"PRESENTING CAPACITY PLANNING REPORTS TO MANAGEMENT USING SAS SOFTWARE"

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1 ABSTRACT

This paper provides an overview of an Online System, "CAPLAN" designed at the Overseas Telecommunications Commission by the Capacity Planning group using SAS Software.

This Online system provides Managers, Computer Support, Data Centre, Systems programmers, Information Centre and Capacity Planning with graphs and reports related to the performance of the system, as well as workload analysis and forecast.

The whole system runs daily and is fully automated. It generates daily, weekly, monthly and historical graphs.

MERRILL's Software collects data from the RMF/SMF and builds Performance Databases.

Then using SAS/BASE(*) SAS/FSP(*) SAS/AF(*) and SAS/GRAPH(*) the information is retrieved and manipulated to create reports and graphs that can be accessed online by authorised users.

2 INTRODUCTION

At the Overseas Telecommunications Commission, Capacity Planning has been taken very seriously after experiencing a severe resource shortage with all its consequences, at the end of 1984.

Just like a lot of other shops, we have not planned, we have reacted. New equipment was ordered when deadlines were missed and the response time poor.

Finally, in January 1986, Capacity Planning was formalised, and a full time position created.

The newly appointed Capacity Planning Officer attended Computer Performance Measurement and Capacity Planning courses at which MERRILL's software was mentioned as being one of the best package building Performance Data Bases.

A three months evaluation of different Capacity Planning tools took place, and MERRILL's software was choses mainly because of its great flexibility and ease in providing reports and graphs using SAS software.

To be successful in Capacity Planning at least the following five capabilities are required:

a) Mechanism to establish and agree on Service levels.
   - Availability of system and subsystems.
   - Batch turnaround
   - Response time etc.

b) Measurement and analysis of:
   - Existing workload
   - Usage of Computer Systems
   - Are the service levels achieved?
   - Is the availability being met?

c) A means of Forecasting the future workload
   - By looking at the past
   - By interviewing users

d) A method of assessing future hardware requirements:
   - Do we have enough DASD, Channels etc.
   - Any recommendation to improve the performance of the current hardware?

e) The Daily tracking of the Actual workload
   - At the Business element level.
   - The volume and the resource consumed by those business elements.

Without any doubt, to cater for all those requirements, Capacity Planning requires co-operation and interaction between many parts of the organisation.

A monthly meeting was scheduled inviting all potential participants such as Data Centre Manager, Information Centre Manager, Quality Assurance, Systems Programmer etc. As a result, responsibilities were drafted and a list of reports and graphs to be provided by Capacity Planning on a daily, weekly, monthly basis was set up.

The number of reports and graphs was so numerous that an Online System was finally planned and designed in May 1986. That system was developed using SAS/AF(*) Software as the full-screen Manager. The application is written using BASE/SAS(*) system with SAS/FSP(*) and SAS/GRAPH(*). As it is fully automated, it also uses SAS Macro Language.
a) SYSTEMS PROGRAMMERS:

Are responsible for the tuning of the resources. Performance objectives are specified in the system is monitored to check whether those objectives are being met.

b) DATA CENTRE

Is responsible for the availability of the equipment and subsystems as well as production runs.

c) INFORMATION CENTRE:

Representing the End-user Community, the Information Centre educates and guides end-users accessing corporate data through 4GL languages like FOCUS, SAS, EPS etc. Daily tracking of heavy users.

d) BUSINESS PLANNERS

Are responsible for new computer systems being developed, and volume changes on existing systems.

e) DATA BASE ADMINISTRATION

Responsible for the usage and access of DB2.

f) DATA PROCESSING CO-ORDINATORS

Representing different sections of users and involve in Service Levels and Resource consumption.

g) STEERING COMMITTEE

Interested in Capacity Planning Analysis, two and five years forecast and Historical Analysis.

h) HARDWARE COMMITTEE

Involve in the purchase of new equipment. Interest in "WHAT IF" type of reports.

1) CAPACITY PLANNING

Finally, correlates all the information received by the sub-mentioned participants, estimates the growth in workload, converts the estimates to Capacity Requirements to ensure that the required equipment is purchased and installed just in time to cope with the increased workload.

4 CAPPLAN SYSTEM

The CAPPLAN system uses MERRILL's Expanded Guide to Computer Performance Evaluation using the SAS System (SAS/MXG) as the basis for the Capacity Planning System.

The system basically uses the approach detailed by MERRILL'S Software to automatically build Performance Databases on a daily, weekly cycle and to keep long term data in a historical file. Then by using BASE/SAS(*) and SAS/GRAPH(*), all the reports and graphs are generated (daily, weekly, monthly, historically). Information on users, business elements, and even description and location of printers is retrieved by accessing data files maintained by Information Centre or Systems Programming. A PROC FORMAT is fully automated using the powerful SAS Macro Language.

