The Design of Database for the SPring-8 Linac

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When a large amount of data are used by computer systems, a database helps management of data. It gives the flexible expansive computer systems. The construction of the SPring-8 linac control system consists of two phases. In the first phase, i.e. until beam commissioning, the system is the VME computer system which will have whole control data in VME. In the second phase, it will be improved to VME clients and UNIX servers system which have the all of control data in databases of UNIX servers. This phase would have many kinds of data for stable operation. This paper presents about the design of database.

Generally the database is classified by data models into several types: tree structure database, relational database, network database, object oriented database, and so on. It is tended to use a relational database in workstation computers recently. It is the characteristic of relational database that relationship of between some two sets of data is presented by tables. And SQL(Structure Query Language) gives flexible handling to the database. Recently there has been remarkable progress in hardwares and the relational database technique; it is possible to be used in the control system.

In the first phase system, the all of control data will be managed VME computers, and every data of devices are small.(Fig.1) But it is hard to manage a large amount of log data. This problem will be solved with a database by using.

In the second phase, The system has two logical databases: the setup master database, the log database.(Fig.2) The setup master database keeps static data. Examples are: equipment definition, setup data and installation data, etc. In an accelerator, some components are replaced by new one on occasion. The

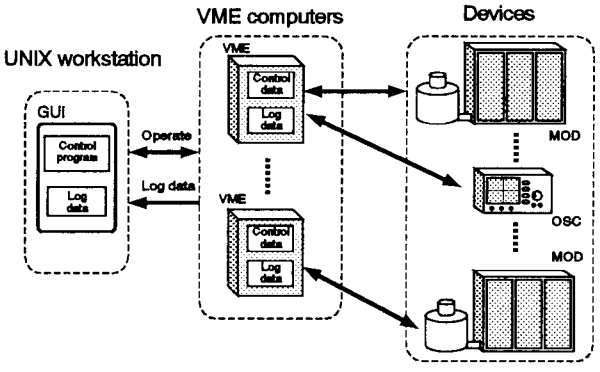

Fig.1 First phase system

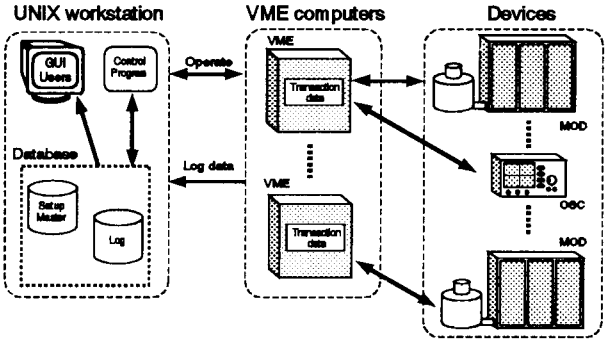

Fig.2 Second phase system

database will give flexible controlling, because the setup master database will also be updated by the new machine data. The log database keeps dynamic data. Examples are: vacuum log, power log, temperature log, etc. The short time transaction is essential in the log database, because it is necessary to control the dynamic data immediately. This problem is solved by using the high performance database.

A database design is as important as choosing of database products. Because if the database design with short time transaction is ignored , then it is impossible to get high performance. There are mainly two important things of the design of database. First is a regulation, this means complex data are adjusted to consistent data. For example,(Fig.3) the table 1 has the different attribute data and duplicate data.(MOD Name, MOD Power) If data are replaced by new one, then the system manager must change all of data in a row. The regulation is able to solve these problems as follows. The table 1 is divided into the table 2 and the table 3. And the relation is made between table 2 and table 3. This is basic of the database design. But if the computer system requests short time transaction, then the regulation is able to ignore. It is necessary that the

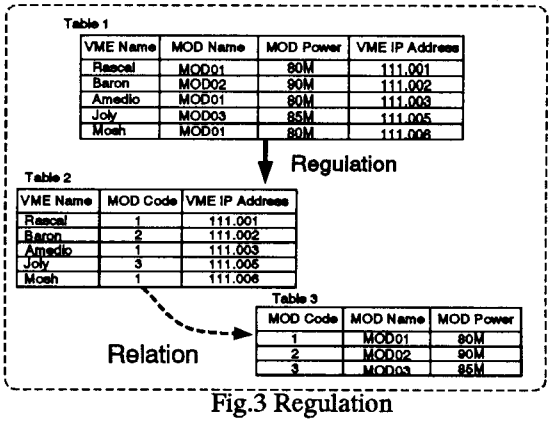

Fig.3 Regulation

database is constructed by the best regulation in a control system. Second is a deadlock. If the deadlock has happened in the database, then the deadlock is solved by several ways from the database management system. But generally the system performance has decrease, and the confidence of data is lost. This factor must be taken into consideration in designing the database. For example, how many data are locked by the one transaction, what are locked by the one transaction, what the unit of exclusive control is, whether the data are locked in exactly order, etc.

When the database is constructed, the best database system and the best design of database is necessary. It is planned that the test of this system will started this year. And it must be finished before first phase system is completed.