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ATB Financial

Grid Computing – The Basics

Points to Cover:

Benefits of Grid Computing

Server Environment

Program Components

The ‘actual’ code

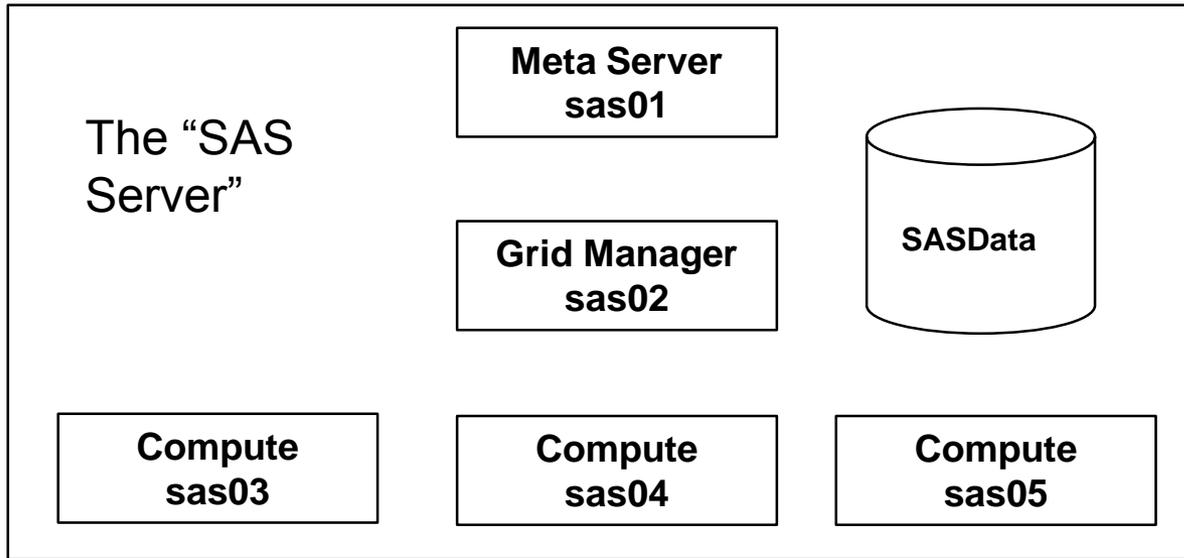
Review the log(s)

Benefits of Grid Computing:

- higher productivity
- run SAS jobs asynchronously
- Grid Manager does all the ‘hard’ work
- readily schedule jobs ‘off’ hours

Server Environment

EG6.1 & Base
SAS (connect)



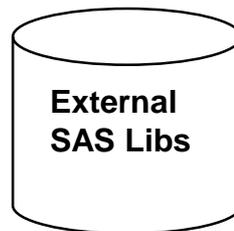
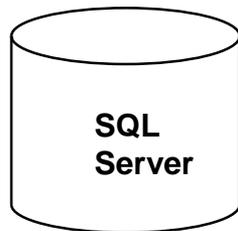
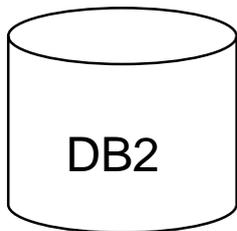
5 node server

Microsoft Server
2012 R2

15 TB server storage

768GB total memory
(256GB / compute server)

General Parallel File
System (GPFS)



Program Tasks:

- activate the grid manager
- create 'remote' sessions (signon)
- specify selection criteria (%syslput)
- submit jobs
 - connect to data repositories
 - process data based on selection criteria
- wait for jobs to complete
- end remote sessions (signoff)

Parameters to pass to each grid session:

- Input or 'source' data location
- Output or 'target' data location
- Criteria or 'data selection'
- 'main' program

The Problem

Create a monthly summary of average balance by product class over the last 3 months (need to process millions of records 'quickly')

Use the SAS grid manager to asynchronously run 3 remote sessions – each session to extract and process 1 month of data.

