



| RMF Development Edition

z/OS Resource Measurement Facility

Analyzing XCF Performance with the
RMF Spreadsheet Reporter



May, 28th 2009

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Agenda

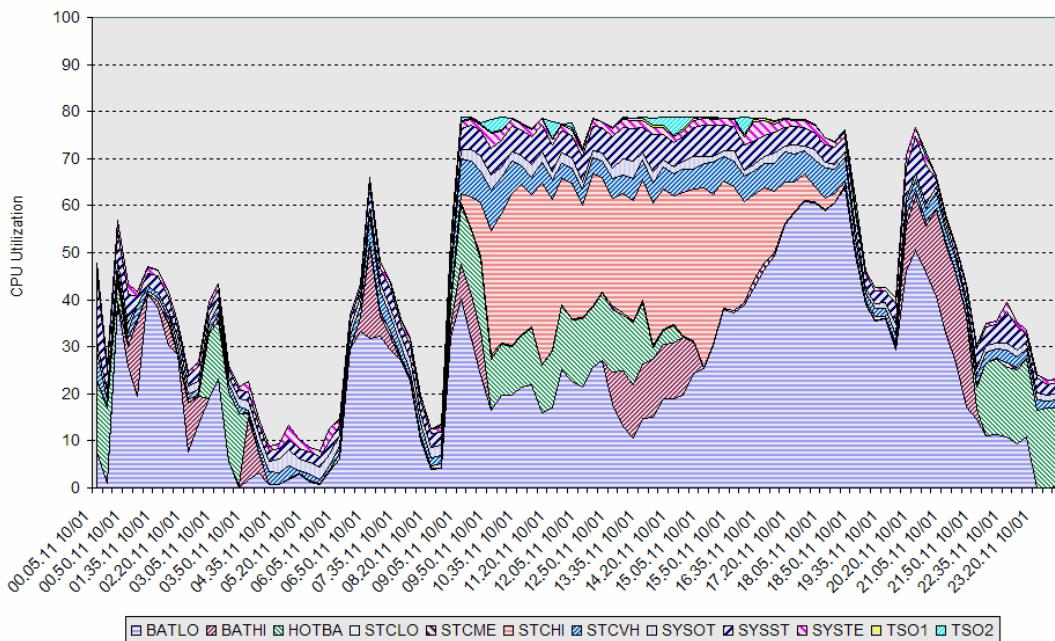
- Introduction
 - Basic Idea
 - Resource Oriented Concept and Data Transitions
 - Spreadsheet Macros
- General Usage
 - Define your initial z/OS System
 - Processing Options
 - Dialog Examples
- Usage Scenario: XCF Performance Analysis
 - XCF Overview and Performance Considerations
 - XCF Trend Report Macro: Preparation and Overview
 - XCF Usage by System: Transport Class Activities
 - XCF Path Activities
- Additional Features
 - Batch Mode
 - Problem Determination

- This session introduces the RMF *Spreadsheet Reporter* and shows you how to use it for performance analysis and capacity planning.
- Step by step you'll learn about the terminology and the usage of the RMF *Spreadsheet Reporter*.
- Furthermore, the sample spreadsheets have been recently extended with the *XCF Trend Report* macro. It is taken as representative example to point out the capabilities of the macros in general as well as to analyze performance critical areas in particular. The session shows you how to use the RMF *Spreadsheet Reporter* to carry out an overall health check of the XCF performance in a z/OS Sysplex environment. You will also learn how to utilize certain functions for an efficient problem drill-down.

The Basic Idea

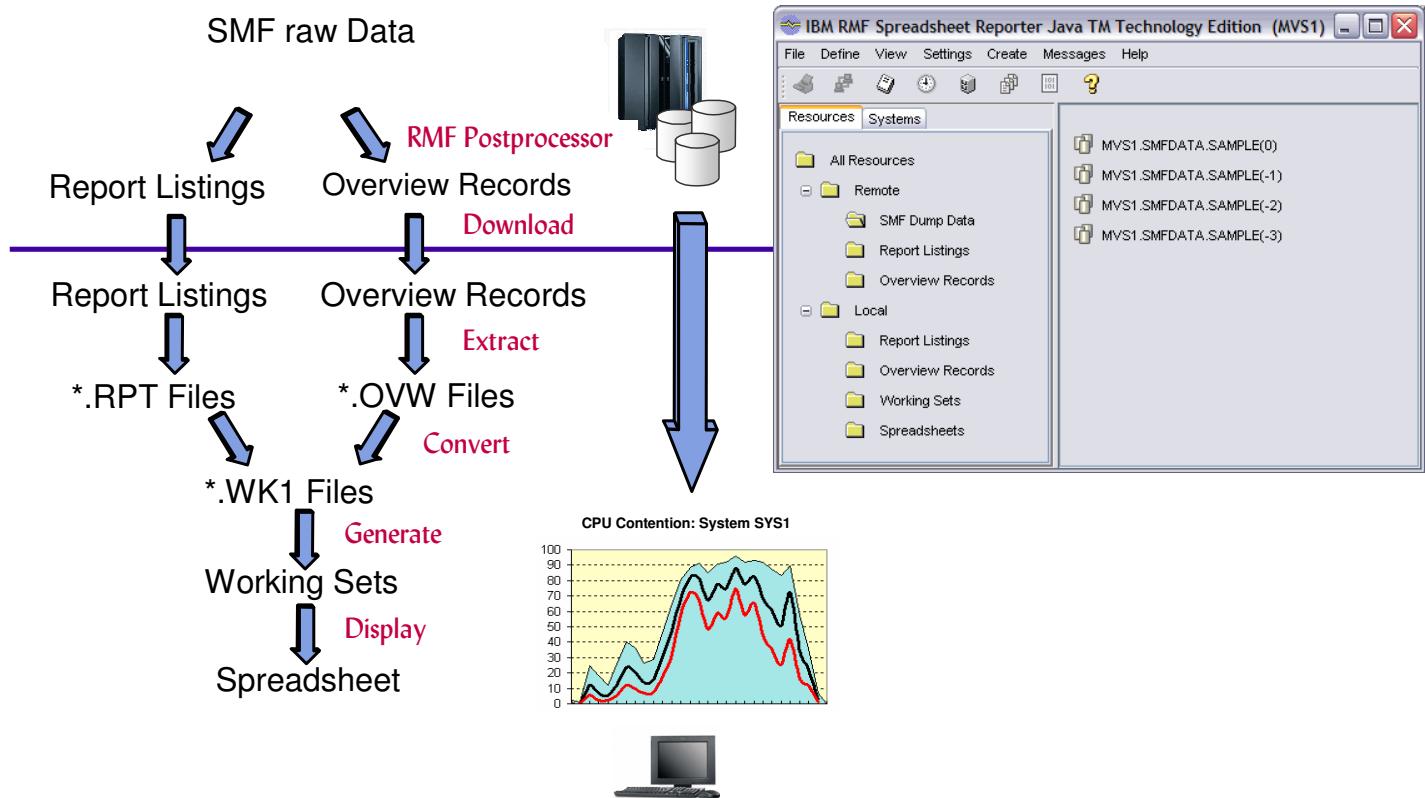
- ▶ converts SMF Data to Spreadsheet Format
- ▶ creates graphical Views for Trend Analysis
- ▶ can be downloaded from the RMF Homepage

Workload Utilization for System: UIG1, Reporting Date: 10/01/2006

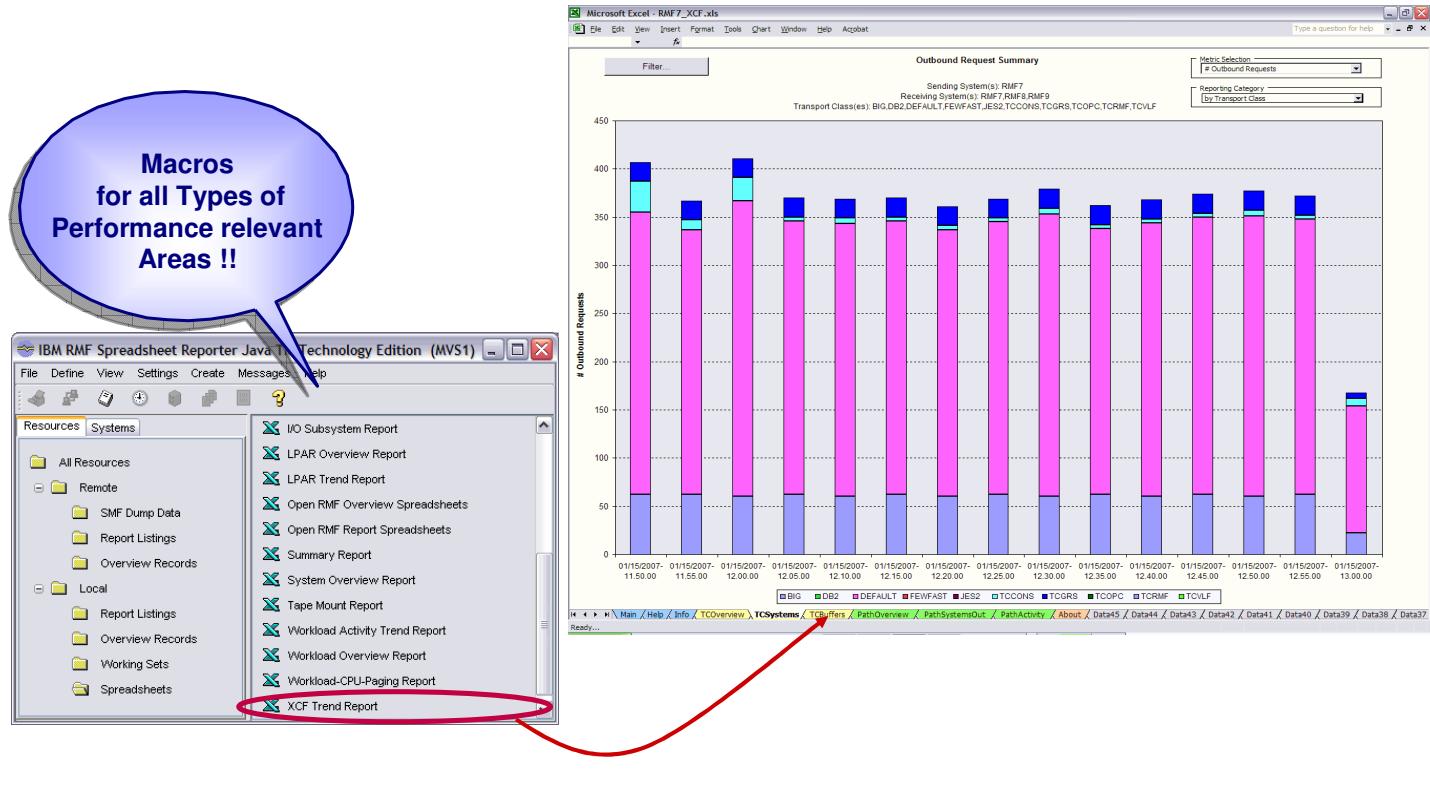


- In extension to the RMF Postprocessor, RMF offers a graphical workstation frontend for historical reporting: the *RMF Spreadsheet Reporter*
- The visualization of the data is performed by spreadsheet macros, which are shipped as samples together with the *Spreadsheet Reporter* main application.
- The *Spreadsheet Reporter* is a basic part of the RMF product and doesn't require additional charges. The installable image is shipped with the host file SYS1.SERBPWS(ERB9R2SW) or the most recent version can be downloaded from the RMF homepage: <http://www.ibm.com/servers/eserver/zseries/zos/rmf/>. You will find the *Spreadsheet Reporter* in the *Tools* category of the homepage.

Resource Oriented Concept and Data Transitions



Spreadsheet Macros



- Once a Working Set has been created from SMF data, the user can select from a rich set of macros for all performance relevant areas.

Spreadsheet Macros ...

Based on Postprocessor Reports

```
//RMFPP EXEC PGM=ERBRMFPP
//SYSIN DD *
DATE(10142002,10142002)
RTOD(1100,1300)
REPORTS(CPU)
SYSOUT(H)
```



Based on Overview Records

```
//RMFPP EXEC PGM=ERBRMFPP
//SYSIN DD *
DATE(10142002,10142002)
OVERVIEW(RECORD)
OVW(CPUBUSY(CPUBSY))
OVW(MVSBUSY(MVSBZY))
OVW(NUMPROC(NUMPROC))
```



Macro	PP Option	SMF Record
Cache Subsystem Report	CACHE	SMF74.5
CF Trend	CF	SMF74.4
DASD Activity Report	DEVICE(DASD)	SMF74.1
I/O Subsystem Report	DEVICE(DASD)	SMF74.1
	+CACHE	SMF74.5
LPAR Trend	CPU	SMF70.1
Summary Report	SUMMARY	SMF70.1,71,72.3
Tape Mount Report	DEVICE(TAPE)	SMF74.1
Workload Activity Trend	WLMGL	SMF72.3
XCF Trend Report	XCF	SMF74.2

Macro	SMF Record
System Overview	SMF70.1,71,72.3
LPAR Overview	SMF70.1
Workload Overview	SMF72.3
Cache Subsystem Overview	SMF74.5
Device Overview	SMF74.1
Channel Overview	SMF73

