Creating RMF Postprocessor XML Reports

Set up the IBM HTTP Server for Remote RMF Report Access

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Trademarks

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Introduction

The plain text format has been the standard output format of *RMF Postprocessor Reports* for decades. Even though this format was well accepted, it implicates a couple of drawbacks:

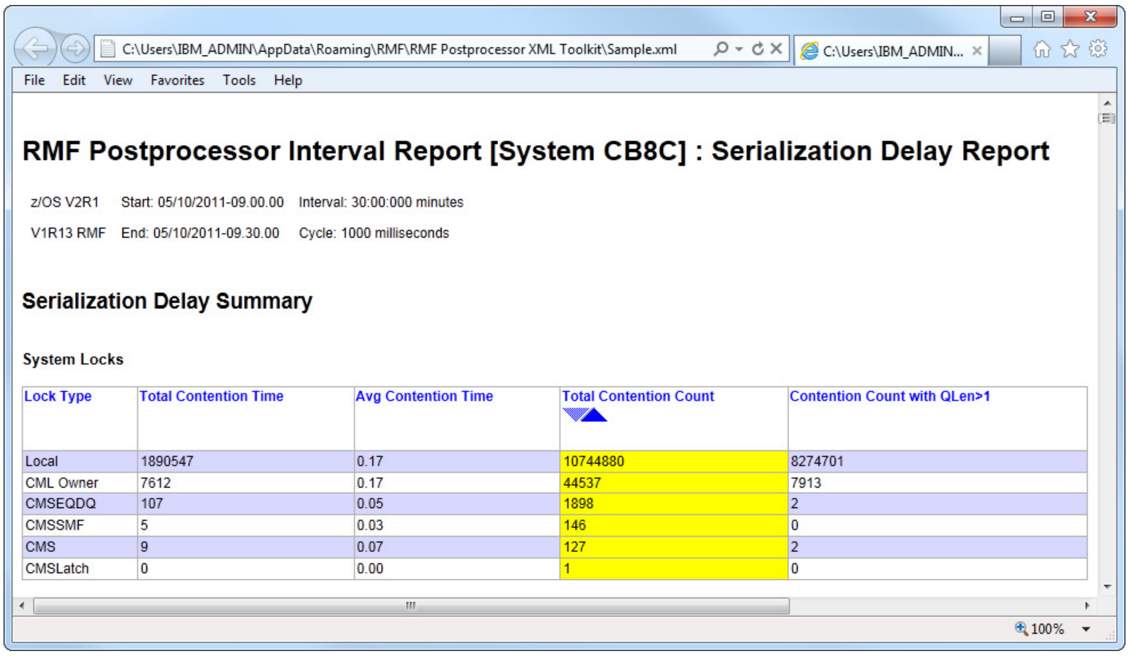
- The standard text output is limited to a width of 132 characters. Therefore, depending on the report contents, some reports appeared squeezed.
- The basic text format doesn‘t exploit today’s presentation capabilities like resizing windows, scrolling back and forth etc.
- Depending on the report type, the report layouts are quite different. Hence, API programs need to supply specific logic in order to extract metrics from the reports.

Hence, starting with z/OS V1R11 RMF, the Postprocessor is able to generate performance reports alternatively in XML format.
Since the reports are pure XML, an arbitrary web browser is perfectly suited to display the reports in a state-of-the art fashion.
Once you have created a USS directory with XML reports by means of a Postprocessor job, you can use the IBM HTTP Server instantly as gateway. The reports can remain in the USS directory of your z/OS system and you can forget about cumbersome downloads.

In this lab you will learn how to create RMF Postprocessor XML reports and how to direct the report output to your USS file system.
Then you will review and adapt a couple of parameters in the configuration file of the IBM HTTP Server.
Finally, just restart your IBM HTTP Server and enjoy the RMF reports in your browser window. Navigate through the reports, expand and collapse individual report sections and explore the built-in sort capability.
And last not least, since the lab script is organized as cookbook, you can implement everything in your home installation in less than an hour!

Lesson 1 – The RMF Postprocessor XML Toolkit

We assume that the installation of the *RMF Postprocessor XML Toolkit* has been finished successfully. The Windows *Start* menu should now contain an additional entry *Programs/IBM RMF Performance Management/RMF Postprocessor XML Toolkit*.
Just click on this item to navigate to the Toolkit's root directory.
In this directory you find the file *Sample.xml* which contains the Postprocessor *Serialization Delay Report* in XML format. Once you double-click this file, a browser window will open and displays the content of the report.
Now you can adjust to your preferred window size or use the sliders to navigate through the various report sections.
When you click on one of the column headers, the rows of the current report segment will be sorted by descending order.


