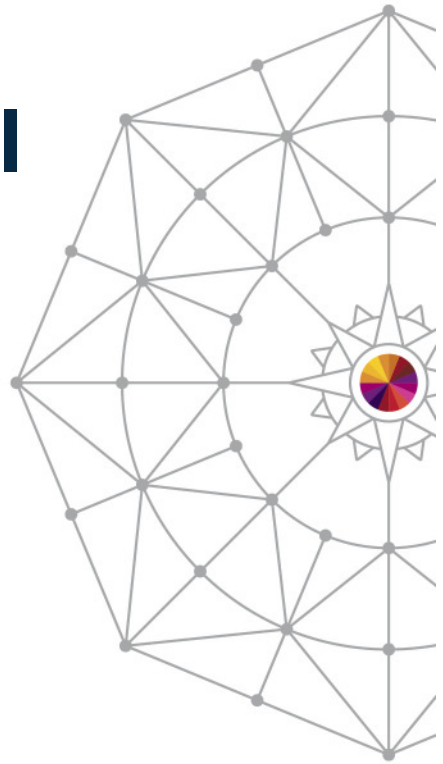
Mining Gold from RMF Monitor III
The XML Batch Reporting Facility



Peter Muench (pmuench@de.ibm.com)
IBM Corporation

Wednesday, August 6, 2014
Session 15713

#SHAREorg

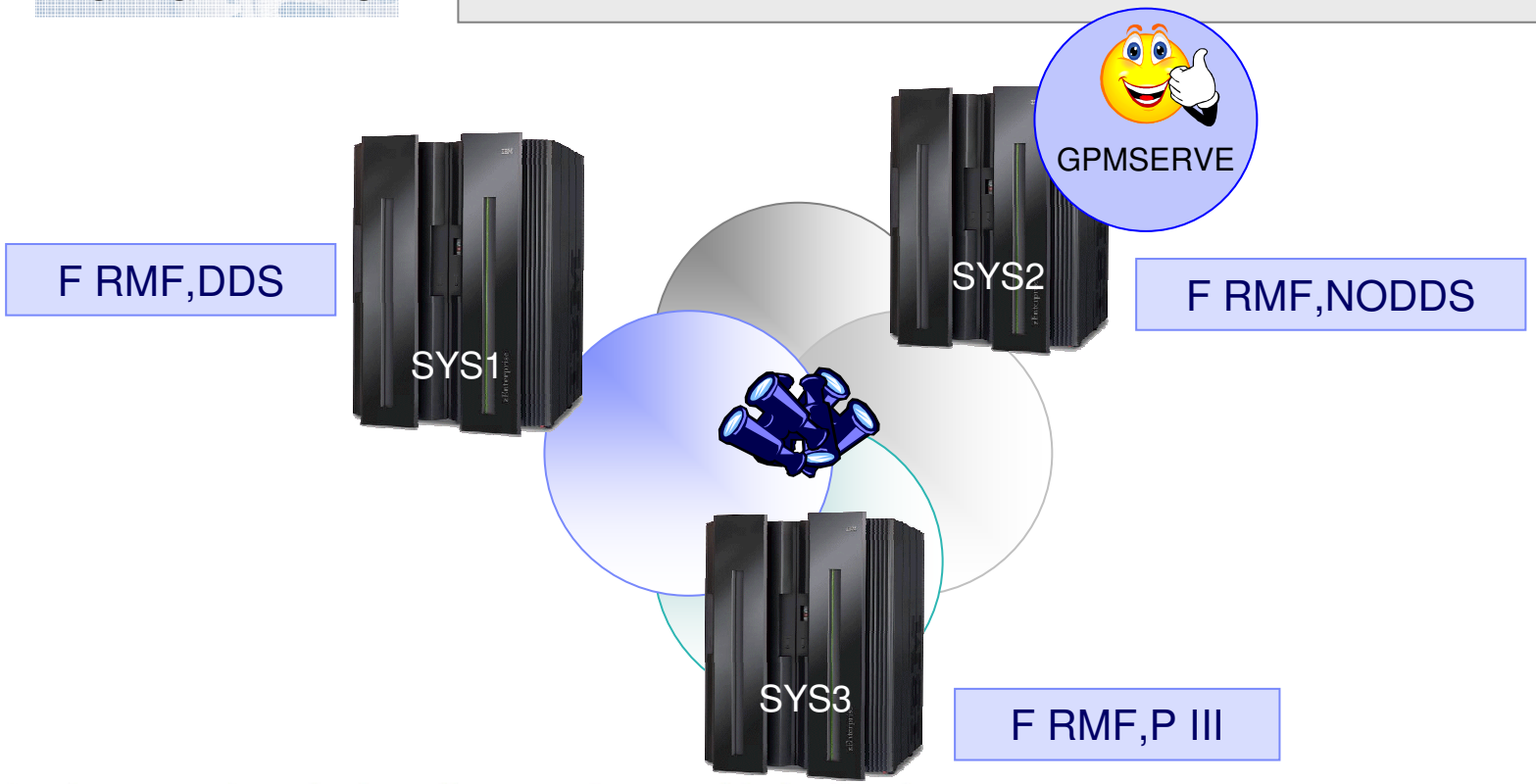
Objectives

- Generate RMF Monitor III Reports automatically
- Provide Sysplex wide Reporting Scope
- Store the Reports persistently for each Mintime
- Create an Archive for selected Reports
- Process individual Reports and apply intelligent Analysis
  - ⇨Convert the Report XML Document to alternate Formats (CSV, JSON)
  - ⇨Parse the Report XML Document and extract Key Metrics
- Provide a State of the Art Reporting GUI
- Avoid cumbersome Downloads to the Workstation

The Monitor III XML Batch Facility (1)

Automatic DDS Detection

- The RMF Distributed Dataserver can generate Monitor III XML Reports
- DDS can change Location based on RMF Master System
- Module GPMXMLM3 can detect the DDS Location automatically



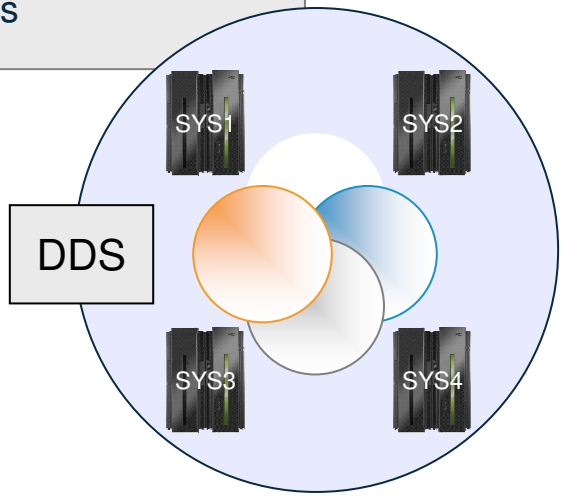
The Monitor III XML Batch Facility (2)

Process Flow

- Module GPMXMLM3 is invoked using a standard batch job
- XML reports are retrieved by means of HTTP Requests

HTTP Request

http://ddshost:8803/gpm/reports/CPC?resource=,SYS3,MVS_IMAGE



z/OS Sysplex

```
<?xml version="1.0">
<ddsml>
  <report>
    <metric id="CPC">
    </metric>
    <caption>
      <var>
        <name>CPCHPNAM</name>
        <value>SYS3</value>
      </var>
      <var
        <name>CPCHMOD</name>
        <value>2097</value>
      </var>
    </caption>
  </report>
</ddsml>
```

XML Response Document

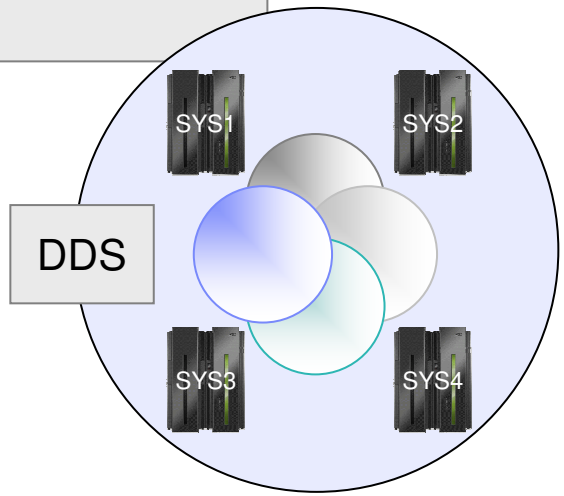
The Monitor III XML Batch Facility (3)

Automatic Sysplex Expansion

- Sysplex wide Reports: One HTTP request against the Sysplex resource
- Reports with System scope: One HTTP request per System

http://ddshost:8803/gpm/reports/CFACT?resource=,ZOS1,SYSPLEX

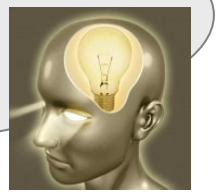
http://ddshost:8803/gpm/reports/CPC?resource=,SYS1,MVS_IMAGE
http://ddshost:8803/gpm/reports/CPC?resource=,SYS2,MVS_IMAGE
http://ddshost:8803/gpm/reports/CPC?resource=,SYS3,MVS_IMAGE
http://ddshost:8803/gpm/reports/CPC?resource=,SYS4,MVS_IMAGE



z/OS Sysplex

Advanced feature for reports with System scope:

- query all System names of the Sysplex
- assemble the HTTP requests accordingly
- combine the reports to one XML document

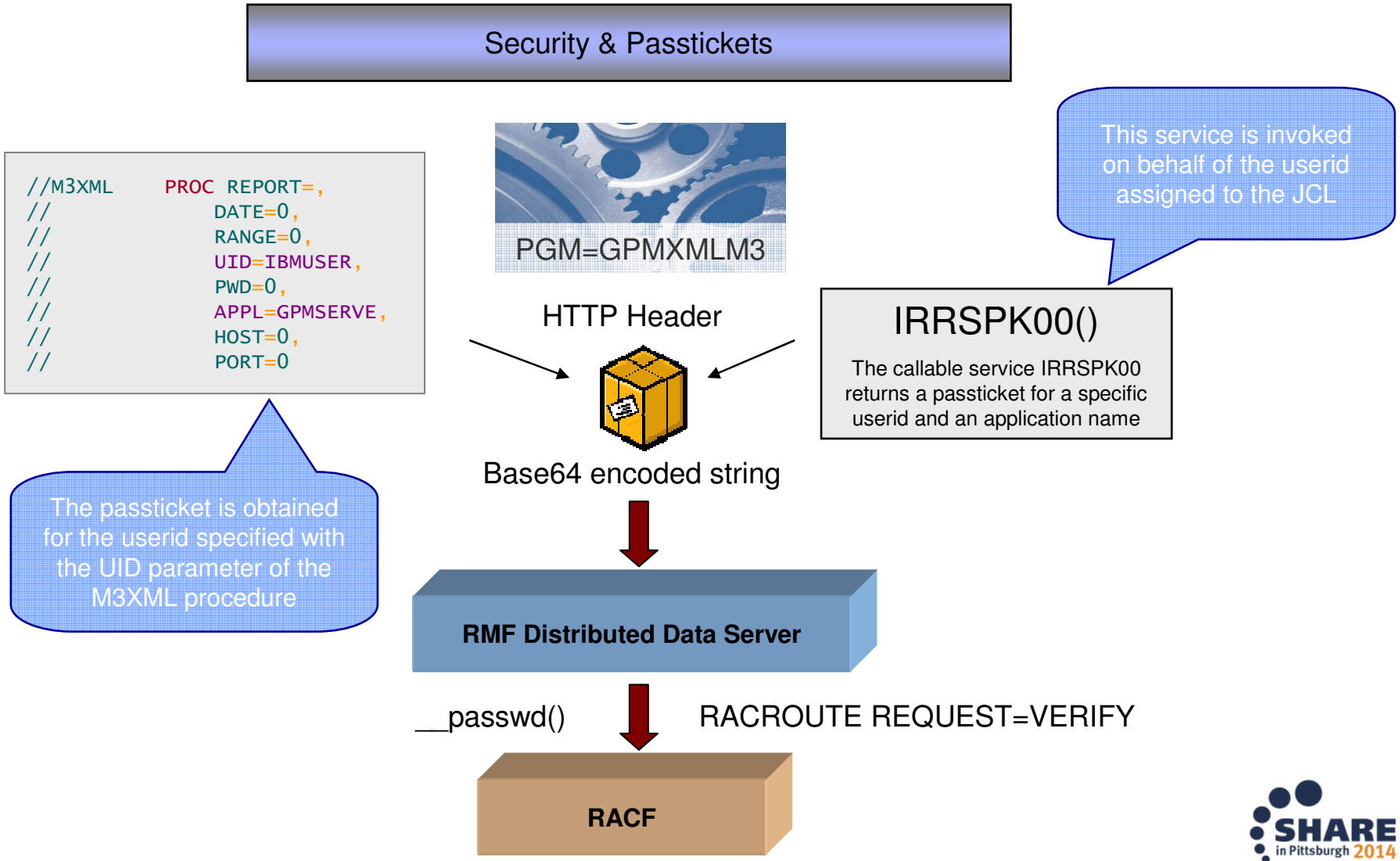


The Monitor III XML Batch Facility (4)

