# When Performance/Capacity Becomes a Performance/Capacity Issue

**Or**

**The Emperor has no Clothes**

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# Caveat

- The opinions expressed herein are the author's alone and do not necessarily in whole or in part reflect the views of any company with which said author may be associated

# Some History - 1983

- MVS/XA Arrives – wow – 24 bit addressing
  - And there are probably still 16 bit applications running
- MXG arrives soon thereafter
- DB2 is still years away
- MIPS are measured in 1 or 2 digits

# Some History - 1998

- OS/390
- WLM has arrived
- 40 GB of SMF data to process is described by Barry Merrill and Chuck Hopf at SHARE in Anaheim
- DB2 is beginning to be the big dog in the SMF world
- MIPS are 3 digits

# Finally – 2011

- zOS v12 is being installed
- DB2 is running rampant
- CICS is dwindling?
- 40 GB is perhaps an hour or less at some large shops
- Both CICS and DB2 SMF data can be compressed
- MIPS are now 5 digits topping out over 50000

- Thus spake CME (now EWCP)
- For 30 years there has been an ongoing struggle to process all of the data available within a reasonable time frame
- It has now reached the point where for some shops, SMF post-processing runs 7X24!!!
- If there is a failure along the way catching up is ugly

# Enough!

# An Example

- A relatively small shop
- 2098-T04
- 2 LPARs – 1 is the 'sandbox' with very little activity
- In a single day – 17GB of SMF data

# The SMF Data

| SMF ID / SUBTYPE | TOTAL | # RECORDS | | % RECS | | BYTES % BYTES | |
|---|---|---|---|---|---|---|---|
| 6.000 | | 1129 | | 0.01 | | 606K | 0.00 |
| 21.000 | | 3580 | | 0.03 | | 307K | 0.00 |
| 26.000 | | 25033 | | 0.23 | | 10M | 0.06 |
| 30.001 | | 25032 | | 0.23 | | 9M | 0.05 |
| 30.002 | | 28915 | | 0.26 | | 86M | 0.48 |
| 30.003 | | 97268 | | 0.88 | | 128M | 0.71 |
| 30.004 | | 98009 | | 0.89 | | 132M | 0.73 |
| 30.005 | | 25078 | | 0.23 | | 48M | 0.27 |
| 30.006 | | 1585 | | 0.01 | | 1572K | 0.01 |
| 70.001 | | 192 | | 0.00 | | 736K | 0.00 |
| 71.001 | | 192 | | 0.00 | | 355K | 0.00 |
| 72.003 | | 19968 | | 0.18 | | 25M | 0.14 |
| 72.004 | | 192 | | 0.00 | | 3620K | 0.02 |
| 73.001 | | 192 | | 0.00 | | 3797K | 0.02 |
| 74.001 | | 1824 | | 0.02 | | 54M | 0.30 |
| 74.002 | | 96 | | 0.00 | | 796K | 0.00 |
| 74.005 | | 3648 | | 0.03 | | 70M | 0.39 |
| 74.008 | | 96 | | 0.00 | | 846K | 0.00 |
| 75.001 | | 1248 | | 0.01 | | 321K | 0.00 |
| 77.001 | | 96 | | 0.00 | | 44K | 0.00 |
| 78.003 | | 96 | | 0.00 | | 1221K | 0.01 |
| 100.000 | | 384 | | 0.00 | | 916K | 0.00 |
| 100.001 | | 384 | | 0.00 | | 1821K | 0.01 |
| 100.002 | | 384 | | 0.00 | | 278K | 0.00 |
| 100.004 | | 384 | | 0.00 | | 197K | 0.00 |
| 101.000 | | 4370062 | | 39.54 | | 9409M | 51.98 |
| 101.001 | | 4367326 | | 39.52 | | 3274M | 18.09 |
| 102.105 | | 2642 | | 0.02 | | 5555K | 0.03 |
| 102.106 | | 384 | | 0.00 | | 1065K | 0.01 |
| 102.172 | | 538 | | 0.00 | | 689K | 0.00 |
| 102.191 | | 2 | | 0.00 | | 1372 | 0.00 |
| 102.196 | | 3 | | 0.00 | | 1848 | 0.00 |
| 102.258 | | 1437 | | 0.01 | | 378K | 0.00 |
| 102.337 | | 1 | | 0.00 | | 562 | 0.00 |
| 110.001 | | 110411 | | 1.00 | | 3375M | 18.65 |
| 110.002 | | 41516 | | 0.38 | | 331M | 1.83 |
| TOTAL | | 11051464 | | 100.00 | | 17G | 100.00 |

# SMF Records



Percent of SMF Records by Type of Data
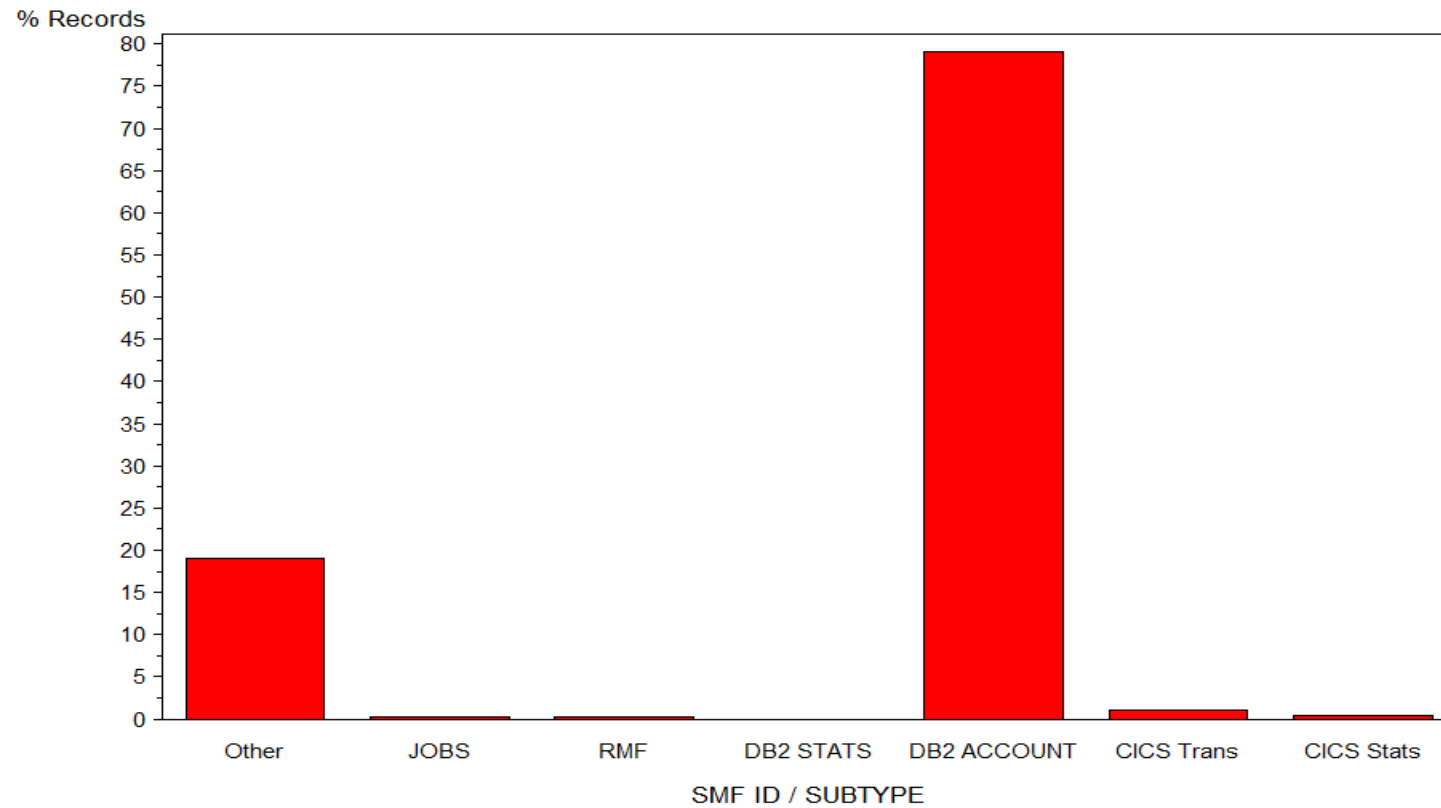
# SMF Bytes



Percent of SMF Records by Type of Data
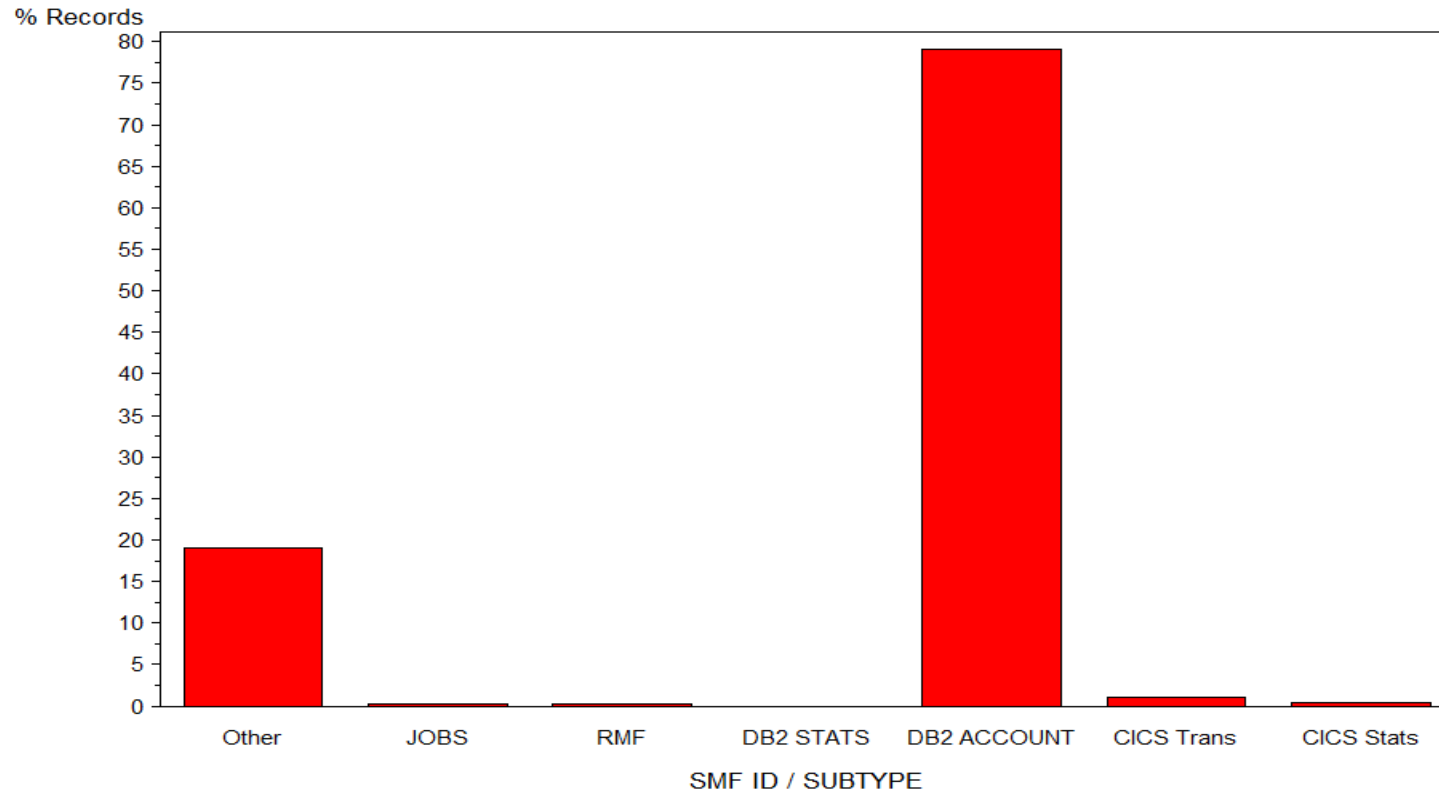
# Daily Post-Processing

| Job | CPU Time | Elapsed Time | EXCP |
|---|---|---|---|
| Base PDB | 4.76 | 9.50 | 64513 |
| DB2/CICS | 44.99 | 102.20 | 1641472 |
| Reports | 1.57 | 3.30 | 31112 |