C:\Users\IBM_ADMIN\AppData\Roaming\RMF\RMF Postprocessor XML Toolkit\Sample.xml
C:\Users\IBM_ADMIN...
File
Edit
View
Favorites
Tools
Help
100%

RMF Postprocessor Interval Report [System CB8C] : Serialization Delay Report

z/OS V2R1 Start: 05/10/2011-09.00.00 Interval: 30:00:000 minutes
V1R13 RMF End: 05/10/2011-09.30.00 Cycle: 1000 milliseconds

Serialization Delay Summary

System Locks

Lock Type	Total Contention Time	Avg Contention Time	Total Contention Count	Contention Count with QLen>1
Local	1890547	0.17	10744880	8274701
CML Owner	7612	0.17	44537	7913
CMSEQDQ	107	0.05	1898	2
CMSSMF	5	0.03	146	0
CMS	9	0.07	127	2
CMSLatch	0	0.00	1	0

Figure 1: Postprocessor XML Toolkit – Serialization Delay Report

Basically all XML documents which are visualized by means of a web browser need some formatting directives in terms of some supplemental files. These files are located in the *include* subdirectory of the *Postprocessor XML Toolkit*. Navigate to this subdirectory and verify the following filetypes:

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

Using the *Postprocessor XML Toolkit* everything is playing pretty well together and the XML reports are displayed properly in our browser window.
However, up to now everything is executed just locally on our workstation.
In other words, once we want to view additional XML reports with the browser we would need to download the report files manually to the *XML Toolkit* root directory on our workstation.
Since this can become very cumbersome…wouldn't it be cute to have a well defined procedure where we can add frequently new reports to our report repository without any download processing?

Lesson 2 – Upload the stylesheet files to the z/OS System

Since we don’t want to bring the Postprocessor XML reports to the location of our stylesheets via download, we need to upload the stylesheets to the location of our frequently created XML reports.

Exercise:

- Login to the z/OS system
  Userid: SHARAnn (where nn is 01 – 20)
  Password:

- Open an OMVS session:

  Type *OMVS* in the command line of the ISPF main panel.
  Then you will see the following command prompt:
  MVS1:SHARAnn:/sharelab/sharann: >

- Create your XML target directories

  Enter the commands
  – *mkdir xmlpp*
  – *mkdir xmlpp/include*

- Type *exit* to close the OMVS session

- Open a command window on your Windows workstation

  Select *All Programs – Accessories – Command Prompt*

- Navigate to the *include* directory of your *XML Toolkit*

  cd C:\Users\SmartSource\AppData\Roaming\RMF\RMF Postprocessor XML Toolkit\include

- Open an FTP session on your Windows workstation

  FTP -i mvs1.centers.ihost.com
  When prompted, enter your userid and your password

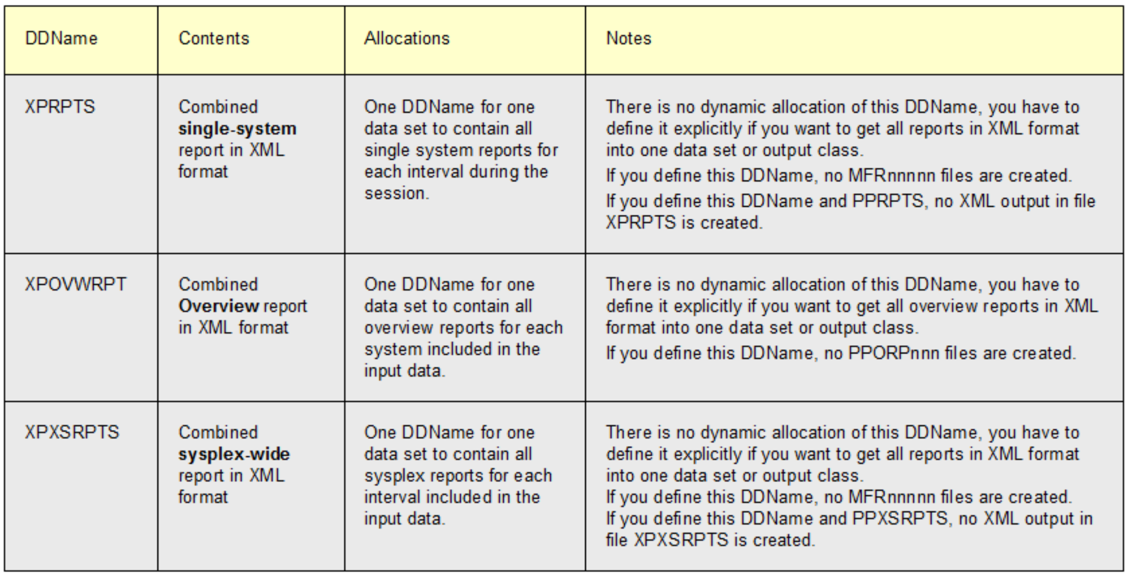
- Upload the stylesheet files to your xmlpp USS directory
  Enter the following command sequence:

  cd /sharelab/sharann/xmlpp/include
  ascii
  *mput *.js*
  *mput *.xsl*
  *mput *.css*
  binary
  *mput *.gif*
  bye