JCL & Module Parameters

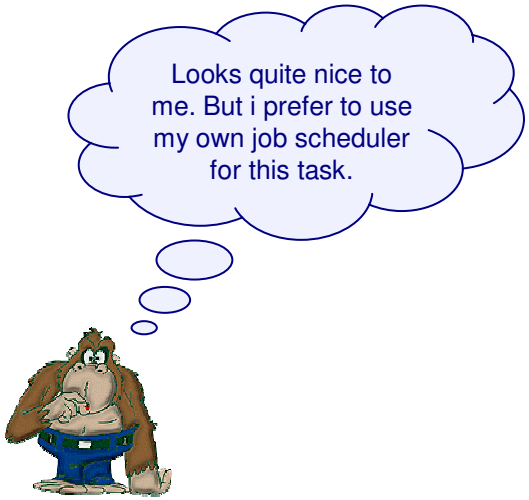
```
//M3XML     PROC REPORT=,               //* Report Type                                 *//
//                DATE=0,               //* Begin Time/Date                             *//
//                RANGE=0,              //* Length of Reporting Range                   *//
//                UID=0,                //* Userid Id (if DDS Login requires Credentials)  *//
//                PWD=0,                //* Password (if no Passtickets are configured)    *//
//                APPL=0,               //* Application Name GPMSERVE (for Passtickets)    *//
//                HOST=0,               //* DDS Hostname (if no Autodetection is required) *//
//                PORT=0                //* Port Number (if no default Port 8803)          *//
//*
//GPMM3     EXEC PGM=GPMXMLM3,
//   PARM=('&REPORT &DATE &RANGE &UID &PWD &APPL &HOST &PORT')
//*
//X3RPTS    DD   PATH='/u/rmf/m3xml/temp/&REPORT..xml',    //* USS Output Directory for *//
//          PATHOPTS=(OWRONLY,OCREAT,OTRUNC),              //* Single System Reports    *//
//          PATHMODE=(SIRUSR,SIWUSR,SIRGRP),FILEDATA=TEXT
//X3XSRPTS DD   PATH= '/u/rmf/m3xml/temp/&REPORT..xml',   //* USS Output Directory for *//
//          PATHOPTS=(OWRONLY,OCREAT,OTRUNC),              //* Sysplex Reports          *//
//          PATHMODE=(SIRUSR,SIWUSR,SIRGRP),FILEDATA=TEXT
//SYSPRINT DD   SYSOUT=*
//SYSOUT    DD   SYSOUT=*
//          PEND
```

The Monitor III XML Batch Facility (5)



Mintime Scheduled Job Submission

```
//JOBRDR PROC JCL=
//*************************************************************
//*                                                           *
//* NOTES:                                                    *
//*   THIS PROCEDURE SENDS A JOB TO THE INTERNAL READER       *
//*   USAGE: S JOBRDR,JCL= MYDSN(M3XML)                       *
//*                                                           *
//*************************************************************
//READJOB EXEC PGM=IEBGENER
//SYSPRINT DD  DUMMY
//SYSIN    DD  DUMMY
//SYSUT1   DD  DISP=SHR,DSN=&JCL
//SYSUT2   DD  SYSOUT=(A,INTRDR)
```



JES2 Automatic Commands

MVS System Commands through JES2

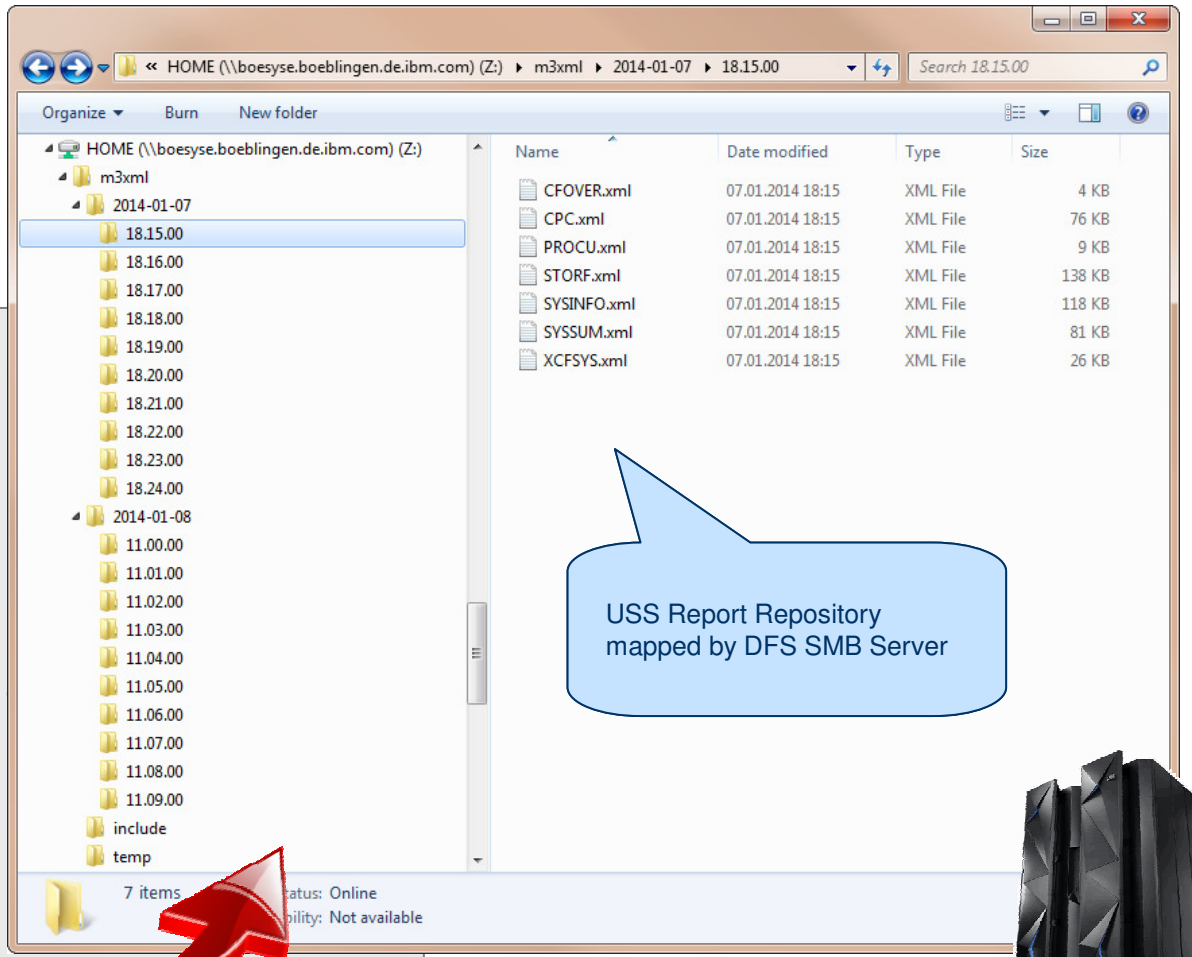
```
$TA,I=100,'$VS,"S JOBRDR,JCL=MYDSN(M3XML)"'
```

Monitor III Mintime in Seconds

Charging the Monitor III Report Repository (1)

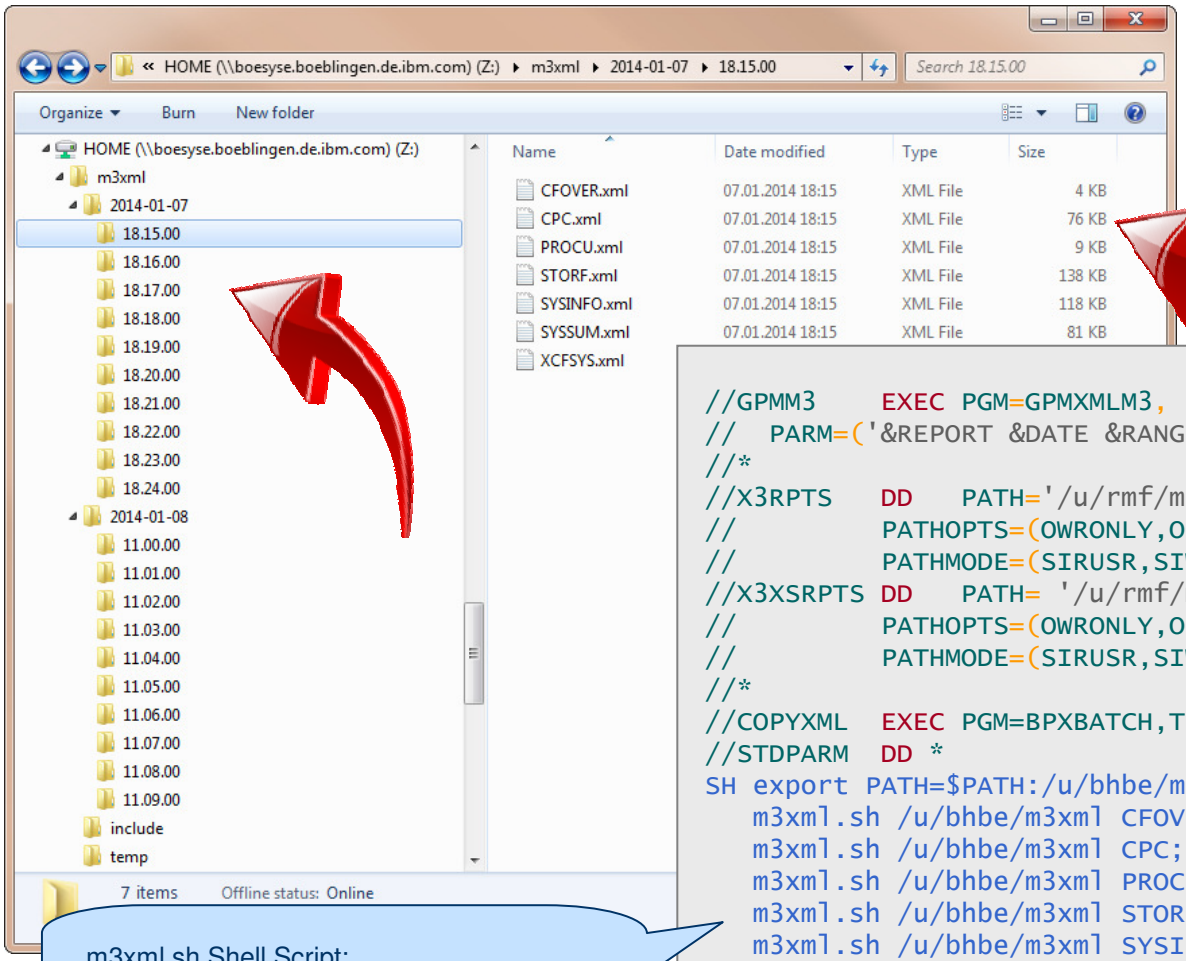
M3XML Procedure:
Recurrent Job Submission right after Mintime Completion

```
//M3XML     PROC REPORT=,
//               DATE=0,
//               RANGE=0,
//               UID=0,
//               PWD=0,
//               APPL=0,
//               HOST=0,
//               PORT=0
//*
//GPMM3     EXEC PGM=GPMXMLM3,
//   PARM=('&REPORT &DATE &RANGE &UID
//          PEND
//*
//M3CFO     EXEC M3XML,REPORT=CFOVER
//M3CPC     EXEC M3XML,REPORT=CPC
//M3PRU     EXEC M3XML,REPORT=PROCU
//M3STF     EXEC M3XML,REPORT=STORF
//M3SYSI    EXEC M3XML,REPORT=SYSINFO
//M3SUM     EXEC M3XML,REPORT=SYSSUM
//M3XCFS    EXEC M3XML,REPORT=XCFSYS
//*
```