Three production jobs to process data
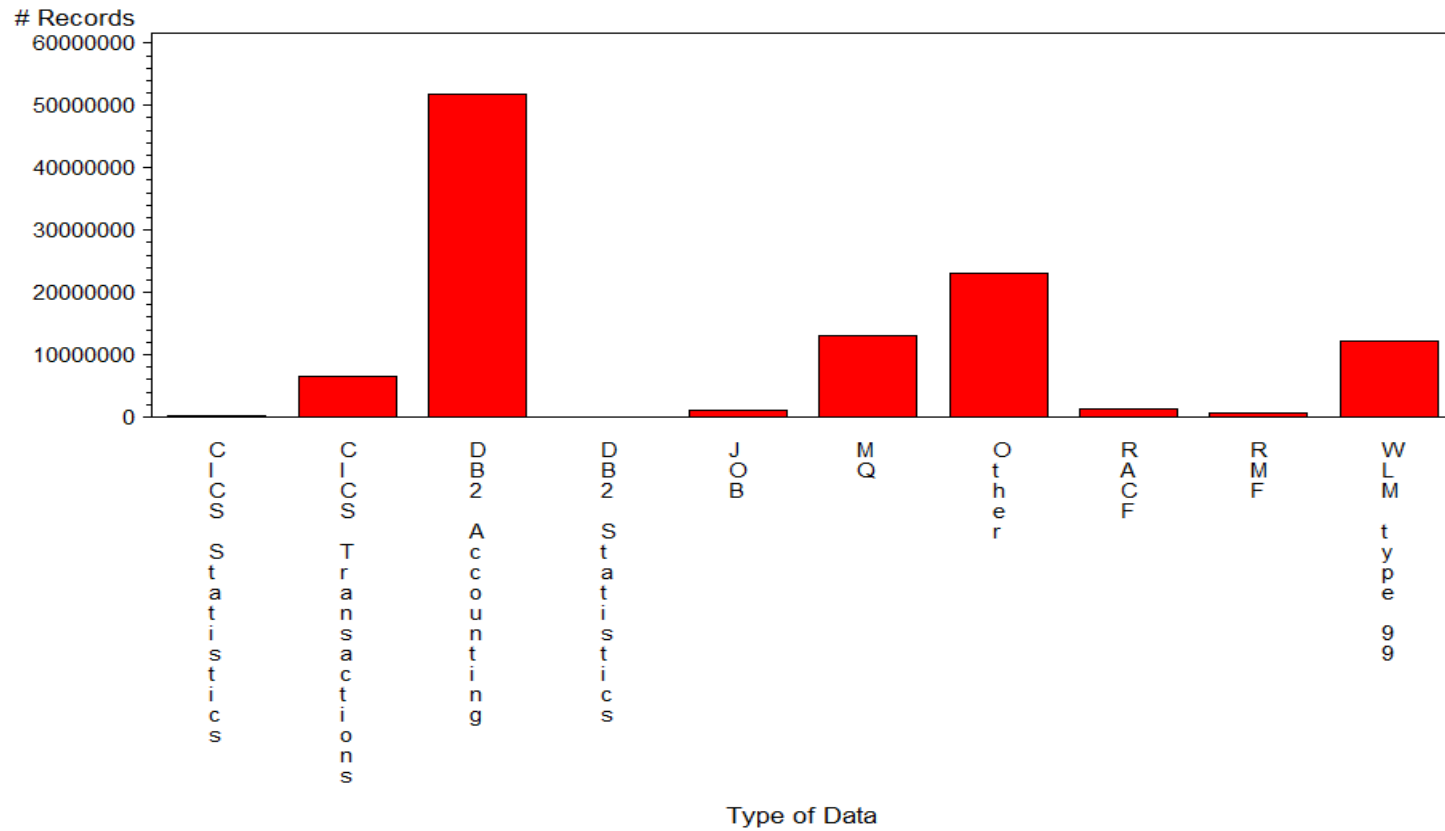Begin at 5AM normally finish about 6:30

# A Larger Shop

| Type of Data | # records | % Records | # Bytes | % Bytes |
|---|---|---|---|---|
| CICS Statistics | 205522 | 0.19 | 4383M | 1.07 |
| CICS Transactions | 6487774 | 5.93 | 203G | 50.69 |
| DB2 Accounting | 51722487 | 47.28 | 85G | 21.32 |
| DB2 Statistics | 3 | 0 | 6K | 0 |
| JOB | 981079 | 0.9 | 3411M | 0.83 |
| MQ | 12962363 | 11.85 | 67G | 16.74 |
| Other | 22972431 | 21 | 17G | 4.48 |
| RACF | 1231262 | 1.13 | 321M | 0.08 |
| RMF | 590654 | 0.54 | 8321M | 2.02 |
| WLM type 99 | 12234117 | 11.18 | 11G | 2.77 |
| Total | 109387692 | 100 | 401G | 100 |

# A Larger Shop



**Large Site SMF Distribution**

# A Larger Shop

## Large Site SMF Distribution



Bytes of Data

| | |
|---|---|
| 279G | |
| 186G | |
| 93G | |
| 0 | |

Type of Data: CICS Statistics, CICS Transactions, DB2 Accounting, DB2 Statistics, JOB, MQ, Other, RACF, RMF, WLM type 99
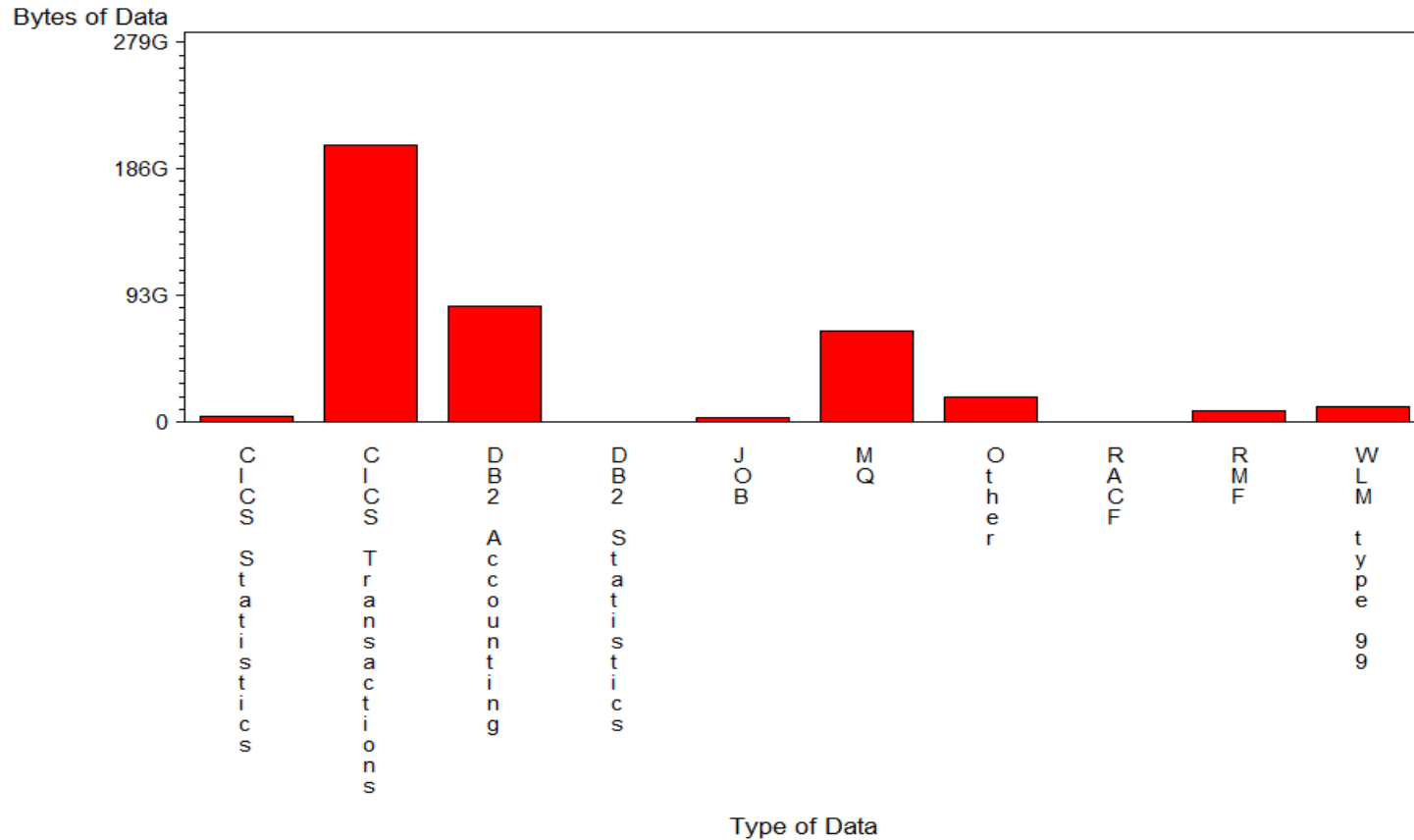
# Testing Some Options