Lesson 3 – Create Postprocessor XML Reports

Once we want to trigger the Postprocessor to create the new XML formatted reports, this can be achieved by means of slight changes in our Postprocessor JCL:

- The generation of Postprocessor reports in XML format is controlled by the new ddnames XPRPTS, XPXSRPTS and XPOVWRPT
- If the XML output is routed to permanent datasets rather than to SYSOUT, define the dataset with RECFM=VB and LRECL between 256 and 8192. In addition, specify an appropriate BLKSIZE



DDName	Contents	Allocations	Notes
XPRPTS	Combined **single-system** report in XML format	One DDName for one data set to contain all single system reports for each interval during the session.	There is no dynamic allocation of this DDName, you have to define it explicitly if you want to get all reports in XML format into one data set or output class. If you define this DDName, no MFRnnnnn files are created. If you define this DDName and PPRPTS, no XML output in file XPRPTS is created.
XPOVWRPT	Combined **Overview** report in XML format	One DDName for one data set to contain all overview reports for each system included in the input data.	There is no dynamic allocation of this DDName, you have to define it explicitly if you want to get all overview reports in XML format into one data set or output class. If you define this DDName, no PPORPnnn files are created.
XPXSRPTS	Combined **sysplex-wide** report in XML format	One DDName for one data set to contain all sysplex reports for each interval included in the input data.	There is no dynamic allocation of this DDName, you have to define it explicitly if you want to get all reports in XML format into one data set or output class. If you define this DDName, no MFRnnnnn files are created. If you define this DDName and PPXSRPTS, no XML output in file XPXSRPTS is created.

Figure 2: Postprocessor DDNames for XML report format

By default the Postprocessor creates its reports based on the SMF record images which are currently available in the SMF buffer of the RMF Sysplex Data Server.
Hence, a single Postprocessor job would create more than one report representing multiple intervals.
In case we just want to create a report for the most current SMF interval we can exploit the capabilities of RMF's utility *ERBAPPL*. By adding a preceding job step together with the '?' input parameter the most recent SMF interval is extracted from the SMF buffer and passed to the Postprocessor.

Altogether, our Postprocessor JCL may now look like as follows:

```
//SHARAnnX JOB (DE03141,,),'SHARAnn',CLASS=A,USER=SHARAnn,
//         MSGCLASS=H,MSGLEVEL=(1,1),NOTIFY=SHARAnn
//*
//XMLPP    PROC SMF=,REPORT=
//GETSMF   EXEC PGM=ERBAPPL,PARM='?/*/&SMF'
//SMFDATA  DD   DISP=(NEW,PASS),UNIT=SYSDA,SPACE=(CYL,(20,20))
//ERBLIST  DD   SYSOUT=*
//*
//RMFPP    EXEC PGM=ERBRMFPP,COND=(4,LT,GETSMF)
//MFPINPUT DD   DISP=(OLD,PASS),DSN=*.GETSMF.SMFDATA
//MFPMSGDS DD   SYSOUT=*
//XPRPTS   DD   PATH='/sharelab/sharann/xmlpp/&REPORT..xml',
//           PATHOPTS=(OWRONLY,OCREAT,OTRUNC),
//           PATHMODE=(SIRUSR,SIWUSR,SIRGRP),FILEDATA=TEXT
//XPXSRPTS DD   PATH='/sharelab/sharann/xmlpp/&REPORT..xml',
//           PATHOPTS=(OWRONLY,OCREAT,OTRUNC),
//           PATHMODE=(SIRUSR,SIWUSR,SIRGRP),FILEDATA=TEXT
//           PEND
//PPCPU    EXEC PROC=XMLPP,SMF=70,REPORT=CPU
//RMFPP.SYSIN DD   *
  REPORTS(CPU)
//PPSDELAY EXEC PROC=XMLPP,SMF=72,REPORT=SDELAY
//RMFPP.SYSIN DD   *
  REPORTS(SDELAY)
//PPWLMGL  EXEC PROC=XMLPP,SMF=72,REPORT=WLMGL
//RMFPP.SYSIN DD   *
  SYSRPTS(WLMGL(SCPER,POLICY))
//
```