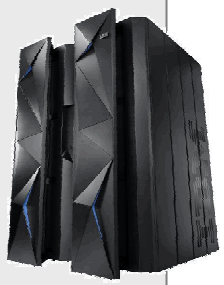
USS Report Repository mapped by DFS SMB Server

Charging the Monitor III Report Repository (2)




```
//GPMM3     EXEC PGM=GPMXMLM3,
//   PARM=('&REPORT &DATE &RANGE &UID &PWD &APPL &HOST &PORT')
//*
//X3RPTS    DD   PATH='/u/rmf/m3xml/temp/&REPORT..xml',
//          PATHOPTS=(OWRONLY,OCREAT,OTRUNC),
//          PATHMODE=(SIRUSR,SIWUSR,SIRGRP),FILEDATA=TEXT
//X3XSRPTS DD    PATH= '/u/rmf/m3xml/temp/&REPORT..xml' ,
//          PATHOPTS=(OWRONLY,OCREAT,OTRUNC),
//          PATHMODE=(SIRUSR,SIWUSR,SIRGRP),FILEDATA=TEXT
//*
//COPYXML   EXEC PGM=BPXBATCH,TIME=NOLIMIT,REGION=0M
//STDPARM   DD *
SH export PATH=$PATH:/u/bhbe/m3xml;
   m3xml.sh /u/bhbe/m3xml CFOVER;
   m3xml.sh /u/bhbe/m3xml CPC;
   m3xml.sh /u/bhbe/m3xml PROCU;
   m3xml.sh /u/bhbe/m3xml STORF;
   m3xml.sh /u/bhbe/m3xml SYSINFO;
   m3xml.sh /u/bhbe/m3xml SYSSUM;
   m3xml.sh /u/bhbe/m3xml XCFSYS;
//
```

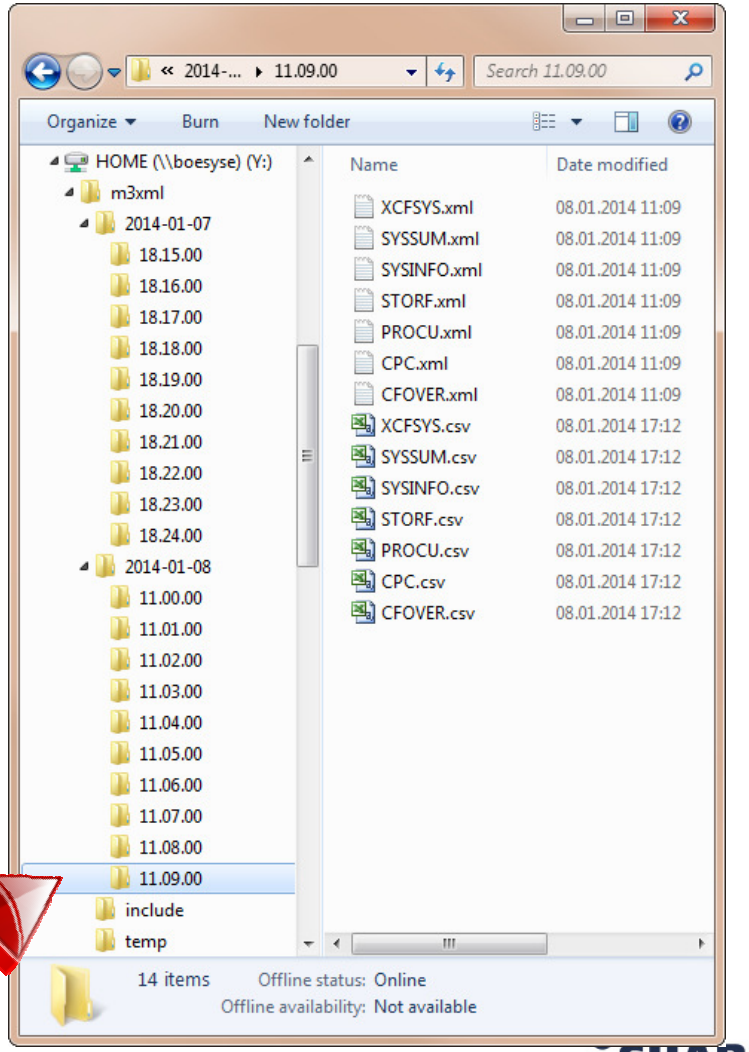
m3xml.sh Shell Script:
Creates Directories based on Report Range
Copies the Reports from /temp Directory



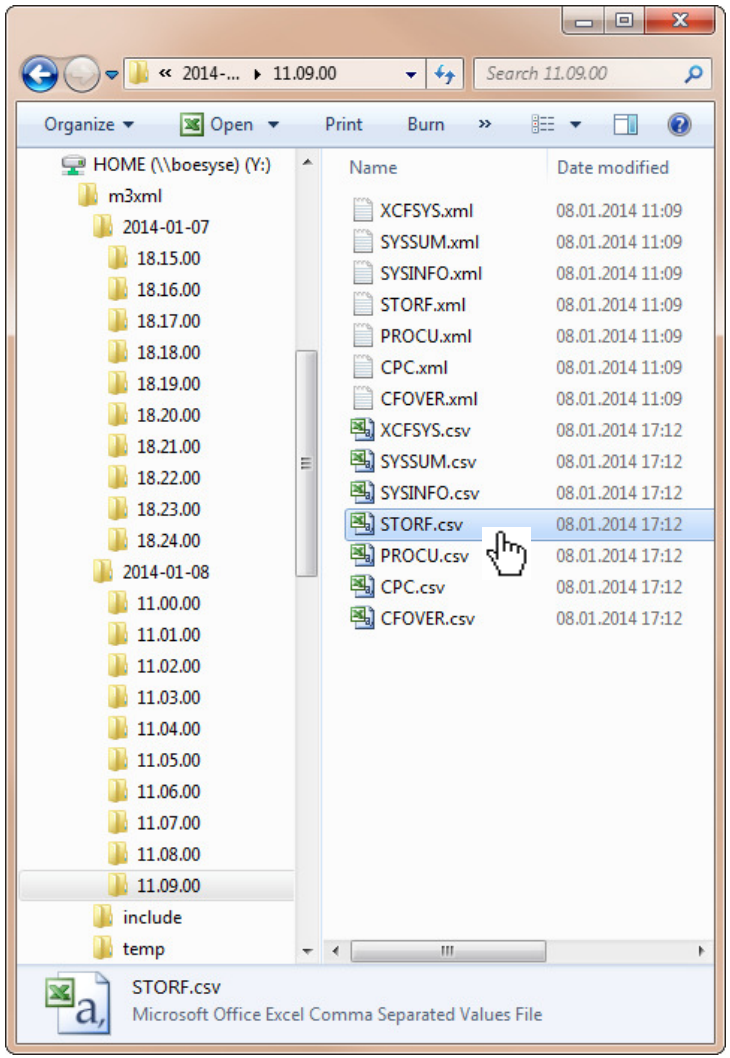
Mining Gold – CSV Conversion (1)

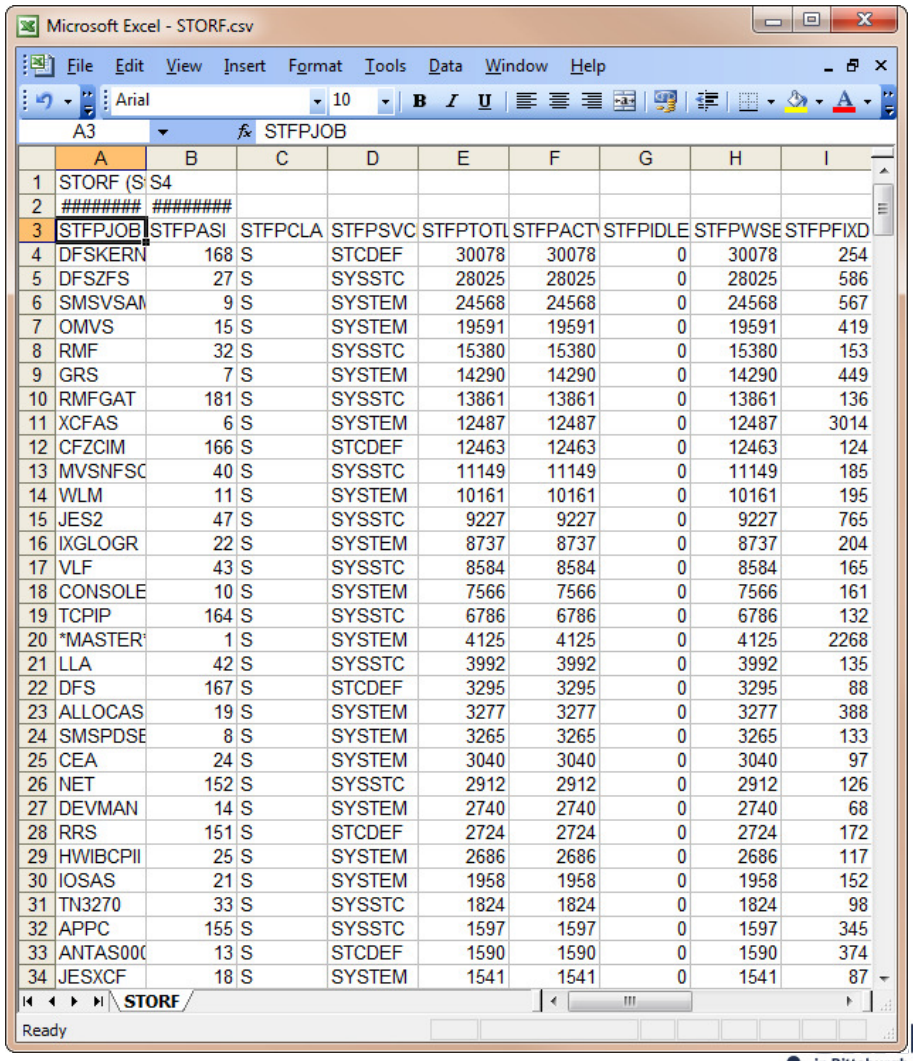
```
//M3PARSE  PROC REPORT=,
//             LOW=1,
//             HIGH=9,
//             VAR=,
//             INST=
//*-------------------------------------------------------------
//*  GPMXMLPP Parameters:
//*
//*  PARM 1: XML FILENAME
//*  PARM 2: EXTRACTION - LOW BOUND     ==> CSV Extraction
//*  PARM 3: EXTRACTION - HIGH BOUND    ==> CSV Extraction
//*  PARM 4: SEPARATOR FOR CSV FORMAT   ==> CSV Dump
//*  PARM 5: VARIABLE NAME              ==> Table Header Value
//*  PARM 6: INSTANCE NAME              ==> Table Value
//*-------------------------------------------------------------
//STEP1    EXEC PGM=GPMXMLPP,
//  PARM=('DD:XMLFILE &LOW &HIGH ; &VAR &INST')
//STEPLIB  DD   DSN=SYS1.SIEALNKE,DISP=SHR
//XMLFILE  DD   PATH='/u/bhbe/m3xml/temp/&REPORT..xml',
//         PATHOPTS=(ORDONLY)
//SYSPRINT DD   PATH='/u/bhbe/m3xml/temp/&REPORT..csv',
//         PATHOPTS=(OWRONLY,OCREAT,OTRUNC),
//         PATHMODE=(SIRUSR,SIWUSR,SIRGRP),FILEDATA=TEXT
//         PEND
//M3CFO    EXEC M3PARSE,REPORT=CFOVER
//M3CPC    EXEC M3PARSE,REPORT=CPC
//M3PRU    EXEC M3PARSE,REPORT=PROCU
//M3STF    EXEC M3PARSE,REPORT=STORF
//M3SYSI   EXEC M3PARSE,REPORT=SYSINFO
//M3SUM    EXEC M3PARSE,REPORT=SYSSUM
//M3XCFS   EXEC M3PARSE,REPORT=XCFSYS
//
```