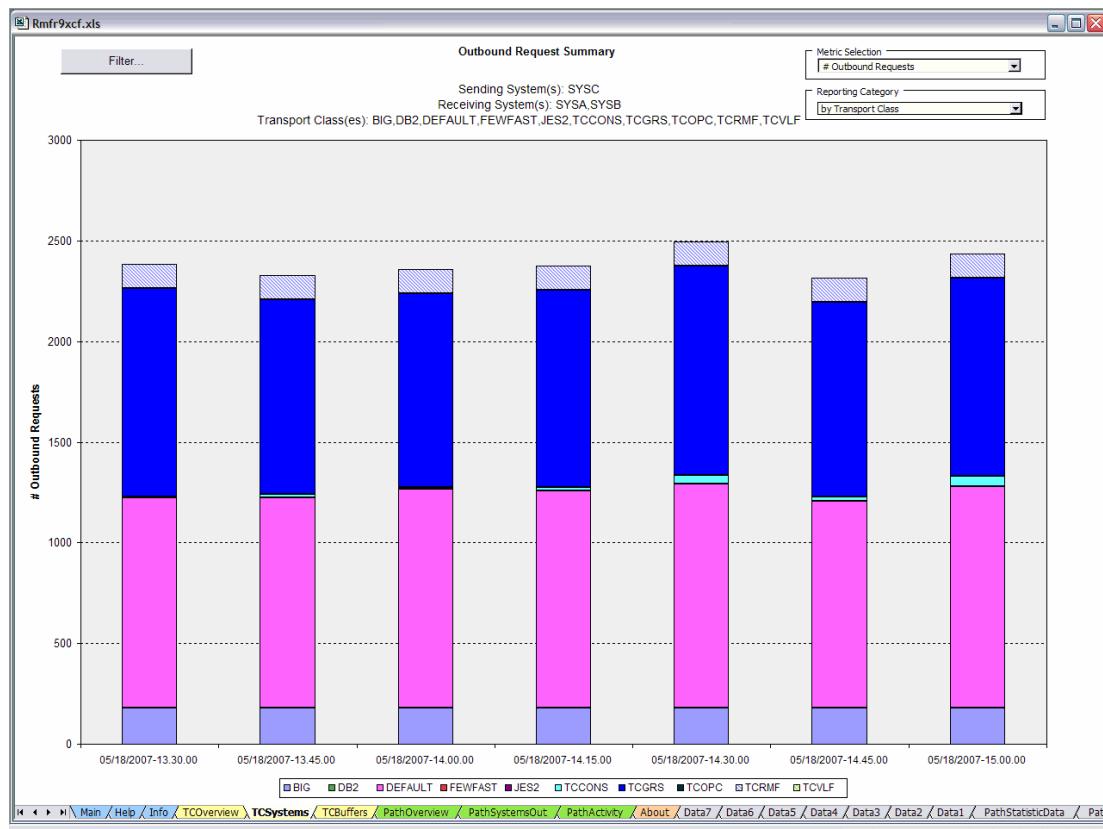
→ Standard Macros: Single intervals

→ Summary + Trend Macros: Multiple Intervals

→ Overview Macros: Multiple Intervals

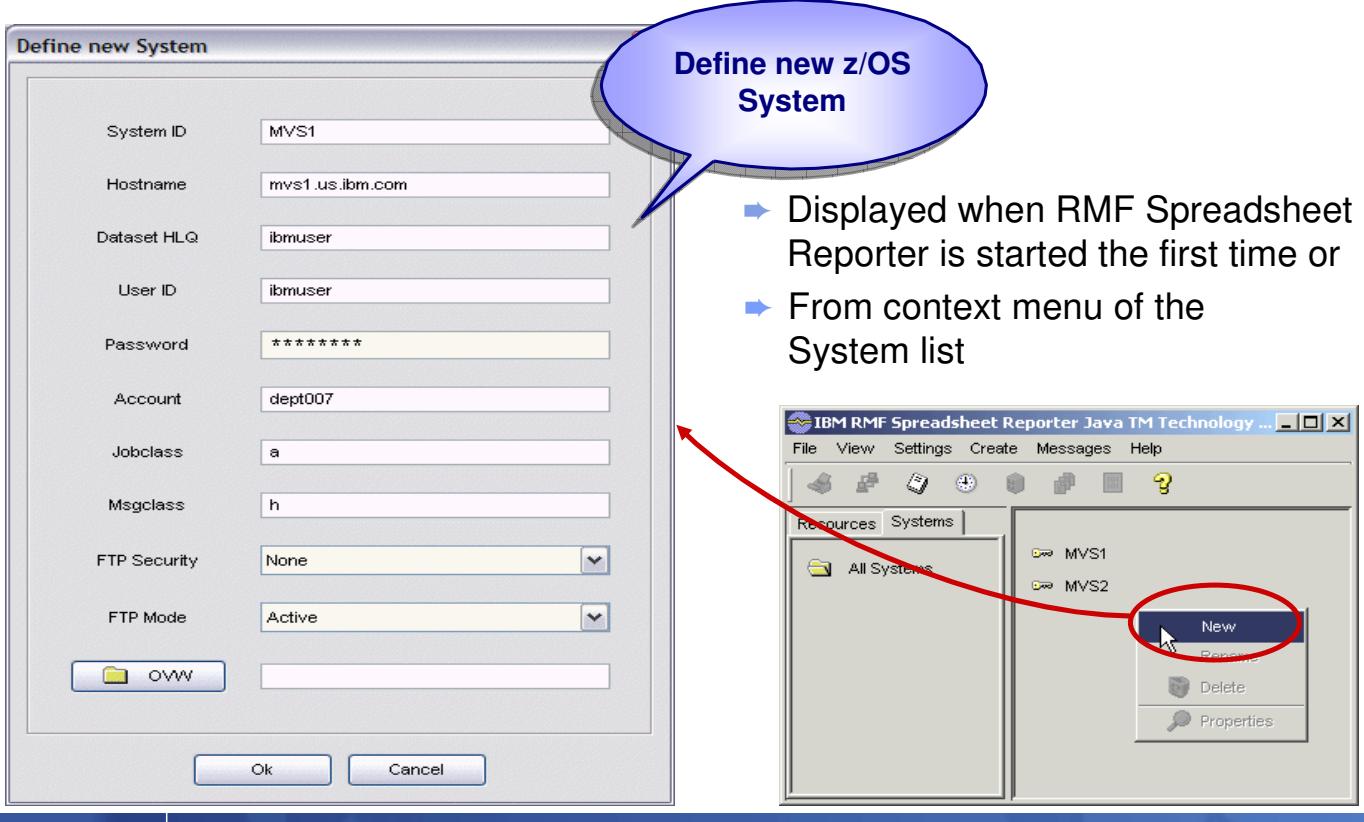
- Three basic types of macros can be distinguished:
 - Macros based on data contained in one interval of a Postprocessor Report (for detailed analysis of one single interval)
 - Macros based on data contained in Overview Records (for trend analysis with multiple intervals)
 - Macros based on data contained in multiple intervals of a Postprocessor Report ("hybrid" macros)
- The new XCF Trend Report macro belongs to the family of "hybrid" macros

Spreadsheet Macros: Example



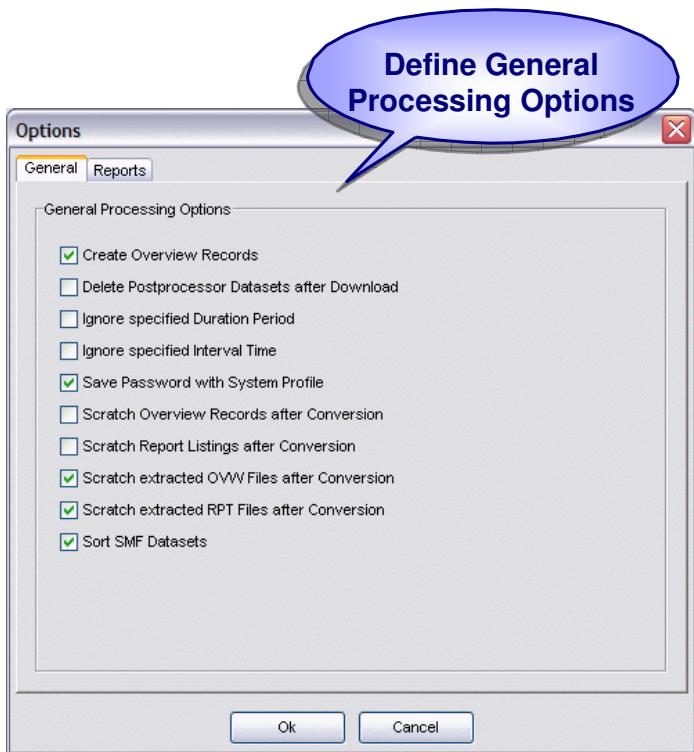
- Each macro consists of various worksheets with either graphical charts or tabular data.
- The chart shows the Excel macro RMFR9XCF which extracts the data out of the Postprocessor XCF Activity Report and generates a set of powerful worksheets.
- Like most of the macros, the XCF Trend Report macro contains the following three basic pages or worksheets:
 - Main: Control page to load or append the input data
 - Help: Information and general guidelines for usage
 - Info: Tabular overview, definition of settings
- Accordingly to the sections of the RMF Postprocessor XCF Activity Report, the graphical worksheets of the macro can be divided into the following categories:
 - select the yellow-tabbed spreadsheets for graphs with data extracted from the *XCF Usage By System* section
 - select the green-tabbed spreadsheets for graphs with data extracted from the *XCF Path Statistics* section

Starting to work with the RMF Spreadsheet Reporter



- When you start the RMF *Spreadsheet Reporter* for the first time or you have not yet defined at least one z/OS host, you are prompted whether you want to perform your initial system definition. Confirm with Yes and the *Define new System* dialog is displayed.
- The system definition consists of:
 - free selectable System ID
 - symbolic hostname or IP address
 - user ID and password for FTP logon
 - variable parameters which are inserted into the Postprocessor JCL (Account, Jobclass)
 - FTP Security (SSL Server Authentication or None)
 - FTP Mode (Active or Passive)
 - text file with Overview control statements (optional)
- Some installations might have their own conventions for TSO data set high level qualifiers. The remote Postprocessor execution requires the allocation of several datasets. For these reasons, the HLQ can be specified independent from the TSO userid.
- Overview control statements can be attached to a system by means of a standard file dialog.
- Usually you want to work with different OVW control statement sets for the same system without changing the attachment all the time. In this case you can simply create multiple system definitions with the same IP address but with different OVW attachments.
- When you select the *Systems* tab in the RMF *Spreadsheet Reporter* Main Window, you will see the list of defined z/OS systems. The context menu of the system list allows to define a new z/OS system. With this, multiple system definitions can be used in the RMF *Spreadsheet Reporter*.

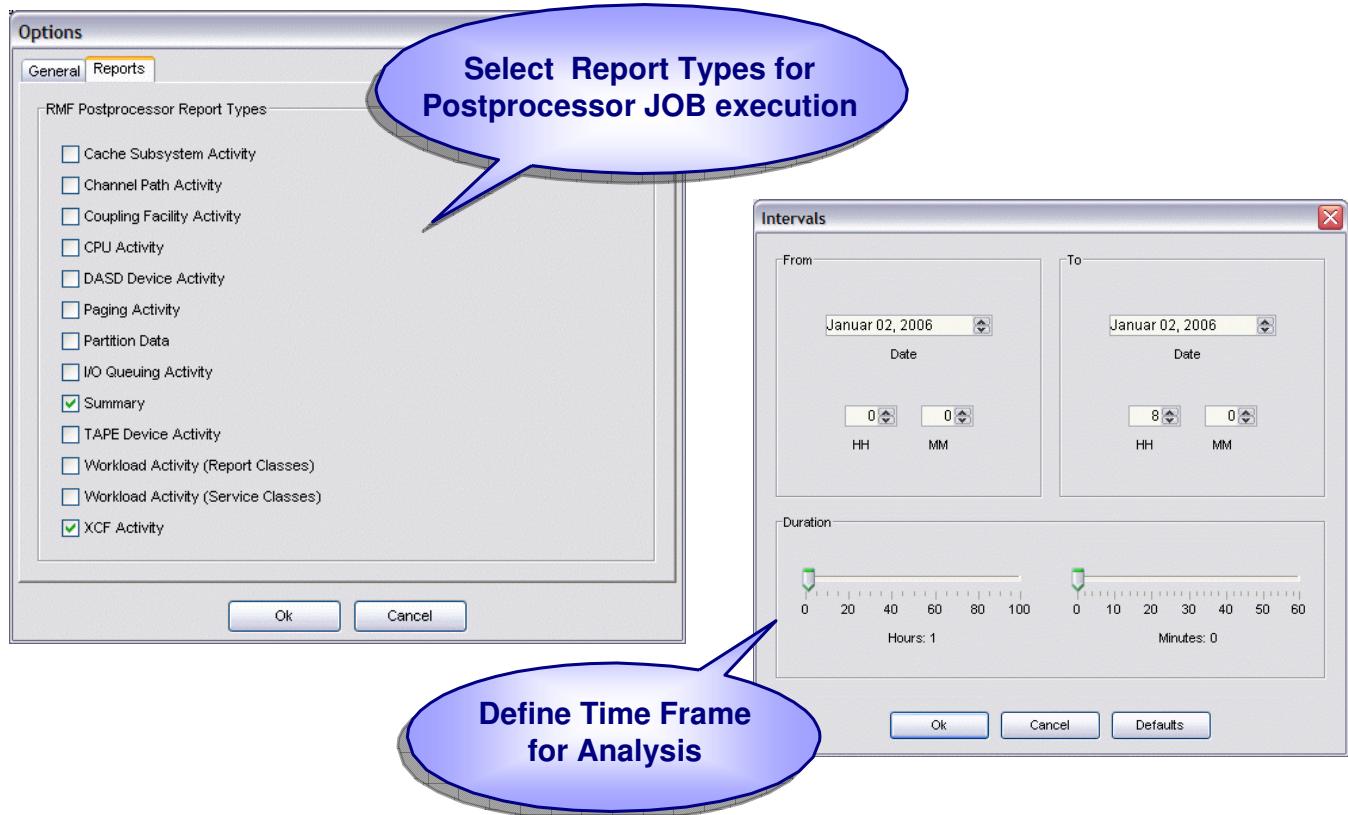
Defining Processing Options



Option	Explanation
Create Overview Records	Overview Records (instead of Reports) will be created as result of OVW control statements
Delete Postprocessor Datasets after Download	The remote Report Listing or Overview Record is deleted after successful download
Ignore specified Duration Period	No DINTV control statement is generated from the duration settings of the Intervals dialog
Ignore specified Interval Time	No RTOD control statement is generated from the time settings of the Intervals dialog
Save Password with System Profile	The TSO password is stored as part of the system profile - otherwise a password prompt appears for all actions which require a remote connection
Scratch Overview Records after Conversion	The Overview Records are removed from the local disc after the Conversion step
Scratch Report Listings after Conversion	The Report Listings are removed from the local disc after the Conversion step
Scratch extracted OVW Files after Conversion	The extracted OVW files are removed from the local disk after the Conversion step
Scratch extracted RPT Files after Conversion	The extracted RPT files are removed from the local disk after the Conversion step
Sort SMF Datasets	A SORT step is generated for the SMF Dump Datasets

- Before you are ready to retrieve RMF performance data from your remote system, it is recommended to review the settings of your processing options.
- There are three categories of processing options:
 - general options
 - report selection options
 - interval options
- Each category is reflected by a corresponding dialog.
- From the menu bar in the RMF *Spreadsheet Reporter* Main Window, you can invoke the option dialogs either directly with the toolbar buttons or via the *Settings* menu.

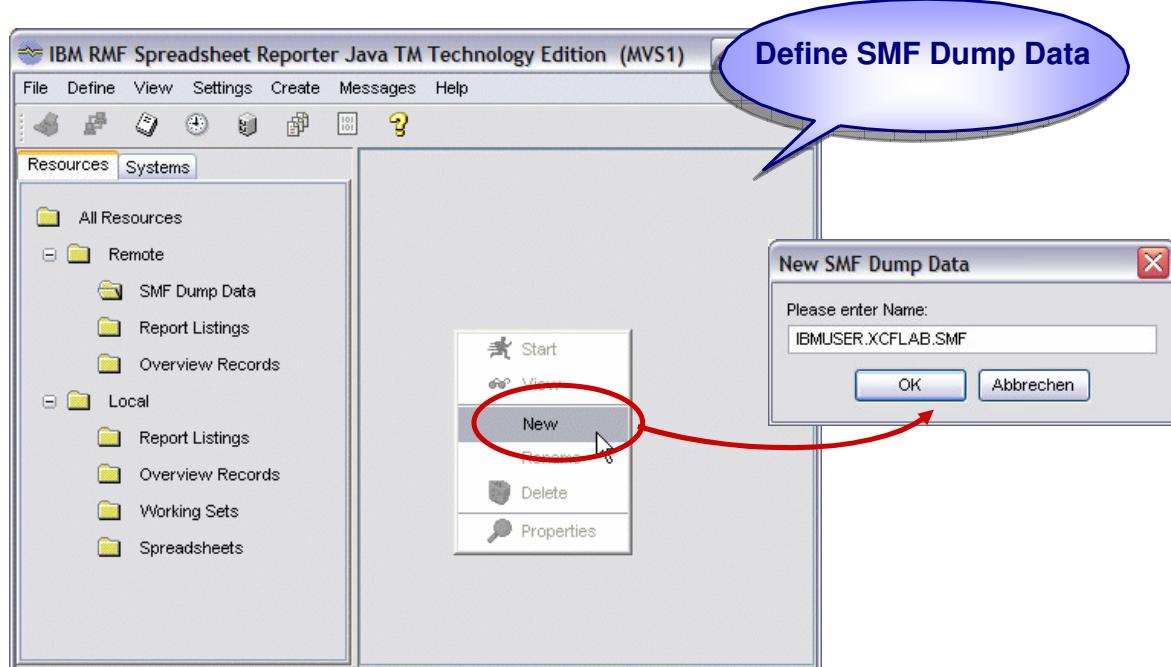
Defining Processing Options ...



