TOOLS FOR DEVELOPING A RADIOCHEMISTRY DEPARTMENTAL DATABASE.

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ABSTRACT

Utilizing Microsoft Access^{tm}, Visual Basic^{tm} and Oracle^{tm}, a flexible relational database is being developed to meet the diverse needs of a full service radiochemistry laboratory. The database is used for storage of critical data elements used in the creation of electronic data deliverables, hard copy deliverables, QC charts, client specific calculations, analyst training records, method requirements, tracking productivity, capacity and other applications.

HISTORY

In January, 1992 Environmental Physics, Inc. (EPI) was established as General Engineering Laboratories' (GEL) radiological affiliate. GEL has provided radiochemistry services since 1986, and non-radiological testing since 1981. GEL radiochemistry capabilities were limited to indicator type analyses until 1992 when EPI was created to dedicate resources and personnel to the development and expansion of our capabilities in radiochemistry.

CURRENT CAPABILITIES

A critical component of any radioanalytical laboratory lies in its ability to manage information and get critical information to the end user. This system is generally some form of Laboratory Information Management System (LIMS). EPI uses a fully integrated LIMS developed by GEL that controls all processing from login to billing.

At GEL, the LIMS functions are performed on a Dual Sun SparcServer® 4/670 system utilizing a Unix™ based operating system. The software is an extensive modification of a program package from Automated Compliance Systems which includes SeedPak1®, SeedPak2®, and DataPak®. The Oracle database associated with these three packages contains a set of tools that has enabled GEL to customize many of our data

forms and programs. This capability provides for more efficient data processing throughout the entire company, from sample log-in to analysis and final report preparation.

While the LIMS system is very flexible and functional for reporting and tracking samples, EPI is putting a significant effort toward developing a radiochemistry specific database that will support LIMS in meeting the diverse requirements of our clients. This radiochemistry departmental database is designed to receive and store data from all instruments contained within the laboratory. Instrument results stored in a like format simplifies the laboratories ability to retrieve and present the data to the end user.

CURRENT DEVELOPMENT EFFORTS

The database tables are contained in an Oracle 7^{tm} database whose operating system is a Pentium^{tm} 90 computer running Windows NT^{tm} server. The server uses SQL*NET Server and ODBC Server and serves as the administrator for the Environmental Physics workgroup. This computer also runs a NFS mountable drive for the shared files in the workgroup. Disk drives on the server are mirrored for reliability and backed up nightly to protect from loss of data and minimize or eliminate downtime in the event of component failure. The remaining instrument and office computers in the company are linked to this server via Windows for Workgroups^{tm} and ODBC ^{tm}. Data transfer to the database from the laboratory computers is being performed by Visual Basic^{tm} programming. Performing uploads in this way minimizes the overhead required to run the large programs usually utilized to transfer data. Visual Basic^{tm} and Microsoft Access^{tm} is being utilized to process the data once it is in the database. Microsoft Access^{tm} is then used to present the data after being retrieved from the database.

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LIMS

Instrument

Windows
NT (Server)

Instrument

Oracle 7 Relational Database
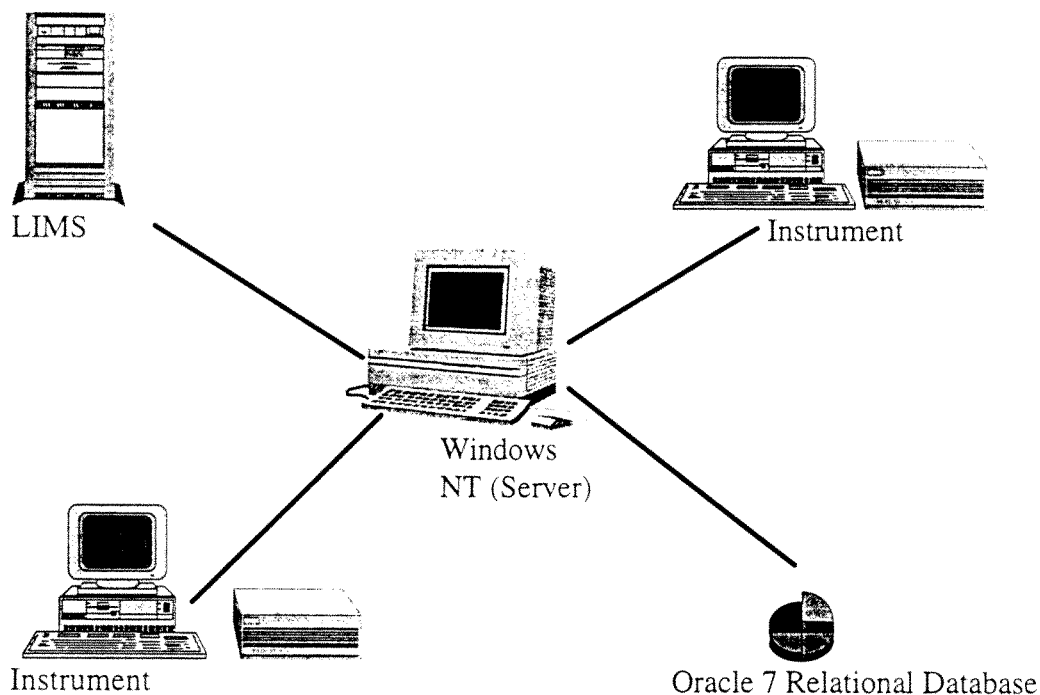
Database structure:

A relational database model was used to design the database. The database tables are linked so a record from one table can have many attributes stored on another table. Figure 1 shows how two tables are linked in the database structure.