Module exploits z/OS XML System Services



Mining Gold – CSV Conversion (2)





	A	B	C	D	E	F	G	H	I
1	STORF (S	S4							
2	########	########							
3	STFPJOB	STFPASI	STFPCLA	STFPSVC	STFPTOTL	STFPACTV	STFPIDLE	STFPWSE	STFPFIXD
4	DFSKERN	168	S	STCDEF	30078	30078	0	30078	254
5	DFSZFS	27	S	SYSSTC	28025	28025	0	28025	586
6	SMSVSAM	9	S	SYSTEM	24568	24568	0	24568	567
7	OMVS	15	S	SYSTEM	19591	19591	0	19591	419
8	RMF	32	S	SYSSTC	15380	15380	0	15380	153
9	GRS	7	S	SYSTEM	14290	14290	0	14290	449
10	RMFGAT	181	S	SYSSTC	13861	13861	0	13861	136
11	XCFAS	6	S	SYSTEM	12487	12487	0	12487	3014
12	CFZCIM	166	S	STCDEF	12463	12463	0	12463	124
13	MVSNFSC	40	S	SYSSTC	11149	11149	0	11149	185
14	WLM	11	S	SYSTEM	10161	10161	0	10161	195
15	JES2	47	S	SYSSTC	9227	9227	0	9227	765
16	IXGLOGR	22	S	SYSTEM	8737	8737	0	8737	204
17	VLF	43	S	SYSSTC	8584	8584	0	8584	165
18	CONSOLE	10	S	SYSTEM	7566	7566	0	7566	161
19	TCPIP	164	S	SYSSTC	6786	6786	0	6786	132
20	*MASTER*	1	S	SYSTEM	4125	4125	0	4125	2268
21	LLA	42	S	SYSSTC	3992	3992	0	3992	135
22	DFS	167	S	STCDEF	3295	3295	0	3295	88
23	ALLOCAS	19	S	SYSTEM	3277	3277	0	3277	388
24	SMSPDSE	8	S	SYSTEM	3265	3265	0	3265	133
25	CEA	24	S	SYSTEM	3040	3040	0	3040	97
26	NET	152	S	SYSSTC	2912	2912	0	2912	126
27	DEVMAN	14	S	SYSTEM	2740	2740	0	2740	68
28	RRS	151	S	STCDEF	2724	2724	0	2724	172
29	HWIBCPII	25	S	SYSTEM	2686	2686	0	2686	117
30	IOSAS	21	S	SYSTEM	1958	1958	0	1958	152
31	TN3270	33	S	SYSSTC	1824	1824	0	1824	98
32	APPC	155	S	SYSSTC	1597	1597	0	1597	345
33	ANTAS000	13	S	STCDEF	1590	1590	0	1590	374
34	JESXCF	18	S	SYSTEM	1541	1541	0	1541	87

Mining Gold – Extract Key Metrics (1)

```
SYSE     14009 16:14:31.29 BHBE     00000210  D A
SYSE     14009 16:14:31.29 BHBE     00000010  IEE114I 16.14.31 2014.009 ACTIVITY 321
                                321 00000010   JOBS     M/S    TS USERS    SYSAS    INITS   ACTIVE/MAX VTAM     OAS
                                321 00000010  00004    00029    00002      00040    00106    00002/00125       00022
SYSE     14009 16:16:45.98 JOB03419 00000211  $HASP100 BHBE$XP  ON INTRDR      BHBE                 FROM TSU03418
                                              BHBE
SYSE     14009 16:16:45.98 JOB03419 00000210  IRR010I  USERID BHBE     IS ASSIGNED TO THIS JOB.
SYSE     14009 16:16:46.02 JOB03419 00000211  ICH70001I BHBE     LAST ACCESS AT 16:11:37 ON THURSDAY, JANUARY 9, 2014
SYSE     14009 16:16:46.03 JOB03419 00000010  $HASP373 BHBE$XW  STARTED - INIT 1    - CLASS A        - SYS SYSE
SYSE     14009 16:16:46.16 JOB03419 00000010  +XML200I VAR: PRUPCPT  INST: XCFAS  VALUE: 0.6
SYSE     14009 16:16:46.16 JOB03419 00000010  +XML200I VAR: PRUPCPT  INST: XCFAS  VALUE: 0.9
SYSE     14009 16:16:46.16 JOB03419 00000010  +XML200I VAR: PRUPCPT  INST: XCFAS  VALUE: 0.6
SYSE     14009 16:16:46.17 JOB03419 00000210  -                                                  --TIMINGS (MINS.)--
SYSE     14009 16:16:46.17 JOB03419 00000210  -JOBNAME  STEPNAME PROCSTEP    RC    EXCP    CONN    TCB    SRB  CLOCK
                                               SERV  PG  PAGE  SWAP   VIO SWAPS
SYSE     14009 16:16:46.17 JOB03419 00000210  -BHBE$XP  STEP1                00   2259     79 ******    .00     .0
                                              35615   0     4     0     0     0
SYSE     14009 16:16:46.17 JOB03419 00000210  -BHBE$XP  ENDED.  NAME-BHBE                TOTAL TCB CPU TIME=   .00
                                              TOTAL ELAPSED TIME=    .0
SYSE     14009 16:16:46.17 JOB03419 00000010  $HASP395 BHBE$XP  ENDED
SYSE     14009 16:16:46.18          00000010  $HASP309 INIT 1    INACTIVE ******** C=A
SYSE     14009 16:16:46.18 INTERNAL 00000210  SE '16.16.46 JOB03419 $HASP165 BHBE$XP  ENDED AT BOESYS1  MAXCC=0000',
                                              LOGON,USER=(BHBE)
```

```
//M3PARSE
//
//
//
//
//*-------
//*  GPMXM
//*
//*  PARM
//*  PARM
//*  PARM
//*  PARM
//*  PARM
//*  PARM
//*-------
//STEP1
//  PARM=(
//STEPLIB
//XMLFILE
//         PATHOPTS=(ORDONLY)
//SYSPRINT DD   *
//         PEND
//M3SYSI   EXEC M3PARSE,REPORT=SYSINFO,VAR=SYSLCPVC            //* System wide MVS Utilizat n % *//
//M3SUM    EXEC M3PARSE,REPORT=SYSSUM,VAR=SUMPFID,INST=BATHI   //* Performance Index            *//
//M3PRU    EXEC M3PARSE,REPORT=PROCU,VAR=PRUPCPT,INST=XCFAS    //* Total Time on CP %           *//
//
```

Mining Gold – Extract Key Metrics (2)

```
SYSE     14009 16:16:46.16 JOB03419 00000010  +XML200I VAR: PRUPCPT  INST: XCFAS  VALUE: 0.6
SYSE     14009 16:16:46.16 JOB03419 00000010  +XML200I VAR: PRUPCPT  INST: XCFAS  VALUE: 0.9
SYSE     14009 16:16:46.16 JOB03419 00000010  +XML200I VAR: PRUPCPT  INST: XCFAS  VALUE: 0.6
```

Firefox — RMF Monitor III Rep — file:///D:/m3xml/2014-01-08/11.09.00/PROCU.xml

RMF Report [,S4,MVS_IMAGE] : PROCU (Processor Usage)

Time Range: 01/08/2014 11:08:00 - 01/08/2014 11:09:00

Jobname	ASID (dec)	Job Class	Job Class Ext	Service Class	Period	Total Time on CP %	AAP Time on CP %	IIP Time on CP %	CP EAppl %	AAP EAppl %	IIP EAppl %	Total Appl %	Total EAppl %	TCB Time %	SRB Time %	P/C SRB %	P/C SRB + Enclave %	Total CPU Time in mSec
XCFAS	0006	S	S	SYSTEM	1	0.6	0.0	0.0	0.6	0.0	0.0	0.6	0.6	0.5	0.1	0.0	0.0	364
RMFGAT	0181	S	SO	SYSSTC	1	0.4	0.0	0.0	0.4	0.0	0.0	0.4	0.4	0.4	0.0	0.0	0.0	256
SMSVSAM	0009	S	S	SYSTEM	1	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	73

RMF Report [,SYSF,MVS_IMAGE] : PROCU (Processor Usage)

Time Range: 01/08/2014 11:08:00 - 01/08/2014 11:09:00

Jobname	ASID (dec)	Job Class	Job Class Ext	Service Class	Period	Total Time on CP %	AAP Time on CP %	IIP Time on CP %	CP EAppl %	AAP EAppl %	IIP EAppl %	Total Appl %	Total EAppl %	TCB Time %	SRB Time %	P/C SRB %	P/C SRB + Enclave %	Total CPU Time in mSec
GPM4CIMX	0116	S	SO	STCDEF	1	1.0	0.0	0.7	1.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	577
XCFAS	0006	S	S	SYSTEM	1	0.9	0.0	0.0	0.9	0.0	0.0	0.9	0.9	0.8	0.2	0.0	0.0	562
GPM4CIMZ	0117	S	SO	STCDEF	1	0.5	0.0	0.4	0.5	0.0	0.0	0.5	0.5	0.5	0.0	0.0	0.0	276
SMSVSAM	0009	S	S	SYSTEM	1	0.4	0.0	0.0	0.4	0.0	0.0	0.4	0.4	0.4	0.0	0.0	0.0	234
RMFGAT	0066	S	SO	SYSSTC	1	0.4	0.0	0.0	0.4	0.0	0.0	0.4	0.4	0.4	0.0	0.0	0.0	256
TCPIP	0098	S	SO	SYSSTC	1	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0	88
GPMSERVE	0115	S	SO	GPMSERVE	1	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	47

RMF Report [,SYSE,MVS_IMAGE] : PROCU (Processor Usage)

Time Range: 01/08/2014 11:08:00 - 01/08/2014 11:09:00

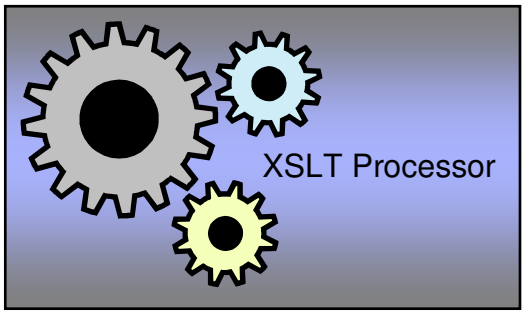
Jobname	ASID (dec)	Job Class	Job Class Ext	Service Class	Period	Total Time on CP %	AAP Time on CP %	IIP Time on CP %	CP EAppl %	AAP EAppl %	IIP EAppl %	Total Appl %	Total EAppl %	TCB Time %	SRB Time %	P/C SRB %	P/C SRB + Enclave %	Total CPU Time in mSec
XCFAS	0006	S	S	SYSTEM	1	0.6	0.0	0.0	0.6	0.0	0.0	0.6	0.6	0.4	0.2	0.0	0.0	366
RMFGAT	0064	S	SO	SYSSTC	1	0.4	0.0	0.0	0.4	0.0	0.0	0.4	0.4	0.4	0.0	0.0	0.0	251
MASTER	0001	S	S	SYSTEM	1	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0	63
GRS	0007	S	S	SYSTEM	1	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	48
SMSVSAM	0009	S	S	SYSTEM	1	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	77
JES2	0051	S	S	SYSSTC	1	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	48
BHBE$XML	0055	B	BO	BTCHDEF	2	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	71

z/OS and XML Parsing

- z/OS offers two Facilities for low cost and efficient XML Parsing:
  - ⇨ z/OS XML Toolkit
  - ⇨ z/OS XML System Services

XML Parsing with XSL Stylesheets

```
<?xml version="1.0">
<ddsml>
  <report>
    <metric id="CPC">
    </metric>
    <caption>
      <var>
        <name>CPCHPNAM</name>
        <value>SYS3</value>
      </var>
      <var
        <name>CPCHMOD</name>
        <value>2097</value>
      </var>
    </caption>
  </report>
</ddsml>
```