Figure 3: Postprocessor JCL Example for XML Reports

Exercise:

- Login to the z/OS system
- Open the dataset SHARAnn.RMF.CNTL(XMLPP) with the ISPF Editor
- Review and adjust the content of the JCL (update nn)
- Submit the Job
- Once the Job is complete, check the job output with the SDSF application (type *SDSF* in the command line of the ISPF primary panel)
- Open an OMVS session and navigate to your xmlpp subdirectory

  Type *OMVS* in the command line of the ISPF main panel.
  cd /sharelab/sharann/xmlpp

- Check the existence of the new XML reports (e.g. with the USS *ls* command)
  1. CPU.xml
  2. SDELAY.xml
  3. WLMGL.xml

- Verify the content of the CPU report with the ISPF editor:

  type *oedit CPU.xml*

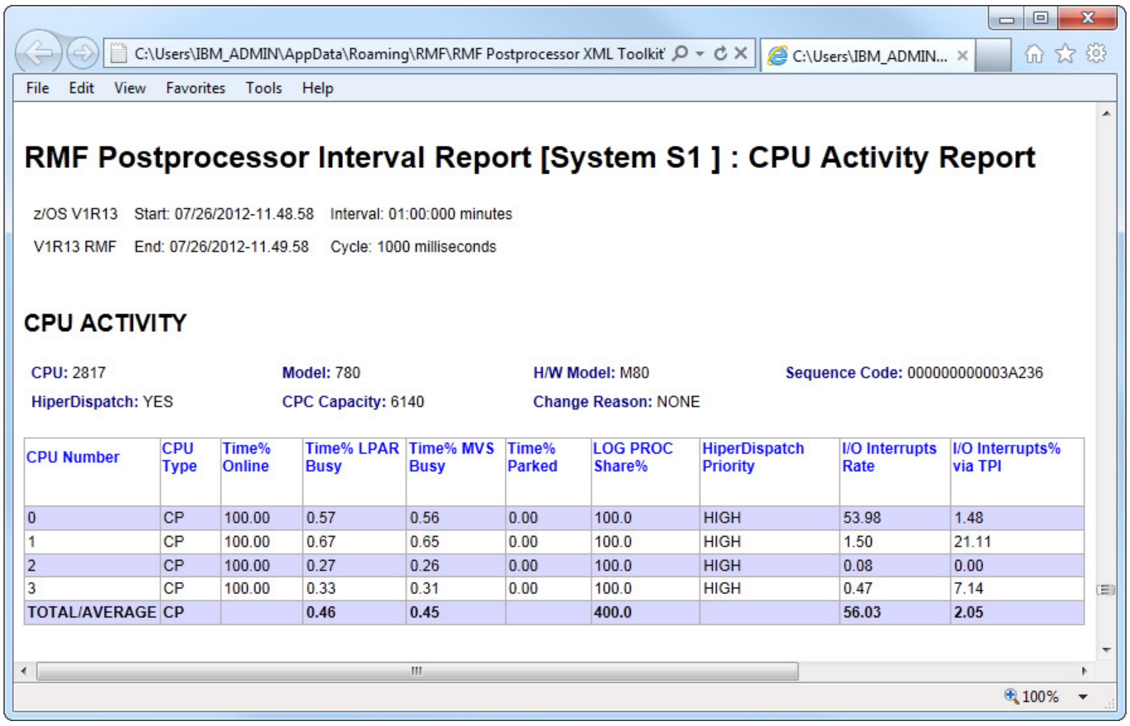
- Type *exit* to close the OMVS session

Optional Exercise:

- Download the CPU report to the root directory of the *RMF Postprocessor XML Toolkit* (C:\Users\SmartSource\AppData\Roaming\RMF\RMF Postprocessor XML Toolkit)

  Note: The report needs to be downloaded in ascii format (type 'ascii' in the ftp session before downloading the report)

- Open the CPU report in a browser window and verify the report content


C:\Users\IBM_ADMIN\AppData\Roaming\RMF\RMF Postprocessor XML Toolkit
C:\Users\IBM_ADMIN...
File
Edit
View
Favorites
Tools
Help
100%

