

## Three Advanced Data Management Techniques

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You can customize and submit MVS JCL batch jobs and monitor their execution from an easy to use control screen using SAS/AF software without ever seeing JCL.

In the Online Budget system at United Airlines, The Cargo Revenue Management analyst enters the CLIST member "ONBUD" at the TSO READY prompt to invoke the SAS system with an AUTOEXEC file that starts up SAS/AF software and displays the Budget Control screen. It is a PROGRAM entry with an extended table populated by an external file of job names:

	Help	Bye	Reset
Job name	Action	Status	
-----	-----	-----	
3. CRFRT			
4. ADDLY			
5. PLANOB		Running	
6. PRINTOB			

Screen 1: Budget Control

### *Variable Substitution in the JCL*

The analyst types SUB next to a jobname on this screen and presses Return. The Program screen executes a CALL DISPLAY statement for the name of the corresponding SCL entry, which performs SCL variable substitution into the JCL inside a SUBMIT block, which puts the JCL into the preview buffer, and it is not submitted to the SAS word scanner, but rather, it is written to an external file. Then the SCL program calls the host system to SUBMIT the external file to the internal reader:

```
/* planob.scl */
length jobid $ 7;
length mon yr py cy fy $ 2;
entry jobname $ 8 userid $ 7
      month 8 year 8;
init: control asis;
main: return;
term: /* get substitution values: */
      mon = put(month, 2.);
      if year = 0 then pyear = 99;
      else pyear = year - 1;
      py = put(pyear, Z2.);
submit;
```

```
//UOB JOB (00000000),'&userid'
//* step to mark job as "running"
// EXEC SAS6
//UA DD DSN=C.A.S,DISP=SHR
//PLN DD DSN=C.P.PLAN&py,
//      DISP=SHR
//* lots of other filerefs here
//SYSIN DD *
  %let jobname=&jobname;
// DD DSN=C.P.SAS(PLANO),
//      DISP=SHR
// DD DSN=C.P.S(C),DISP=SHR
endsubmit;
rc = filename('jcl',
              '.jcl',',',lrecl=80');
rc = preview('FILE', 'JCL');
rc = preview('CLEAR');
rc = filename('JCL', '');
rc = SYSTEM("SUBMIT JCL");
return;
```

### ***Resource Locking***

Access to the Budget Control screen is controlled by BUZZLOCK Software, a SAS/AF application that controls concurrent access to resources. You may wonder what would happen if two users try to access this screen at the same time, such that both are trying to submit jobs. In this situation, BUZZLOCK software displays a message:

Warning: Resource BUDGET  
locked by NX91141.

Enter END to try again or  
CANCEL to exit.

Screen 2: BUZZLOCK message

Now, when the PLANO job is submitted, the Base SAS code sets up the input data sets and the SCL entry is invoked to open them. For each record on the point of sale file, the routing is determined, if possible, and the revenue allocated to each leg in the routing by mileage. The CALL DISPLAY statement invokes the SCL entry from within the Base SAS job, where multiple SAS data sets are open for concurrent processing:

```
PROC DISPLAY
```

```
  C=UA.BUD.OB.SCL; RUN;
```

### ***Fast Lookups***

WHERE and FETCH statements determine possible routings from the key city and connection data sets. Rather than read the output data set for every leg in a routing, the 700 direct flight origin-destination pairs and mileage values are read into arrays:

```

/* Here is some code that beats
WHERE -FETCH lookups by
loading a lookup data set into
arrays. Values of ORIGDEST
are two cities of a lane segment.
Find the distance between them:
*/
lanecnt = 0;
length mi1-mi999 8; /* miles */
length od1-od999 $ 6; /* org-dst */
array mi(999) mi1-mi999;
array od(999) $ od1-od999;

/* Arrays loaded by read routine */
/* which sets lanecnt. */

/* Get miles for lane segment */
/* that is specified in origdest: */
found = 0;
if lanecnt = 0 then return;
else do;
  H = lanecnt+1; /* high index */
  L = 1; /* low index */
end;
do while(not found);
  M = INT((L+H) / 2);
  if origdest = od(M) then do;
    if M ne L then L = M;
    else return;
  end;
  else if origdest < od(M) then do;
    if M ne H then H = M;
    else return;
  end;
  else do;
    miles = mi(M);
    found = 1;
  end;
end;
end;

```

The application was written with version 6.09 of SAS® and SAS/AF® Software under the MVS operating system.

### **Conclusion**

The SAS/AF program screen gives analysts ease of use and control over batch job submission without having to mess with JCL. The SCL entry executed by PROC DISPLAY can access multiple SAS data sets dynamically. The SCL array with a binary search provides fast table lookup.

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