



# Data Logging System Upgrade For Indus Accelerator

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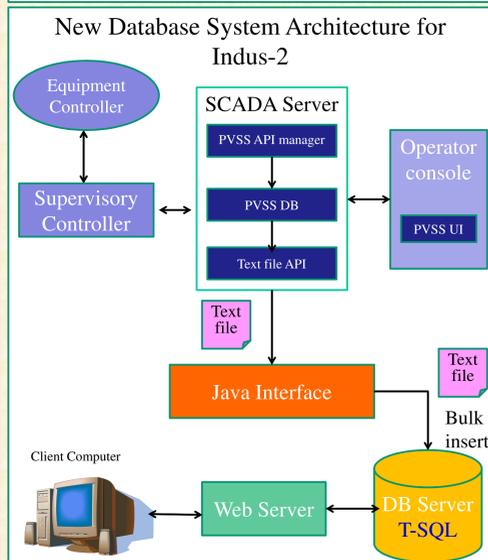
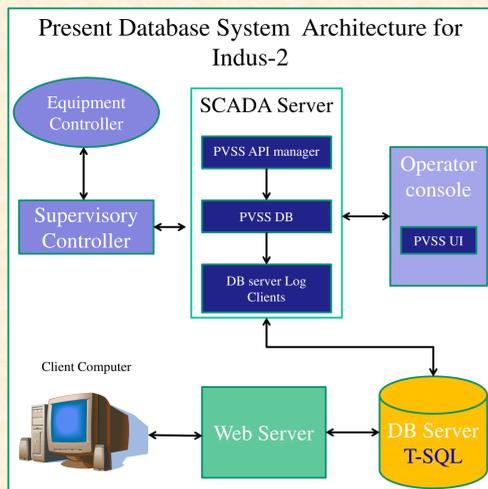
## Introduction

Indus-1 and Indus-2 Synchrotron Radiation Source (SRS), housed in Indus accelerator complex, are cyclic particle accelerators that accelerate electrons up to 450 MeV and 2.5 GeV respectively. It is supported by Microtron injector, Booster synchrotron and various complex subsystems like Magnet Power Supply (MPS), Beam Diagnostic and Vacuum etc. Logging of system parameters at a faster rate plays a crucial role in analyzing and understanding machine behavior. Hence a data logging system is essential for successful operation of Indus accelerator. The presently running data logging system is capable of logging the data of approximately ten thousand parameters at a time interval of one second to one minute but does not scale well as data logging rate is enhanced to one hertz for all the parameters.

This poster describes the modifications implemented in the present data logging system at both hardware and software architecture. It also describes the new features of Relational Database Management System (RDBMS) implemented in new data logging scheme to achieve data logging rate of 1Hz for all the parameters.

## Database system architecture

- Indus-2 data logging system is a three layer architecture and based on client/server model. The three layers are: Equipment Controller (EC), Supervisory Controller (SC) and User Interface.
- Data can be classified into three categories: #Digital or Online data #Analog or History data #Static or Configuration data



