ABSTRACT

This paper describes the COMSYM software system designed for IBM's Internal Voice Network by the Network Management Systems Development department. This system is used by telecommunications engineers to design and analyze IBM's internal voice network.

The system incorporates different languages to provide a comprehensive reporting tool for telecommunications engineers. The paper will focus on the graphics subsystem which is written using SAS and SAS/GRAPH. This system is designed to be used by non-technical people. Front end panels (screens) were designed to prompt the user for parameters which determine the input records used as well as the plot produced. The large amounts of data associated with call detail records, performance records, and utility records are easily handled by SAS and can be displayed effectively using SAS graphics. The ability to generate graphs and isolate certain information is required in order to manage a complex voice network.

Examples of input parameters and graphs produced will demonstrate the variety of graphs available. A statistics summary produced by PROC MEANS is also generated. The information provided by these reports enable our division to provide cost effective communications to a large number of users.

INTRODUCTION

The ability to analyze information in a data-rich environment was needed by IBM's telecommunications engineers to aid their design and analysis of IBM's internal voice network. As a result, the COMSYM graphics system was designed, since graphics provide the best way to present large amounts of information. The system features a friendly panel-driven environment which allows even inexperienced computer users to generate a variety of graphics reports.

THE PROBLEM

In order to provide cost-effective communications to a large number of users, analysts must have access to station message detail records (SMDR), utility records, and performance records. This data forms the vital information associated with each call: caller, time data, duration, called number, facility used, satellite id, transponder id, network id, call type, call disposition, etc. The collected information is analyzed to determine the grade of service (GOS) during the busiest hours, usually 10 a.m. and 2 p.m. A high GOS means calls are being blocked and users cannot get through.

A low GOS means that you have good service but you might be paying for excess lines. Since modifications to the network are based on the GOS information provided by these records, they must be processed both rapidly and reliably.

THE SYSTEM

The COMSYM software allows users to generate different types of reports such as IMS queries, traffic summaries, call analyses, exception reports, and graphic analyses. The graphics subsystem permits the user to select fields from the input records for graphics displays. TSO CLISTS and the SPF Dialog Manager are used to display panels, verify input (allowing easy correction of errors), and submit a batch job to provide only the reports desired by the user. A data flow diagram of the system is provided in figure 1.

Although our data is on magnetic tape, this is of no concern to the user since the COMSYM system generates both JCL and SAS source code. A CLIST is run once a week in order to create a table of cataloged data set names and their corresponding starting and ending dates. This table is used to verify user input and in file tailoring the skeleton JCL.

The first panel prompts the user for required parameters. The variable to be plotted, SCC id, and date range are the only required fields. The other parameters are used to extract subsets of the input records. Problems can be isolated by using the disposition code and call type fields to reduce the amount of information plotted. There is also the ability to print a formatted report of the records used in the graphic analysis. The second panel is used to select different Satellite Computer Controller (SCC) locations. In addition, the system provides warning messages and help screens. (The complete panel hierarchy is shown in figure 2 - figure 6.)

THE OUTPUT

The graphics subsystem produces a line graph of the variables selected by the user. The actual points are grouped by hour or day and plotted with a mean line is drawn through these points. The output produced by PROC MEANS is also printed. This statistics summary is very useful in evaluating the graph. If a graph of call disposition codes is requested then a bar chart is produced, since disposition codes are discrete and frequency is the only relevant information. The examples shown in the appendix have been chosen to demonstrate the variety of graphs available.
The graphs are printed at an IBM 3287 color printer, the statistics summary at an IBM 3289 printer. Since most of the users have IBM 3277 terminals, we route output to a printer. We will provide the capability of routing graphics output back to color terminals when the users receive them. It should also be noted that the jobs are submitted in batch mode, because of the potentially long processing time required when using tape datasets. This allows the user's terminal to be freed while the job is processed. A notification message is transmitted to the user when the jobs are finished.

SUMMARY

The flexibility provided by SAS in graphing and statistical analysis are well suited to this type of application. The ability to generate graphs and isolate certain information is useful in maintaining and designing a complex voice network. This system can be enhanced to include different types of input or produce other reports or graphs. Using the SPF Dialog Manager and CLISTS enable the programmer to combine IMS, PL/I, and SAS programs into one system that can be utilized by non-technical personnel.
SELECT VARIABLE TO BE PLOTTED ==> 

1. VOICE CHANNELS  
2. DATA CHANNELS  
3. VOICE PLUS DATA CHANNELS  
4. ALLOCATED CHANNELS  
5. REQUESTED CHANNELS  
6. VOICE LINKS  
7. DATA LINKS  
8. VOICE PLUS DATA LINKS  
9. FREEZOUTS  
10. LPI  
11. ACTIVITY FACTOR  
12. CALL DISPOSITION CODE(S)  
13. STATIC NETWORK-CAPACITY ALLOCATION  
14. BORROWING LIMIT  
15. CURRENT ALLOCATION  
16. EXCESSIVE CAPACITY REQUEST  