The "Run" table contains basic run information such as the instrument identification, method name, and sample number. The "Run Ext" table contains the analytical result and units. These are two of many tables used in the database.

A uniform storage system for all radioanalytical instrumentation, reduces additional programming needed when new requirements are placed on the laboratory such as a special calculation of minimum detectable activity or total propagated uncertainty.
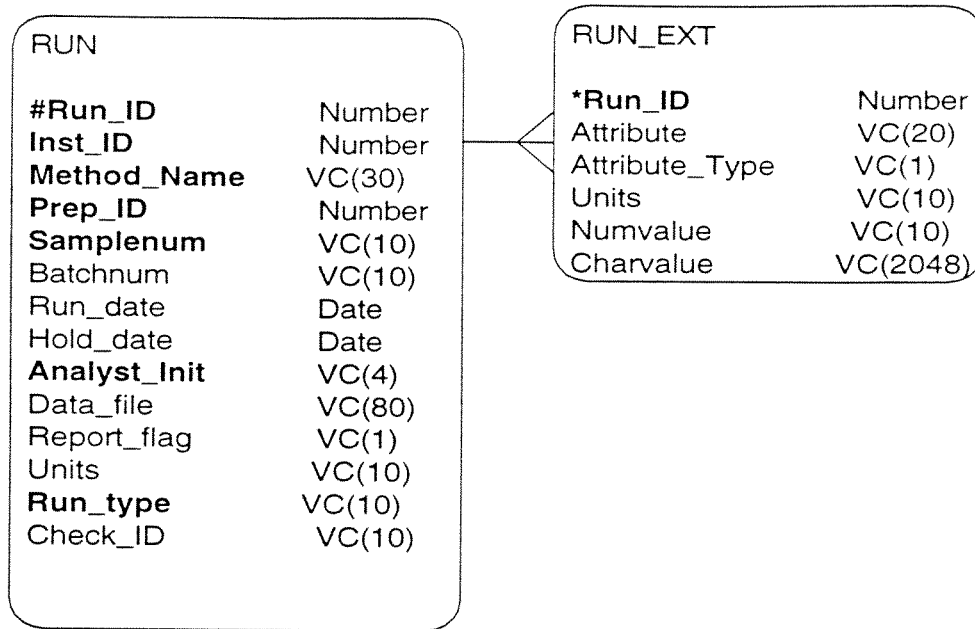
```
RUN                                    RUN_EXT

#Run_ID        Number                  *Run_ID          Number
Inst_ID        Number                  Attribute        VC(20)
Method_Name    VC(30)                  Attribute_Type   VC(1)
Prep_ID        Number                  Units            VC(10)
Samplenum      VC(10)                  Numvalue         VC(10)
Batchnum       VC(10)                  Charvalue        VC(2048)
Run_date       Date
Hold_date      Date
Analyst_Init   VC(4)
Data_file      VC(80)
Report_flag    VC(1)
Units          VC(10)
Run_type       VC(10)
Check_ID       VC(10)
```

Figure 1

Benefits of the new database:

- The data for all of the radiochemistry instruments will be stored in a similar format.

- Data deliverables for the stored data can be made for individual clients with ease.

- Oracle can handle billions of records per table with the relational database model.

- Administrative tracking is centralized on items such as : methods, standards, instrument calibration, dosimetry, employee training, scheduling, etc.

- Instrument and method control charts can be generated easily in a variety of formats for trending analysis.

Limitations of the new database:

- Speed. One record from a Gas Flow Proportional Counter takes about 15 seconds to upload into the database tables, one Liquid Scintillation Counter record is sent in 7 seconds.

ADDITIONAL DEVELOPMENT EFFORTS

GEL/EPI is also in the process of establishing an electronic data packaging system. This system, based on Adobe Acrobat© and NetScape Navigator© technology, will allow GEL/EPI to build hard copy equivalent data packages in a totally electronic environment. The resultant Portable Document Format (PDF) can be supplied to the client as a supplement to the hard copy deliverable, or, ideally, as a replacement to the hard copy deliverable. These PDF files have 100% accuracy when compared to the printed page. PDF files issued either through Internet transfer or via floppy or CD-ROM are also significantly smaller in size that the hard copy equivalents, and are therefore easier to store, exchange, distribute and review than paper.