

# **Data Warehouse: A Telecommunications Business Solution**

Demetris Papaiaovou, Philos Computer Solutions, Inc., Oakland, CA  
Larry D. Bramblett, Pacific Bell, San Ramon, CA  
June Burgess, Pacific Bell, San Ramon, CA

## **1. ABSTRACT**

The telecommunications industry is rapidly becoming the largest user of high volume information systems. This is especially true in the United States, where telecommunications, Internet, video and audio services all fall under the larger umbrella of the information superhighway.

Our project team is adept at providing customized business solutions to telecommunications managers by creating specialized information systems to meet their individual needs. We design personalized systems which transcend the traditional boundaries of data warehousing systems by gathering and storing important data, analyzing and transforming the data, and then summarizing and reordering it in accordance with the demands of the user. This provides a dynamic and efficient front-end presentation and reporting tools that transform the users from reactive recipients of hard copy reports to competitive executives poised to make efficient, well informed decisions.

This paper will discuss how the power and versatility of the SAS system were used to provide data warehousing business solutions to Pacific Bell, one of the largest telecommunication companies in the United States. It will then demonstrate how millions of data are gathered on a daily basis, stored in tens of on-line tables and then delivered to the user's desk in real time for strategic decision making.

## **2. THE PROBLEM**

In a large industry like telecommunication, information can be stored in a variety of ways, including in multiple operating systems, in a myriad of platforms and structures, and in large or small volumes. The problem arises when a user, either a manager or high executive, needs access to the stored information. If she has unlimited time to devote to retrieving the data, then using the information once she has accessed it is not a big problem, providing she can find what she is looking for. However, what if her time is limited, and she needs the information gathered from multiple systems screens and compiled in a report format on a monthly basis? In this case, better planning is needed in order to design a system to extract and organize the relevant data on a regular basis. Now lets take this scenario on level higher. The decision maker of the company wants a point and click application that would give her instant results on a real time basis. The problem now requires a well thought out business solution which creates a customized information system tailored to her specific needs.

## **3. THE SOLUTION**

We needed to provide a dynamic and efficient front end process and reporting tool which would transform the user from reactive recipient of hard copy reports to competitive executives poised to make efficient, well informed decisions. Given the complexity and variety of the existing systems, we determined that the strength and

flexibility of SAS made it the best choice as an operating system to provide the data warehousing solution to this problem.

Our objectives were to build a diagnostic system which would provide proactive rather than reactive support capabilities, help to avoid any future emergency situations and allow early detection of reductions in call volumes.

At the time we began our project, the limitations of the existing system included:

- inability to identify calls not going through due to undetected equipment failures
- delayed billing due to messages in connection stage
- there was no ability to track removed telephone sets (vacant buildings)
- geographic or market specific trends could not be identified
- systems did not talk to each other  
inability to identify **specific** call detail

At the time, the way these problems were being dealt with involved paper or PC based data retrieval. There was no common database for call usage by telephone number. Data was not available until 1-2 months after actual activity date. Data was available only as a summary of monthly activities.

The overriding problem with all of this was that compensation/commission could not be tracked to specific calls.

The new system had to be able to provide as close to real time usage information as possible on calls, lines, and fraud. The usage information on calls needed would have to reflect:

- attempted Vs completed calls
- type of call (Collect, Calling Card, etc.)
- length of call

- originating and terminating numbers
- rating
- time of day

The usage information on lines needed would have to reflect:

- change in usage patterns over, under, or no use
- blocking effectiveness and appropriateness
- screen codes and IDDD errors
- routine verification
- provisioning information

The usage information on fraud need, would have to reflect history and data. The design approach taken was a time critical project approach including Rapid Application Development (RAD) phase design and implementation and targeted initial roll out. It would have the capabilities to interface with future or pending projects but with no direct dependencies.

The benefits of this system to Pacific Bell was enormous. It decreased the risk of future emergency situations by providing on-line, alarm triggered, real-time analysis, and access to both summary and detail information.

It increased fraud prevention by allowing analysis by call and by line. Unusual trends could be identified. It also provided faster, more accurate response to billing and compensation/commission problems by decreasing wait for and dependency on microfiche and other reports.