- On the *Reports* Notebook Page, you can select the report types for the Postprocessor job execution. A REPORTS or SYSRPTS control statement is generated for each checked report type.
- The *Intervals* dialog allows you to specify the time frame for your analysis:
 - the interval time and date settings can be controlled by means of spin buttons
 - the default button sets the current date and the 24 hour reporting range (00h-24h)
 - the duration length (hours and minutes) can be controlled by means of sliders
- It is recommended to select only those reports and intervals which are the candidates for further spreadsheet processing. Thus, the data reduction is moved to the earliest point in the processing chain - which is the RMF Postprocessor input control. This avoids the generation and download of large listing files when only a small set of report types and intervals are needed for the further analysis.
- Note that the scope of the option specifications is application-wide. In other words, the options are globally in effect for all defined systems.

Dialog Examples:

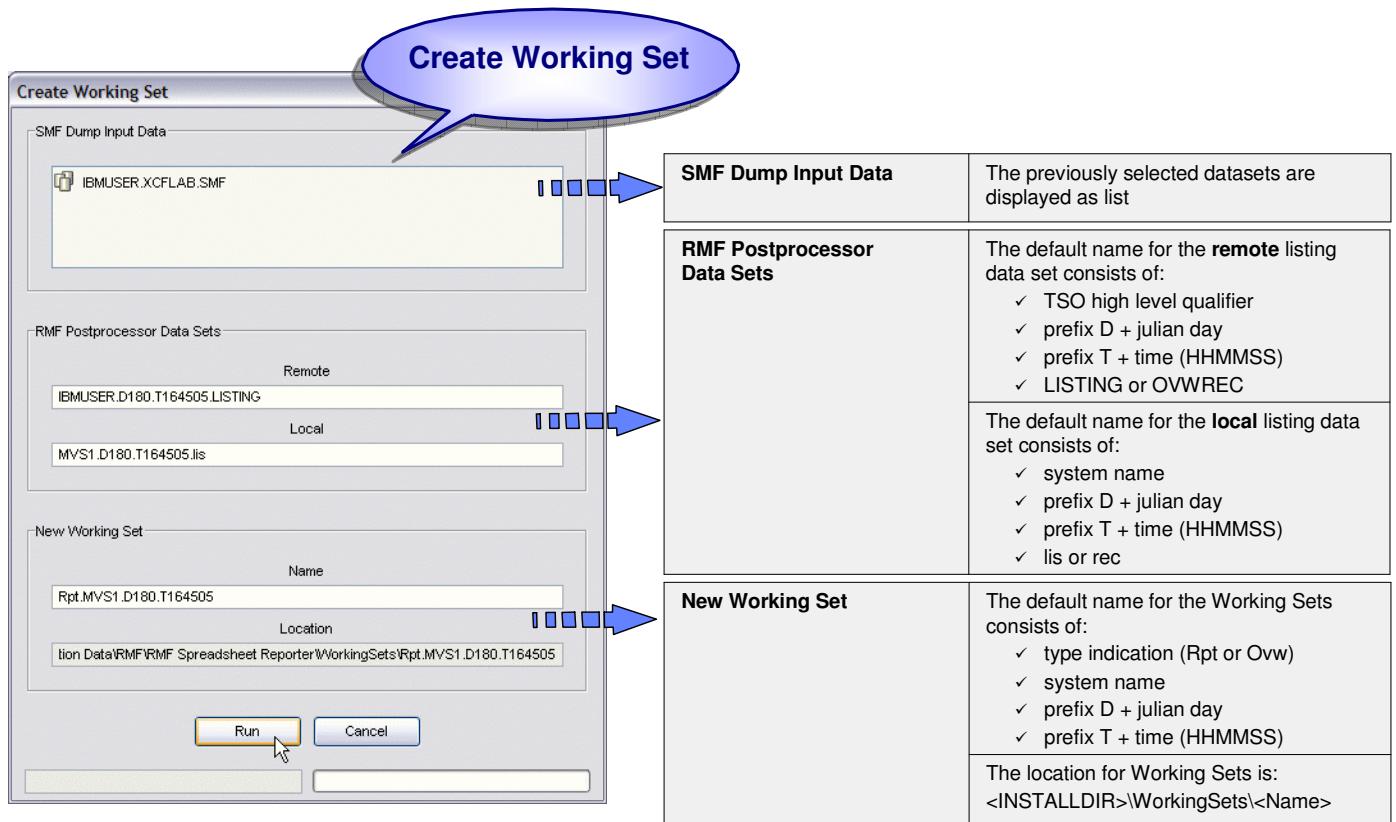
Creating a Working Set from SMF Data



- A Working Set consists of the spreadsheet compliant performance data as well as the index information needed for housekeeping purposes.
- The creation of a Working Set includes all processing steps to generate both kinds of data from the input source (e.g. SMF data).
- The RMF Postprocessor can be fed with SMF records residing either in SMF dump datasets or in the SMF buffer of the RMF Sysplex Data Server.
- In order to define your SMF dump datasets, perform the following steps:
 1. on the navigation pane, click onto the *Resource* tab
 2. select *SMF Dump Data* on the resource tree
 3. open the context menu from the free surface of the view pane
 4. select option *New* and specify the SMF dataset name
 5. Click *Ok* to add the new dataset to the list
- This step doesn't perform any real dataset allocations. It simply publishes your existing SMF dump datasets on your remote system to the RMF Spreadsheet Reporter on your workstation.

Dialog Examples:

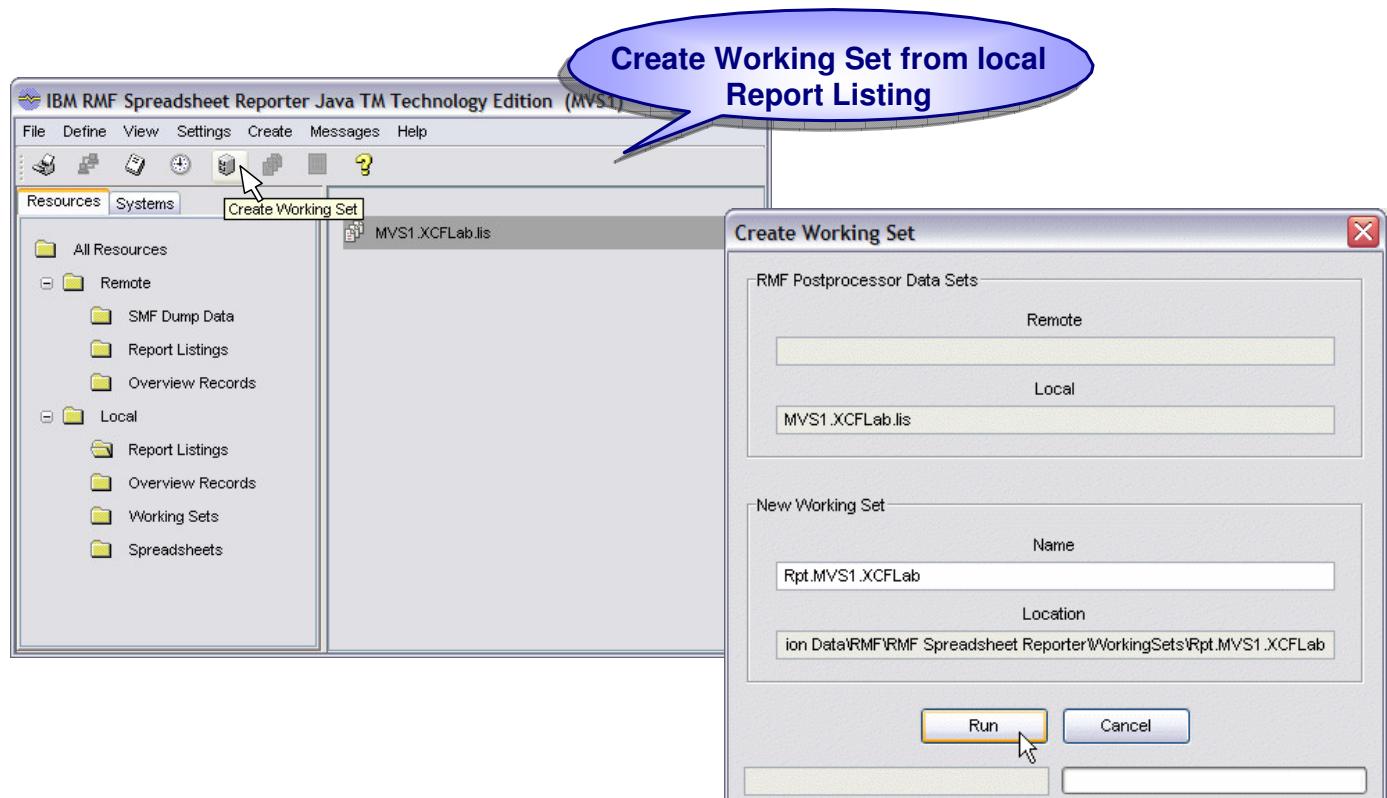
Creating a Working Set from SMF Data ...



- If you want to use your SMF dump datasets as input source, you are now ready to run the Working Set creation:
- Select one or more of the defined SMF datasets from the list and then choose *Working Set...* from the *Create* menu. This displays the *Create Working Set* dialog.
- The *Create Working Set* dialog window consists of three sections which are already initialized with appropriate names and defaults:
 1. SMF Dump Input Data
 2. RMF Postprocessor Data Sets
 3. New Working Set

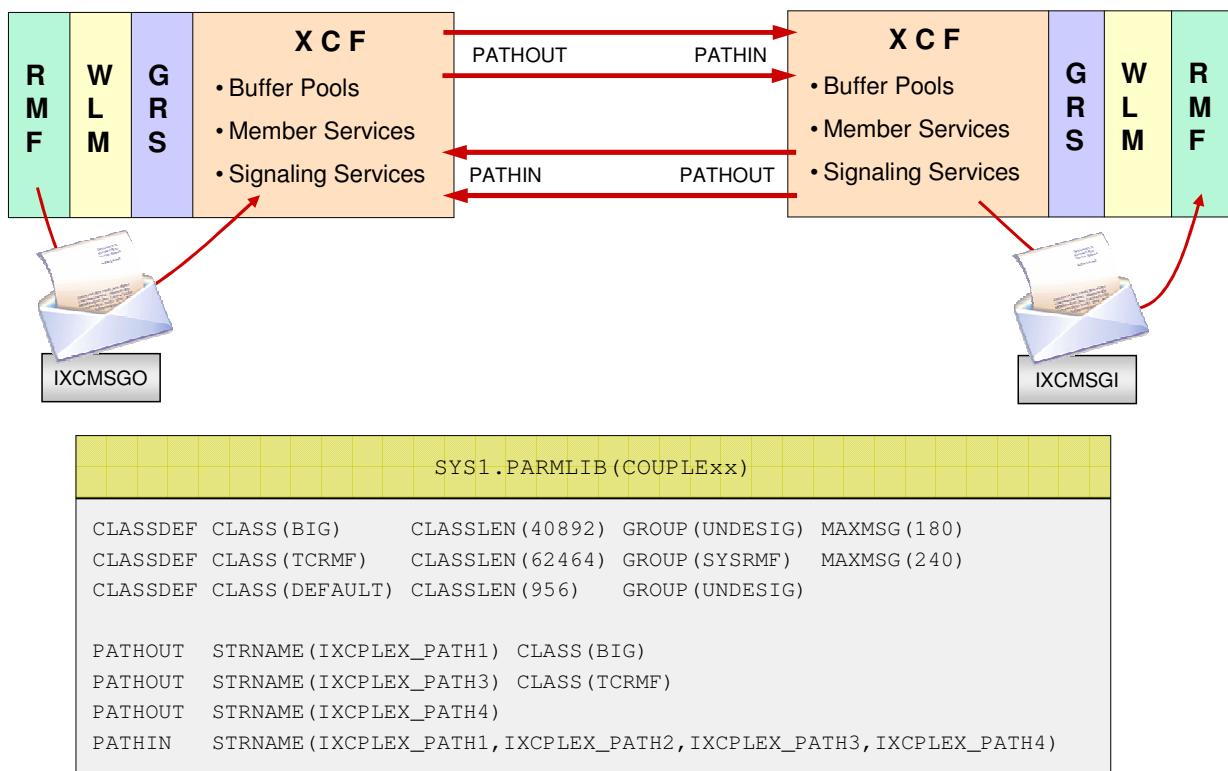
Dialog Examples:

Creating a Working Set from local Listing



- Since you are a performance expert, someone might send you an RMF Postprocessor Listing with the request for a detailed analysis.
- In order to publish the new file to the RMF Spreadsheet Reporter, you can simply copy it to the subdirectory *RmfListings* which resides below the Spreadsheet Reporters resource directory (e.g. *C:\Documents and Settings\<userid>\Application Data\RMF\RMF Spreadsheet Reporter*).
- After you've done this you should find the RMF Postprocessor Listing file when you open the *Local Report Listings* folder on the navigation pane of the main window.
- Now you can immediately create the Working Set from this resource.
- Select the file from the list and then choose *Working Set...* from the *Create* menu.
- When you choose *Working Set...* from the *Create* menu without selection of a local listing file, the *File Dialog Window* is displayed. This allows to process local listing files from directories other than the Spreadsheet Reporters resource directory.
- As soon as you've created a *Working Set* you can start to work with the Excel Macros of RMF *Spreadsheet Reporter*. On the next couple of foils you can see how to use the *XCF Trend Report* macro to analyze your XCF performance.