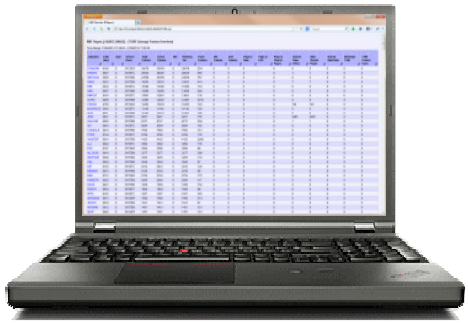

```
<?xml version="1.0" encoding="UTF-8"?>
<xsl:stylesheet version="1.0" xmlns:xsl="http://www.w3.org/1999/XSL/
    <xsl:output omit-xml-declaration="yes" indent="no" method="text"/>
    <xsl:param select="string(';')" name="sep"/>
  - <xsl:template match="/">
        <xsl:apply-templates select="ddsml/report"/>
    </xsl:template>
  - <xsl:template match="report">
        <xsl:apply-templates select="caption/var"/>
        <xsl:text> </xsl:text>
        <xsl:apply-templates select="column-headers/col"/>
        <xsl:apply-templates select="row"/>
        <xsl:text> </xsl:text>
    </xsl:template>
  - <xsl:template match="var">
        <xsl:value-of select="name"/>
        <xsl:value-of select="$sep"/>
        <xsl:value-of select="value"/>
        <xsl:text> </xsl:text>
    </xsl:template>
  - <xsl:template match="row">
        <xsl:apply-templates select="col"/>
    </xsl:template>
  - <xsl:template match="col">
        <xsl:value-of select="."/>
      - <xsl:if test="position()!=last()">
            <xsl:value-of select="$sep"/>
        </xsl:if>
      - <xsl:if test="position()=last()">
            <xsl:text> </xsl:text>
        </xsl:if>
    </xsl:template>
</xsl:stylesheet>
```

```
Metric;CPC
CPCHPNAM;SYS3
CPCHMOD;2097
```

Objectives

- Generate RMF Monitor III Reports automatically
- Provide Sysplex wide Reporting Scope
- Store the Reports persistently for each Mintime
- Create an Archive for selected Reports
- Process individual Reports and apply intelligent Analysis
  - ⇨Convert the Report XML Document to alternate Formats (CSV, JSON)
  - ⇨Parse the Report XML Document and extract Key Metrics
- Provide a State of the Art Reporting GUI
- Avoid cumbersome Downloads to the Workstation

Mining Gold – The Workstation GUI (1)



file:///D:/m3xml/2014-01-08/11.09.00/STORF.xml - Original Source

File Edit Format

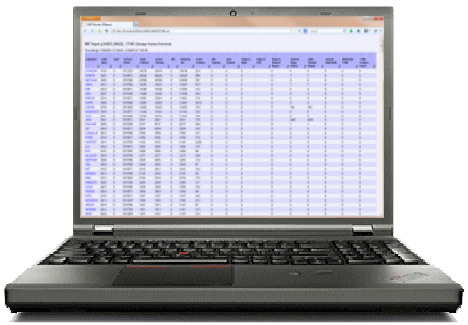
```
1  <?xml version="1.0" encoding="UTF-8"?>
2  <?xml-stylesheet type="text/xsl" href="include/ddsml-m3.xsl"?>
3  <ddsml>
4  <report>
5  <metric id="STORF">
6  <description>STORF (Storage Frames Overview)</description>
7  <format>report</format>
8  <numcols>19</numcols>
9  </metric>
10 <resource>
11 <reslabel>,S4,MVS_IMAGE</reslabel>
12 <restype>MVS_IMAGE</restype>
13 <reslabelurl>%2CS4%2CMVS_IMAGE</reslabelurl>
14 </resource>
15 <time-data>
16 <local-start>20140108110800</local-start>
17 <local-end>20140108110900</local-end>
18 <utc-start>20140108100800</utc-start>
19 <utc-end>20140108100900</utc-end>
20 <local-prev>20140108110730</local-prev>
21 <local-next>20140108110930</local-next>
22 <display-start locale="en-us">01/08/2014 11:08:00</display-start>
23 <display-end locale="en-us">01/08/2014 11:09:00</display-end>
24 <gatherer-interval unit="seconds">60</gatherer-interval>
25 <data-range unit="seconds">60</data-range>
26 </time-data>
27 <row refno="1"><col>DFSKERN</col> <col>0168</col> <col>S</col> <col>STCDEF</col>
```

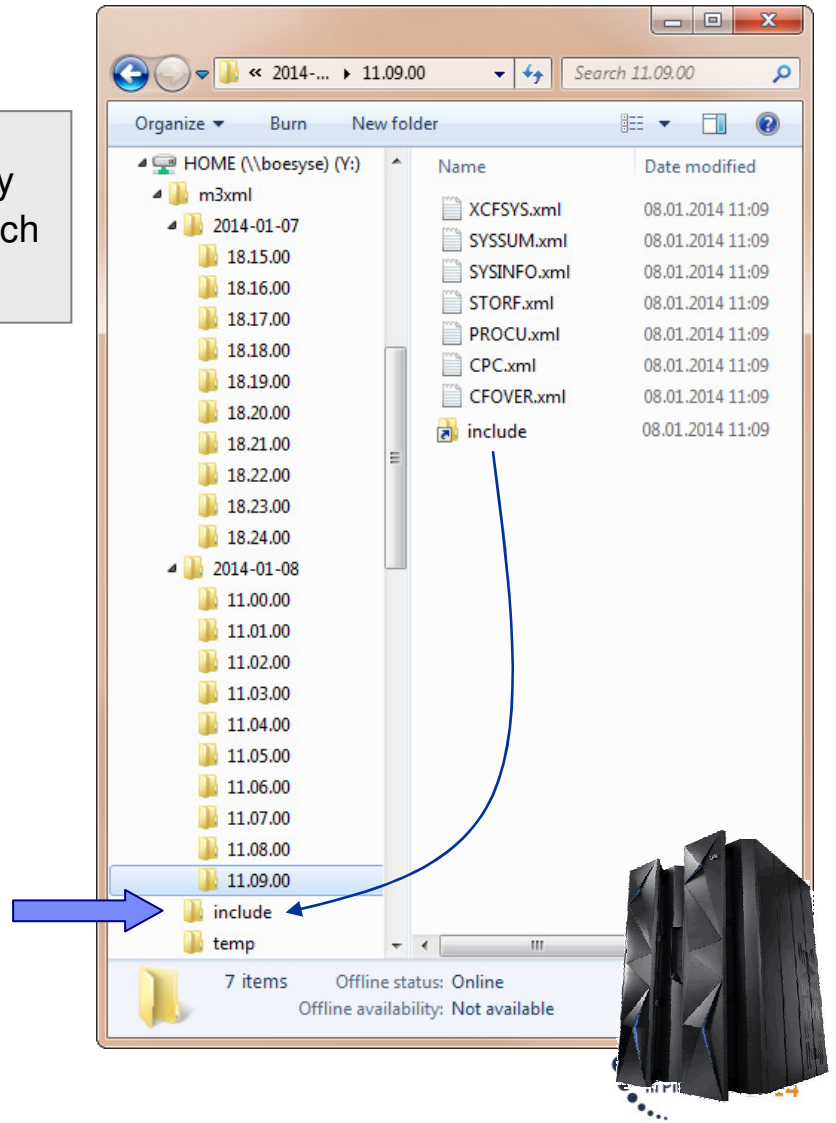
Additional files are needed to format the XML document :

- XSL — main XSL stylesheet with formatting directives. It is used by the browsers XSLT engine to create the HTML document from the XML input
- XSD — XML schema definition
- CSS — cascading stylesheet with additional settings (e.g. fonts, colors)
- JS — java script file with specific processing logic
- GIF — graphical elements like buttons, arrows etc.

Mining Gold – The Workstation GUI (2)

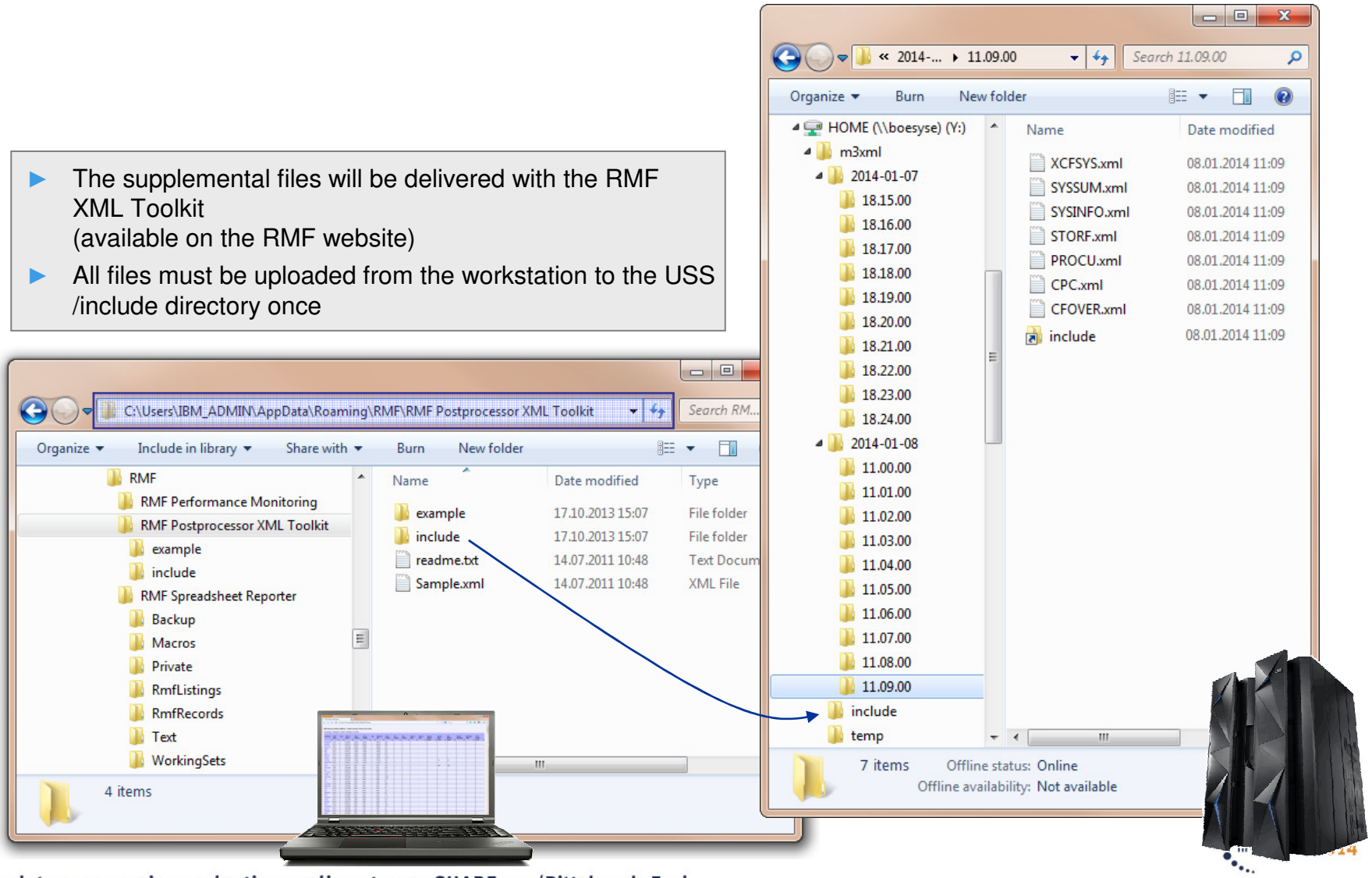
- All supplemental files are located in the /include directory
- The m3xml.sh Shell Script creates a symbolic link for each new directory





Mining Gold – The Workstation GUI (3)

- The supplemental files will be delivered with the RMF XML Toolkit
  (available on the RMF website)
- All files must be uploaded from the workstation to the USS /include directory once