What's needed:

- connect script to access DB2 data warehouse (2 schema & 3 tables)
- libname for permanent SAS dataset (STAGING)
- start and end dates for Jan 2016, Dec 2015 and Nov 2015
- 'main' SAS program

DB2 connect script & Staging libname assignment reside in COMMON directory

Use the %SYSLPUT statement to pass date parameters to each remote session

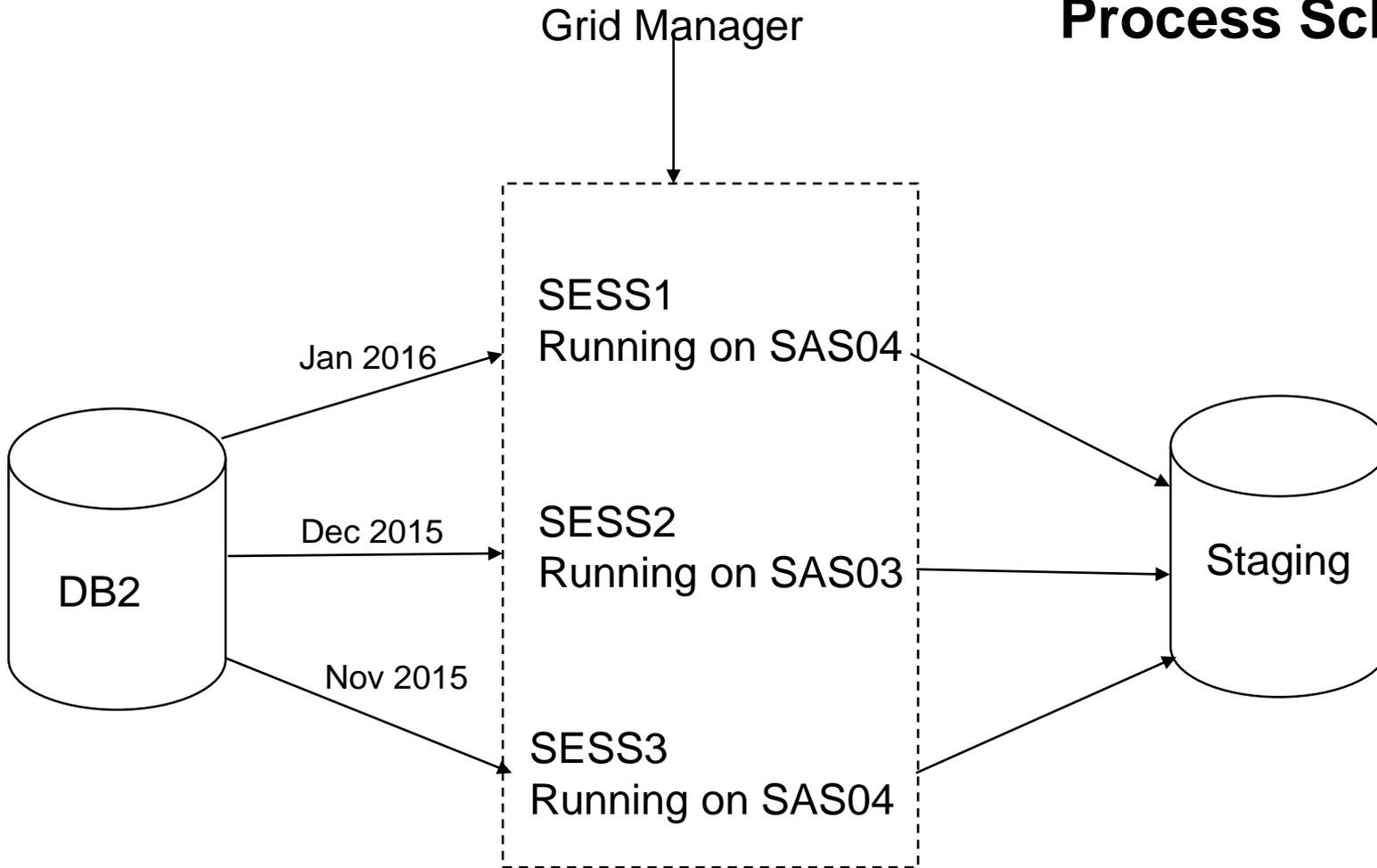
%SYSLPUT Statement

Creates a single macro variable in the server session or copies a specified group of macro variables to the server session.