RMF Postprocessor Interval Report [System S1] : CPU Activity Report

z/OS V1R13 Start: 07/26/2012-11.48.58 Interval: 01:00:000 minutes

V1R13 RMF End: 07/26/2012-11.49.58 Cycle: 1000 milliseconds

CPU ACTIVITY

CPU: 2817 **Model:** 780 **H/W Model:** M80 **Sequence Code:** 000000000003A236

HiperDispatch: YES **CPC Capacity:** 6140 **Change Reason:** NONE

CPU Number	CPU Type	Time% Online	Time% LPAR Busy	Time% MVS Busy	Time% Parked	LOG PROC Share%	HiperDispatch Priority	I/O Interrupts Rate	I/O Interrupts% via TPI
0	CP	100.00	0.57	0.56	0.00	100.0	HIGH	53.98	1.48
1	CP	100.00	0.67	0.65	0.00	100.0	HIGH	1.50	21.11
2	CP	100.00	0.27	0.26	0.00	100.0	HIGH	0.08	0.00
3	CP	100.00	0.33	0.31	0.00	100.0	HIGH	0.47	7.14
TOTAL/AVERAGE	**CP**		**0.46**	**0.45**		**400.0**		**56.03**	**2.05**

Figure 4: Postprocessor XML Toolkit – CPU Activity Report

Lesson 4 – Configure the IBM HTTP Server

The IBM HTTP Server is a standard component of the z/OS operating system.
You can start the module either from the IBM WebSphere Administrative Console or directly from the OMVS command line. The HTTP Daemon *httpd* is located in the directory /usr/lpp/internet/sbin.
Alternatively, you can invoke the module SYS1.LINKLIB(IMWHTTPD) from the z/OS system console together with a cataloged procedure. An example JCL for this procedure can be found in SYS1.SAMPLIB(IMWEBSRV).

```
//IMWPROC PROC ICSPARM='-r /sharelab/sharann/httpd/httpd.conf',
//   LEPARM='HEAPP(ON),ENVAR("_CEE_ENVFILE=/etc/httpd.envvars")'
//*
//WEBSRV    EXEC PGM=IMWHTTPD,REGION=0K,TIME=NOLIMIT,
//    PARM=('&LEPARM/&ICSPARM')
//SYSIN     DD DUMMY
//OUTDSC    OUTPUT DEST=HOLD
//SYSPRINT DD SYSOUT=*,OUTPUT=(*.OUTDSC)
//SYSERR    DD SYSOUT=*,OUTPUT=(*.OUTDSC)
//STDOUT    DD SYSOUT=*,OUTPUT=(*.OUTDSC)
//STDERR    DD SYSOUT=*,OUTPUT=(*.OUTDSC)
//SYSOUT    DD SYSOUT=*,OUTPUT=(*.OUTDSC)
//CEEDUMP   DD SYSOUT=*,OUTPUT=(*.OUTDSC)
//          PEND
```

Figure 5: Started Task Procedure for the IBM HTTP Server

As the JCL above shows, the parameters for the HTTP daemon are kept in the following files:

• httpd.conf	HTTP Server Control Statements
• httpd.envvars	HTTP Server Environment Variables

While the environment variables can remain unchanged, we need to customize a couple of directives in the control statement file *httpd.conf*.

Exercise:

- Login to the z/OS system
  Userid: SHARAnn (where nn is 01 – 20)
  Password:

- Open an OMVS session:

  Type *OMVS* in the command line of the ISPF main panel.
  Then you will see the following command prompt:
  MVS1:SHARAnn:/sharelab/sharann: >

- Create your directory for the HTTP Daemon's configuration file

  Enter the command *mkdir httpd*

- Make your private copy of the configuration file. Enter the command:
  cp /usr/lpp/internet/samples/config/httpd.conf /sharelab/sharann/httpd/httpd.conf

- Adjust the parameters in the configuration file */sharelab/sharann/httpd/httpd.conf*

  Enter commands:
  cd httpd
  oedit httpd.conf

  Adjust the following contents in the httpd.conf file:

  – Specify the HTTP Port number (where nn is the suffix of your userid)

    ```
    Port  85nn
    ```

  – Allow HTTP Server Login without userid/password prompt

    Specify `UserId %%SERVER%%` instead of `UserId %%CLIENT%%`

  – Allow HTTP users to navigate through directories:

    ```
    DirAccess   on
    ```

  – Specify the xmlpp Pass mapping directive right behind the line with the text:
    # *** ADD NEW PASS RULES HERE ***
    (the generic Pass mapping directive must remain the last directive)

    ```
    Pass  /xmlpp/*    /sharelab/sharann/xmlpp/*
    ```

  – Ensure that the HTTP server processes the XML documents in text mode and the include files in the same mode used for the file upload
    (which was ascii/ebcdic, except the gif files).
    Hence, the *AddType* directives for the affected filetypes should look like as follows:

