IBM Education Assistance for z/OS V2R2

Item: zFS Monitoring Enhancements
Element/Component: RMF

Material current as of May 2015

Agenda

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Trademarks

- See url http://www.ibm.com/legal/copytrade.shtml for a list of trademarks.

Presentation Objectives

- Explain purpose and usage of RMF z/OS V2R2 zFS Monitoring Enhancements
- RMF zFS Monitoring Enhancements introduces three new Monitor III Sysplex reports with z/OS Distributed File system (zFS) data.
- The reports allow to keep track of sysplex-wide z/OS Distributed File system (zFS) usage and analyse short-term performance.
- RMF Distributed Data Server (DDS) supports the new sysplex-wide metrics to allow performance analysis of zFS by DDS API exploiters.

Overview

- Problem Statement / Need Addressed
  - Existing RMF Monitor III single system reports ZFSSUM and ZFSACT offered no possibility to monitor details of zFS related to sysplex awareness of zFS file systems.
  - Some customers observed performance problems when gathering zFS performance data.
- Solution
  - Provide new RMF Monitor III Sysplex reports with detailed and aggregated zFS data for various aspects of zFS performance analysis.
  - The new reports are: ZFSOVW (wait and cache statistics), ZFSFS (file system statistics), ZFSKN (zFS kernel statistics).
  - RMF utilizes new zFS APIs to gather zFS performance data.
- Benefit / Value
  - RMF online monitoring can be used to identify performance problems related to zFS distributed file systems.

Usage & Invocation: RMF Monitor III Data Gatherer Option

- Users can control whether they want Monitor III to collect zFS activity data by specifying the data gathering option

  ZFS | NOZFS

- Default value ZFS is set in shipped PARMLIB member ERBRMF04

```
/*********************************************************************/
/* NAME:        ERBRMF04                                             */
/* DESCRIPTION: PARMLIB MEMBER WITH RMF MONITOR III GATHERER OPTIONS */
/*              (ALL OPTIONS ARE SET TO DEFAULTS)                    */
/*********************************************************************/
  CYCLE(1000)               /* SAMPLE EVERY SECOND (1000 MSEC)      */
  DATASET(STOP)             /* NO DATASET SUPPORT                   */
  DATASET(NOSWITCH)         /* APPEND TO LAST NON-FULL DATASET      */
  DATASET(WHOLD(7))         /* CONTROLS BUFFER PAGES IN STORAGE     */
  MINTIME(100)              /* LENGTH OF MINTIME                    */
NOOPTIONS                   /* DO NOT DISPLAY OPTIONS               */
  RESOURCE(*JES2,JES2)      /* SPECIFIES JES STARTED TASK NAME      */
NOSTOP                      /* RUN UNTIL OPERATOR ISSUES STOP       */
  SYNC(00)                  /* MINTIME SYNCHRONIZATION              */
  ..................................
  VSAMRLS                   /* ACTIVATE VSAM RLS GATHERING          */
  OPD                       /* ACTIVATE OMVS PROCESS DATA GATHERING */
  PCIE                      /* ACTIVATE PCIE DATA GATHERING         */
  ZFS                       /* ACTIVATE ZFS DATA GATHERING          */
NOSGSPACE                   /* NO STORAGE GROUP SPACE GATHERING     */
NOLOCK                      /* NO LOCK DATA GATHERING               */
```