XCF Overview



Before we start our XCF performance analysis with the *XCF Trend Report Macro*, let's have a look to the components that have to be considered when looking to XCF performance:

- XCF signaling is used to communicate between members of a sysplex. The user of XCF signaling, usually an MVS component or a subsystem, issue messages to members within the user's group
- As XCF messages are generated, they are assigned to a transport class based on group name and/or message size. The messages are copied into a signal buffer from the XCF buffer pool
- The messages are sent over outbound paths, (PATHOUT), defined for the appropriate transport class
- Messages from other systems are received by inbound paths, (PATHIN). Inbound paths are not directly assigned to transport classes, although a correlation can be made about which transport class messages are received via the inbound paths based on the outbound path to which the inbound side is connected
- The key to ensuring good performance for the XCF signaling service is to provide sufficient signaling resources, namely message buffers, message buffer space, and signaling paths, and to control access to those resources with the Transport Class definitions
- The XCF definitions are kept in SYS1.PARMLIB(COUPLExx)
 - Use the CLASSDEF statement to define Transport Classes
 - CLASSLEN determines the size of the message buffers
 - MAXMSG determines the number of message buffers allocated by XCF
 - Use the GROUP statement to direct the messages of a specific XCF Group to a dedicated Transport Class
 - Recommendation: 1 Transport Class for 1K messages, 1 Transport Class for 16K messages
 - PATHOUT directs the messages to a specific CF Structure or CTC
 - Optionally, this path can be associated with a Transport Class
 - PATHIN specifies all CF Structures and CTCs that are used for incoming messages

XCF Performance Considerations

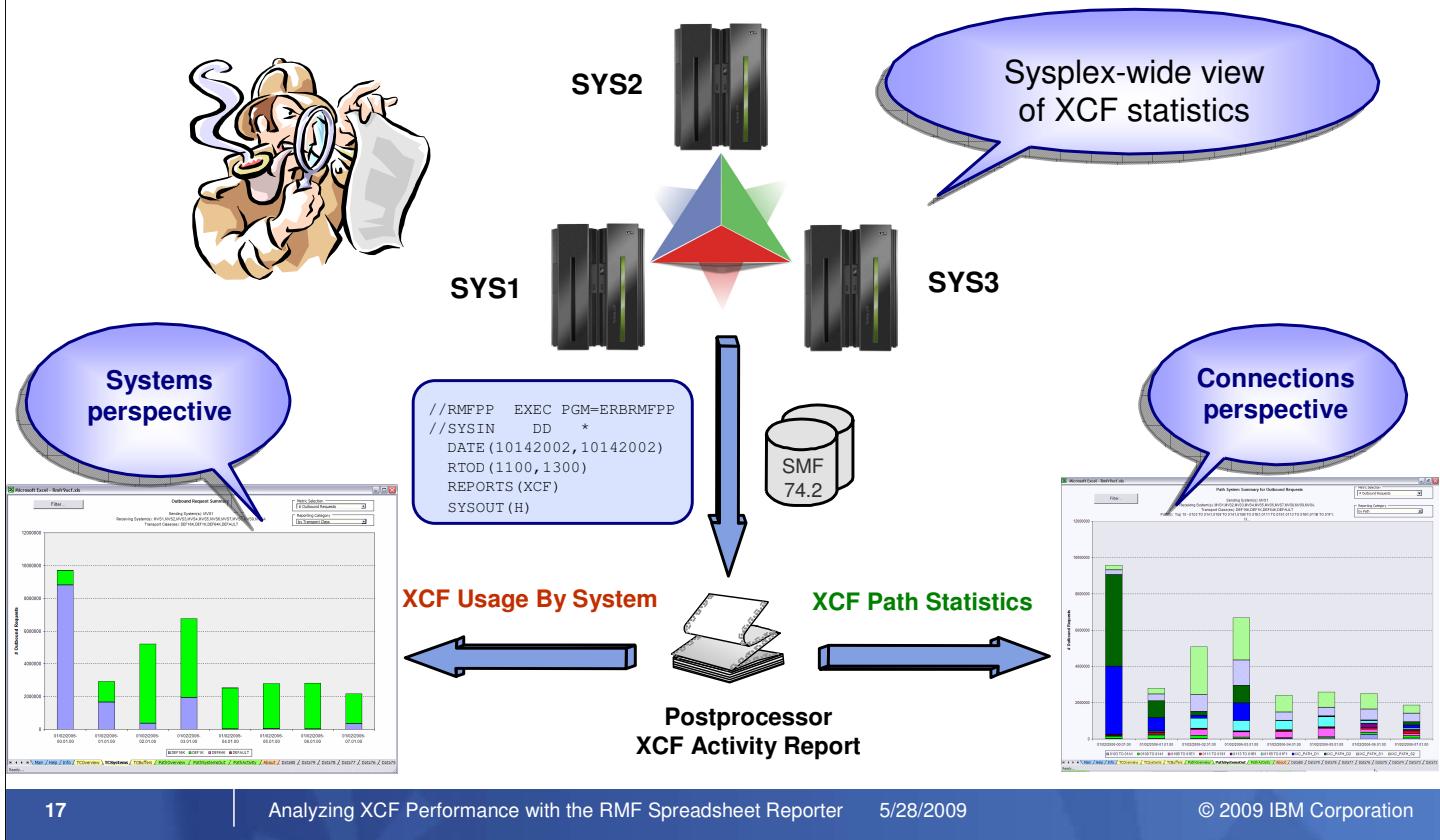
- ▶ What systems are involved in signaling?
- ▶ What is the load going to and from the systems?
- ▶ What are the Transport Classes and the load on each Transport Class?
- ▶ What is the size of the messages?
- ▶ How are my XCF buffers doing?
- ▶ What hardware resources are involved (CFs and CTCs)?
- ▶ Are there any malfunctions? How busy are the resources?
- ▶ What applications are causing the XCF load?

RMF Postprocessor
XCF Activity Report

- **XCF Usage By System**
 - ▶ Buffer statistics from the local systems perspective
 - ▶ Outbound, Inbound and Local signaling activities on Transport Class granularity
- **XCF Path Statistics**
 - ▶ Physical connection statistics
 - ▶ Outbound and Inbound signaling activities and contention
- **XCF Usage by Member**
 - ▶ Message statistics on Group and Member granularity
 - ▶ Outbound and Inbound signaling activities

- Your COUPLExx Parmlib definitions will have direct impact on the sysplex-wide XCF performance
- For an analysis, you should look at the XCF performance from different perspectives:
 - Systems perspective
 - Connections perspective
 - Applications perspective
- The existing RMF Postprocessor XCF Activity Report is grouped into three different sections which correspond to the above categories
- The report statistics allow you to analyze and - if necessary - tune your XCF definitions:
 - Are there systems with extraordinary high messaging activities?
 - Do I have enough message buffers?
 - Are the buffers properly sized?
 - How is my connectivity setup? Do I have single points of failure?
 - Should I define more connections?
 - What applications make use of XCF services. Are there "bad guys" with abnormal high request rates?

XCF Trend Report Macro: Overview

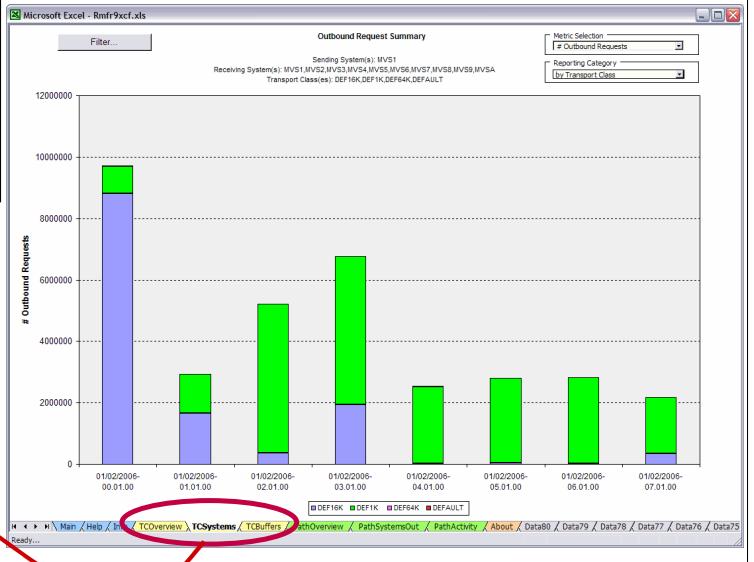


- The *XCF Trend Report Macro* of RMF *Spreadsheet Reporter* allows to process and visualize the data from RMF Postprocessor XCF Activity Report.
- In contrast to the RMF Postprocessor XCF Activity Report, which is a single system report , the *XCF Trend Report Macro* allows to get a sysplex-wide view of XCF performance since it can combine the Postprocessor XCF Activity reports from several sysplex systems. To get this sysplex view, you just have to select the SMF datasets of all systems in sysplex when you create a new working set with the RMF *Spreadsheet Reporter*.
- The *XCF Trend Report Macro* processes the data in the *XCF Usage By System* and *XCF Path Statistics* sections of the RMF Postprocessor XCF Activity Report. Based on these data you can use a set of worksheets to analyze the XCF performance from a *Systems perspective* and a *Connections perspective*.

XCF Usage by System: Transport Class Activities

XCF USAGE BY SYSTEM										
OUTBOUND FROM MVS1										
TO SYSTEM	TRANSPORT CLASS	BUFFER LENGTH	BUFFER				ALL			REQ REJECT
			REQ OUT	% SML	% FIT	% BIG	% OVR	PATHS	UNAVAIL	
MVS2	DEFAULT	956	0	0	0	0	0	0	0	0
	DEF1K	956	91,421	0	100	0	0	0	0	0
	DEF16K	16,316	7647971	99	1	0	0	0	0	0
	DEF64K	62,464	13,902	100	0	0	0	0	0	0
MVS3	DEFAULT	956	0	0	0	0	0	0	0	0
	DEF1K	956	96,847	0	100	0	0	0	0	0
	DEF16K	16,316	507,147	99	1	0	0	0	0	0
	DEF64K	62,464	4,417	100	0	0	0	0	0	0

- ▶ What systems are involved in signaling?
- ▶ What is the load going to and from the systems?
- ▶ What are the Transport Classes and their load?
- ▶ What is the size of the messages?
- ▶ How are my XCF buffers doing?



► TCOverset:

Transport Classes with their defined buffer length

► TCSystems:

Signaling activities between systems

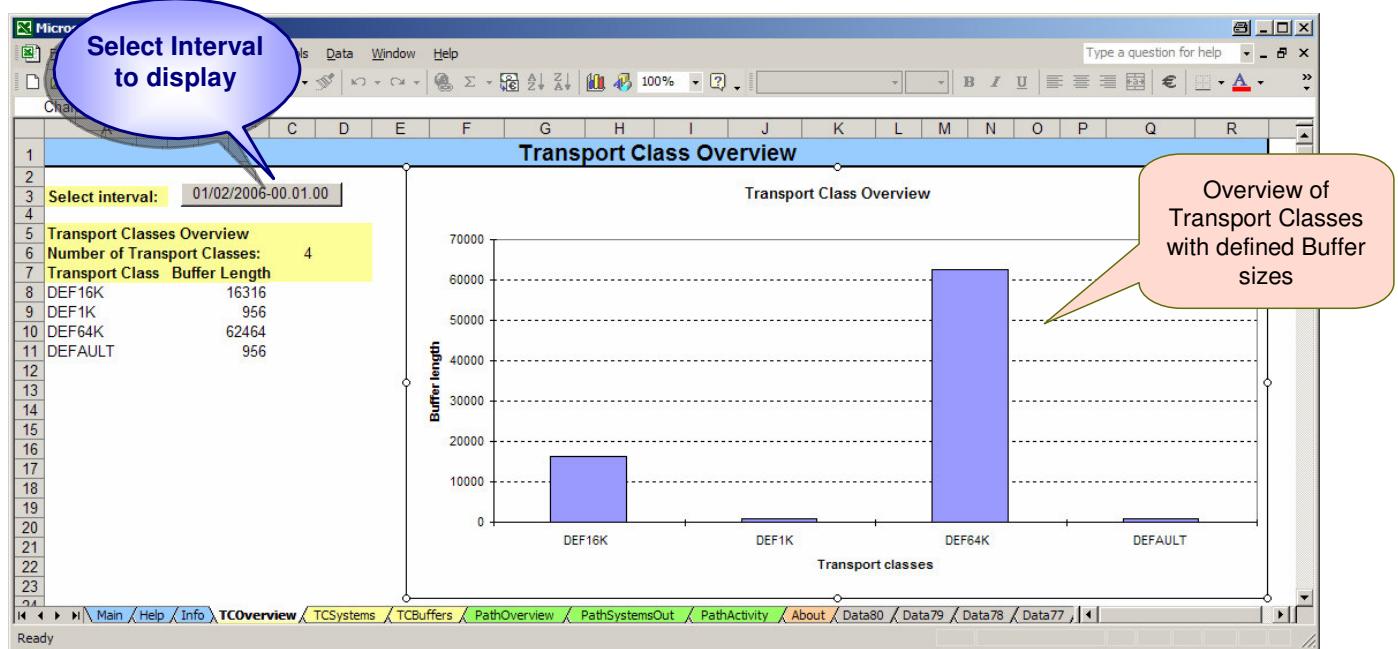
► TCBuffers:

Decomposition of outbound requests with regard to buffer size

- The yellow-tabbed worksheets of the *XCF Trend Report* macro contain data extracted from the *XCF Usage By System* section of the Postprocessor XCF Activity Report.
- This section formats the Outbound and Inbound activities from the view of the system where the SMF 74.2 records have been collected. For Outbound requests, the statistics are available on Transport Class granularity.
- In the XCF Trend Report Macro, the data from *XCF Usage By System* section of the Postprocessor XCF Activity Report is mapped to the following three worksheets:
 - TCOverset
 - TCSystems
 - TCBuffers
- The *TCOverset* worksheet contains a list of all XCF Transport Classes including the size of the associated buffers (as defined by the CLASSDEF and CLASSLEN parameter in SYS.PARMLIB(COUPLExx))
- With the *TCSystems* worksheet you can easily monitor the overall signaling activities between your systems. Furthermore, you can analyze how well your XCF buffers are doing.
- Regarding the buffer size, the following conditions can occur:
 - at best, the XCF message fits to the buffer size of a Transport Class (% FIT)
 - the XCF message is smaller than the buffer size, which may cause an unnecessary waste of storage (% SML)
 - the XCF message is bigger than the buffer size. In this case, XCF must enlarge the buffers to transfer the message. Initially, this causes a performance degradation (% OVR). Later on, XCF is smart enough to reuse the previously allocated buffers for large messages (% BIG)
- The transfer of messages is completely rejected, when no XCF buffers at all are currently available (Number of Requests Rejected)
- The *TCBuffers* worksheet provides a decomposition of all Outbound requests into the above categories

XCF Usage by System: The TCOerview Worksheet

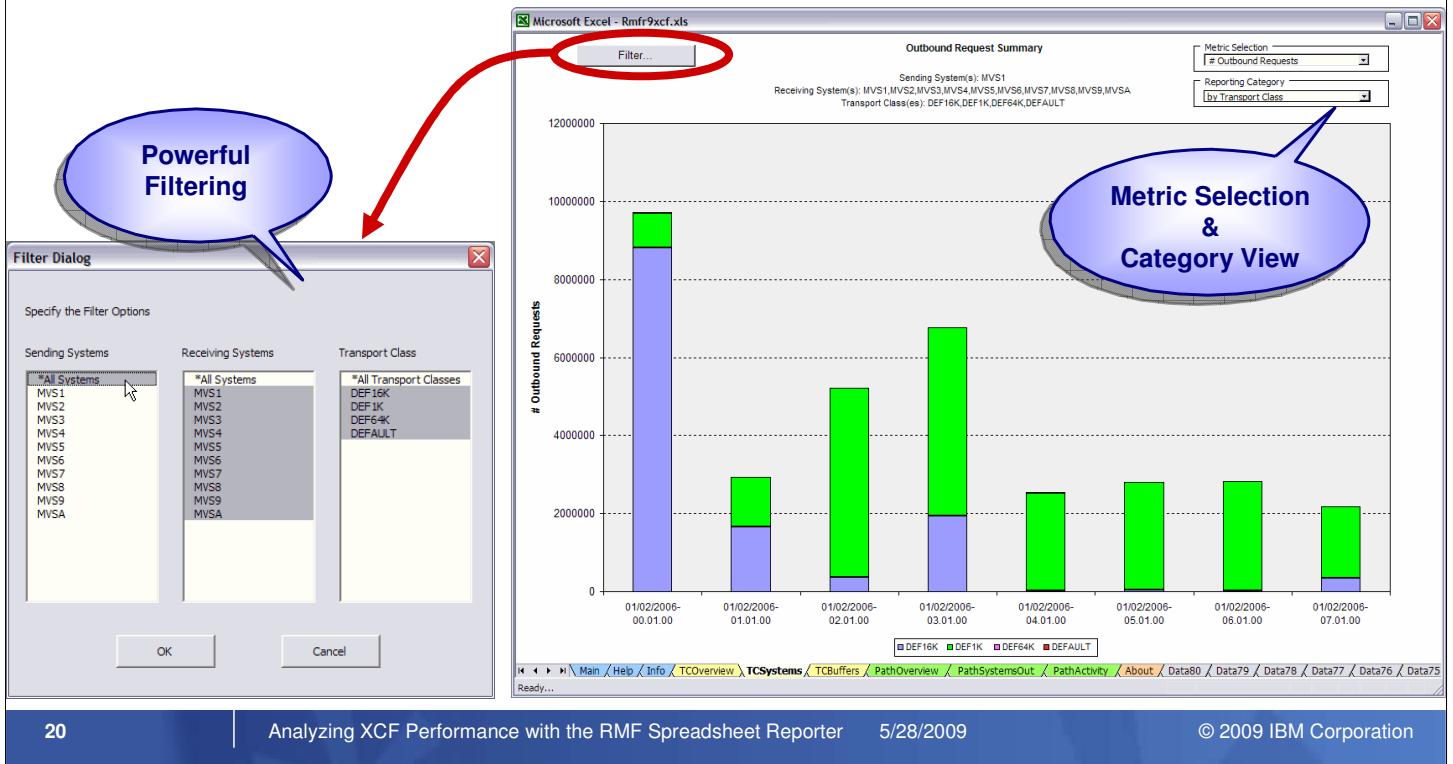
What Transport Classes are defined on my Sysplex ?