    ```
    AddType  .xml    text/xml          ebcdic  1.0 # xml
    AddType  .xsl    text/xml-xsl      ebcdic  1.0 # xsl
    AddType  .css    text/css          ebcdic  1.0 # css
    Addtype  .js     text/javascript   ebcdic  1.0 # js
    Addtype  .gif    image/gif         binary  1.0 # gif
    ```

    Note: the *AddType* directive for the filetype *.xsl* needs to be inserted

  – Type *save* to save your changes

- Type *exit* to close the OMVS session

Lesson 5 – Remote Access to Postprocessor XML Reports

Now everything should be ready to access and display the XML reports that we have created in Lesson 3 by means of our web browser.

Exercise:

- Start the HTTP Daemon
  - Login to the z/OS system
  - Open the dataset SHARAnn.RMF.CNTL(IMWEBSRV) with the ISPF Editor
  - Review and adjust the parameters of the JCL (update nn)
  - Submit the Job

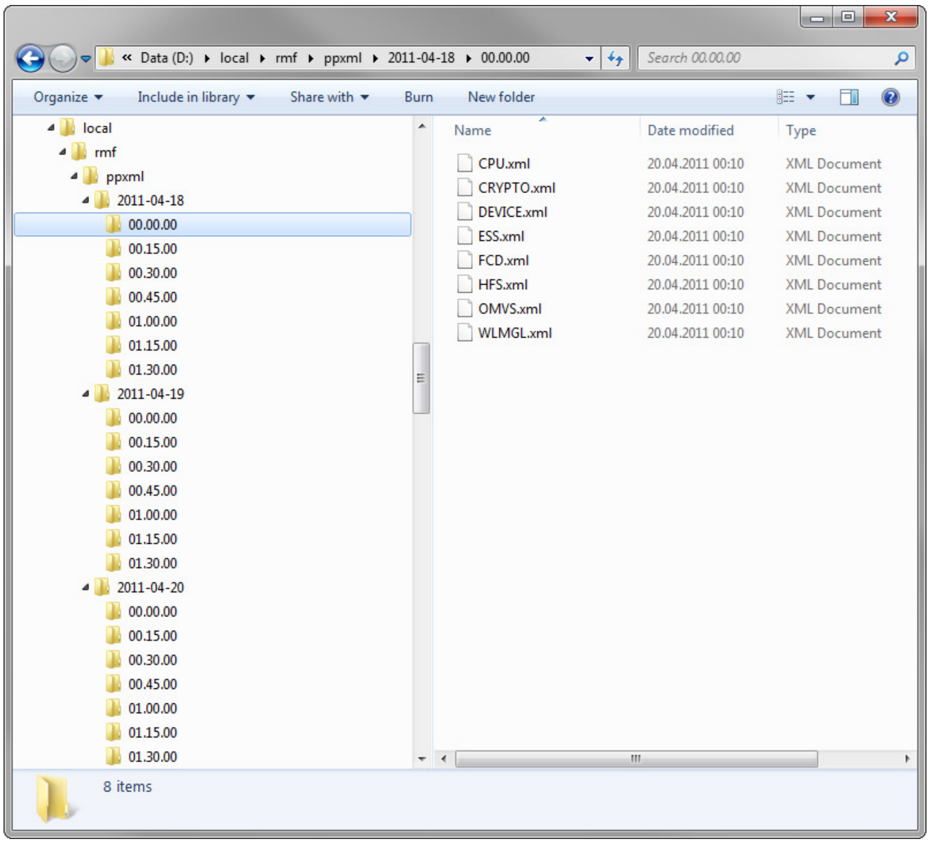
- View the remote XML Reports
  - Open your preferred web browser
  - Type in the address bar: http://mvs1.centers.ihost.com:85nn/xmlpp
  - Select your preferred report and check the report content

All done – Congratulations!
In case you have performed the previous lessons without errors, you should now be able to view your remote Postprocessor reports properly by means of your web browser.

Lesson 6 – Create frequent Postprocessor Realtime Reports (Optional Lesson)

With the successful completion of lesson 5 we are already able do display our Postprocessor by means of a web browser without any download processing.
Now let's perform the next step: wouldn't it be cute to produce frequently Postprocessor Realtime Reports and keep them in a well defined directory structure?

No problem, this can be achieved just in a couple of minutes.
The *RMF Postprocessor XML Toolkit* comes with the shell script *ppxml.sh* that creates one directory per day and one subdirectory per SMF interval. On interval completion, the new XML reports are copied from a temporary location to the appropriate subdirectory.