Form 1: %SYSLPUT macro-variable=value </REMOTE=server-ID>;

Form 2: %SYSLPUT _ALL_ | _AUTOMATIC_ | _GLOBAL_ | _LOCAL_ | _USER_
</LIKE='character-string'><REMOTE=server-ID>;

Process Schematic



Each remote session is independent with a unique WORK directory

```
*** Simplistic grid enabled program *** ;
```

```
**** start the grid manager **** ;
```

```
%let rc = %sysfunc(grdsvc_enable(_all_, resource=SASApp));
```

```
**** create the remote sessions **** ;
```

```
signon sess1 signonwait=yes connectwait=no ;
```

```
signon sess2 signonwait=yes connectwait=no ;
```

```
signon sess3 signonwait=yes connectwait=no ;
```

```
run ;
```

```
**** specify date criteria **** ;
```

```
%syslput startdt = '01jan2016'd / remote=sess1;
```

```
%syslput enddt = '31jan2016'd / remote=sess1;
```

```
%syslput startdt = '01dec2015'd / remote=sess2;
```

```
%syslput enddt = '31dec2015'd / remote=sess2;
```

```
%syslput startdt = '01nov2015'd / remote=sess3;
```

```
%syslput enddt = '30nov2015'd / remote=sess3;
```

```
run ;
```

Initial Log for signon and %syslput statements

```
801 %let rc = %sysfunc(grdsvc_enable(_all_, resource=SASApp));
```

```
802 signon sess1 signonwait=yes connectwait=no ;
```

```
NOTE: Remote session ID SESS1 will use the grid service _ALL_.
```

```
NOTE: SIGNON request submitted to grid as job ID '99623'.
```

```
NOTE: SIGNON request completed to grid host 'app-p-sas04.atb.ab.com'.
```

```
803 signon sess2 signonwait=yes connectwait=no ;
```

```
NOTE: Remote session ID SESS2 will use the grid service _ALL_.
```

```
NOTE: SIGNON request submitted to grid as job ID '99624'.
```

```
NOTE: SIGNON request completed to grid host 'app-p-sas03.atb.ab.com'.
```

```
804 signon sess3 signonwait=yes connectwait=no ;
```

```
NOTE: Remote session ID SESS3 will use the grid service _ALL_.
```

```
NOTE: SIGNON request submitted to grid as job ID '99625'.
```

```
NOTE: SIGNON request completed to grid host 'app-p-sas04.atb.ab.com'.
```

```
806 %syslput startdt = '01jan2016'd / remote=sess1;
```

```
807 %syslput enddt = '31jan2016'd / remote=sess1;
```

```
808 %syslput startdt = '01dec2015'd / remote=sess2;
```

```
809 %syslput enddt = '31dec2015'd / remote=sess2;
```

```
810 %syslput startdt = '01nov2015'd / remote=sess3;
```

```
811 %syslput enddt = '30nov2015'd / remote=sess3;
```

```
812 run ;
```

```

**** “main” program is a macro ****;

%macro rollup(job) ;

rsubmit &job ;
filename common "G:\SASData\teams\ADA\00Pgm\common"
;
%inc common(logonihub) ; /* DB2 connect script */
%inc common(stdlibs) ; /* STAGING libname */
run ;

data _null_ ;
  call symput('yymm',put(&enddt,yymmn4.)) ;
run ;

proc sql ;
create table account_rollup_&yymm as
select
  c.prod_grp_desc_lg as product_class,
  max(a.cal_day) as mth_end_dt,
  count(a.cal_day) as days,
  mean(a.bal) as avg_mth_bal
from
  SOC.SOC_ACCOUNT_ENDING_DAY_BAL_PRD_V as a,
  SOC.SOC_ACCOUNT_SCD_V as b,
  DMC.DMC_PRODUCT_DIM_T1_V as c
where
  a.acct_oid = b.acct_oid
and b.prod_fk = c.prod
and b.curr_versn_flg = 'Y'
and a.cal_day between &startdt and &enddt
/* and a.acct_oid = (?????????) test only */
group by 1
;
quit ;