- As a starting point for XCF performance analysis, the TCOerview sheet can be used. It provides an overview about the transport classes and their defined buffer lengths.
- With the *Select Interval* button you can specify an interval for the reported Transport Classes and the actual buffer sizes assigned to these Transport Classes.

XCF Usage by System: The TCSystems Worksheet

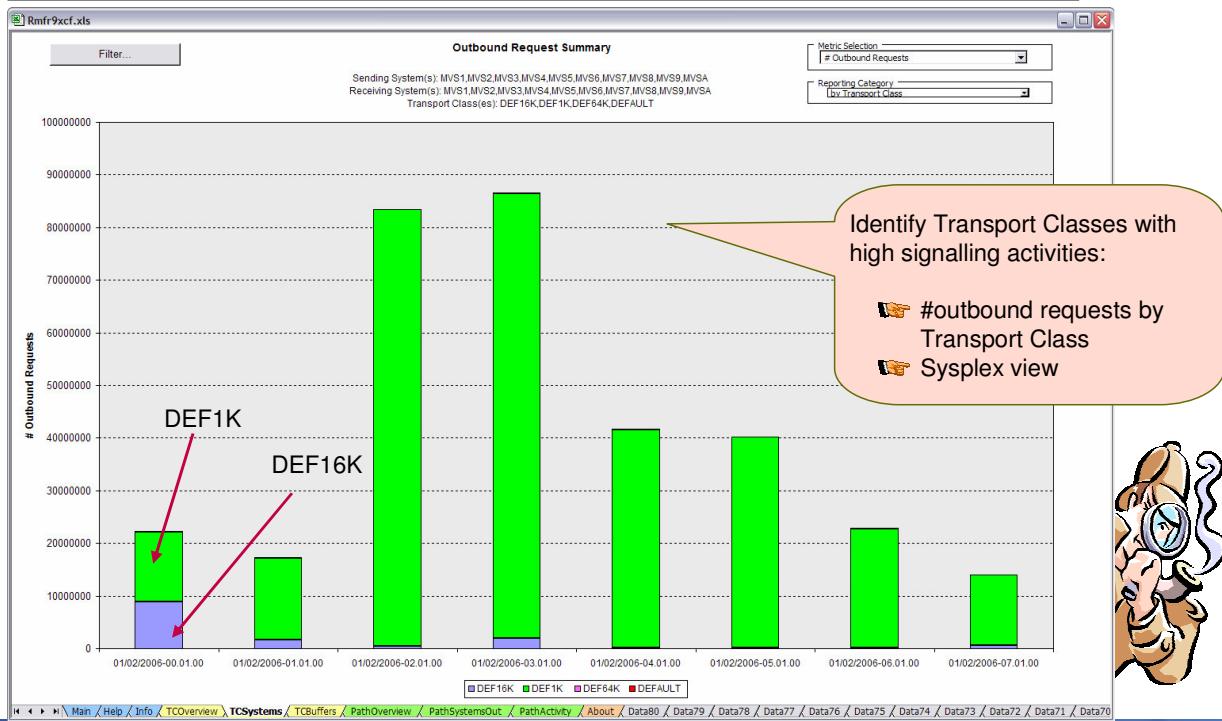
What is the XCF message exchange between the systems ?



- The TCSystems worksheet allows to analyze the signaling activities between systems on transport class level.
- The example screenshot of the TCSystems worksheet shows the Outbound requests going from system MVS1 to all other systems of the Sysplex. By default, only one sending system is preselected. That means, the view corresponds to the data contained in a single system Postprocessor XCF Report.
- The *Metric Selection* drop-down box in the upper right corner of the worksheet allows to choose between the following metrics:
 - Number of Outbound Requests
 - Outbound Request Rate
 - Number of Paths Unavailable
 - Path Unavailable Rate
 - Number of Requests Rejected
 - Request Rejected Rate
 - % Requests SML
 - % Requests FIT
 - % Requests BIG
 - % Requests OVR
- The *Filter* button allows to define the scope of the reported data in a *Filter Dialog* window. To get a Sysplex-wide view, select *All Systems in the *Sending Systems* column, then confirm with *OK*.
- With the Transport Class filter in the *Filter Dialog*, you can focus on specific Transport Classes.
- Additional, the *Reporting Category* drop-down box in the upper right corner of the worksheet allows to choose between the following reporting categories:
 - By Sending System
 - by Receiving System
 - by Transport Class

XCF Usage by System: The TCSystems Worksheet ...

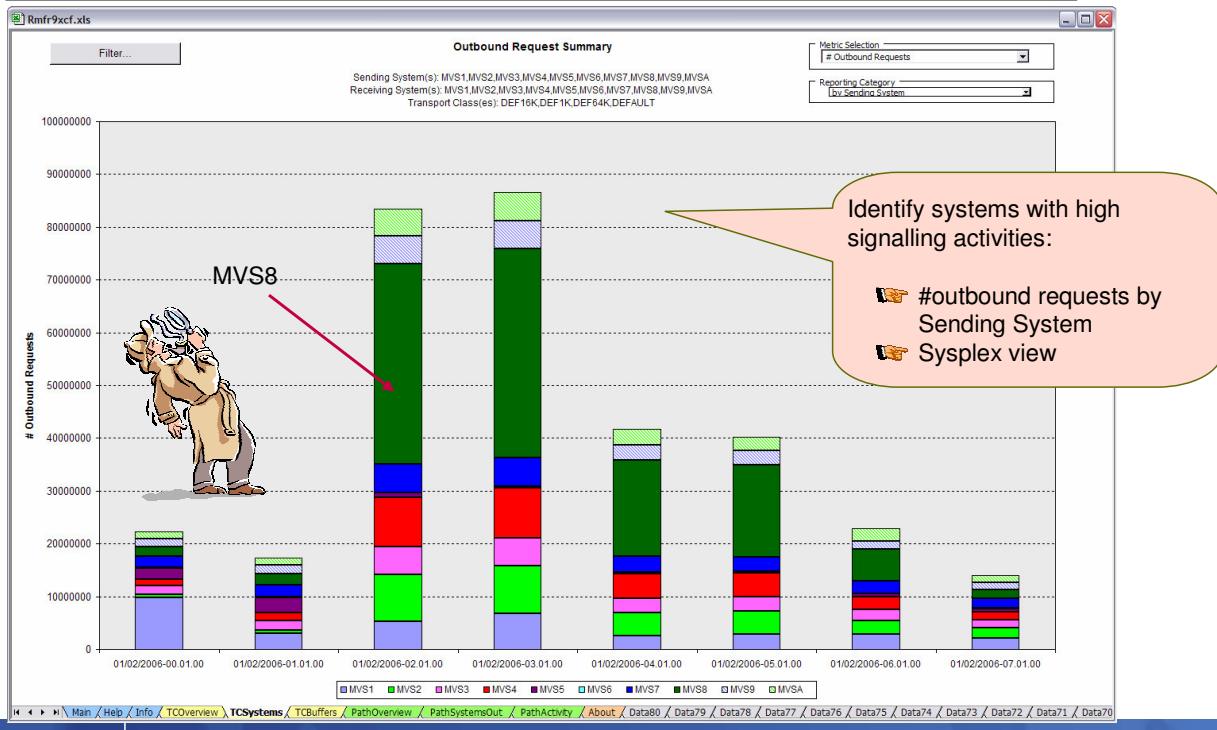
What Transport Classes are used for the XCF messages ?



- From the TCOOverview worksheet on Page 19, we've seen that there are 4 transport classes defined on the sysplex:
 - DEF1K
 - DEF16K
 - DEF64K
 - DEFAULT
- Let's get an overview about the overall signaling activities between the sysplex systems.
- The chart shows the sysplex view with the amount of outbound requests on Transport Class level. To create this view you've to use the following setting in the *Filter Dialog* window:
 - *All Systems in the *Sending Systems* column
 - *All Systems in the *Receiving Systems* column
 - *All Transport Classes in the *Transport Class* column
- The Sysplex-wide view aggregation points out clearly that the majority of the XCF messages is assigned to Transport Class DEF1K.

XCF Usage by System: The TCSysystems Worksheet ...

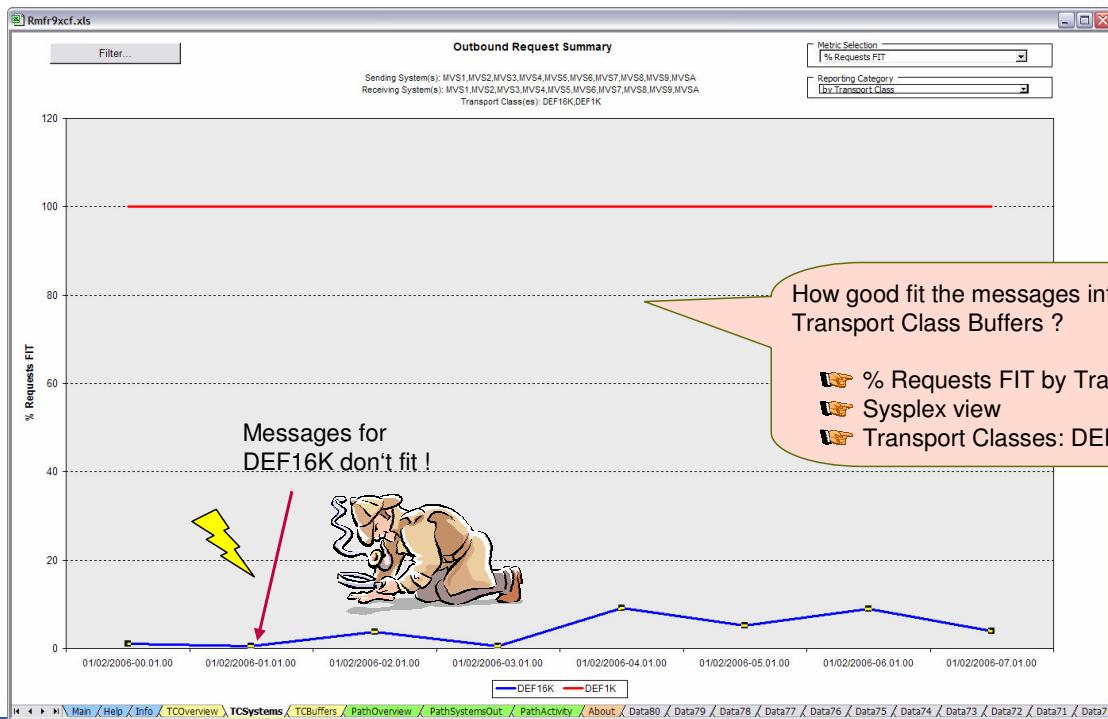
What System is the highest contributor to XCF messages traffic ?



- At this point we don't know which systems are the highest contributors to the XCF message traffic: no problem, with the *Reporting Category* drop-down box you can choose between the following scopes:
 - by Transport Class
 - by Sending System
 - by Receiving System
- The screenshot with the *#outbound requests by Sending System* makes it quite clear: system MVS8 is the biggest contributor to XCF message traffic. It covers up to 50% of the Outbound message traffic
- If you want to see what are the preferred systems MVS8 is communicating with, you just have to select MVS8 in the *Sending Systems* column of the *Filter Dialog* and choose *by Receiving System* in the *Reporting Category* drop-down box.
- Beyond the pure load statistics, you can perform a signaling health check to see if there is any path contention or problems with the availability of the message buffers. For this:
 - switch back to the Sysplex-wide view: on the *Filter Dialog*, select *All Systems from the *Sending Systems* column and confirm with *OK*
 - reset the category: select *by Transport Class*
 - check for possible connectivity problems: from the *Metric Selection* drop-down box, choose *# Paths Unavailable*
 - for possible buffer shortages: change the metric to *# Requests Rejected*