- Test 1 – Baseline – process all data
- Test 2 – Suppress processing of CICS data
- Test 3 – Suppress processing of DB2 data
- Test 4 – Suppress processing of type 74 data
- Test 5 – Suppress DB2 and CICS
- Test 6 -  Suppress DB2, CICS, and type 74
- Test 7 -  Suppress processing of DB2 accounting data – type 101
- Test 8 – Suppress processing of DB2 acctg and CICS transaction data
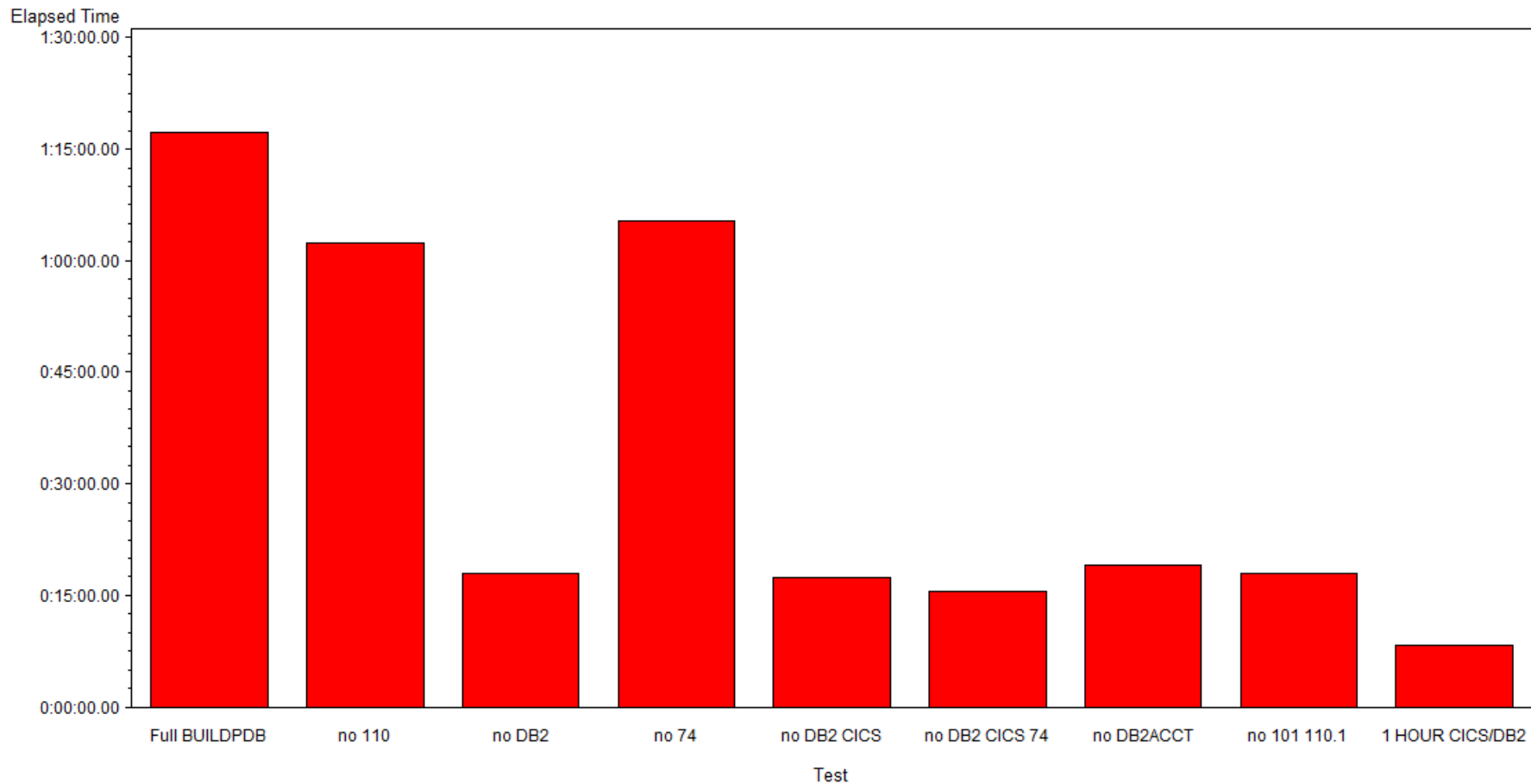- Test 9 – extract 1 hour of CICS and DB2 transaction data