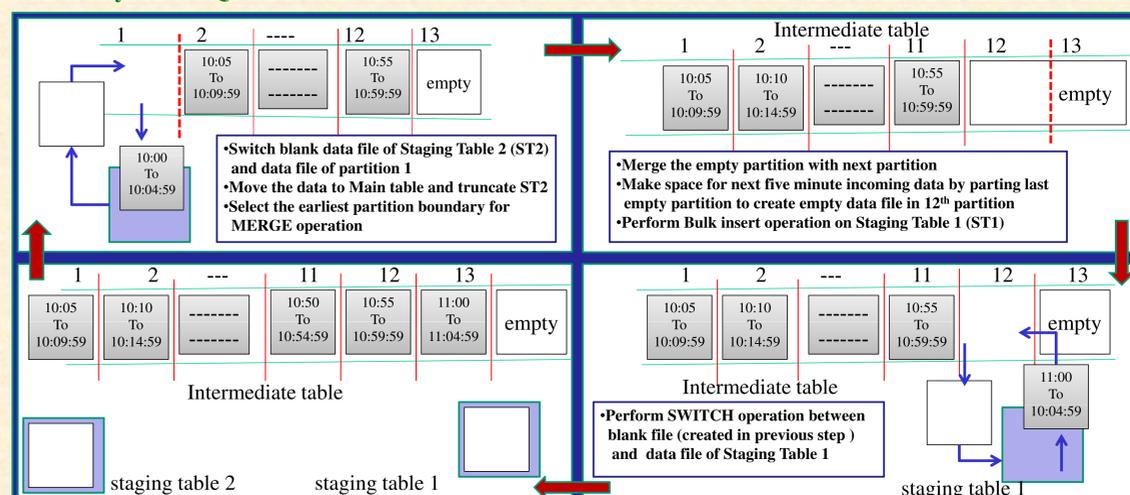
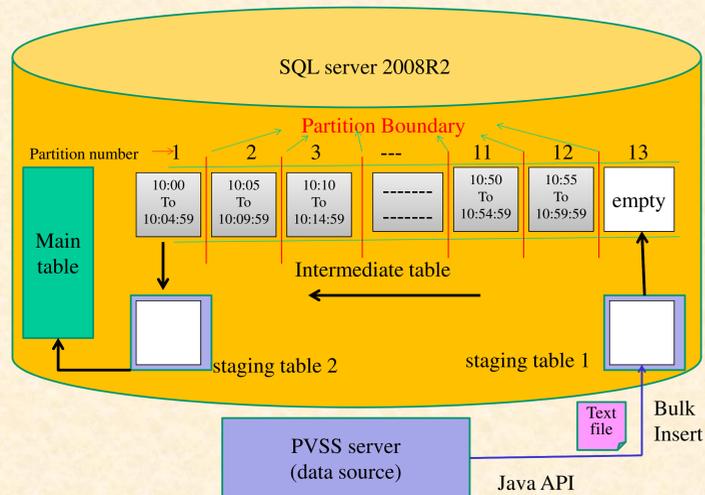
## Salient features of present data logging system

- Nearly 10000 parameters are logged at the varying time interval of 1 second to 1 minute.
- All tables have a similar structure with similar devices grouped together to form time series data indexed over time.
- No direct access to data is given to users. The read only usage of the stored log data is publicly available to end users within RRCAT.
- The data is available on 24 x 7 basis with backup servers installed and backups scheduled.
- The logging modules have auto corrective mechanism to recover from the faults.
- All alarms/faults occurring in Indus-1 and Indus-2 are logged on event basis.
- Microsoft SQL Server 2000 is used as a database server.
- PVSSII 3.0 version is used as a logging client application.
- ADO is used for database interface.

## Salient features of new data logging system

- Nearly 8000 parameters are being logged at the rate of 1 Hertz.
- Database schema is based on the theme of "one data table per data type" for each subsystem.
- Data is collected in comma separated text files in the form of string.
- Java interface is introduced to eliminate direct interaction of PVSS server from database server.
- Text file is parsed and Bulk Insertion is done to load the data into database.
- Recent one hour available data is kept in separate table termed as Intermediate table. This table is partitioned at the interval of five minutes.
- Remaining all past data is residing in the separate table termed as Main table.
- Each subsystem has its own Intermediate table and Main table for each data type.
- Each subsystem has one configuration table and two staging table for each data type.
- To ensure efficient flow of data inside database, "sliding window scenario" concept is used. This is a significant feature of table partitioning.
- Java interface manages the temporal synchronization and provides error handling capability.
- To diagnose the complete data logging system, a graphical panel is designed at PVSS server which monitors the status of every data logging application and reflects any undesired behavior in the logging system.
- Microsoft SQL Server 2008 R2 is used as a database server.
- PVSSII 3.9 version is used as a logging client application.
- JDBC is used for database interface.

## Data flow Cycle in SQL server database



## Conclusion:

A new upgraded data logging system has been designed which is tested at the experimental server machine. It has been demonstrated that the scheme has successfully logged approximately 1 GB of data per day. Almost 8000 parameters are logged at the rate of one hertz without any loss of data at any time instant. Thus this logging system is more suitable in terms of performance & scalability and it is being deployed in Indus control system architecture.