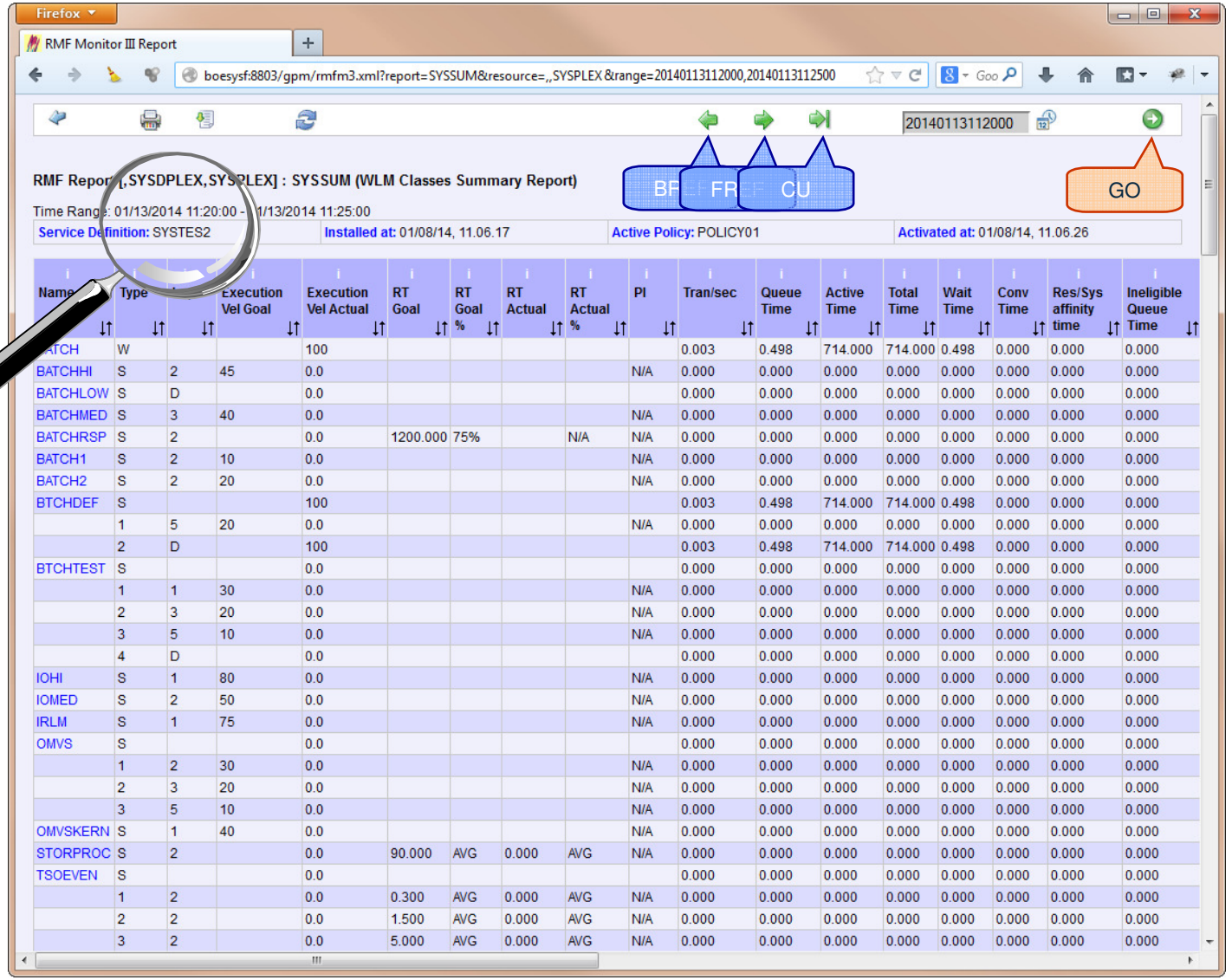
Mining Gold – Reporting with M III VSAM Data Sets (1)

```
//STEP1
//   PARM=(
//GPMINI
//GPMHTC
//GPMPPJCL
//SYSPRINT
//SYSOUT
//RMFDS00
//RMFDS01
//RMFDS02
//RMFDS03
//
```

```
//M3XML     PROC REPORT=,
//               DATE=20140701150000,
//               RANGE=900,
//               UID=0,
//               PWD=0,
//               APPL=0,
//               HOST=0,
//               PORT=0
//*
//GPMM3     EXEC PGM=GPMXMLM3,
//   PARM=('&REPORT &DATE &RANGE &UID &PWD &APPL &HOST &PORT')
//*
//X3RPTS    DD   PATH='/u/rmf/m3xml/temp/&REPORT..xml',
//          PATHOPTS=(OWRONLY,OCREAT,OTRUNC),
//          PATHMODE=(SIRUSR,SIWUSR,SIRGRP),FILEDATA=TEXT
//X3XSRPTS DD   PATH= '/u/rmf/m3xml/temp/&REPORT..xml' ,
//          PATHOPTS=(OWRONLY,OCREAT,OTRUNC),
//          PATHMODE=(SIRUSR,SIWUSR,SIRGRP),FILEDATA=TEXT
//SYSPRINT DD   SYSOUT=*
//SYSOUT    DD   SYSOUT=*
//          PEND
```

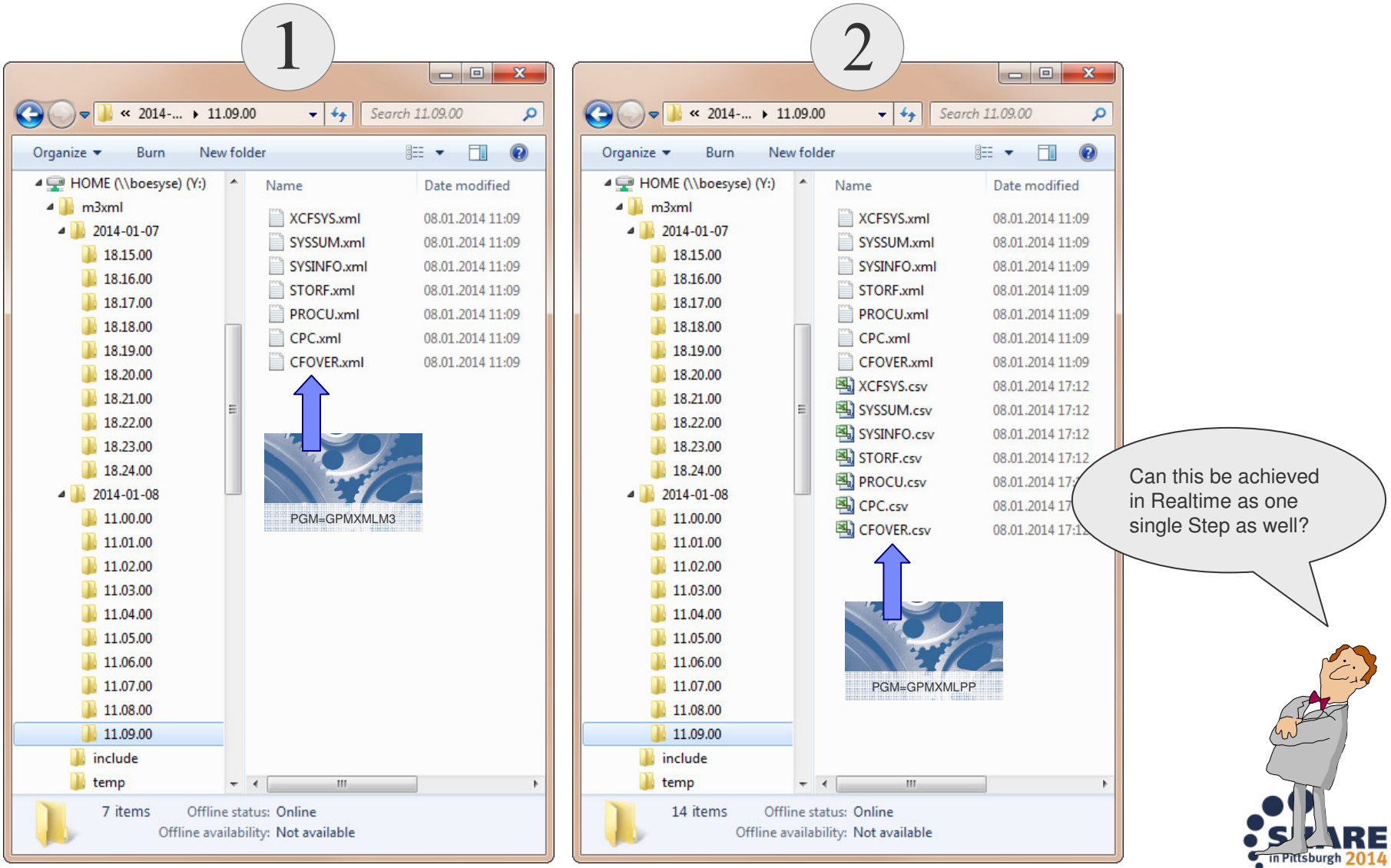
Monitor III VSAM Datasets can be supplied to the DDS with the same DD Names as for a Monitor III ISPF Report Session

Mining Gold – Reporting with M III VSAM Data Sets (2)