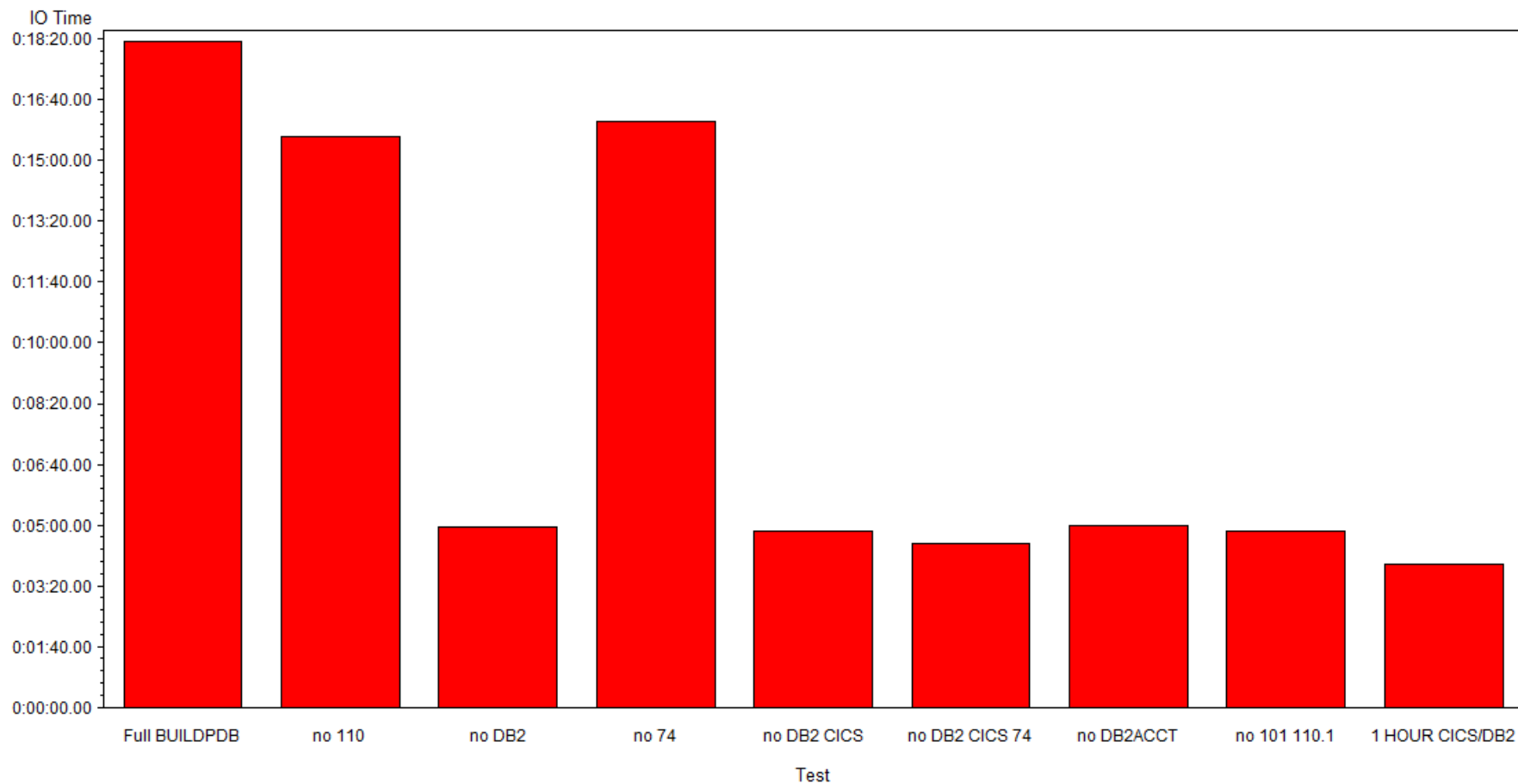# CPU Time per Test



Tests Run
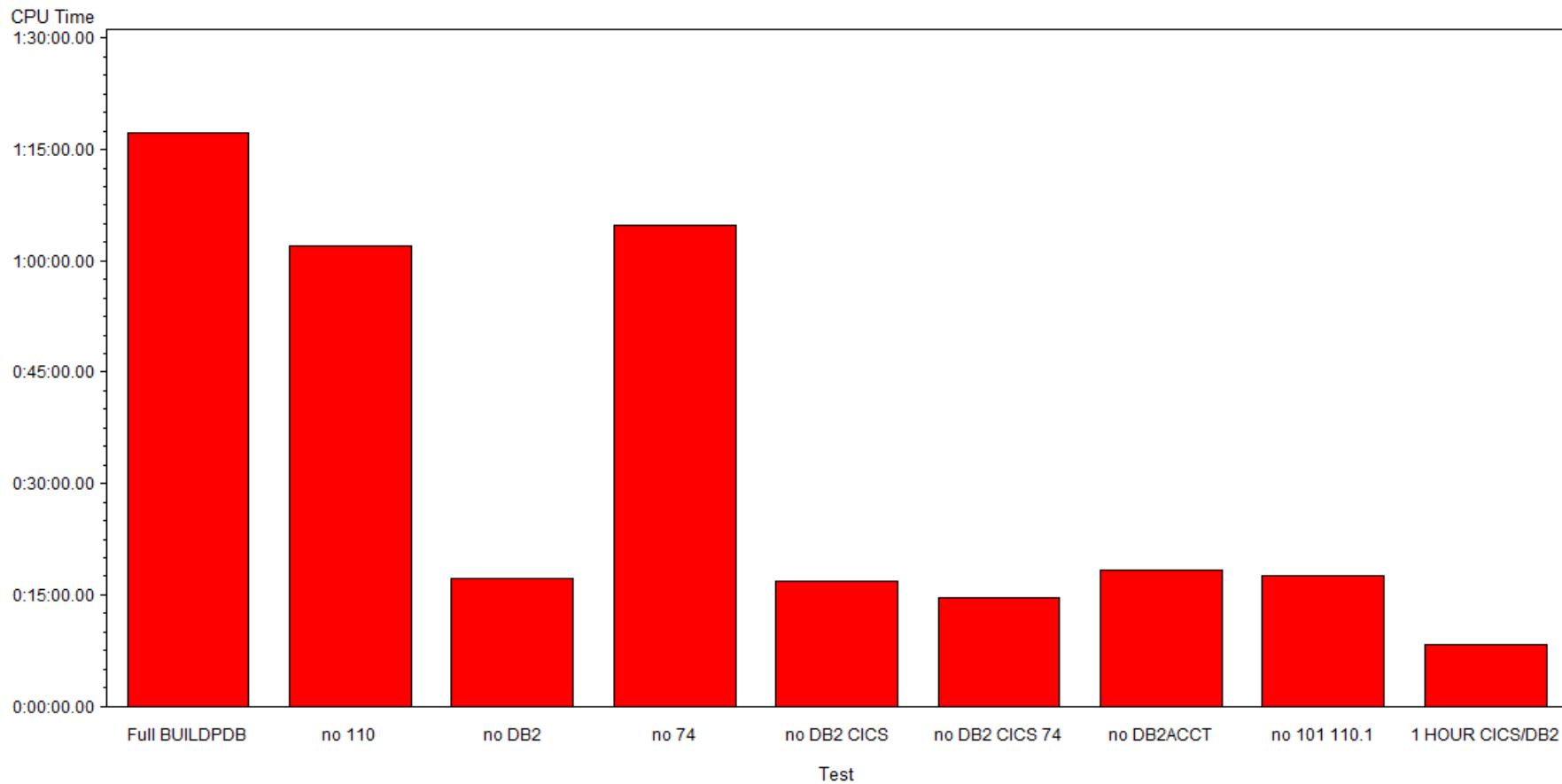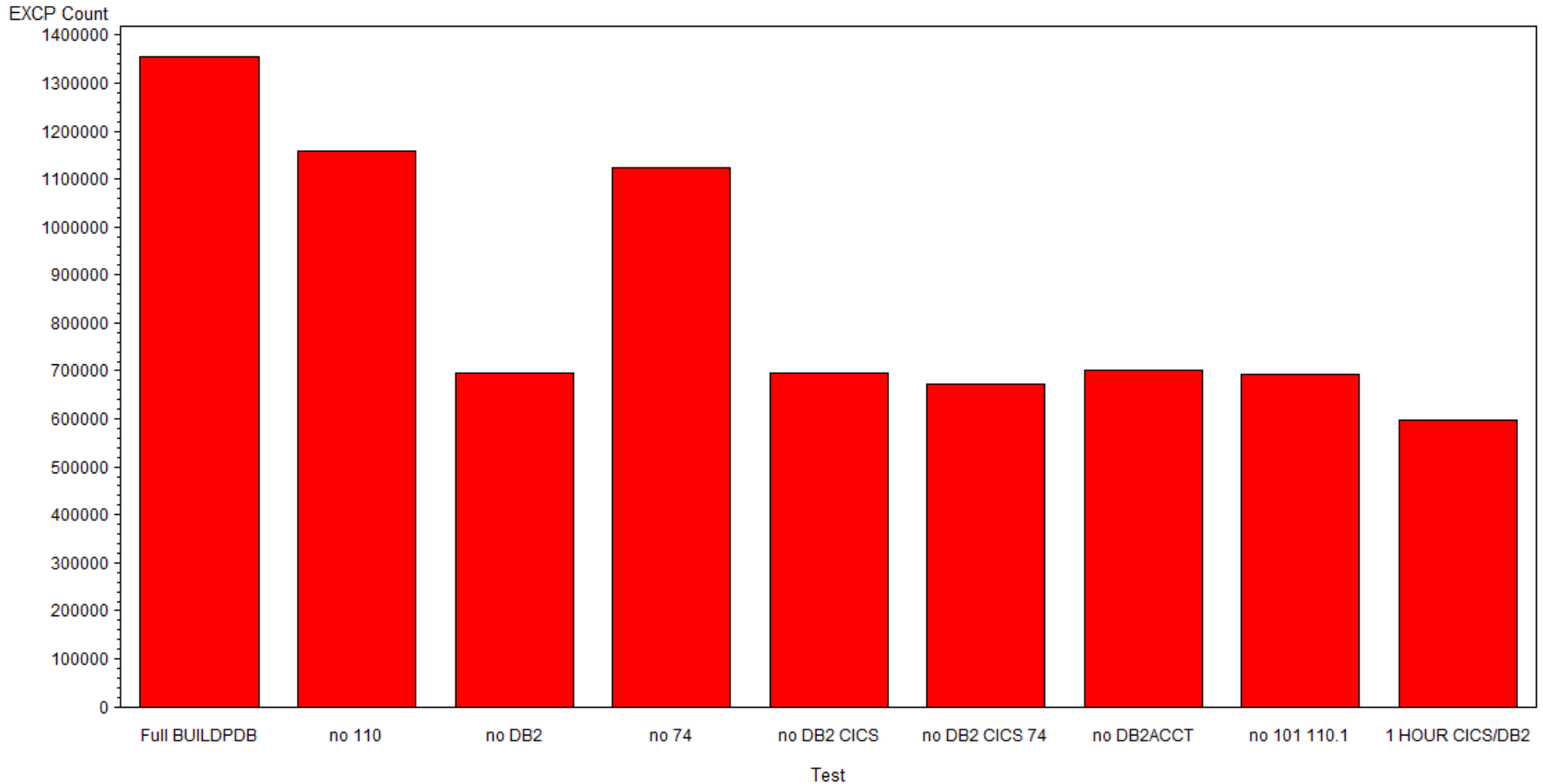
# Elapsed Time

# IO Time

# EXCP Counts



**Tests Run**

# And What Does it Mean?

- If DB2 is 80% of the data, it will likely be 80% of the processing time.  Same for CICS.
- CICS and DB2 statistics are miniscule in terms of processing time
- Type 74 may be larger in shops with 10s of thousands of devices – this is not one and the type 74 data really does not matter here
- Shop does not run MQ and that can also be large
- Best run time eliminates the processing of CICS and DB2 transaction data

# So how do we fix it?

- It depends…
  - There are three kinds of data here (in my mind)
    - Accounting – if you are doing detailed chargeback or have a group of surly auditors this can be all encompassing
    - Tactical – data needed for problem solving
    - Strategic – data for longer range planning

# Accounting Data

- Types 6 26 30
- Possibly DB2 accounting and CICS transaction data
- Possibly HSM data and DCOLLECT data
- Possibly tape management data
- If there is detailed chargeback this may need to be retained for long periods

# Tactical Data

- May encompass most of the accounting data
- RMF
- Tape Mount Monitor
- Other monitors

# Strategic Data

- All of the above but highly summarized with only the variables that are needed
  - Week and shift (If shift is important)
  - Some variables may archaic – anyone still have a 3350 or a 3380?  EXCP counts for those devices are fundamentally useless since they don't translate well and are almost certainly missing in any case

# What Are the Options?

- Forego the processing of DB2 and CICS transaction data every day but process as needed for problem solving

- Just as it was in 1998, one option is to split the data into bite sized pieces for processing in separate tasks though some of the bites are fairly huge

- Also now an option to 'outsource' the processing of SMF data to a UNIX or Windows platform

# Option 1 – No DB2/CICS/MQ

- If detailed chargeback is being done – not an option

- Reporting of transaction volumes, CPU consumption, response time can (in some cases) be done from RMF type 72
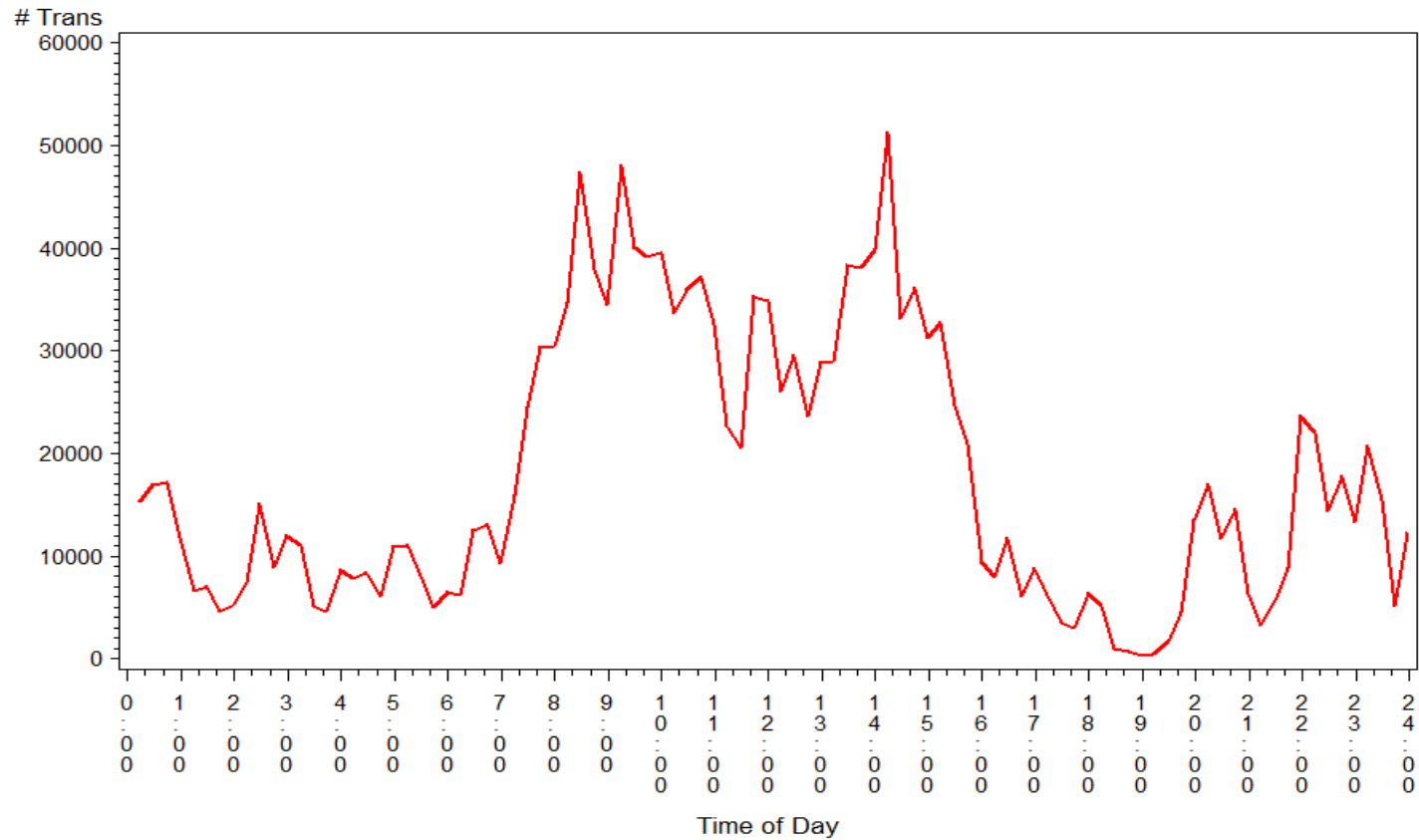
# Reporting for DDF

- Report granularity is dependent on how well (or badly) the queries are identified