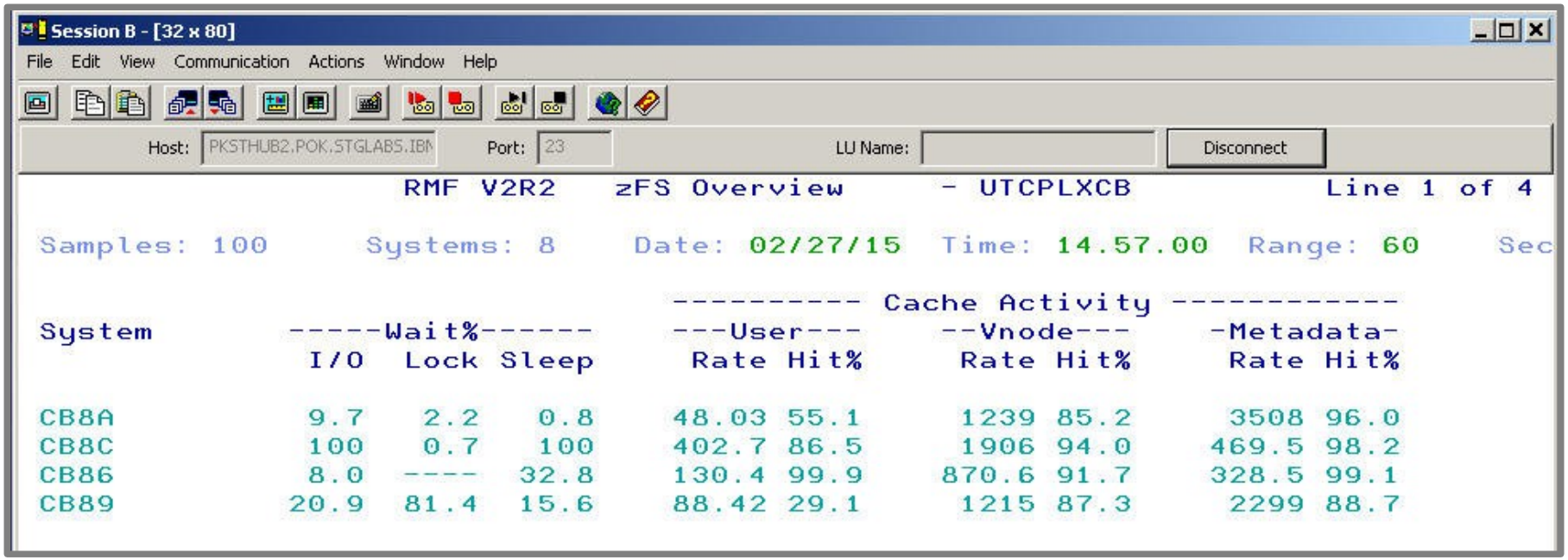
Usage & Invocation: RMF Monitor III zFS Sysplex Reports

- To request the Monitor III ZFSOVW, ZFSFS and ZFSKN reports select 'S' from the Primary Menu, then select option 13, 14 or 15 from the Sysplex Report Selection Menu.
- Alternatively, enter one of these commands:
  ZFSOVW or ZFO, ZFSFS or ZFF, ZFSKN or ZFK

```
                    RMF Sysplex Report Selection Menu

Enter selection number or command for desired report.


 Sysplex Reports
          1 SYSSUM    Sysplex performance summary                  (SUM)
          2 SYSRTD    Response time distribution                   (RTD)
          3 SYSWKM    Work Manager delays                          (WKM)
          4 SYSENQ    Sysplex-wide Enqueue delays                   (ES)
          5 CFOVER    Coupling Facility overview                    (CO)
          6 CFSYS     Coupling Facility systems                     (CS)
          7 CFACT     Coupling Facility activity                    (CA)
          8 CACHSUM   Cache summary                                (CAS)
          9 CACHDET   Cache detail                                 (CAD)
         10 RLSSC     VSAM RLS activity by storage class          (RLS)
         11 RLSDS     VSAM RLS activity by data set               (RLD)
         12 RLSLRU    VSAM LRU overview                           (RLL)
         13 ZFSOVW    zFS Overview                                (ZFO)
         14 ZFSFS     zFS File System                             (ZFF)
         15 ZFSKN     zFS Kernel                                  (ZFK)

 Data Index
          D DSINDEX   Data index                                    (DI)
```

Usage & Invocation: RMF Monitor III ZFSOVW Report

- The Monitor III ZFSOVW report provides a summary of zFS activity, wait percentages and cache statistics on the current sysplex. This helps to discover bottlenecks and tune cache behaviour.