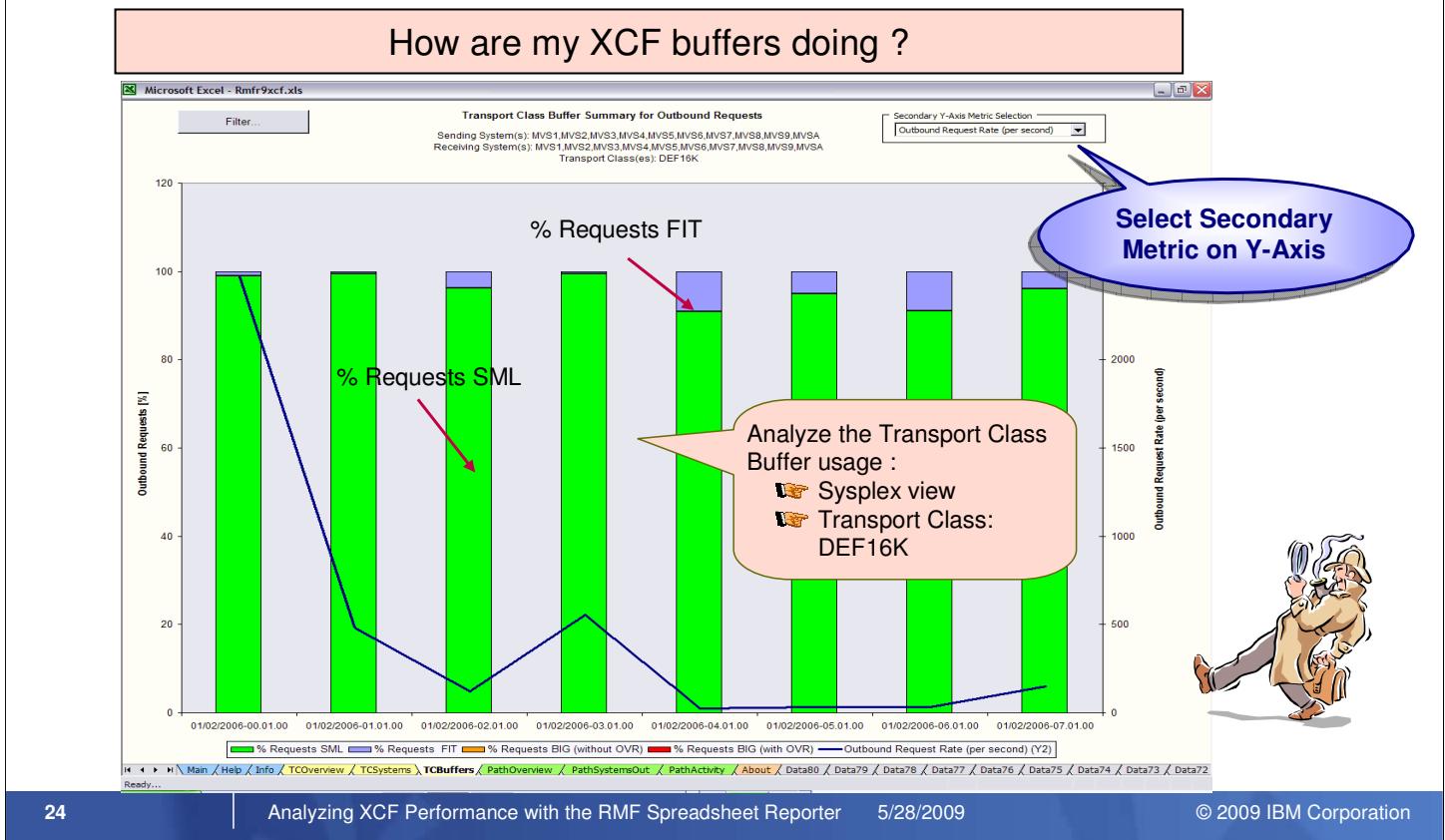
XCF Usage by System: The TCSystems Worksheet ...

How efficient are the Buffers of the Transport Classes used ?



- As next step in our XCF Performance analysis scenario we want to check how efficient the buffers of the Transport Classes are used:
 - We hide the Transport Classes without activity: on the *Filter Dialog*, deselect the Transport Classes DEF64K and DEFAULT
 - From the *Metric Selection* drop-down box, we choose % FIT
- While the messages for Transport Class DEF1K fit by 100 %, it is obvious that the messages for Transport Class DEF16K don't fit with the 16K buffer size at all.
- Now it's time to examine whether the messages are too small or too large for the buffers provided by Transport Class DEF16K. So let's have a look to the XCF Buffer analysis capabilities of the *XCF Trend Report Macro*

XCF Usage by System: The TCBuffers Worksheet



- The TCBuffers Worksheet allows to further analyze the XCF buffer usage of Transport Classes. It shows a decomposition of the outbound requests with regard to the buffer sizes. The requests are assigned to the following categories:

- % Requests SML:** The percentage of messages sent that could have used a smaller buffer length than their defined Buffer Length.
- % Requests FIT:** The percentage of messages sent that fit the defined buffer length.
- % Requests BIG (with OVR):** The percentage of messages sent, that needed a buffer length larger than the defined buffer length, AND suffered performance degradation (OVR only).
If messages are bigger than the defined transport class buffer length, XCF must allocate larger buffers. This causes overhead.
- % Requests BIG (without OVR):** The percentage of messages sent, that needed a buffer length larger than the defined buffer length, but don't suffered performance degradation (OVR) since the messages can reuse buffers that were already allocated for large messages. XCF can dynamically adjust the defined transport class buffer length to avoid overhead for large messages.

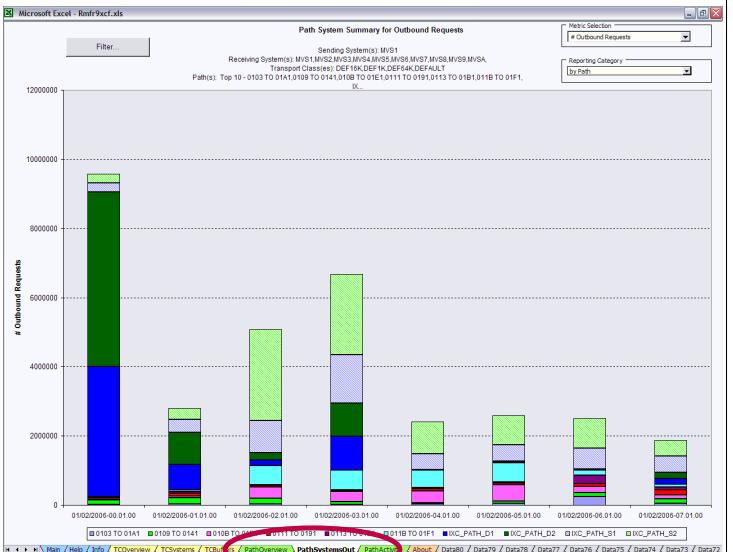
- In the previous chart we have detected a mismatch between the size of buffers and the size of the messages for Transport Class DEF16K. The filter dialog in the TCBuffers worksheet allows to focus on the DEF16K Transport Class and analyze the buffer details:
- There are no requests in the BIG categories. That means, no additional large buffers must be allocated by XCF to satisfy the Outbound requests.
- However, buffer space is wasted since most of the messages are too small for the 16K buffers. Thus, the following actions can be considered:
 - If one or more XCF Groups are explicitly assigned to Transport Class DEF16K, this assignment can be completely removed or changed towards smaller buffers
 - If the messages are directed to Transport Class DEF16K due to their pure size, the definition of an additional Transport Class (e.g. DEF4K) can be useful

XCF Path Activities

XCF PATH STATISTICS							
OUTBOUND FROM MVS1							
T TO	FROM/TO Y DEVICE, OR SYSTEM P STRUCTURE	TRANSPORT CLASS	REQ OUT	AVG Q LNGTH	AVAIL	BUSY	RETRY
MVSA	S IXC_PATH_D1	DEF16K	449	0.00	449	0	0
	S IXC_PATH_I2	DEF64K	218	0.00	218	0	0
	S IXC_PATH_S1	DEF1K	6,031	0.00	5,996	35	0
C 0103 TO 01A1	DEF1K		14,203	0.00	14,179	24	0
C 0113 TO 01B1	DEF1K		20,940	0.00	20,920	20	0
MVS2	S IXC_PATH_D1	DEF16K	3238605	0.24	2198680	1039925	0
	S IXC_PATH_I2	DEF64K	12,077	0.00	12,077	0	0
	S IXC_PATH_S1	DEF1K	16,338	0.00	16,213	125	0
C 010D TO 01E1	DEF1K		13,260	0.00	13,165	95	0
C 011D TO 0171	DEF1K		23,176	0.00	23,059	117	0



- ▶ What hardware resources are involved (CFs and CTCs)?
- ▶ Are there any malfunctions?
- ▶ How busy are the resources?



- ▶ **PathOverview:**
XCF Paths with associated Transport Classes and actual Outbound Request statistics
- ▶ **PathSystemsOut:**
Signaling activities on path level
- ▶ **PathActivity:**
Decomposition of outbound requests with regard to path availability

- The green-tabbed worksheets of the XCF Trend Report macro contain data extracted from the *XCF Path Statistics* section of the Postprocessor XCF Activity Report.
- This section shows the Path perspective of XCF activity and formats the Outbound and Inbound activities from the view of the system where the SMF 74.2 records have been collected. For Outbound requests, the Transport Class information is also included.
- The Path perspective of the XCF Trend Macro consists of the following worksheets:
 - PathOverview
 - Lists all Paths with system connection name, Transport Class and request numbers
 - all columns are sortable!
 - PathSystemsOut
 - Displays the outbound activity with various metrics
 - The category view can be switched: by Path, by Transport Class, Sending Systems, Receiving Systems
 - multiple filters (accordingly to the categories) can be selected
 - PathActivity
 - Provides decomposition of outbound requests with regard to path availability
 - Supports the same filters as PathSystemsOut worksheet

XCF Path Activities: The PathOverview Worksheet

What XCF Paths are defined on my Sysplex ?

The screenshot shows the 'Path Overview' worksheet interface. At the top, there is a header bar with tabs B, C, D, E. Below it is a control panel with a date selector (01/02/2006-00.01.00), a 'Table Option' dropdown (From:To System), and two counters: 3600 seconds and 653. A large yellow-highlighted area covers the first 10 rows of a table titled 'Path Overview Table'. This table has columns: From:To System, Path, Transport Class, Number of Outbound Requests, and Outbound Requests Rate. The first row shows MVS1 :MVS2 with IXC_PATH_D1, DEF16K, 3238605, and 899.6. The last row shown is MVS1 :MVS3 with IXC_PATH_S1, DEF1K, 87724, and 22.00. Several callouts provide annotations:

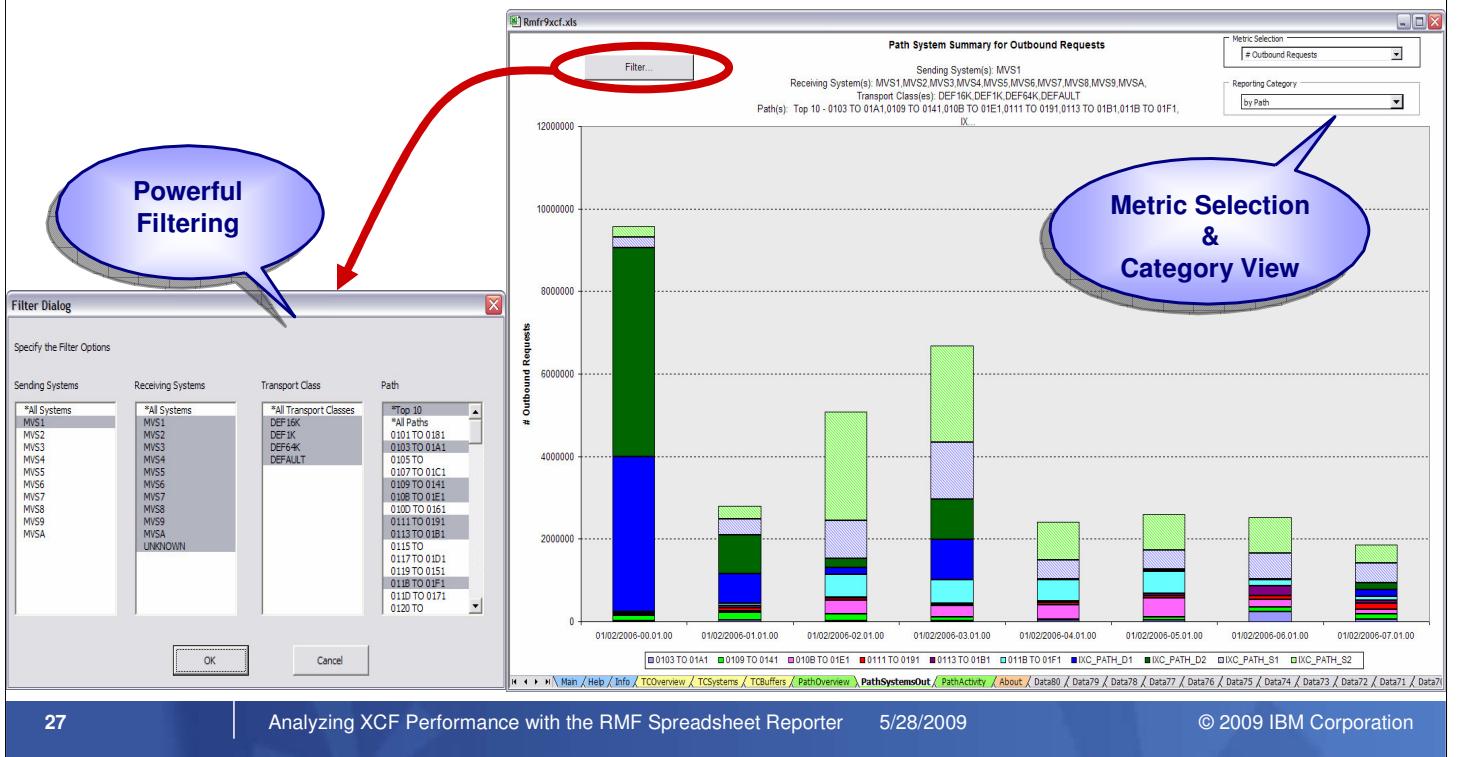
- A blue speech bubble points to the date selector with the text "Select Interval to display".
- A blue speech bubble points to the 'Table Option' dropdown with the text "Define Sort Criteria for Path Table".
- A green speech bubble points to the right side of the table with the text "Overview of XCF Paths with associated Transport Classes and Outbound Request statistics".
- A blue speech bubble points to the 'Rate' column header with the text "Additional Filter for each column".

From:To System	Path	Transport Class	Number of Outbound Requests	Outbound Requests Rate
MVS1 :MVS2	IXC_PATH_D1	DEF16K	3238605	899.6
MVS1 :MVS2	IXC_PATH_D2	DEF16K	4409366	1224.82
MVS1 :MVS2	IXC_PATH_L1	DEF64K	1825	0.51
MVS1 :MVS2	IXC_PATH_L2	DEF64K	12077	3.33
MVS1 :MVS2	IXC_PATH_S1	DEF1K	16338	4.33
MVS1 :MVS2	IXC_PATH_S2	DEF1K	39335	10.33
MVS1 :MVS2	010D TO 0161	DEF1K	13260	3.67
MVS1 :MVS2	011D TO 0171	DEF1K	23176	6.44
MVS1 :MVS3	IXC_PATH_D1	DEF16K	286428	79.56
MVS1 :MVS3	IXC_PATH_D2	DEF16K	220719	61.31
MVS1 :MVS3	IXC_PATH_L1	DEF64K	129	0.04
MVS1 :MVS3	IXC_PATH_L2	DEF64K	4288	1.19
MVS1 :MVS3	IXC_PATH_S1	DEF1K	87724	22.00

- The PathOverview worksheet provides an overview of XCF path connectivity. It shows all XCF Paths (as defined by the PATHOUT parameter in SYS.PARMLIB(COUPLExx)) including their associated Transport Classes as well as actual Outbound Request statistics
- To sort the data in the Path Overview table, the following sort criteria can be used:
 - From:To System
 - Path
 - Transport Class
 - Outbound Requests
- An additional filter can be set for each column, e.g. to show only paths that are defined to transport class DEFAULT.