- USERID (QWHCAID) may not be adequate

- PLAN (QWHCPLN) will always be something like DISTSERV

- Developers may not want to take the time to properly identify the work

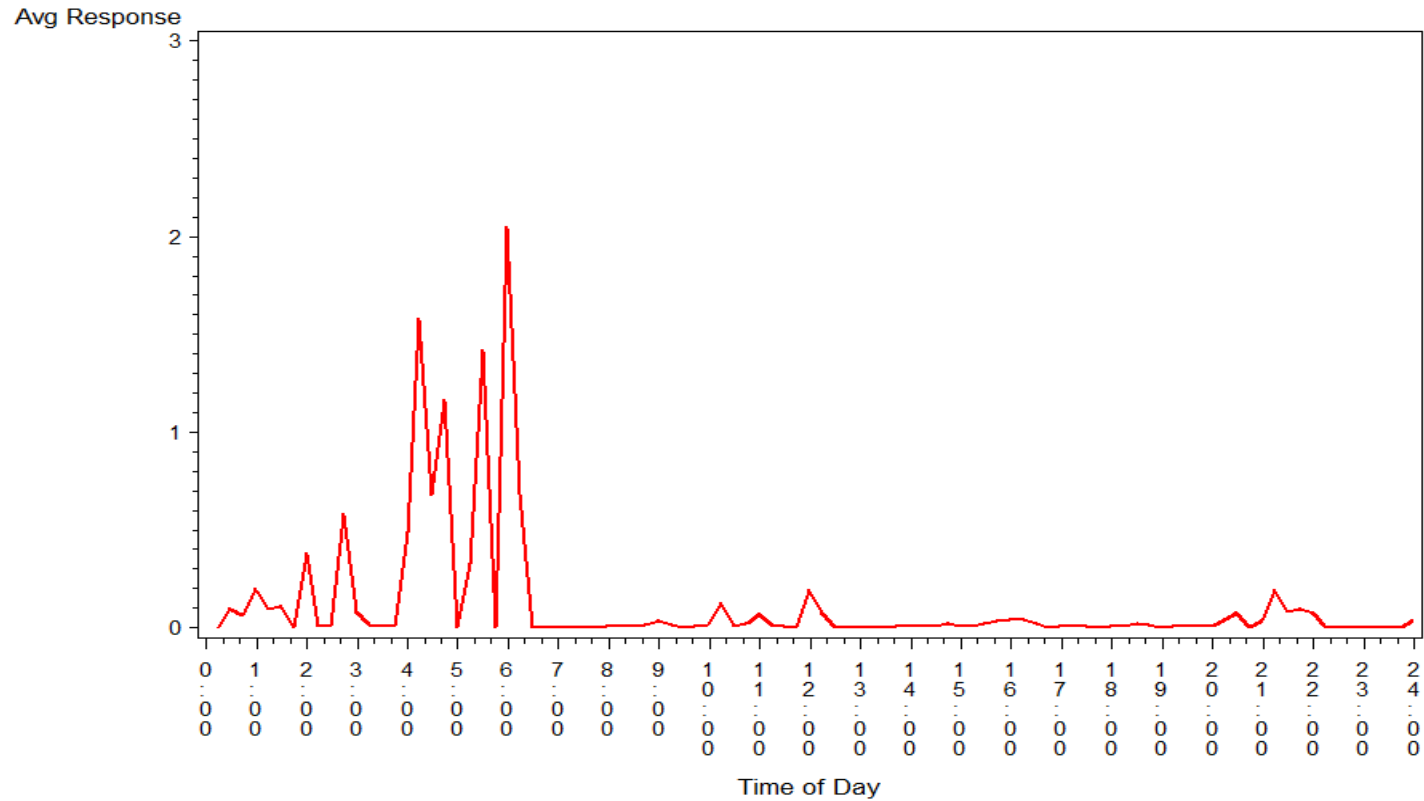- WLM only sees the first action for a query
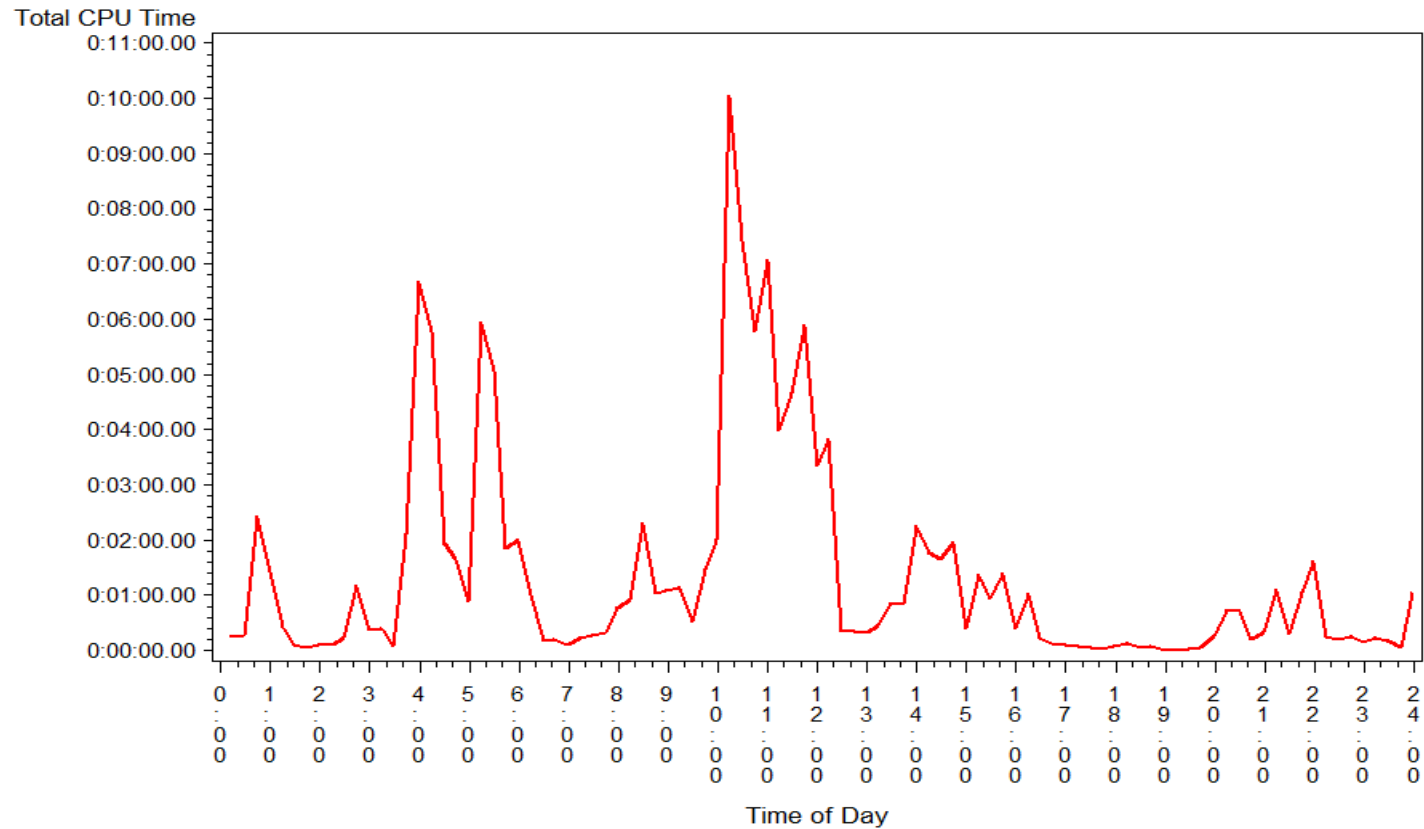
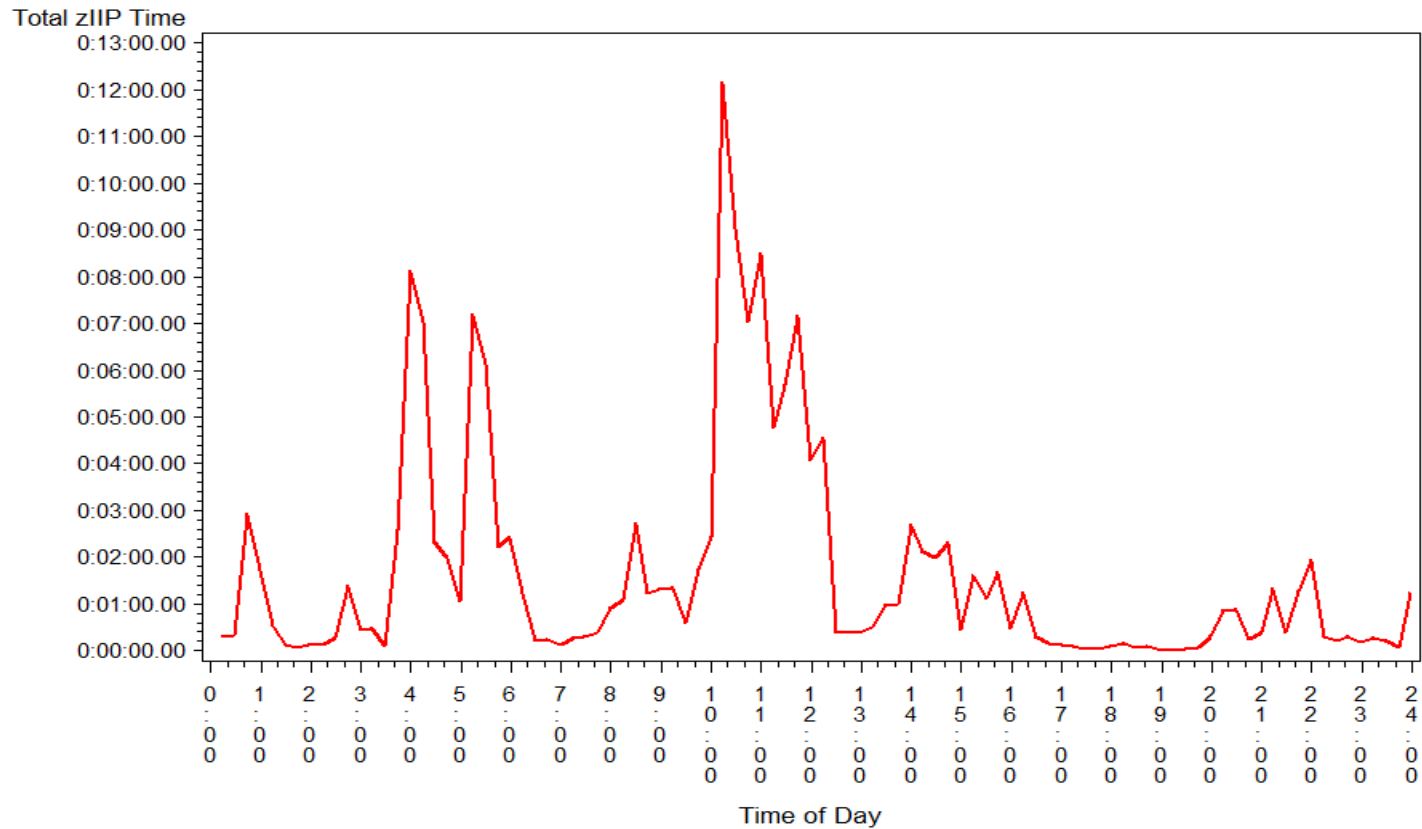# DDF Reporting