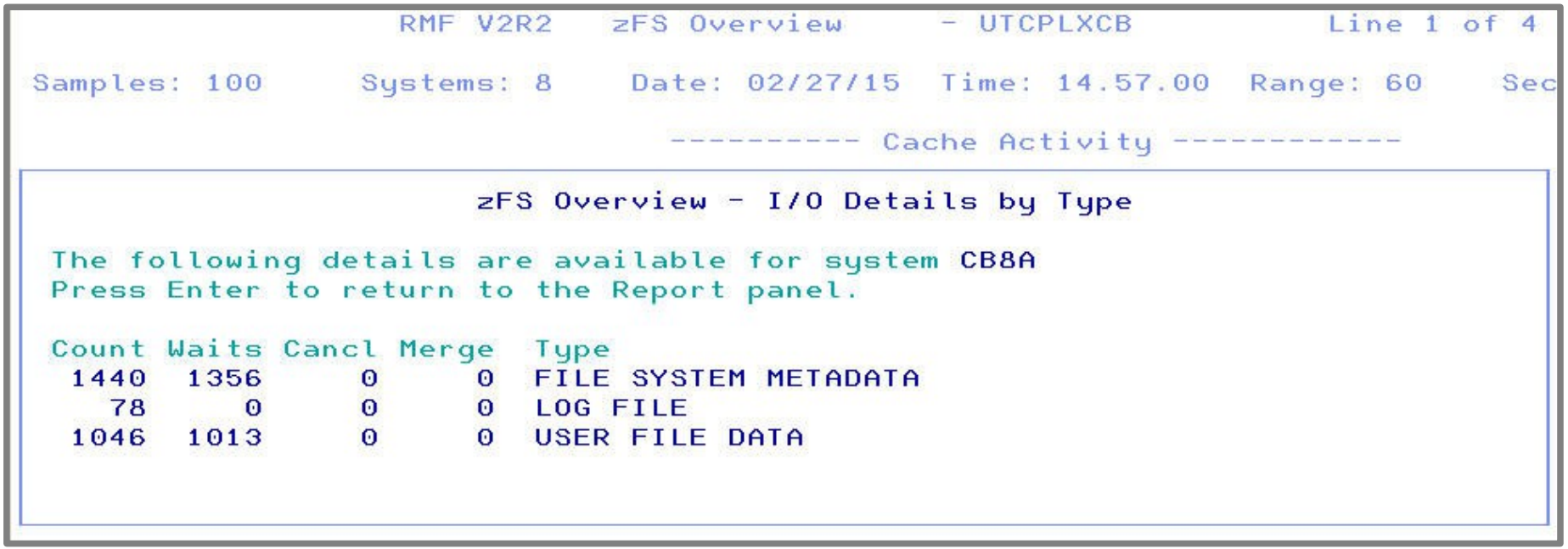


Usage & Invocation: RMF Monitor III ZFSOVW – Fields

Field Heading	Meaning
System	Name of the system running zFS.
Wait%	The following Wait percentages are reported: **I/O** Percentage of time that zFS requests had to wait for I/O completion. **Lock** Percentage of time that zFS requests had to wait for locks. **Sleep** Percentage of time that zFS requests had to wait for events. Dashes (----) in these fields indicate that RMF is unable to calculate a reasonable value.
Cache Activity section	
User	The user file cache is for caching regular user files that are larger than 7K. The measured statistics have the following meanings: **Rate** Total number of read and write requests per second made to the user file cache. **Hit%** Percentage of read and write requests to the user file cache that completed without accessing the DASDs.
Vnode	The vnode cache is used to hold virtual inodes. An inode is a data structure related to a file in the file system, holding information about the file's user and group ownership, access mode and type. The measured statistics have the following meanings: **Rate** Number of read and write requests per second made to the vnode cache. **Hit%** Percentage of read and write requests to the vnode cache that completed without accessing the DASDs.
Metadata	The metadata cache is used for file system metadata and for files smaller than 7K. It resides in the primary z/FS address space. The measured statistics have the following meanings: **Rate** Number of read and write requests per second made to the metadata cache. **Hit%** Percentage of read and write requests to the metadata cache that completed without accessing the DASDs.