XCF Path Activities: The PathSystemsOut Worksheet

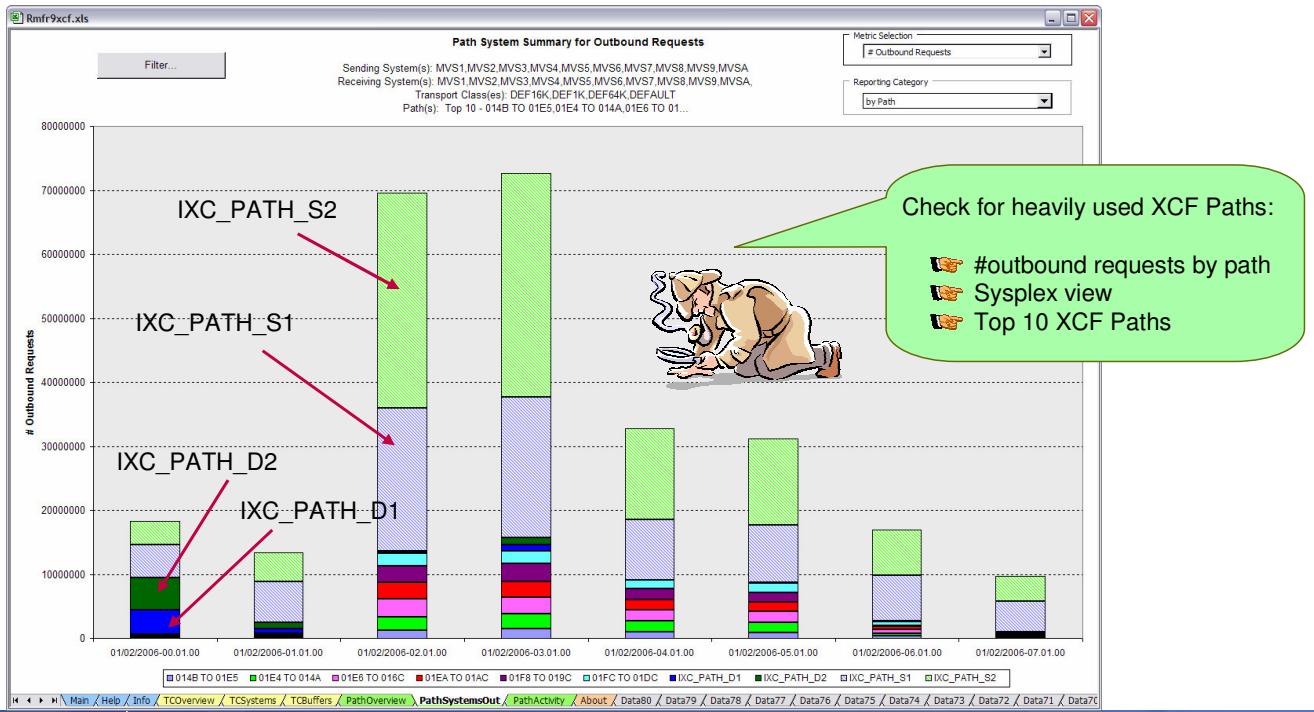
How busy are the XCF paths ?



- With the PathSystemsOut worksheet you are able to analyze the signalling activities between systems on path level.
- The example screenshot of the PathSystemsOut Worksheet shows the Outbound requests going from system MVS1 to all other systems of the Sysplex. By default, only one sending system is pre-selected. That means, the view corresponds to the data contained in a single system Postprocessor XCF Report.
- The *Metric Selection* drop-down box in the upper right corner of the worksheet allows to choose between the following metrics:
 - Number of Outbound Requests
 - Outbound Request Rate
 - Number of Path Available
 - Path Available Rate
 - Number of Path Busy
 - Path Busy Rate
 - Number of Retries
 - Retry Rate
 - Average Queue Length
- The *Filter* button allows to define the scope of the reported data in a *Filter Dialog* window. To get a Sysplex-wide select **All Systems* in the *Sending Systems* column, then confirm with *OK*.
- The *Filter Dialog* also allows to focus on specific Transport Classes or XCF Paths.
- Additional, the *Reporting Category* drop-down box in the upper right corner of the worksheet allows to choose between the following reporting categories:
 - by Sending System
 - by Receiving System
 - by Transport Class
 - by Path

XCF Path Activities: The PathSystemsOut Worksheet ...

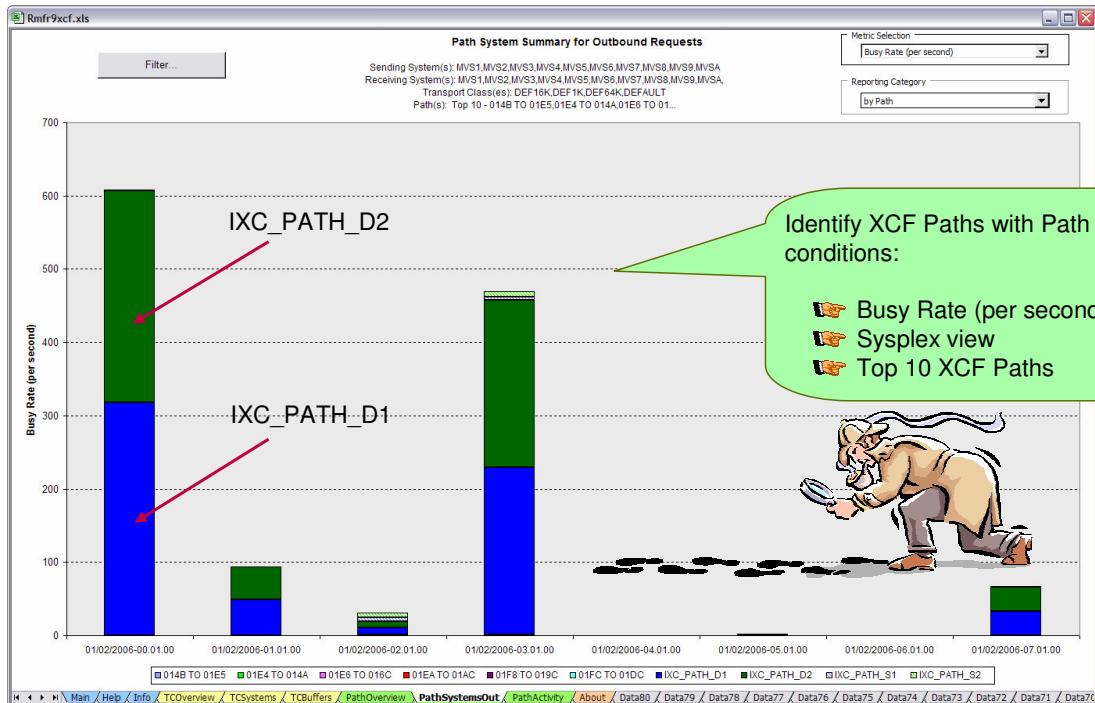
What Paths are used for the XCF messages ?



- Now let's get further in our XCF Performance analysis scenario and see how the message traffic looks like, when we take all sending systems into consideration:
- For the sysplex view we use the the *Filter* button and select *All Systems in the *Sending Systems* column, then confirm with *OK*
- The Sysplex-wide view aggregation points out clearly that the majority of the XCF messages is exchanged thru the following Coupling Facility Structures:
 - IXC_PATH_S1
 - IXC_PATH_S2
 - IXC_PATH_D1
 - IXC_PATH_D2

XCF Path Activities: The PathSystemsOut Worksheet ...

Is there any Path Contention ?

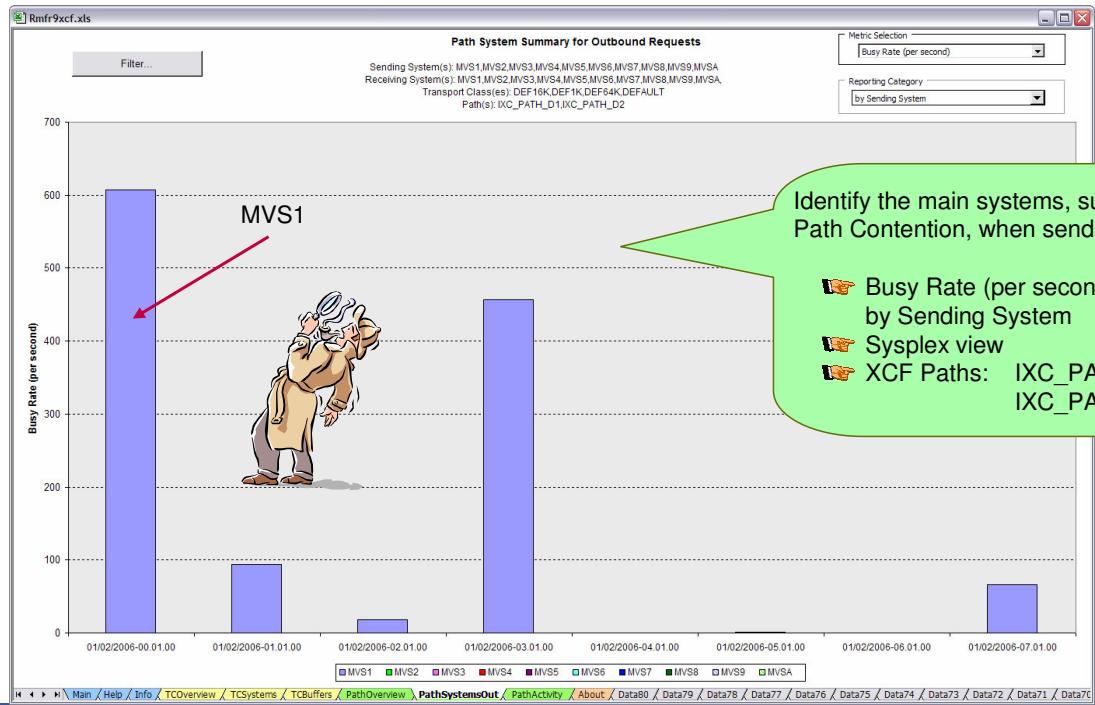


- When XCF selects a path while a message is already in the process of being transferred, a *Path Busy* condition occurs. Thus, let's check for possible path contention:
 - from the *Metric Selection* drop-down box, we choose *Busy Rate*
- Obviously there is some contention for a couple of restless paths, especially IXC_PATH_D1 and IXC_PATH_D2.

XCF Path Activities:

The PathSystemsOut Worksheet ...

What systems are impacted by the Path Contention ?



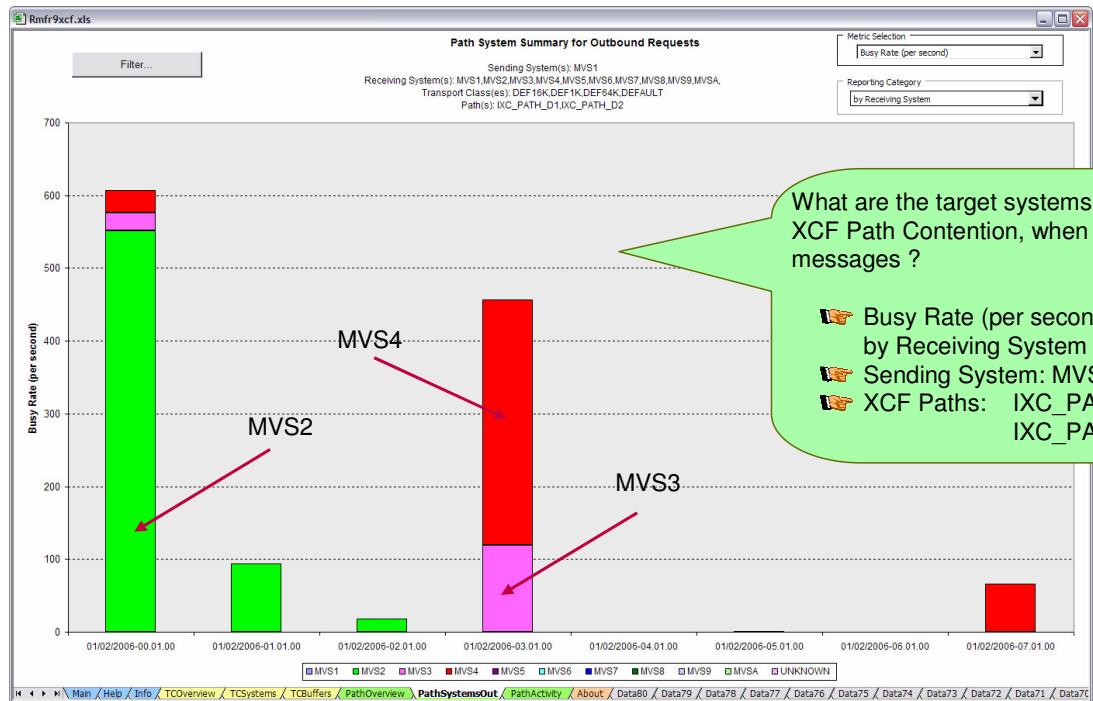
Identify the main systems, suffering from XCF Path Contention, when sending messages:

- 👉 Busy Rate (per second) by Sending System
- 👉 Sysplex view
- 👉 XCF Paths: IXC_PATH_D1, IXC_PATH_D2

- XCF paths IXC_PATH_D1 and IXC_PATH_D2 are defined on all systems of our Sysplex.
- Let's investigate further which systems are suffering from the path contention:
 - on the *Filter Dialog*, we select IXC_PATH_D1 and IXC_PATH_D2 from the *Path* column and confirm with *OK*
 - from the *Reporting Category* drop-down box, we choose *by Sending System*
- The worksheet brings it to light: The critical system is MVS1.

XCF Path Activities: The PathSystemsOut Worksheet ...

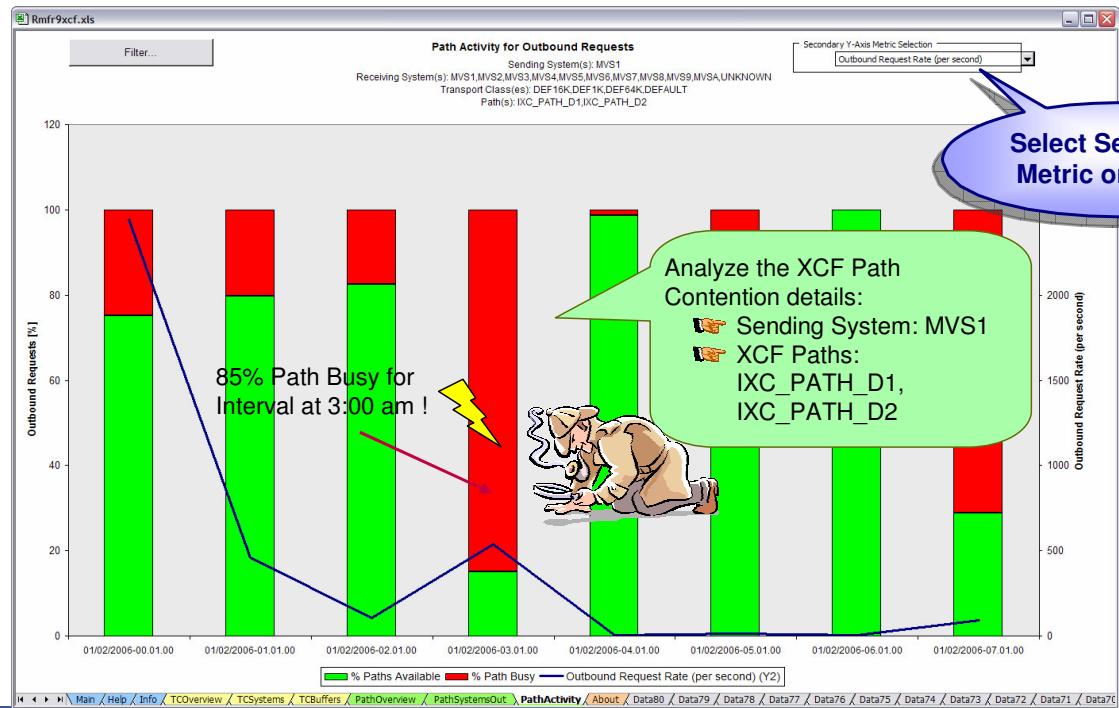
What systems are impacted by the Path Contention ?