ENTER SELECTION CRITERIA:  

PRINT INPUT RECORDS(Y/N)==> 

TRANSPOUNDER ID (2,9) ==> SCC ID (A-ALL, S-SELECT)===> 

DATE: FROM (YMDH) ==> TO (YMDH) ==> 

GTM TIME: FROM (HMMSS) ==> TO (HMMSS) ==> 

DISP CODES: FROM ==> TO ==> 

CALL TYPES: FROM ==> TO ==> 

PLOTTING INTERVAL (HORIZONTAL AXIS - D=DATE, T=TIME) ==> 

PRESS ENTER KEY TO SUBMIT JOB OR END KEY (PF3) TO EXIT 

FIGURE 5  

SELECT SCC LOCATION(S) TO BE PLOTTED 

BY PLACING AN 'X' BEFORE LOCATION NAME:  

1. CHICAGO  
2. SAN JOSE  
3. HARRISON  
4. DALLAS-IRVING  
5. POUGHKEEPSIE  
6. KINGSTON  
7. RALEIGH  
8. BOULDER  
9. AUSTIN  
10. LOS ANGELES  
11. BOCA RATON  
12. ATLANTA  
13. WHITE PLAINS  
14. ROCHESTER  
15. TUCSON  
16. LEXINGTON  
17. KANSAS CITY  
18. CHARLOTTE  
19. ENDICOTT  
20. BETHESDA  
21. SOUTHFIELD  
22. SCC 22  
23. SCC 23  
24. SCC 24  
25. SCC 25  
26. SCC 26  

PRESS ENTER KEY TO SUBMIT JOB 

PRESS END KEY (PF3) TO DISREGARD ALL INPUT OR EXIT 

FIGURE 6
APPENDIX

SELECT VARIABLE TO BE PLOTTED => 1

1  VOICE CHANNELS  9  FREEZOUTS
2  DATA CHANNELS  10  LPI
3  VOICE PLUS DATA CHANNELS  11  ACTIVITY FACTOR
4  ALLOCATED CHANNELS  12  CALL DISPOSITION CODE(S)
5  REQUESTED CHANNELS  13  STATIC NETWORK-CAPACITY ALLOCATION
6  VOICE LINKS  14  BORROWING LIMIT
7  DATA LINKS  15  CURRENT ALLOCATION
8  VOICE PLUS DATA LINKS  16  EXCESSIVE CAPACITY REQUEST

ENTER SELECTION CRITERIA:

TRANSPOUNDER ID  (2,9) => 2
DATE: FROM (YYMMDD) => 830622  TO (YYMMDD) => 830622
GTM TIME: FROM (HHMMSS) =>
DISP CODES: FROM =>  TO =>
CALL TYPES: FROM =>  TO =>

PLOTTING INTERVAL (HORIZONTAL AXIS - D=DATE, T=TIME) => T

PRESS ENTER KEY TO SUBMIT JOB OR END KEY (PP3) TO EXIT
SELECT VARIABLE TO BE PLOTTED ==> 12
1 VOICE CHANNELS
2 DATA CHANNELS
3 VOICE PLUS DATA CHANNELS
4 ALLOCATED CHANNELS
5 REQUESTED CHANNELS
6 VOICE LINKS
7 DATA LINKS
8 VOICE PLUS DATA LINKS
9 FREEZOUTS
10 LFI
11 ACTIVITY FACTOR
12 CALL DISPOSITION CODE(S)
13 STATIC NETWORK-CAPACITY ALLOCATION
14 BORROWING LIMIT
15 CURRENT ALLOCATION
16 EXCESSIVE CAPACITY REQUEST

ENTER SELECTION CRITERIA:

PRINT INPUT RECORDS (Y/N) ==> N
TRANSPONDER ID (2,9) ==> 2
SCC ID (A-ALL, S-SELECT) ==> A

DATE: FROM (YYMMDD) ==> 830618
TO (YYMMDD) ==> 830624

GTM TIME: FROM (HHMMSS) ==> 
TO (HHMMSS) ==> 

DISP CODES: FROM ==> 0 
TO ==> 0

CALL TYPES: FROM ==> 0 
TO ==> 15

PLOTTING INTERVAL (HORIZONTAL AXIS - D=DATE, T=TIME) ==> 

PRESS ENTER KEY TO SUBMIT JOB OR END KEY (PF3) TO EXIT

COMSYM GRAPHICS SYSTEM

GRAPH GENERATED BY D562271