tabular display and graphical display. Data logging is also available at DRS site.

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