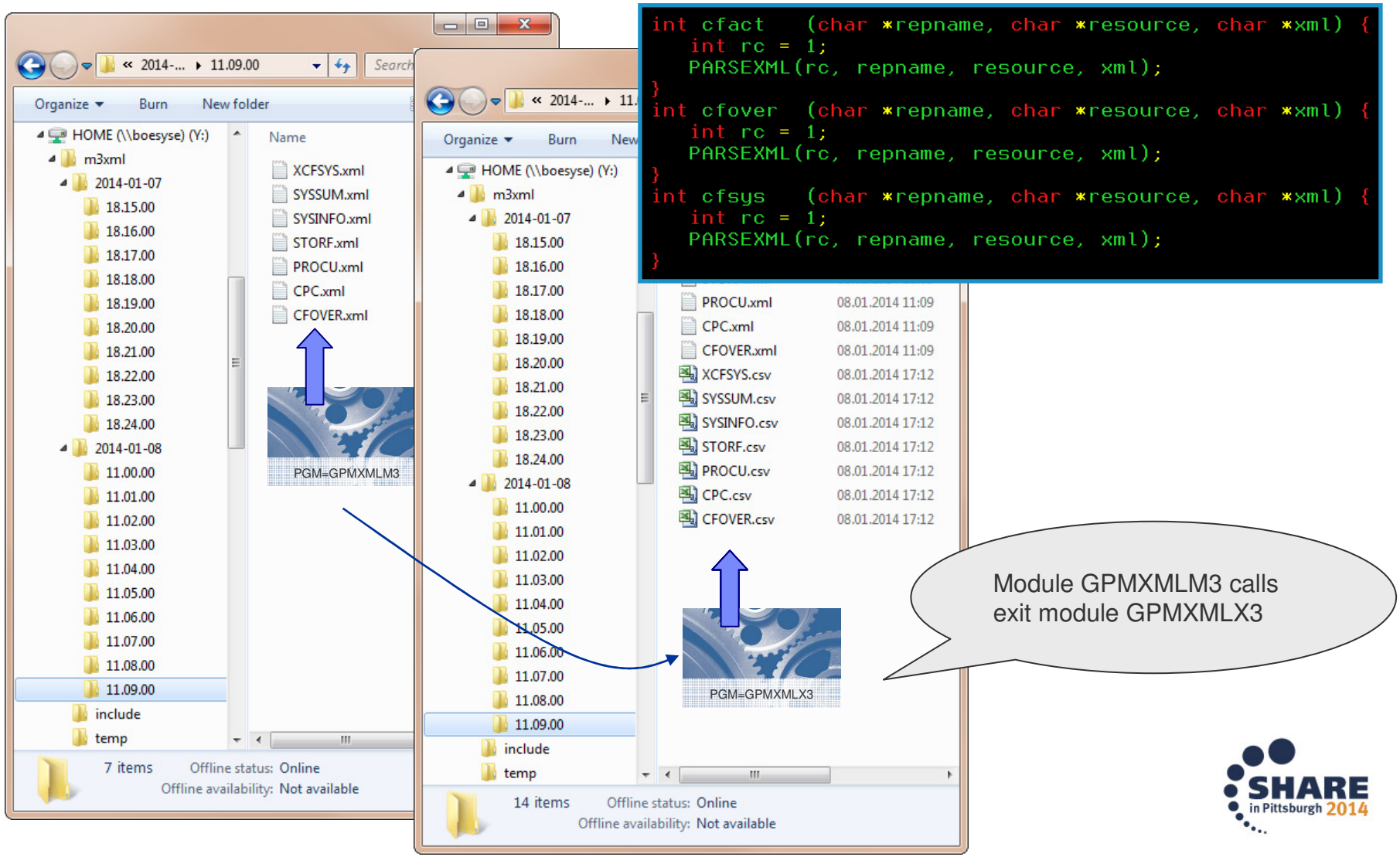


Name	Type			Execution Vel Goal	Execution Vel Actual	RT Goal	RT Goal %	RT Actual	RT Actual %	PI	Tran/sec	Queue Time	Active Time	Total Time	Wait Time	Conv Time	Res/Sys affinity time	Ineligible Queue Time
ATCH	W				100						0.003	0.498	714.000	714.000	0.498	0.000	0.000	0.000
BATCHHI	S	2	45		0.0					N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BATCHLOW	S	D			0.0						0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BATCHMED	S	3	40		0.0					N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BATCHRSP	S	2			0.0	1200.000	75%		N/A	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BATCH1	S	2	10		0.0					N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BATCH2	S	2	20		0.0					N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BTCHDEF	S				100						0.003	0.498	714.000	714.000	0.498	0.000	0.000	0.000
	1	5	20		0.0					N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2	D			100						0.003	0.498	714.000	714.000	0.498	0.000	0.000	0.000
BTCHTEST	S				0.0						0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	1	1	30		0.0					N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2	3	20		0.0					N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	3	5	10		0.0					N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	4	D			0.0						0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IOHI	S	1	80		0.0					N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IOMED	S	2	50		0.0					N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IRLM	S	1	75		0.0					N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OMVS	S				0.0						0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	1	2	30		0.0					N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2	3	20		0.0					N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	3	5	10		0.0					N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OMVSKERN	S	1	40		0.0					N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
STORPROC	S	2			0.0	90.000	AVG	0.000	AVG	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TSOEVEN	S				0.0						0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	1	2			0.0	0.300	AVG	0.000	AVG	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2	2			0.0	1.500	AVG	0.000	AVG	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	3	2			0.0	5.000	AVG	0.000	AVG	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Mining Gold – Realtime Parsing (1)



Mining Gold – Realtime Parsing (2)



Mining Gold – Realtime Parsing (3)

Module GPMXMLM3 is shipped with RMF V2R1

- Obtains the Monitor III XML report from RMF DDS (based on parameters)
- Tries to load exit module GPMXMLX3
- Searches for a function name in GPMXMLX3 equal to the report type
- If entry point could be found calls the function
- The parameters are:
  - Report name
  - Resource qualifier (eg. ***,,SYSPLEX*** or ***,SYSA,MVS_IMAGE***)
  - XML Document
- Writes the XML report to the USS file system (based on the return code of the GPMXMLX3 function)

Module GPMXMLX3 is shipped with RMF V2R1. A source code example is planned for RMF V2R2.

- Provides one function skeleton per report type
- Can parse the XML document and perform an individual action (CSV conversion, WTO...)
- Sets the return code in order to indicate whether the report should be written (rc=1) or not (rc=0)

Summary

The Monitor III XML Batch Facility can:

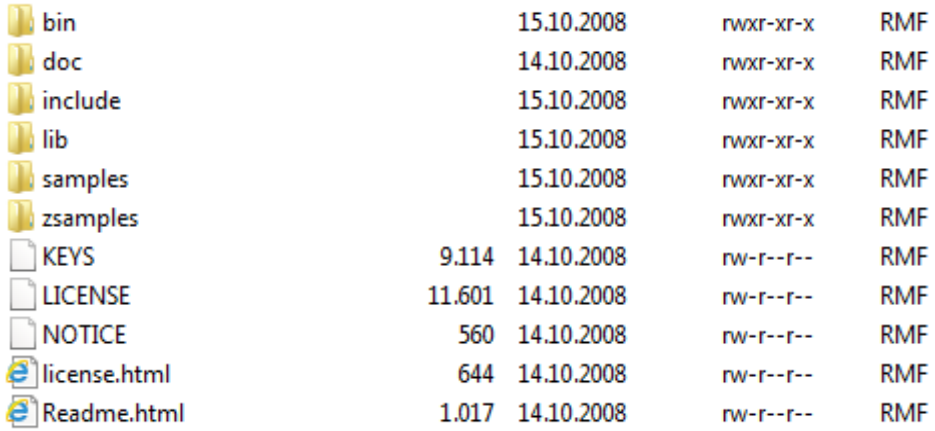
- Generate RMF Monitor III Reports automatically
- Provide Sysplex wide Reporting Scope
- Store the Reports persistently for each Mintime
- Create an Archive for selected Reports
- Process individual Reports and apply intelligent Analysis
  - ⇨Convert the Report XML Document to alternate Formats (CSV, JSON)
  - ⇨Parse the Report XML Document and extract Key Metrics
- Provide a State of the Art Reporting GUI
- Avoid cumbersome Downloads to the Workstation

Appendix – z/OS XML Facilities

- XML Processing in the z/OS environment
  - z/OS XML Toolkit
  - z/OS XML System Services
- XML Parsing with z/OS XML System Services
  - Callable Services Overview
  - Structure of Parsed Documents
  - C++ Mappings and Coding Example

z/OS XML Toolkit

- Optional Priced Feature (FMID HXML 1A0)
- Two Components
  - XML Parser
  - XSLT Processor
- Advanced Parsing Functions: Full implementation of SAX and DOM Parsers
- Stubs and Modules in the USS File System and in z/OS Library Format
- USS File System
  - /usr/lpp/ixm/IBM/xml4c-5_7 XML Parser
  - /usr/lpp/ixm/IBM/xslt4c-1_11 XSLT Processor



bin		15.10.2008	rwxr-xr-x	RMF
doc		14.10.2008	rwxr-xr-x	RMF
include		15.10.2008	rwxr-xr-x	RMF
lib		15.10.2008	rwxr-xr-x	RMF
samples		15.10.2008	rwxr-xr-x	RMF
zsamples		15.10.2008	rwxr-xr-x	RMF
KEYS	9.114	14.10.2008	rw-r--r--	RMF
LICENSE	11.601	14.10.2008	rw-r--r--	RMF
NOTICE	560	14.10.2008	rw-r--r--	RMF
license.html	644	14.10.2008	rw-r--r--	RMF
Readme.html	1.017	14.10.2008	rw-r--r--	RMF

- z/OS Library Format
  - Stubs SYS1.SIXMEXP
  - Run-Time Library SYS1.SIXMLOD1

z/OS XML System Services

- Integrated z/OS Component
- Provides set of services
  - gxlpQuery
  - gxlpInit
  - gxlpParse
  - gxlpTerminate
- Header Files — SYS1.SIEAHDRV.H
  - GXLHXML — Function prototypes
  - GXLHQXD — Query service return data mapping
  - GXLHXEH — Output record data mappings
  - GXLHXEC — Constants
- Link Library: — SYS1.SIEASID(GXLXXML1/GXLXXML4)
- Run-Time Library: — SYS1.SIEALNKE(GXLCXML1/GXLCXML4)

z/OS XML System Services

gxlpQuery — query an XML document

Obtains the XML characteristics of a document. The XML characteristics are either the default values, the values contained in an XML declaration or a combination of both.

```
int gxlpQuery (void * work_area,
               long work_area_length,
               void * input_buffer,
               long input_buffer_length,
               GXLHQXD ** return_data,
               int * rc_p,
               int * rsn_p);
```

Return Data is mapped by GXLHQXD.H

```
typedef struct _GXLHQXD
{
   int QXD_Version;
   unsigned int QXD_XML_Autodet_value;
   unsigned int QXD_XML_Autodet_CCSID;
   unsigned short QXD_XML_Version;
   unsigned short QXD_XML_Release;
   unsigned int QXD_XML_Specified_CCSID;
   unsigned char QXD_XML_Flag1;
   unsigned char QXD_XML_Flag2;
   unsigned short Rsvd_18;
   unsigned int QXD_XML_Decl_Len;
} GXLHQXD;
```

XML Version & Release

Encoding Information

```
<?xml version="1.0" encoding="UTF-8"?>
<directory>
 <user id="007">
  <name>
   <first>James</first>
   <last>Bond</last>
  </name>
  <profession>problem solver</profession>
 </user>
</directory>
```

z/OS XML System Services

gxlpInit — initialize the XML Parser

Initializes the PIMA and records the addresses of the caller's system service routines (if any).
The PIMA storage is divided into the areas that will be used by the XML parser to process the input buffer and produce the parsed data stream.

```
int gxlpInit (void * PIMA,
              long PIMA_LEN,
              int ccsid,
              int feature_flags,
              GXLHXSV sys_svc_vector,
              void * sys_svc_parm,
              int * rc_p,
              int * rsn_p);
```

Parse Instance Memory Area

Coded Character Set Identifier

Exit Routines and Parameters

z/OS XML System Services

gxlpParse — parse a buffer of XML text

Parses a buffer of XML text and places the result in an output buffer.

```
int gxlpParse(void * PIMA,
        int * option_flags,
        void ** input_buffer_addr,
        long * input_buffer_bytes_left,
        void ** output_buffer_addr,
        long * output_buffer_bytes_left,
        int * rc_p,
        int * rsn_p);
```

- Parse Instance Memory Area
- XML Input Document
- Parsed Result Area

gxlpTerminate — terminate a parse instance

Releases all resources obtained (including storage) by the XML parser and resets the PIMA so that it can be re-initialized or freed.

```
int gxlpTerminate (void * PIMA,
        int * rc,
        int * rsn);
```

- Parse Instance Memory Area

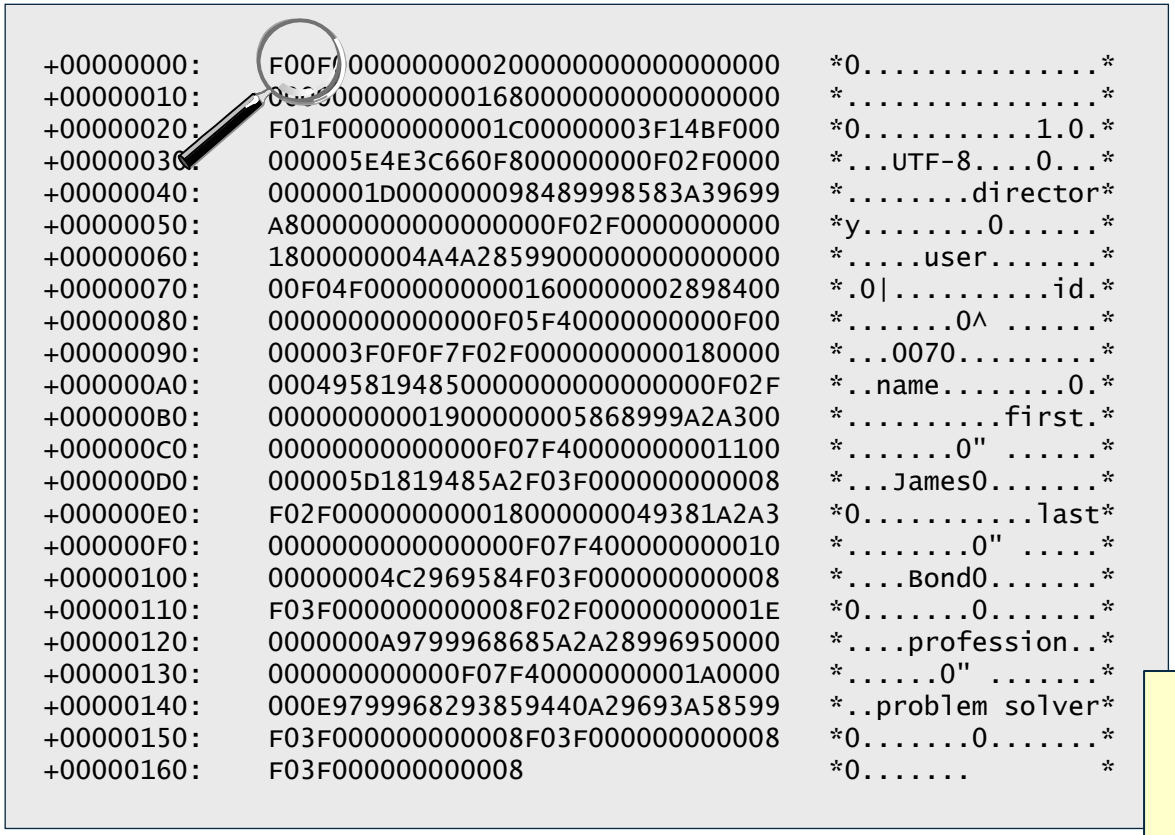
z/OS XML System Services – Parser Example

```
<?xml version="1.0" encoding="UTF-8"?>
<directory>
 <user id="007">
  <name>
   <first>James</first>
   <last>Bond</last>
  </name>
  <profession>problem solver</profession>
 </user>
</directory>
```