- local
  - rmf
    - ppxml
      - 2011-04-18
        - 00.00.00
        - 00.15.00
        - 00.30.00
        - 00.45.00
        - 01.00.00
        - 01.15.00
        - 01.30.00
      - 2011-04-19
        - 00.00.00
        - 00.15.00
        - 00.30.00
        - 00.45.00
        - 01.00.00
        - 01.15.00
        - 01.30.00
      - 2011-04-20
        - 00.00.00
        - 00.15.00
        - 00.30.00
        - 00.45.00
        - 01.00.00
        - 01.15.00
        - 01.30.00

Name	Date modified	Type
CPU.xml	20.04.2011 00:10	XML Document
CRYPTO.xml	20.04.2011 00:10	XML Document
DEVICE.xml	20.04.2011 00:10	XML Document
ESS.xml	20.04.2011 00:10	XML Document
FCD.xml	20.04.2011 00:10	XML Document
HFS.xml	20.04.2011 00:10	XML Document
OMVS.xml	20.04.2011 00:10	XML Document
WLMGL.xml	20.04.2011 00:10	XML Document

Figure 6: Postprocessor XML Reports – Directory Structure

Since the *ppxml.sh* shell script needs to be executed on our z/OS system, we have to upload the file from the workstation in ASCII mode.

Exercise:

- Open a command window on your Windows workstation

  Select *All Programs – Accessories – Command Prompt*

- Navigate to the *example* directory of your *XML Toolkit*

  cd C:\Users\SmartSource\AppData\Roaming\RMF\RMF Postprocessor XML Toolkit\example

- Open an FTP session on your Windows workstation

  FTP mvs1.centers.ihost.com
  When prompted, enter your userid and your password

- Upload the stylesheet files to your xmlpp USS directory
  Enter the following command sequence:

  ascii
  cd /sharelab/sharann/xmlpp/
  put ppxml.sh
  quote site chmod 755 ppxml.sh
  bye

In lesson 2 we have already copied the stylesheet files to the */xmlpp/include* subdirectory. Hence the stylesheets are at the proper location as long as the XML reports reside in the */xmlpp* parent directory.
But in this lesson we will create frequently a set of XML reports and copy the reports to new subdirectories. For this reason we need to place a symbolic link in each new subdirectory which points to the true location of the stylesheet files.
This symbolic link is created by the *ppxml.sh* shell script too.

We are now ready to integrate the *ppxml.sh* shell script in our existing Postprocessor JCL that we have already used in lesson 3.
An example is provided on our z/OS system in SHARAnn.RMF.CNTL(XMLPP10)

Exercise:

- Login to the z/OS system

- Create a temporary directory and allow other users to write new XML reports to all xmlpp subdirectories.
  Open an OMVS session and issue the following command:

  mkdir /sharelab/sharann/xmlpp/temp
  chmod –R 777 /sharelab/sharann/xmlpp

- Open the dataset SHARAnn.RMF.CNTL(XMLPP10) with the ISPF Editor

- Review and adjust the content of the JCL

- Submit the Job

- Once the Job is complete, check the job output with the SDSF application

- Open an OMVS session and navigate to the new xmlpp/yyyy-mm-dd/hh.mm.ss/ subdirectory

- Check the existence of the new XML reports (e.g. with the USS *ls* command)
    1. CPU.xml
    2. SDELAY.xml
    3. WLMGL.xml

- View the remote XML Reports

  – Open your preferred web browser

  – Type in the address bar: http://mvs1.centers.ihost.com:85nn/xmlpp

  – Navigate to the new xmlpp/yyyy-mm-dd/hh.mm.ss/ subdirectory

  – Select your preferred report and check the report content

So far, so good. But there is one task remaining:
How we can achieve that our JCL is frequently submitted right after each SMF interval completion?

Exercise:

- Check the SMF interval length with the *D SMF,O* console command
  The value of the INTVAL directive (e.g. *INTVAL(10) – PARMLIB*) displays the length in minutes. On our SHARE system, the SMF Interval length is set to 10 minutes resp. 600 seconds