All the graphs are written to the graphic file for later Replay (using PROC GREPLAY in presentation mode). Reports which have been processed are also saved into a Report file for later PROC PRINT or PROC TABULATE. This pre-processing reduces considerably the time to get the result Online.

An option to get a hard-copy of any report is also available in the Online System. Multiple copies of monthly graphs are also sent each month to a Tektronix inkjet colour printer for specialised reports to executive management (using the GCOPIES option). Screen copies of a graph can be printed to an IBM inkjet colour graphic printer attached to a 3179 or 3192 type of terminal or through a PS 2.

4.1 THE PROCESSING CYCLE

A daily SMF/RMF file is created every day by a Started Task which is submitted by DUMPCTL at midnight by an automatic JES command. DUMPCTL is also invoked at IPL to ensure that the Started Task was run at midnight. If the machine shut down prior to midnight, DUMPCTL at next IPL, will ensure correct SMF processing.
Once the daily SMF data file is created, the Started Task submits to the internal reader the Capacity Planning Job (CPLANA) after checking that the SMF data is correct.

If an error has been detected, a Job named CPLANF is submitted instead which will issue a message to the operator's console and set a NOGO status in the CONTROL file to prevent any uncontrolled processing from occurring within the CAPLAN system. If no error detected, the normal CPLAN job is submitted (BUILDDAY).

The first step (DAIREQ) copies all the daily graphs into the appropriate day interrogating the CONTROL file (MON through SUN).

The second step (BUILDPDB) creates all the daily performance Databases from the SMF/RMF daily file. This is done by MERRILL's codes adapted to the requirements of OTC.

The last step (BUILDOTC) will automatically submit jobs for daily, weekly and/or monthly processing depending on the status of the CONTROL file. All the reports and graphs are also submitted by BUILDOTC.

An automatic backup will be issued at recognition of an end of month process.

End of month is by far the longest run of the System as it generates all the monthly reports and graphs as well as a full analysis on workload and some Capacity Planning result such as the CPU.

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5 ACCESSING THE SYSTEM ONLINE

Access to the Online System is through a CLIST invocation, the user simply types %CAPLAN and follows the instructions on the menus.

Graphics terminals (3279, 3179G or 3192G), Colour terminals (3179 or 3278) or monochrome terminals (327x) can be used to access the CAPLAN system. This is made possible by the use of a generalised device driver in the GOPTIONS when the graphs were created.

After checking the authorisation access defined to RACF, required files are automatically allocated, the SAS system is called and the SAS/AF(*) main menu is displayed on the screen as follows:

Options 1 through to 4 are mainly performance related type of graphs and reports.
Daily, weekly, monthly and historical graphs/reports are available. An option to get the 6 previous days or 5 previous weeks is also given.

Options 5 through 7 displays reports and graphs related to a specific section.

Option 8 is the CPE Starter Set available from SAS Institute.

Option 9 reports the consumption in CPU time, number of transactions etc., from division level to its business element.

Option 99 gives help and online documentation.

For each option further instructions are available from background help screens and Computer Based Training panels provided by SAS/AF.

6 GRAPH/REPORTS AVAILABLE

Most of the graphs and reports are available on daily, weekly, monthly or historical basis. Daily graphs are represented on an hour by hour basis. Weekly graphs are on a day by day basis. Monthly graphs on a day to day basis, excluding weekends and public holidays, and averaging the PEAK period only. The historical graphs, similar to the Monthly graphs but on a month by month basis, start from March 1985.

Most of the graphs have trend and objectives lines drawn.

OPTION 1. MVS - VM - TSO
- Percentage CPU busy (Total Problem Program-OVHD)
- Breakup of PP busy (CICS-TSO-BATCH-DB2)
- Average activity
- TSO trivial response time
- Maximum and Average TSO users
- Maximum Total Swap and Demand Paging
- TSO transaction count
- Terminal Analysis by session
- Cartridge mounts (3480)
- Problem Program and MIX activity
- TSO TOTAL and TRIVIAL response time.
- Print time for system printers
- TSO users versus Paging
- Batch turnaround by shift and class
- Lines printed by remote printers
- Total space allocated/used on DASD
- Lines printed by system printers per month.

OPTION 2. CICS (options for different CICS regions)
- Number of transactions
- CICS transaction MIX
- Average response time less than 5.5 secs.
- Average response time greater than 5.5 secs.
- Transaction ID greater than 5.5 secs.
- CPU time (System-transaction-Total)
- Paging
- Number of CICS tasks
- Program Compressions
- Detailed daily report on transactions with response time greater than 5.5 secs.