```

```

proc copy
  in=work
  out=staging
;
select
  account_rollup_&yymm
;
run ;

endrsubmit ;
run ;

%mend rollup ;
;

```

```
**** submit the jobs **** ;
%rollup(sess1)
%rollup(sess2)
%rollup(sess3)

**** wait for all jobs to finish **** ;
waitfor _all_ sess1 sess2 sess3 ;

**** combine outputs & make a report **** ;
data final_rpt ;
  set
    staging.account_rollup_1511
    staging.account_rollup_1512
    staging.account_rollup_1601
  ;
run ;

proc print data=final_rpt ;
run ;

**** end the remote sessions **** ;
signoff sess1 ;
signoff sess2 ;
signoff sess3 ;
```

Log after jobs submitted

NOTE: Remote submit to REMHOST commencing.

249 %rollup(sess1)

NOTE: Background remote submit to SESS1 in progress.

250 %rollup(sess2)

NOTE: Background remote submit to SESS2 in progress.

251 %rollup(sess3)

NOTE: Background remote submit to SESS3 in progress.

252 **** wait for ALL jobs to complete - then proceed ***** ;

253 waitfor _all_ sess1 sess2 sess3 ;

254 run ;

255 **** combine files and print a report **** ;

256 data final_rpt ;

257 set

258 staging.account_rollup_1511

259 staging.account_rollup_1512

260 staging.account_rollup_1601

261 ;

262 run ;

NOTE: There were 4 observations read from the data set STAGING.ACCOUNT_ROLLUP_1511.

NOTE: There were 4 observations read from the data set STAGING.ACCOUNT_ROLLUP_1512.

NOTE: There were 4 observations read from the data set STAGING.ACCOUNT_ROLLUP_1601.

NOTE: The data set WORK.FINAL_RPT has 12 observations and 4 variables.

263 proc sort data=final_rpt ;

264 by product_class mth_end_dt ;

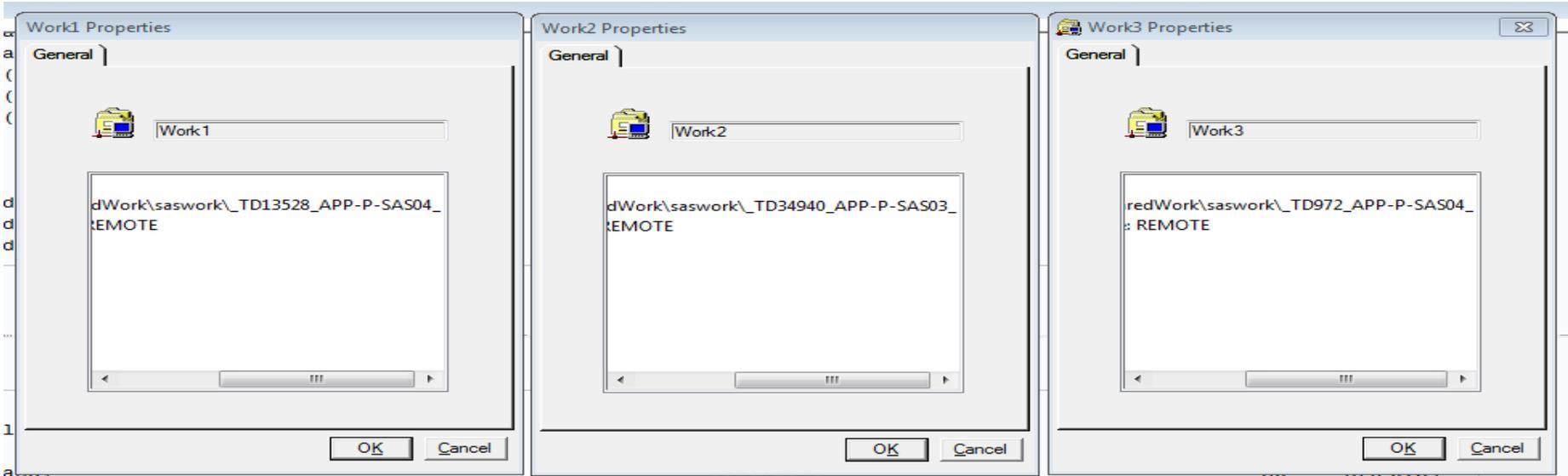
265 proc print data=final_rpt ;