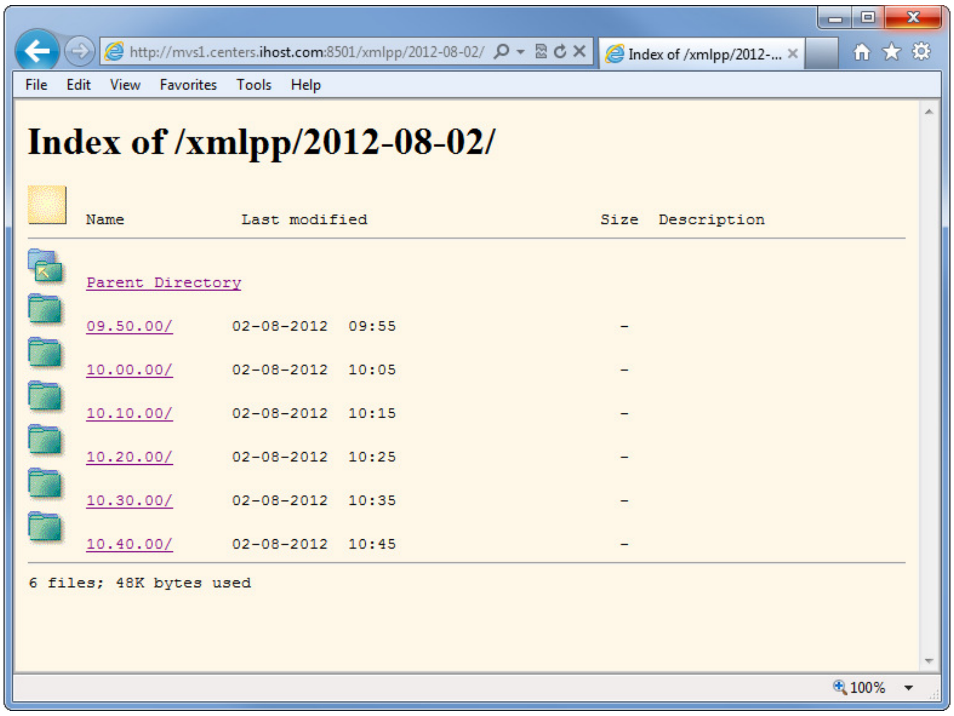
- Schedule the automatic submission of the Postprocessor JCL using the JES2 Automatic Command Facility. With the following command the JCL will be passed to the JES2 internal reader and executed every 600 seconds:

  $TAnn,I=600,'$VS,''S JOBRDR,DS=SHARAnn.RMF.CNTL(XMLPP10)'''

As response you might see on the SHARE lab system the following console messages:

```
ICH408I USER(SHARAnn ) GROUP(SHARUSER) NAME(SHARE USER
  JES2.VS CL(OPERCMDS)
  INSUFFICIENT ACCESS AUTHORITY
  FROM JES%.** (G)
  ACCESS INTENT(CONTROL)  ACCESS ALLOWED(UPDATE )
$HASP249 COMMAND RECEIVED FROM AUTO COMMAND ID=01 768
$VS,'S JOBRDR,DS=SHARAnn.RMF.CNTL(XMLPP10)'
$HASP690 COMMAND REJECTED - AUTHORIZATION FAILURE
```

However, with the proper authorization in your home installation everything should work fine: from now on your XMLPP10 JCL will be submitted every 10 minutes.
That means a comprehensive repository with XML reports will be established and extended automatically.
Hence, if you have enough time to wait for at least one hour ☺ your directory for the current day should contain 6 new subdirectories. Once you navigate with your web browser to the day's directory, your window should look similar than shown in Figure 7.



Index of /xmlpp/2012-08-02/

```
Name              Last modified                    Size  Description

Parent Directory
09.50.00/        02-08-2012  09:55                   -
10.00.00/        02-08-2012  10:05                   -
10.10.00/        02-08-2012  10:15                   -
10.20.00/        02-08-2012  10:25                   -
10.30.00/        02-08-2012  10:35                   -
10.40.00/        02-08-2012  10:45                   -

6 files; 48K bytes used
```

Figure 7: New Subdirectories with XML Reports

Altogether, using this technology, you don't have to care about housekeeping of SMF raw data. You can instantly analyze the Postprocessor reports for any interval of your choice.

Lesson 7 – Cleanup

We have used the JES2 Automatic Command Facility in lesson 6 in order to submit our Postprocessor JCL frequently after SMF interval completion. If you have performed lesson 6 successfully, the timer is still active and the JCL will still be submitted unless we don't remove the timer.
Then we will throw away all the fruits of our hard work completely and remove our xmlpp and httpd directories including all subdirectories.
Finally we should not forget to stop our HTTP server instance.

Exercise:

- Cleanup your timer:

  Issue the console command *$CAnn*

- Reset your changes in the dataset SHARAnn.RMF.CNTL:

  Exchange your sequence number against the characters 'nn' in all members

- Cleanup your *xmlpp* and *httpd* subdirectories

  Open an OMVS session and issue the commands *rm –R xmlpp* and *rm –R httpd*

- Shutdown your HTTP Server:

  Issue the console command *P SHARAnnH*