The financial benefits to Pacific Bell were estimated in millions resulting from:

- faster troubleshooting and repair of phones
- increased staff production in sales offices
- quicker response to customers' billing questions

- accurate tracking of 0+ call details
- minimized fraud settlements

Additional benefits were also provided to customers by contributing to and endorsing the customers' bottom line by improving reliability of current systems and identifying new markets. To the end-user, it assured higher quality and better availability of service.

To the sales teams, it provided "real-time" information on trouble lines and allowed timely intervention. It also allowed responses to inquiries without labor intensive fiche look-ups.

#### **4. METHOD**

When the project began we needed to test the existing system for accuracy and sufficient time processing. Using the SAS/FSP product we were able to put quickly together source data entry and validation screens in order to create a preliminary database for analysis. After a period of two months of testing validation and analysis, we identified key data sources and processes that track each message from the actual originating phone to the final bill to the customer.

The next challenge was to put together the data warehouse that would enable the user to better monitor the phones usage, identify trends, isolate problems and better market their products.

The power of the SAS system was identified as the best instrument to deliver the end-to-end application to the customer in a timely manner, simplicity in operation, and easy in maintenance.

Files from PC, Unix, MVS, IMS, and Db2 system were gathered into a MVS SAS data warehouse that contained every message that was placed into a Pacific Bell Copt/Coin phone. We were tracking over 60 thousand

phones with an average of 500 messages per month.

The detail data was kept on disk for fast throughput access for 3 months and migrated to tapes for historical information. After a well thought out design by both Philos Computer Solutions Inc., consultants and Pacific Bell managers, a multiple level of summarization was put together as part of the Copt/Coin data warehouse.

As a result of the new system, the managers were notified if any of the phones showed unexpected behavior and at a touch of a mouse click they could identify any problems through comparative statistics, go to the detail data and have service support correct the phones if necessary. The gains of more satisfied customer and recovery of potential less revenue was evident within the first month of operation.

#### **5. NEXT STEP IN PROCESS**

Philos has been privileged to be chosen as one of the first companies to test and help with the better development of the SAS Multi dimensional Data Base. In cooperation with Pacific Bell, we were able to use the strength of the MDDB to expand even more the accessibility of information to the user from their data warehouse. The different level of summarization were easily turned into hierarchies and the dynamic system gave a new meaning to OLAP application for our customers.

Off loading of querying against the data warehouse thus reducing transactions against the large volume data file gave instant results to the executives that could not be satisfied with anything less than that. At the same time with the passthrough facilities on MDDB viewer we could go back and look at the original files of individual records.

Having worked with artificial intelligence systems before, we could see the flexibility

and ability of our system to learn and improve itself by tracking request to the different hierarchies and detail information. More hierarchies could be built based on demand for specific information and unused hierarchies can be put aside for future use.

## 6. CONCLUSION

The system is getting better and more efficient by the day, making our users stronger and happier in a market where competition demands the best just for survival.

As we work with the SAS Institute, we expect to upgrade every system we can get our hands on to this new dimension of software technology.

## 7. ACKNOWLEDGMENTS:

The authors would like to acknowledge the following members of the original project teams:

Jack Hewlett, Philos Computer Solutions, Inc.

Andy Gunn, Philos Computer Solutions, Inc.

Carol Nielson, Philos Computer Solutions, Inc.

Ioannis Papaiacovou, Philos Computer Solutions, Inc.

Ann King, Pacific Bell

Linda Forester, Pacific Bell

Demetris Papaiacovou  
President  
Philos Computer Solutions, Inc.  
475 14<sup>th</sup> Street, Suite 150  
Oakland, CA 94612  
(510)836-1795  
demetris@philos.com  
www.philos.com

Larry Bramblett  
Systems Architect  
Pacific Bell  
2600 Camino Ramon, Rm. 3w100c  
San Ramon, CA 94583  
(510)823-8320  
Idbram@pb1.pacbell.com

June Burgess  
Project Manager  
Pacific Bell  
2600 Camino Ramon, Rm. 3w102  
San Ramon, CA 94583  
jaburge@pb1.pacbell.com