- Now we choose *by Receiving System* as *Reporting Category* and it becomes quite clear: just in case system MVS1 is talking to system MVS2, MVS3 or MVS4, we have to take care of path contention.

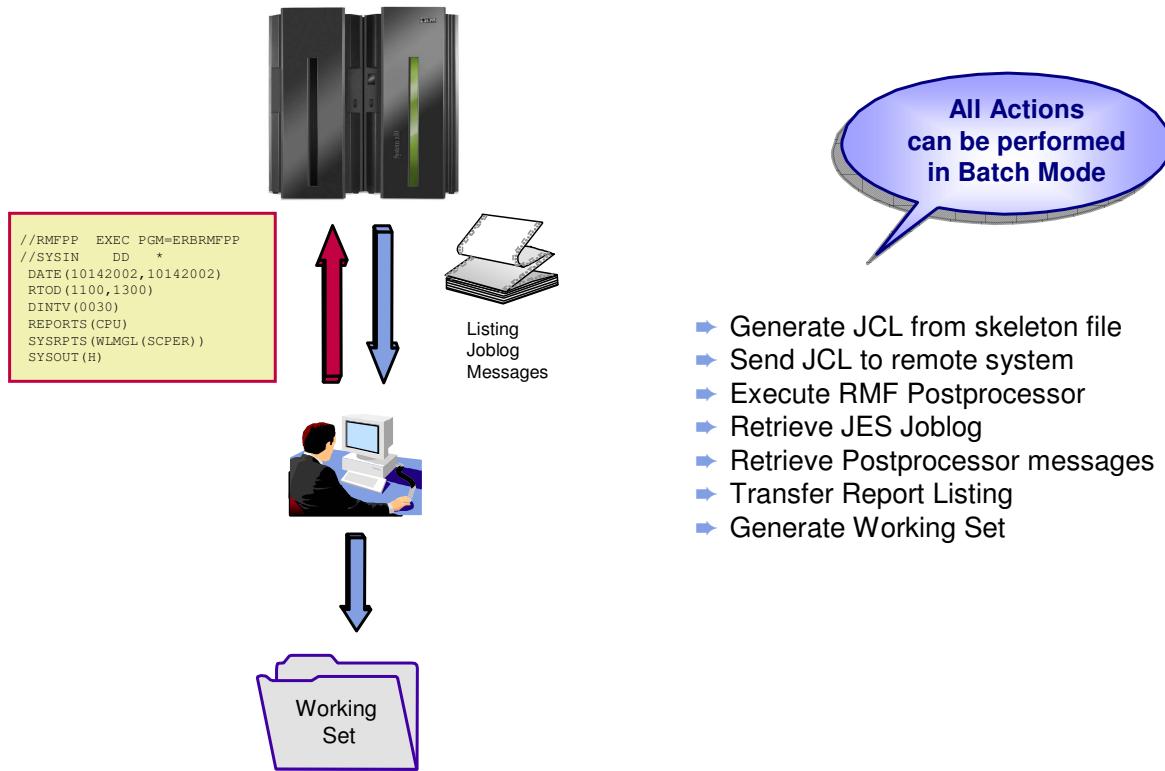
XCF Path Activities: The PathActivity Worksheet

What are the XCF path contention details ?



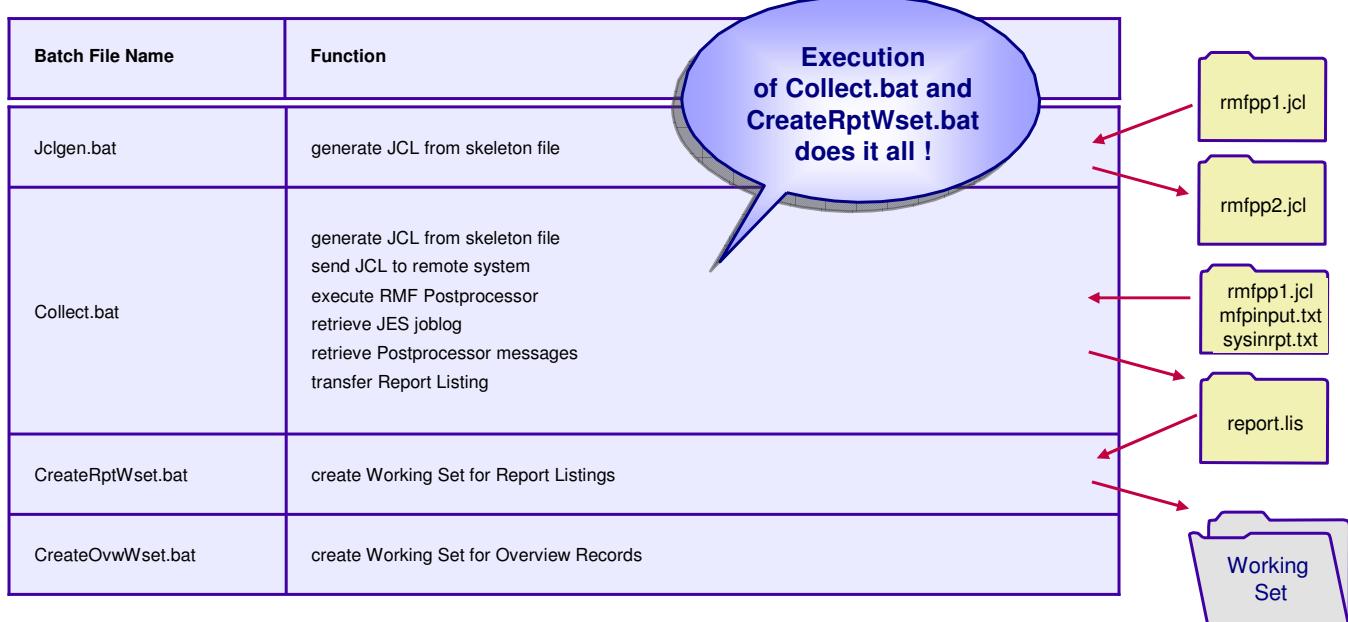
- The PathActivity worksheet allows to further analyze the XCF path contention. It provides a decomposition of all Outbound requests into the Path Available and the Path Busy condition.
- Additionally, a selectable metric is reported on the secondary Y-Axis. A filter can be used, to specify the Sending System, Receiving System, Transport class and Path.
- With the PathSystemsOut worksheet we have identified the Coupling Facility Structures IXC_PATH_D1 and IXC_PATH_D2 as main contributors to the XCF Path activity and contention. The filter dialog in the PathActivity worksheet allows to focus on the IXC_PATH_D1 and IXC_PATH_D2 Paths and analyze the contention in more details:
 - The interval at 3:00 am shows a peak: more than 85% of the Outbound requests receive a *Path Busy* condition. Furthermore, most of the remaining intervals don't seem to be in really good shape.
 - So, from the XCF perspective there is a problem with these two Coupling Facility structures.
 - What's next? Of course, we can take a look at the RMF Coupling Facility Reports with special regard to these structures.
 - However, instead of searching through all the lines and columns of endless reports: wouldn't it be great to have a powerful spreadsheet macro for the analysis of Coupling Facility data as well.....

Additional Features: Batch Mode



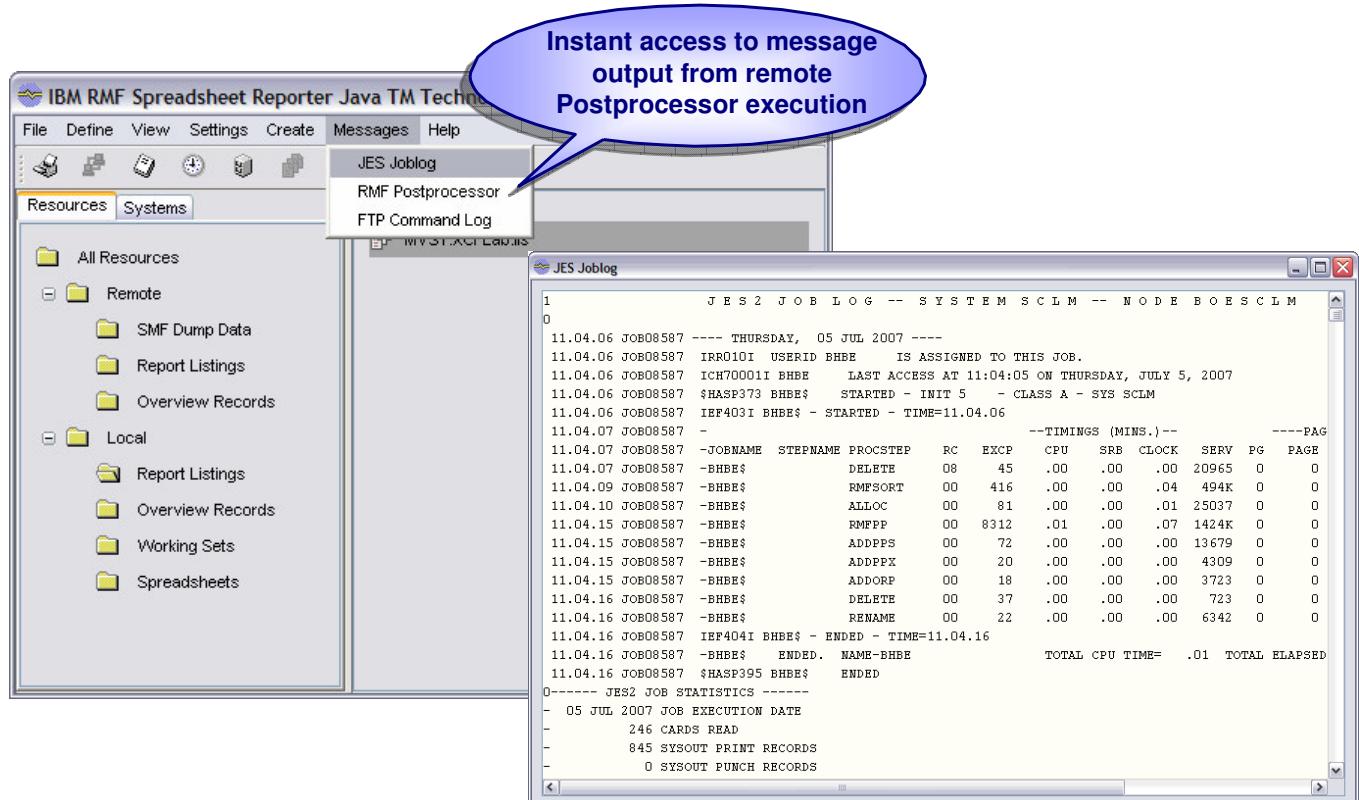
- All actions supported by the RMF *Spreadsheet Reporter* GUI can also be performed via batch mode. A set of command files allows you to generate Working Sets from SMF raw data without any user interaction:
 - Insert the variable parameters from the system profile into the JCL skeleton file
 - Send the JCL to the remote system (FTP PUT)
 - Execute the JCL and wait synchronously for job completion (FTP GET with FILETYPE=JES)
 - Retrieve JES Joblog
 - Retrieve Postprocessor messages
 - Transfer Report Listing to the workstation (FTP GET)
 - Extract the Report files from the Report Listing
 - Convert the Report files to spreadsheet format
 - Generate the control information for the Spreadsheet Reporter macros

Additional Features: Batch Mode ...



- In the root directory of your *Spreadsheet Reporter* installation you find a set of command files. If you want to setup automated procedures without using the GUI, these files are an excellent starting point:
 - Just adapt the variables within the Collect.bat file to your needs
 - Specify your SMF datasets in the file mfpinput.txt
 - Provide the Postprocessor control statements in the file sysinrpt.txt
 - Execute the Collect command with the following parameters:
 - Hostname
 - Password
 - Report type indication
 - Execute CreateRptWset command with the following parameters:
 - Filename of the Report Listing
 - Working Set output directory
 - Working Set name

Additional Features: Problem Determination



- The remote Postprocessor execution is an area where further diagnostic information might be helpful. The *Messages* menu item allows you to access the message output from the following components:
 - JES
 - RMF
 - FTP
- The screenshot shows the JES Joblog after the RMF Postprocessor job has finished.

Additional Features: Problem Determination ...

```
D:\Temp>ftp boesclm
Connected to boesclm.boeblingen.de.ibm.com.
220-FIPD1 IBM FTP CS U2R10 at BOESCLM.boeblingen.de.ibm.com, 13:18:48 on 2003-10
-01.
220 Connection will close if idle for more than 60 minutes.
User <boesclm.boeblingen.de.ibm.com:<none>>: bhbe
331 Send password please.
Password:
230 BHBE is logged on. Working directory is "BHBE.".
ftp> ascii
200 Representation type is Ascii NonPrint
ftp> put iefbr14.jcl
200 Port request OK.
125 Storing data set BHBE.IEFBR14.JCL
250 Transfer completed successfully.
ftp: 287 bytes sent in 0.00Seconds 287000.00Kbytes/sec.
ftp> quote site filetype=jes
200 SITE command was accepted
ftp> get iefbr14.jcl iefbr14.joblog
200 Port request OK.
125-Submitting job iefbr14.jcl FIXrcfm 80
125 When JOB09207 is done, will retrieve its output
250 Transfer completed successfully.
ftp: 3416 bytes received in 3.11Seconds 1.10Kbytes/sec.
ftp> bye
221 Quit command received. Goodbye.

D:\Temp>
```

Verify FTP connection setup with
command line FTP

- In case of FTP errors, some users might blame the Spreadsheet Reporter for their FTP setup problems.
- For further analysis, you can simply use the standard command line FTP in the same way as the RMF *Spreadsheet Reporter*:
 - prepare a text file with a pure IEFBR14 job control
 - put this file to the remote system in ascii mode
 - submit the job on the remote system and retrieve the JES Joblog
- Internally, the Spreadsheet Reporter issues the same command sequence as shown in the screenshot.
- If this procedure does not work correctly, review your network parameters before you continue to try the remote job execution with the RMF Spreadsheet Reporter.
- In case the job execution for module IEFBR14 works fine, the same should apply for the RMF Postprocessor module.

RMF Information and Tools

RMF homepage: www.ibm.com/servers/eserver/zseries/zos/rmf/

- **Product information, newsletters, presentations, ...**
- **Downloads**
 - ▶ Spreadsheet Reporter
 - ▶ RMF PM Java Edition
 - ▶ RMF data collector for Linux

RMF email address: rmf@de.ibm.com



Documentation and news

- **RMF Performance Management Guide, SC33-7992**
- **RMF Report Analysis, SC33-7991**
- **RMF User's Guide, SC33-7990**
- **Latest version of PDF files can be downloaded from:**
www.ibm.com/servers/eserver/zseries/zos/bkserv/r10pdf/rmf.html