DDF Resource Consumption

# DDF Reporting

# DDF Reporting

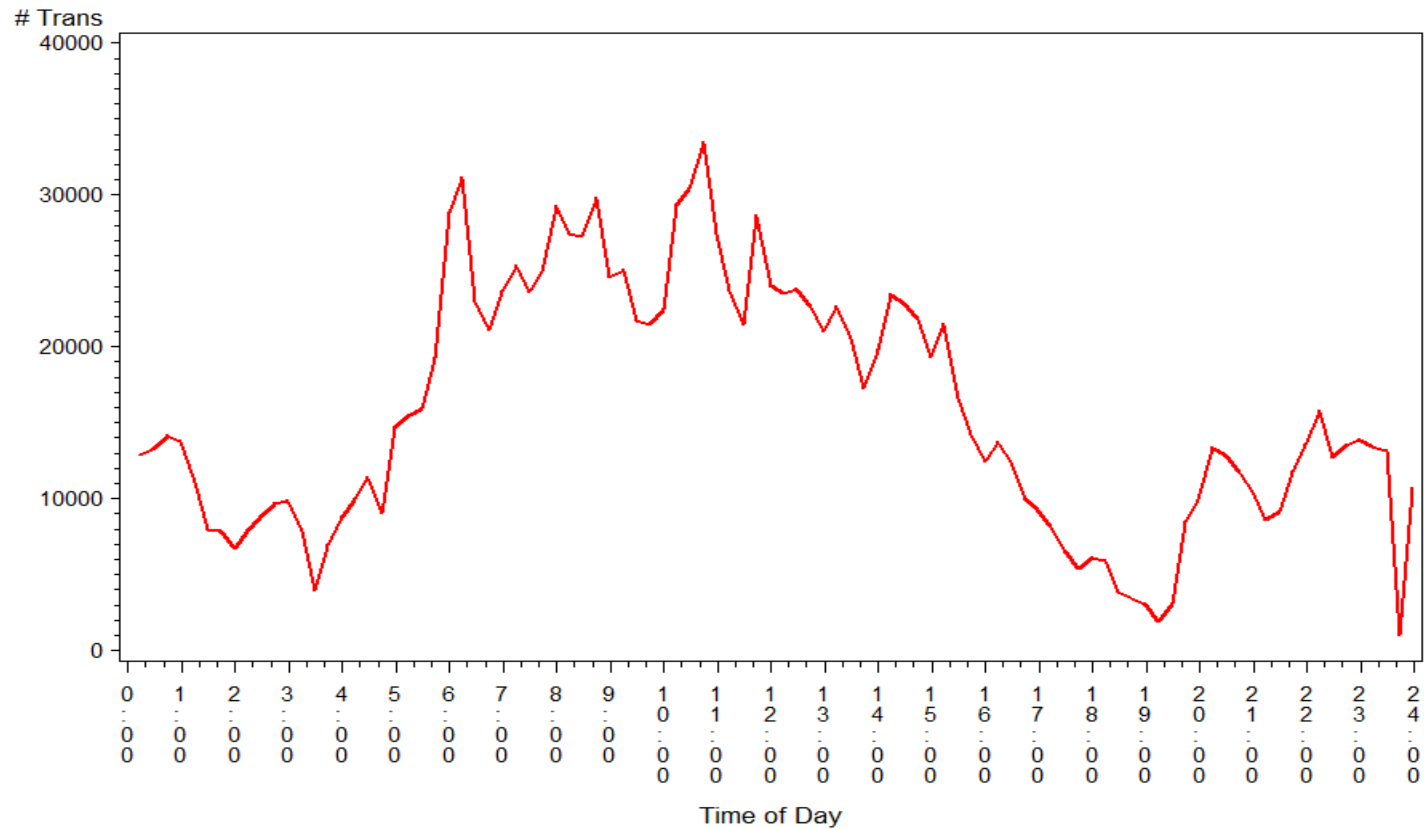# DDF Reporting



DDF Resource Consumption

# CICS Reporting

- If response time goals are being used, something similar to DDF can be done by breaking the transactions down into report classes

- CPU time must come from the base service class since it does not exist in the transaction report classes

- Transaction count and response time from the base service class have to be ignored