gxlpParse()

```
+00000000:    F00F000000000200000000000000000    *0..............*
+00000010:    00000000000001680000000000000000    *.............. *
+00000020:    F01F00000000001C00000003F14BF000    *0...........1.0.*
+00000030:    000005E4E3C660F800000000F02F0000    *...UTF-8....0...*
+00000040:    0000001D000000098489998583A39699    *........director*
+00000050:    A80000000000000000F02F0000000000    *y........0......*
+00000060:    1800000004A4A2859900000000000000    *.....user.......*
+00000070:    00F04F0000000000160000000 2898400    *.0|..........id.*
+00000080:    00000000000000F05F40000000000F00    *.......0^ ......*
+00000090:    000003F0F0F7F02F0000000000180000    *...0070.........*
+000000A0:    000495819485000000000000000F02F    *..name........0.*
+000000B0:    0000000000190000000 5868999A2A300    *..........first.*
+000000C0:    00000000000000F07F40000000001100    *.......0" ......*
+000000D0:    000005D1819485A2F03F000000000008    *...James0.......*
+000000E0:    F02F000000000018000000049381A2A3    *0...........last*
+000000F0:    0000000000000000F07F400000000010    *........0" .....*
+00000100:    00000004C2969584F03F000000000008    *....Bond0.......*
+00000110:    F03F000000000008F02F00000000001E    *0.......0.......*
+00000120:    0000000A9799968685A2A28996950000    *....profession..*
+00000130:    000000000000F07F40000000001A0000    *......0" .......*
+00000140:    000E9799968293859440A29693A58599    *..problem solver*
+00000150:    F03F000000000008F03F000000000008    *0.......0.......*
+00000160:    F03F000000000008                    *0.......        *
```

z/OS XML System Services – Parser Example



```
+00000000:    F00F000000000200000000000000000   *0..............*
+00000010:    0000000000001680000000000000000   *................*
+00000020:    F01F00000000001C00000003F14BF000  *0...........1.0.*
+00000030:    000005E4E3C660F800000000F02F0000  *...UTF-8....0...*
+00000040:    0000001D000000098489998583A39699  *........director*
+00000050:    A80000000000000000F02F0000000000  *y........0......*
+00000060:    1800000004A4A2859900000000000000  *.....user.......*
+00000070:    00F04F0000000000160000002898400   *.0|..........id.*
+00000080:    00000000000000F05F40000000000F00  *.......0^ ......*
+00000090:    000003F0F0F7F02F0000000000180000  *...0070.........*
+000000A0:    0004958194850000000000000000F02F  *..name........0.*
+000000B0:    0000000000190000000005868999A2A300  *..........first.*
+000000C0:    00000000000000F07F40000000001100  *.......0" ......*
+000000D0:    000005D1819485A2F03F000000000008  *...James0.......*
+000000E0:    F02F000000000018000000049381A2A3  *0...........last*
+000000F0:    0000000000000000F07F400000000010  *........0" .....*
+00000100:    00000004C2969584F03F000000000008  *....Bond0.......*
+00000110:    F03F000000000008F02F00000000001E  *0.......0.......*
+00000120:    0000000A9799968685A2A28996950000  *....profession..*
+00000130:    000000000000F07F40000000001A0000  *......0" .......*
+00000140:    000E9799968293859440A29693A58599  *..problem solver*
+00000150:    F03F000000000008F03F000000000008  *0.......0.......*
+00000160:    F03F000000000008                  *0.......        *
```

GXLHXEC_TOK_BUFFER_INFO	0xF00F
GXLHXEC_TOK_XML_DECL	0xF01F
GXLHXEC_TOK_START_ELEM	0xF02F
GXLHXEC_TOK_START_ELEM	0xF02F
GXLHXEC_TOK_ATTR_NAME	0xF04F
GXLHXEC_TOK_ATTR_VALUE	0xF05F
GXLHXEC_TOK_START_ELEM	0xF02F
GXLHXEC_TOK_CHAR_DATA	0xF07F
GXLHXEC_TOK_END_ELEM	0xF03F

```
<?xml version="1.0" encoding="UTF-8"?>
<directory>
 <user id="007">
  <name>
   <first>James</first>
   <last>Bond</last>
  </name>
  <profession>problem solver</profession>
 </user>
</directory>
```

z/OS XML System Services – Parser

```
+00000000:    F00F0000000000200000000000000000    *0...............*
+00000010:    00000000000001680000000000000000    *................*
+00000020:    F01F00000000001C00000003F14BF000    *0...........1.0.*
+00000030:    000005E4E3C660F800000000F02F0000    *...UTF-8....0...*
+00000040:    0000001D000000098489998583A39699    *........director*
+00000050:    A8000000000000000F02F0000000000     *y........0......*
+00000060:    1800000004A4A2859900000000000000    *.....user.......*
+00000070:    00F04F00000000001600000002898400    *.0|..........id.*
+00000080:    00000000000000F05F40000000000F00    *.......0^ ......*
+00000090:    000003F0F0F7F02F0000000000180000    *...0070.........*
+000000A0:    000495819485000000000000000F02F     *..name........0.*
+000000B0:    0000000000190000000005868999A2A300  *..........first.*
+000000C0:    00000000000000F07F40000000001100    *.......0" ......*
+000000D0:    000005D1819485A2F03F000000000008    *...James0.......*
+000000E0:    F02F000000000018000000049381A2A3    *0...........last*
+000000F0:    0000000000000000F07F400000000010    *........0" .....*
+00000100:    00000004C2969584F03F000000000008    *....Bond0.......*
+00000110:    F03F000000000008F02F00000000001E    *0.......0.......*
+00000120:    0000000A9799968685A2A28996950000    *....profession..*
+00000130:    000000000000F07F40000000001A0000    *......0" .......*
+00000140:    000E9799968293859440A29693A58599    *..problem solver*
+00000150:    F03F000000000008F03F000000000008    *0.......0.......*
+00000160:    F03F000000000008                    *0.......        *
```

Total Length of Document

Length of Element

```
<?xml version="1.0" encoding="UTF-8"?>
<directory>
 <user id="007">
  <name>
   <first>James</first>
   <last>Bond</last>
  </name>
  <profession>problem solver</profession>
 </user>
</directory>
```

z/OS XML System Services – Output Area

```
typedef struct _GXLHXEH_RECORD
{
   unsigned short XEH_TokType;
   unsigned char XEH_Flags;
   unsigned char XEH_Reserved;
   int XEH_RecLen;
   char XEH_Values;
} GXLHXEH_RECORD;
```

Return Data is mapped by GXLHQXD.H

```
+00000000:    F00F000000000020000000000000000    *0..............*
+00000010:    00000000000001680000000000000000   *.............*
+00000020:    F01F00000000001C00000003F14BF000   *0..........1.0.*
```

```
typedef struct _GXLHXEH_BUFINFODATA
{
   unsigned int XEH_DSOpts;
   unsigned short XEH_PrsStat;
   unsigned short XEH_BufRsv;
   unsigned long XEH_BufLenUsed;
   unsigned long XEH_ErrOffset;
} GXLHXEH_BUFINFODATA;
```

```
+00000000:    F00F000000000020000000000000000    *0..............*
+00000010:    00000000000001680000000000000000   *.............*
+00000020:    F01F00000000001C00000003F14BF000   *0..........1.0.*
```

```
typedef struct _GXLHXEH_VALUE
{
   int XEH_ValLen;
   char XEH_ValText;
} GXLHXEH_VALUE;
```

```
+000000E0:    F02F000000000018000000049381A2A3   *0..........last*
+000000F0:    0000000000000000F07F400000000010   *........0" .....*
+00000100:    00000004C2969584F03F000000000008   *....Bond0.......*
+00000110:
```

z/OS XML System Services – Parser

```
//-------------------------------------------------------------------
//
//   C++ Programming Example:
//   - loops through XML Output Buffer
//   - prints all tag names and character data
//
//-------------------------------------------------------------------

char text[256];
int  textLen;
GXLHXEH_RECORD *pXEHRecord = output_buffer_addr;
GXLHXEH_RECORD *pXEHEnd = pXEHRecord + (GXLHXEH_RECORD *)pXEHRecord->XEH_BufLenUsed;
GXLHXEH_VALUE  *pXEHValue;
while (pXEHRecord < pXEHEnd) {
   pXEHValue = (GXLHXEH_VALUE *)&pXEHRecord->XEH_Values;
   textLen = pXMLValue->XEH_ValLen;

   switch (pXEHRecord->XEH_TokType) {
      case GXLHXEC_TOK_START_ELEM:
      case GXLHXEC_TOK_CHAR_DATA:
         memcpy(text, (char *)&pXEHValue->XEH_ValText, textLen);
         *(text + pXMLValue->XEH_ValLen) = '\0';
         printf("String found: %s\n, text);
         break;
      case GXLHXEC_TOK_END_ELEM:
      break;
      default:
      break;
   }
   pXMLRecord =
   (GXLHXEH_RECORD *)((char *)pXEHRecord + pXEHRecord->XEH_RecLen);
}
```

```
<?xml version="1.0" encoding="UTF-8"?>
<directory>
 <user id="007">
  <name>
   <first>James</first>
   <last>Bond</last>
  </name>
  <profession>problem solver</profession>
 </user>
</directory>
```

Summary

The Monitor III XML Batch Facility can:

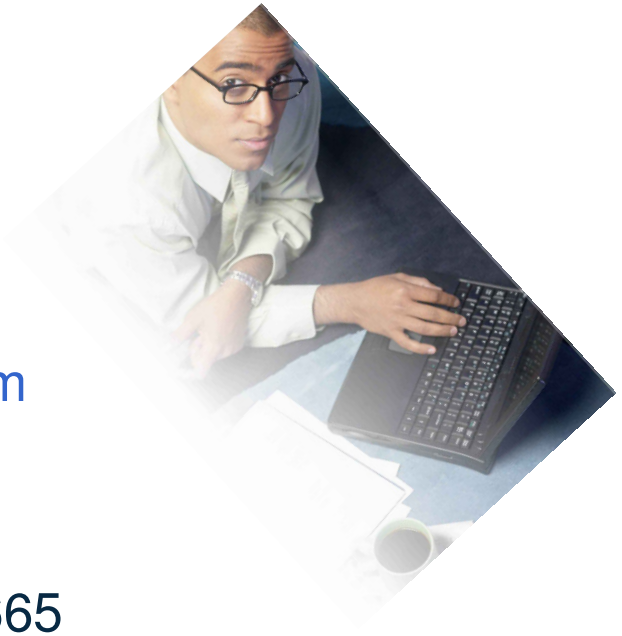
- Generate RMF Monitor III Reports automatically
- Provide Sysplex wide Reporting Scope
- Store the Reports persistently for each Mintime
- Create an Archive for selected Reports
- Process individual Reports and apply intelligent Analysis
  - ⇨ Convert the Report XML Document to alternate Formats (CSV, JSON)
  - ⇨ Parse the Report XML Document and extract Key Metrics
- Provide a State of the Art Reporting GUI
- Avoid cumbersome Downloads to the Workstation

```
<?xml version="1.0" encoding="UTF-8"?>
<directory>
 <user id="007">
  <name>
   <first>James</first>
   <last>Bond</last>
  </name>
  <profession>problem solver</profession>
 </user>
</directory>
```

Information and Tools

RMF website: www.ibm.com/systems/z/os/zos/features/rmf/

- Product information, newsletters, presentations, ...
- Downloads
  - Spreadsheet Reporter
  - RMF PM Java Edition
  - Postprocessor XML Toolkit



RMF email address: rmf@de.ibm.com

Documentation and news:

- ⇨RMF Report Analysis, SC34-2665
- ⇨RMF User‘s Guide, SC34-2664
- ⇨PDF files can be downloaded from: www.ibm.com/systems/z/os/zos/bkserv