266 title "Avg Balance Report" ;

267 run ;

NOTE: There were 12 observations read from the data set WORK.FINAL_RPT.

Work library allocation



Final Report

Obs	product_class	mth_end_ dt	days	avg_mth_ bal
1	HELOC (Loans)	30NOV2015	30	43420.54
2	HELOC (Loans)	31DEC2015	31	43348.21
3	HELOC (Loans)	31JAN2016	31	43330.85
4	Mortgage (Loans)	30NOV2015	30	47510.65
5	Mortgage (Loans)	31DEC2015	31	47139.19
6	Mortgage (Loans)	31JAN2016	31	46692.20
7	Personal	30NOV2015	30	1135.89
8	Personal	31DEC2015	31	1969.72
9	Personal	31JAN2016	31	899.34
10	Registered	30NOV2015	60	2783.86
11	Registered	31DEC2015	62	2783.86
12	Registered	31JAN2016	62	2783.86

Log for ROLLUP(sess1) after signoff

NOTE: Remote submit to SESS1 commencing.

ROLLUP JOB sess1

1 filename common "G:\SASData\teams\ADA\00Pgm\common";

2 %inc common(logonihub);

NOTE: Libref DMC was successfully assigned as follows:

Engine: DB2

Physical Name: IHUBPRD1

NOTE: Libref SOC was successfully assigned as follows:

Engine: DB2

Physical Name: IHUBPRD1

165 %inc common(stdlibs);

NOTE: Libref STAGING was successfully assigned as follows:

Engine: V9

Physical Name: G:\SASData\teams\ADA\data\staging

171 run;

172 data _null_;

173 call symput('yymm',put(&enddt,yymmn4.));

174 run;

176 proc sql;

177 create table account_rollup_&yymm as select c.prod_grp_desc_lg as product_class, max(a.cal_day) as mth_end_dt,

177! count(a.cal_day) as days, mean(a.bal) as avg_mth_bal from SOC.SOC_ACCOUNT_ENDING_DAY_BAL_PRD_V as a, SOC.SOC_ACCOUNT_SCD_V as

177! b, DMC.DMC_PRODUCT_DIM_T1_V as c where a.acct_oid = b.acct_oid and b.prod_fk = c.prod and b.curr_versn_flg = 'Y' and a.cal_day

177! between &startdt and &enddt and acct_oid in (?????????) group by 1;

NOTE: Table WORK.ACCOUNT_ROLLUP_1601 created, with 4 rows and 4 columns.

NOTE: PROCEDURE SQL used (Total process time):

real time 0.09 seconds

cpu time 0.01 seconds

179 proc copy in=work out=staging;

180 select account_rollup_&yymm;

NOTE: Copying WORK.ACCOUNT_ROLLUP_1601 to STAGING.ACCOUNT_ROLLUP_1601 (memtype=DATA).

NOTE: There were 4 observations read from the data set WORK.ACCOUNT_ROLLUP_1601.

Review:

- Input (Source) data
- Output (target)
- criteria
- 'main' program

Next steps:

Grid computing can be applied to:

- 'stable routine' large scale applications
- repeatable processing (monte-carlo, modelling)

Move 'grid' programs to the SAS Scheduling manager