# CICS Reporting

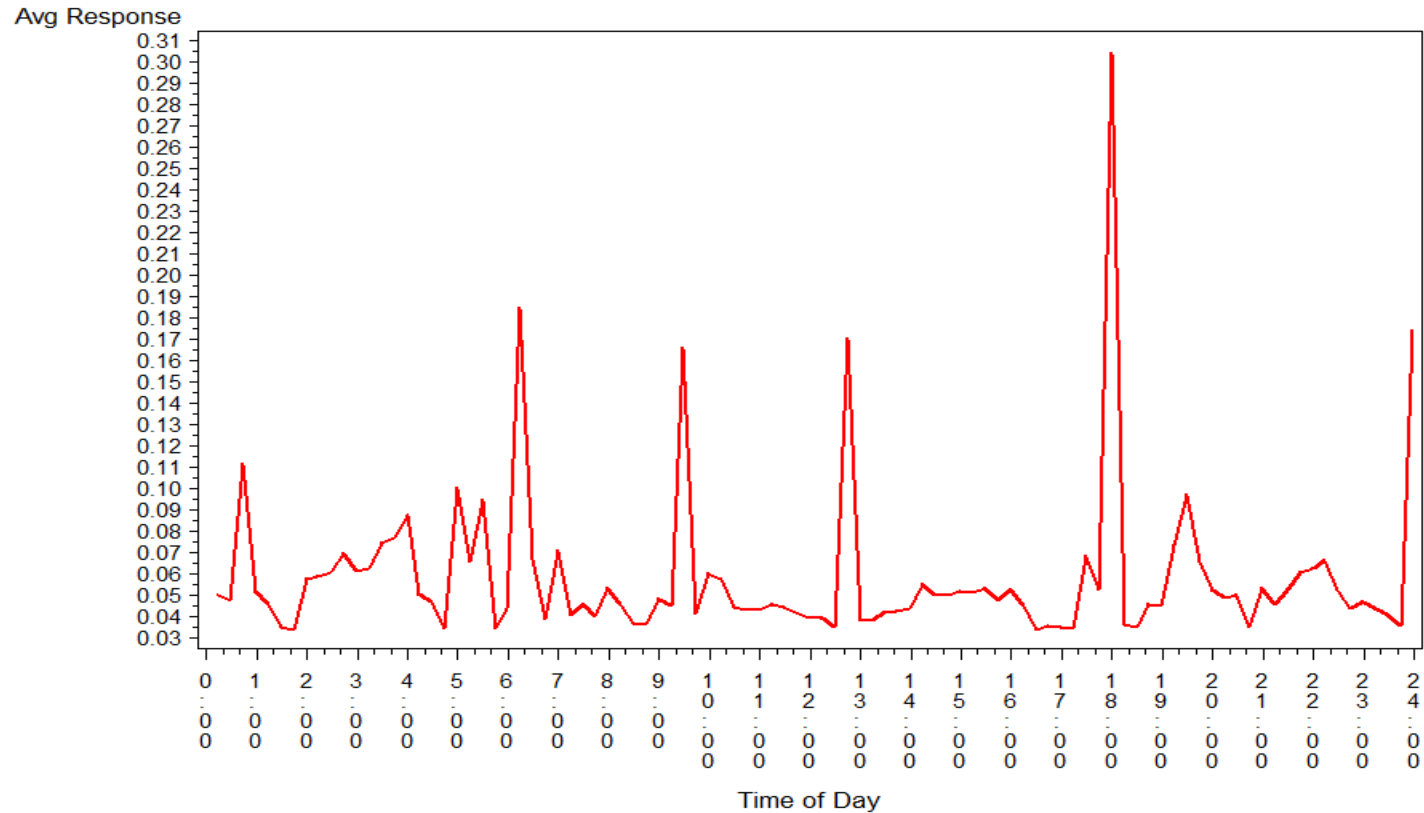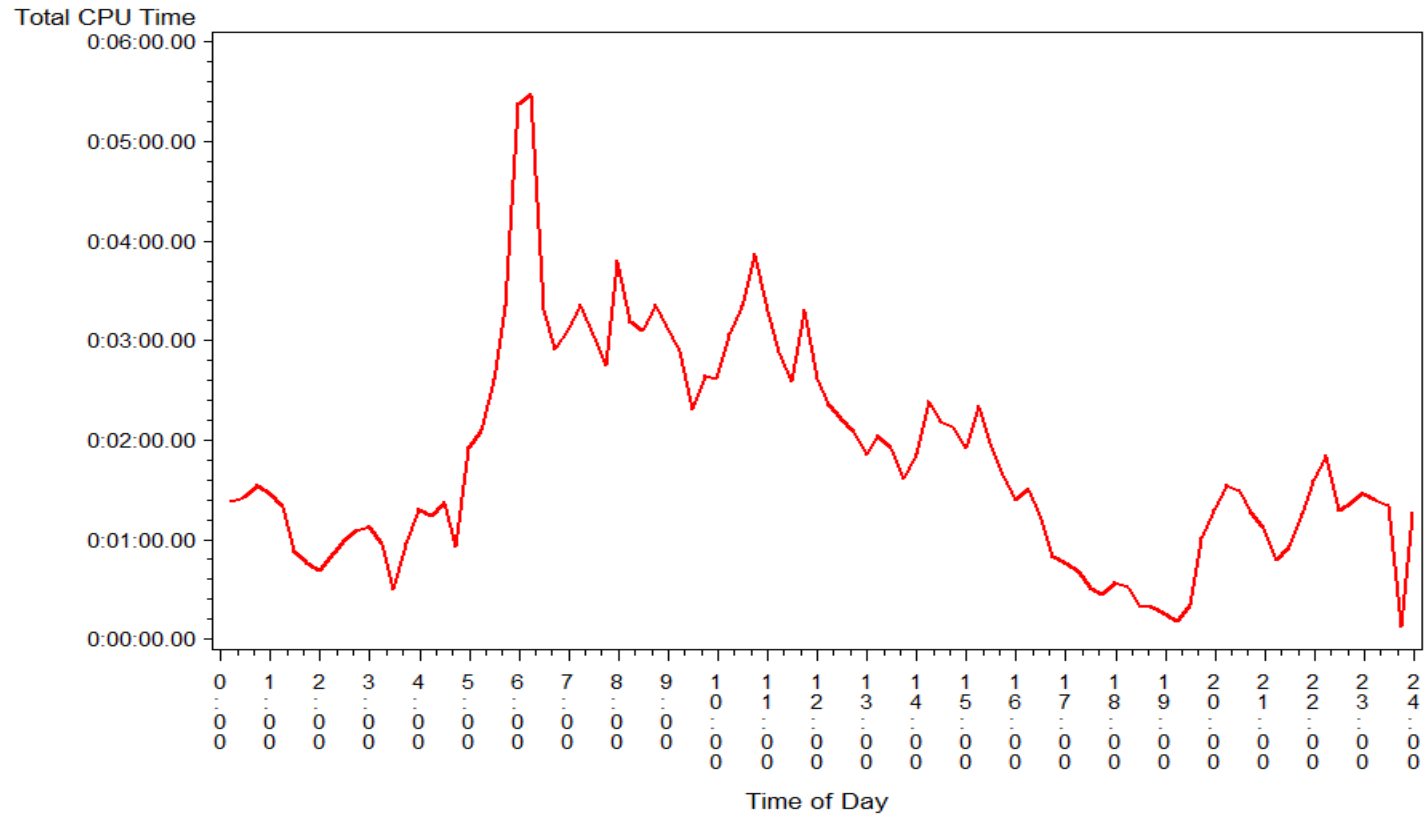

CICS Resource Consumption

# CICS Reporting



CICS Resource Consumption

# CICS Reporting

# CICS Reporting

## CICS Resource Consumption

Total zIIP Time
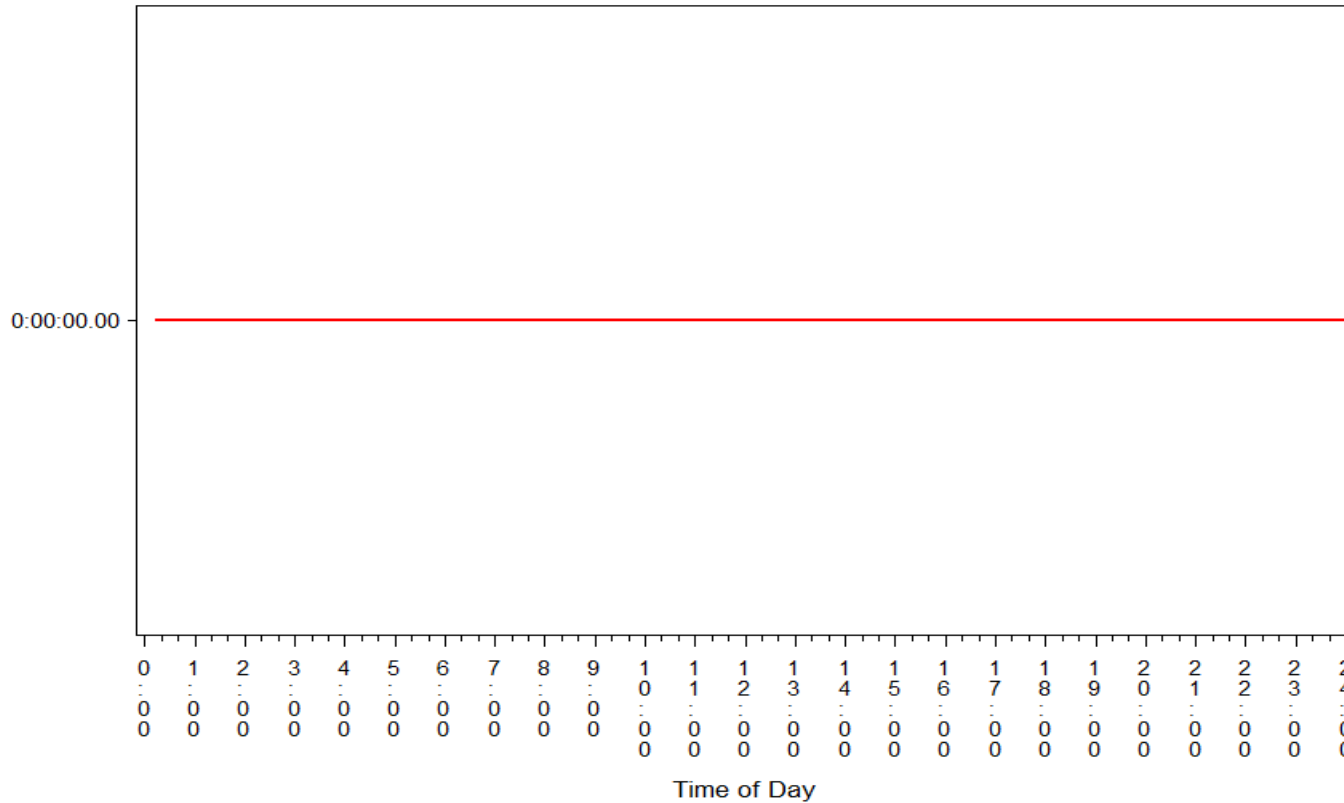
0:00:00.00

Time of Day
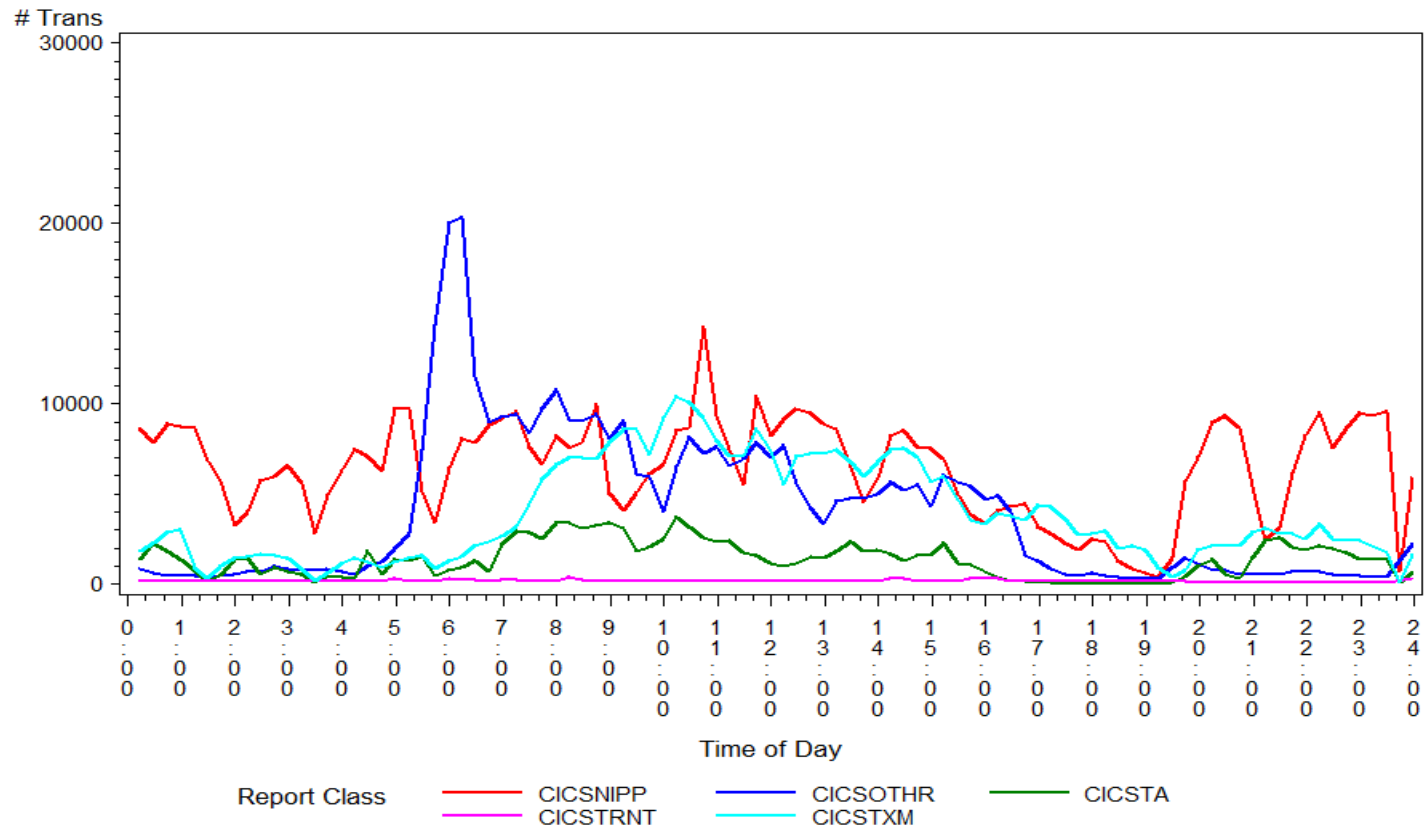
# CICS Reporting



CICS Resource Consumption

# CICS Reporting
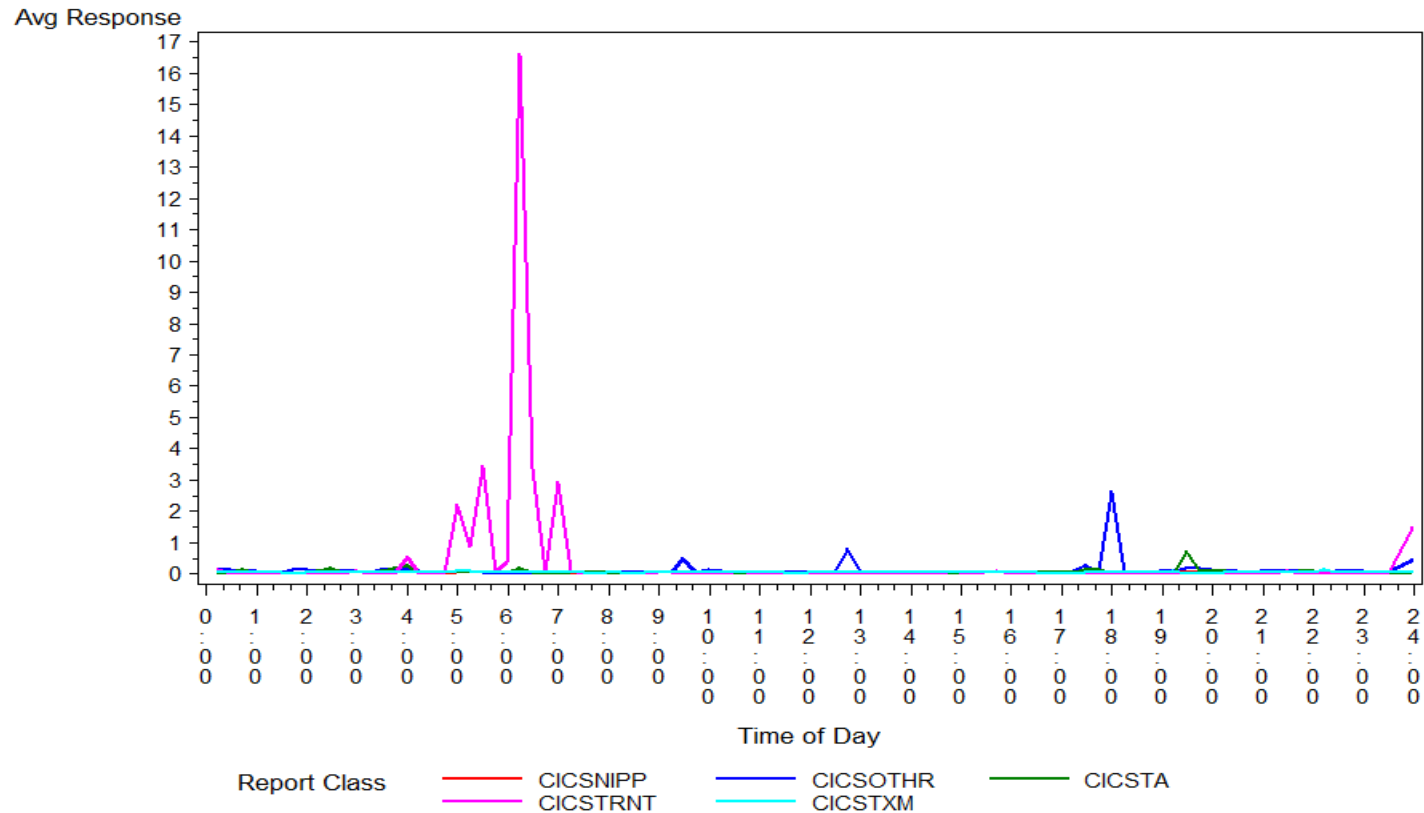
# What about planning?

- Report classes can be as granular as may be needed but in the case of CICS, CPU time will not be captured at the transaction level
    - Sample 1 hour per day to build a baseline?
    - 1 hour of CICS and DB2 can be extracted and processed relatively quickly (test 9)
    - Use the samples to project CPU by transaction

# What about other stuff?

- DB2 – will most likely be batch, DDF, or CICS
  - Batch will be in the type 30 but the DB2 time and resources will not be seperated
  - DDF is covered
  - CICS like batch will not have the DB2 resources broken out except in the samples taken
- Other work will be in the TYPE 72 data as it is now