OPTION 3. NETWORK
- Channel activity by LU and PU. (Max and Average)

OPTION 4. DB2 (currently being designed)

OPTION 5. INFORMATION CENTRE (mainly reports)
- Users exceeding a given number of KSU's
- Jobs waiting more than 3 minutes on resources
- Users of 4GL such as SAS - FOCUS - EPS - QMF
- Facility to browse daily and weekly JOBS datasets
- TSO utilisation in CPU second by User day by day
- Option to print any of the above reports

OPTION 6. DATA CENTRE
- Availability System:
  Data Centre Manager fully responsible of the subsystems availability (CICS-TSO-DB2) by setting up start and finish times of subsystems for any given day.

  This allows:
- Browsing the existing times
- Changing the availability of subsystems
- Report on TSO or CICS availability
- Daily Batch turnaround report (by shift and class)
- DASD report by volume (end of month picture)
- Reason code for IPL (Down time by reason code)
- Daily production runs.
- Option to print any of above reports
OPTION 7. CAPACITY PLANNING (Mainly monthly reports/graphs)
- PEAK CUP busy day by day.
- Capacity Analysis on the CPU
- CPU growth and life expectation
- CPU projection in MIPS for 2 years (Actual vs Projected)
- CPU projection in MIPS for 5 years.
- OTC CPU history and forecast
- OTC DASD usage history and forecast.

OPTION 8. CPE STARTER SET (Available from SAS Institute)

OPTION 9. WORKLOAD
- CPU usage by major systems.
- TSO transactions by major systems.
- CPU - SUS - Transaction by shift
- Workload by Division, Group and Function
- Workload by business element (account)

The following will issue a tabulation:
- Multiple choice Statistics (PROC TABULATE)

OPTION 99. ONLINE HELP AND DOCUMENTATION
1. How to make a selection and move around screens.
2. A helpful series of diagrams of CAPLAN menus
3. A diagramatic listing of programs, menus, reports
4. Written documentation of CAPLAN system
5. Printout of programs and menus codes
6. Catalog listing of all menus and reports.

7 SAMPLE REPORTS AND GRAPHS
1. DAILY CPU BUSY BREAKUP BY HOUR.
2. DAILY CPU BUSY FOR CPU PROGRAM BY HOUR.
3. DAILY TSO TRANSACTION COUNT BY HOUR.
4. DAILY AVERAGE ACTIVITY PER HOUR (STC-BATCH-TSO).
5. DAILY RESPONSE TIME GT 5.5 SECS FOR CICSPROD BY TRANSID.
6. DAILY NUMBER OF CICS TRANSACTIONS BY HOURS.
7. DAILY REPORT ON CICSPROD TRANSACTION WITH RT GT 5.5 SECS.
8. DAILY REPORT ON USERS EXCEEDING 1350 KSU.
9. DAILY REPORT ON TSO SESSIONS USING 4GL BY USERS.
10. WEEKLY TSO TRANSACTION COUNT BY DAY.
11. WEEKLY CPU BUSY BREAKUP FOR CPU PROGRAM BY DAY.
12. WEEKLY REPORT ON CPU TIME FOR TSO BY USER BY DAY.

13. MONTHLY PRINT TIME IN HOUR FOR THE TWO SYSTEM PRINTERS BY DAY.
14. MONTHLY USAGE OF REMOTE PRINTERS BY DEVICE.
15. MONTHLY TSO TRANSACTION COUNT BY DAY.
16. MONTHLY BATCH TURNAROUND BY SHIFT AND JOB CLASS.
17. MONTHLY DASD USAGE BY VOLUME (SPACE FREE AND USED) IN MB.
18. HISTORICAL TSO TRANSACTION COUNT BY MONTH FROM AUGUST 1986.
19. HISTORICAL AVERAGE CPU BUSY AT PEAK FROM MARCH 1985.
21. MONTHLY CAPACITY PLANNING REPORT ON THE CPU.
22. MONTHLY CPU UTILISATION IN MIPS (ACTUAL AGAINST PROJECTED).
23. WORKLOAD ANALYSIS: CPU, CPU AND TRANSACTION BY MAJOR GROUPS.
24. WORKLOAD ANALYSIS: CPU TIME FOR DIVISION TECHNOLOGY BY DAY.
CPU CAPACITY PLANNING
FOR THE MONTH OF JULY 1987

RESOURCE: CPU
CURRENT USE: 63%
CAPACITY LIMIT: 85%
CAPACITY ALARM: 70%
GROWTH POTENTIAL: 36%
FORECAST 1 YEAR: 45%
ESTIMATED LIFE: 9 MONTHS

REFERENCES
MERRILL, H.W. "BARRY"

CPE Starter Set

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