# Option 2 – Divide and Conquer

- Starting with MXG 29.04 sample JCL and code is provided to split the processing of SMF data into parts
    - JCLSPSMA – Read CICS transaction data
    - JCLSPSMB – Read DB2 accounting data
    - JCLSPSMC – Read IO related records
    - JCLSPSMD – Read MQ data
    - JCLSPSME – Read all the rest

# Option 2

- Samples no longer use a special PROC for MXG
- Problem have been encountered when the NLS options in SAS get crossways with the MXG PROC
- SOURCLIB/LIBRARY concatenations built dynamically
- Code is largely based on UTILBLDP

# Option 2 - JCLSPSMA

```
//S1      EXEC SAS,
//  CONFIG='UXMCBH.MXG.SOURCLIB.V2903(CONFIMXG)'
//MXGNAMES DD *
 %LET MXGSOURC=MXG.SOURCLIB;
 %LET MXGFORMT=MXG.FORMATS;
 %LET MXGUSER1=MXG.USERID.SOURCLIB;
 %LET MXGUSER2=;
 %LET MXGUSER3=;
//WORK     DD UNIT=(SYSDA,16),SPACE=(CYL,(500,500))
//CICSTRAN DD DSN=MXG.DAILY.CICSTRAN(+1),
//      UNIT=TAPE ESOTERIC,DISP=(,CATLG,DELETE)
//CICSBAD  DD DSN=MXG.DAILY.CICSBAD(+1),
//      SPACE=(CYL,(5,5)),DISP=(,CATLG,DELETE)
//SMF      DD DSN=YOUR.DAILY.SMF.CICS(0),DISP=SHR
```

# Option 2 - JCLSPSMA

```
//SYSIN   DD *
 %LET MACKEEP=%QUOTE(
   _N110
   MACRO _S110 %
   MACRO _WCICTRN CICSTRAN %
   MACRO _LCICTRN CICSTRAN.CICSTRAN %
   MACRO _WCICBAD CICSBAD.CICSBAD %
   MACRO _LCICBAD CICSBAD.CICSBAD %
 );
 %INCLUDE SOURCLIB(TYPE110);
```

# Option 2 - JCLSPSME

```
Option 2 - JCLSPSMW //S1     EXEC SAS,
//  CONFIG='UXMCBH.MXG.SOURCLIB.V2903(CONFIMXG)'
//MXGNAMES DD *
 %LET MXGSOURC=MXG.SOURCLIB;
 %LET MXGFORMT=MXG.FORMATS;
 %LET MXGUSER1=MXG.USERID.SOURCLIB;
 %LET MXGUSER2=;
 %LET MXGUSER3=;
//WORK    DD UNIT=(SYSDA,16),SPACE=(CYL,(500,500))
//PDB     DD DSN=MXG.DAILY.PDB(+1),DISP=(,CATLG,DELETE),
//          SPACE=(CYL,(500,500))
//SPININ   DD DSN=MXG.DAILY.SPIN(+0),DISP=SHR
//SPIN    DD DSN=MXG.DAILY.SPIN(+1),DISP=(,CATLG,DELETE),
//          SPACE=(CYL,(50,50))
//SMF     DD DSN=YOUR.DAILY.SMF.SPLITPDB(0),DISP=SHR
```

# Option 2 - JCLSPSME

```
%LET SPININ=SPININ;
%LET MACKEEP=%QUOTE(
  MACRO _WCICTRN _NULL_  %
  MACRO _WCICBAD _NULL_ %
  MACRO _WDB2ACC _NULL_ %
  MACRO _WDB2ACP _NULL_ %
  MACRO _WDB2ACB _NULL_ %
  MACRO _WDB2ACG _NULL_ %
  MACRO _WDB2ACR _NULL_ %
  MACRO _WDB2ACW _NULL_ %
  MACRO _SDB2ACP  %
  MACRO _SDB2ACB  %
  MACRO _SDB2ACG  %
  MACRO _SDB2ACR  %
  MACRO _SDB2ACW  %
);
%UTILBLDP(BUILDPDB=YES,
  SUPPRESS=74 115 116,
  MXGINCL=ASUM70PR ASUMTAPE ASUMTMNT ASUMTALO,
  OUTFILE=INSTREAM);
%INCLUDE INSTREAM;
```

# Option 2

- JCLSPUOW – combines CICS, MQ, DB2 data by unit-of work

- JCLSPCPY – copies summary CICS/DB2 datasets into base PDB

- JCLSPWEK – weekly job

- JCLSPMTH – monthly job

# Option 3 - Outsourcing

- Not to a foreign country – only to a foreign operating system/platform

- Can be Windows or UNIX (or anywhere else you can run SAS)

- Same set of jobs as in option 2 but members start with BLD

- Uses a 'pseudo-GDG' structure

# Option 3 – Pseudo-GDG

- Directories are built and managed dynamically based on user parameters for how long to keep them and where to place them
  - Dddmmmyy – daily
  - Wddmmmyy – weekly
  - Mddmmmyy – monthly
  - Tddmmmyy – trend
  - Sddmmmyy – spin
  - CICSddmmmyy – CICSTRAN
  - DB2ddmmmyy – DB2ACCT

# Option 3 - BLDSPSMA

```
%LET MACKEEP=%QUOTE(
  _N110
  MACRO _S110 %
  MACRO _WCICTRN CICSTRAN %
  MACRO _LCICTRN CICSTRAN.CICSTRAN %
  MACRO _WCICBAD PDB.CICSBAD %
  MACRO _LCICBAD PDB.CICSBAD %
);
%VMXGALOC(BASEDIR=C:\MXG);
%INCLUDE SOURCLIB(TYPE110);
RUN;
```

# Option 3 - BLDSPSME

```
%LET MACKEEP=%QUOTE(
  MACRO _WCICTRN _NULL_ %
  MACRO _LCICTRN _NULL_ %
  MACRO _WCICBAD _NULL_ %
  MACRO _WDB2ACC _NULL_ %
  MACRO _LDB2ACC _NULL_ %
  MACRO _WDB2ACP _NULL_ %
  MACRO _WDB2ACB _NULL_ %
  MACRO _WDB2ACG _NULL_ %
  MACRO _WDB2ACR _NULL_ %
  MACRO _WDB2ACW _NULL_ %
  MACRO _SDB2ACP %
  MACRO _SDB2ACB %
  MACRO _SDB2ACG %
  MACRO _SDB2ACR %
  MACRO _SDB2ACW %
  _N74
  MACRO _S74    %
);
%UTILBLDP(BUILDPDB=YES,
  USERADD=TMNT/238,
  SUPPRESS=74 115 116,
  MXGINCL=ASUM70PR ASUMCACH ASUMTAPE ASUMTMNT ASUMTALO,
  OUTFILE=INSTREAM);
%BLDSMPDB(
  AUTOALOC=YES,
  BASEDIR=C:\MXGTEST,
  ERASEPDB=NO,
  RUNDAY=YES,
  BUILDPDB=INSTREAM,
  RUNWEEK=NO,
  RUNMNTH=NO
);
RUN;
```

# Option 3 – A Test

| Intel dual core 2.2Ghz Win 7 Ultimate 32 bit SAS 9.2 | User CPU | System CPU | Run Time | Memory | Total Elapsed | % Reduced Elapsed Time | % Reducion in CPU Time |
|---|---|---|---|---|---|---|---|
| BLDSIMPL | 0:07:31 | 0:02:23 | 0:34:59 | 423165k | | | |
| BLDSPSMA – CICS | 0:00:14 | 0:00:05 | 0:04:30 | 26496k | 0:27:30 | 21.38% | 14.52% |
| BLDSPSMB - DB2 | 0:04:29 | 0:01:28 | 0:24:38 | 425984k | | | |
| BLDSPSMC – IO | 0:00:23 | 0:00:12 | 0:05:30 | 148452k | | | |
| BLDSPSME – SPLIT | 0:01:04 | 0:00:38 | 0:06:45 | 98072k | | | |
| BLDSPUOW | 0:00:12 | 0:00:04 | 0:02:52 | 39700k | | | |

| 2098-T04 zOS 1.10 SAS 9.1.3 | | | | | | | |
|---|---|---|---|---|---|---|---|
| JCLSIMPL | 0:16:42 | | 0:19:54 | 127837K | | | |
| JCLSPSMA - CICS | 0:00:31 | | 0:00:42 | 31991k | 0:13:36 | 31.66% | 14.27% |
| JCLSPSMB - DB2 | 0:09:54 | | 0:12:42 | 33471K | | | |
| JCLSPSMC - IO | 0:00:54 | | 0:01:36 | 44401k | | | |
| JCLSPSME - SPLIT | 0:02:30 | | 0:03:42 | 88933k | | | |
| JCLSPUOW - UOW | 0:00:30 | | 0:00:54 | 22927K | | | |

| SMF Data | 3738MB |
|---|---|
| Records | 2353851 |
| DB2ACCT OBS | 917607 |
| CICSTRAN OBS | 255522 |

# Some Caveats

- All of these jobs A-E are designed to run concurrently but...
  - On zOS you must have separate datasets
  - On ASCII the same directories are used for all jobs
- Locking on ASCII is at the level of the individual SAS dataset but on zOS it is at the level of the SAS data library (unless you happen to have SAS/SHARE).
- Jobs on ASCII might run faster spread across multiple platforms

# So, What to do?

# It Depends!!!!

# Not Doing Chargeback?

- Any of the options will work
  - Not processing DB2/CICS is a management decision
  - If management is unhappy with the cost of SAS on zOS, ASCII might be a better choice

# Got Chargeback?

- May not have a choice other than running on zOS or ASCII

- Unless there is enough granularity in the DDF and CICS report classes and management will buy into charging for CICS based on sampling transactions and applying it to the counted transactions

# What to Keep and How Long?

| SMF ID / SUBTYPE | Process Daily | Retention | Note |
|---|---|---|---|
| 6 | Yes | Ask Auditing | |
| 21 | Yes | Ask Auditing | |
| 26 | Yes | Ask Auditing | |
| 30 | Yes | Ask Auditing | |
| 70 | Yes | 3-4 years | |
| 71 | Yes | 3-4 years | |
| 72 | Yes | 3-4 years | |
| 72 | Yes | 3-4 years | |
| 73 | Yes | 3-4 years | |
| 74 | Yes | 3-4 years | |
| 75 | Yes | 3-4 years | |
| 77 | Yes | 3-4 years | |
| 78 | Yes | 3-4 years | |
| 99 | No | 10 days | |
| 100 | Yes | 3-4 years | |
| 101 | No | 2 weeks | Accounting Data |
| 102 | Maybe | Ask Auditing | Some accounting data may be 102 |
| 110 | No | 2 weeks | Transaction data |
| 110 | Yes | 3-4 years | Statistics |
| 217 | Maybe | Ask Auditing | HSM |
| 218 | Maybe | Ask Auditing | HSM |
| 238 | Maybe | Ask Auditing | MXG Mount Monitor |
| OTHER | Maybe | Ask Auditing | |