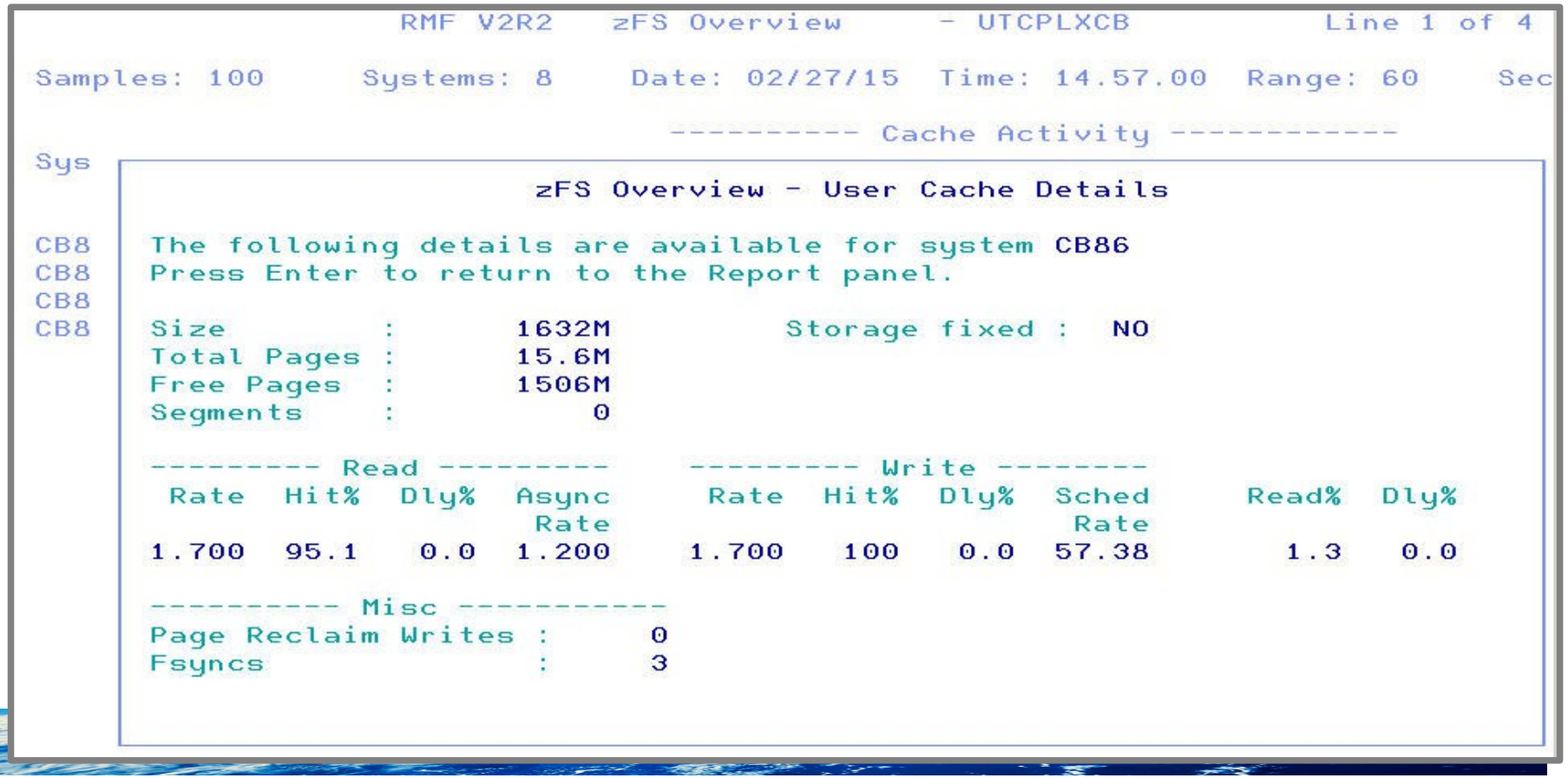
Usage & Invocation: RMF Monitor III ZFSOVW – I/O Data Pop-up

- The Monitor III ZFSOVW – I/O data pop-up panel displays a breakdown of I/O requests into three major request types.



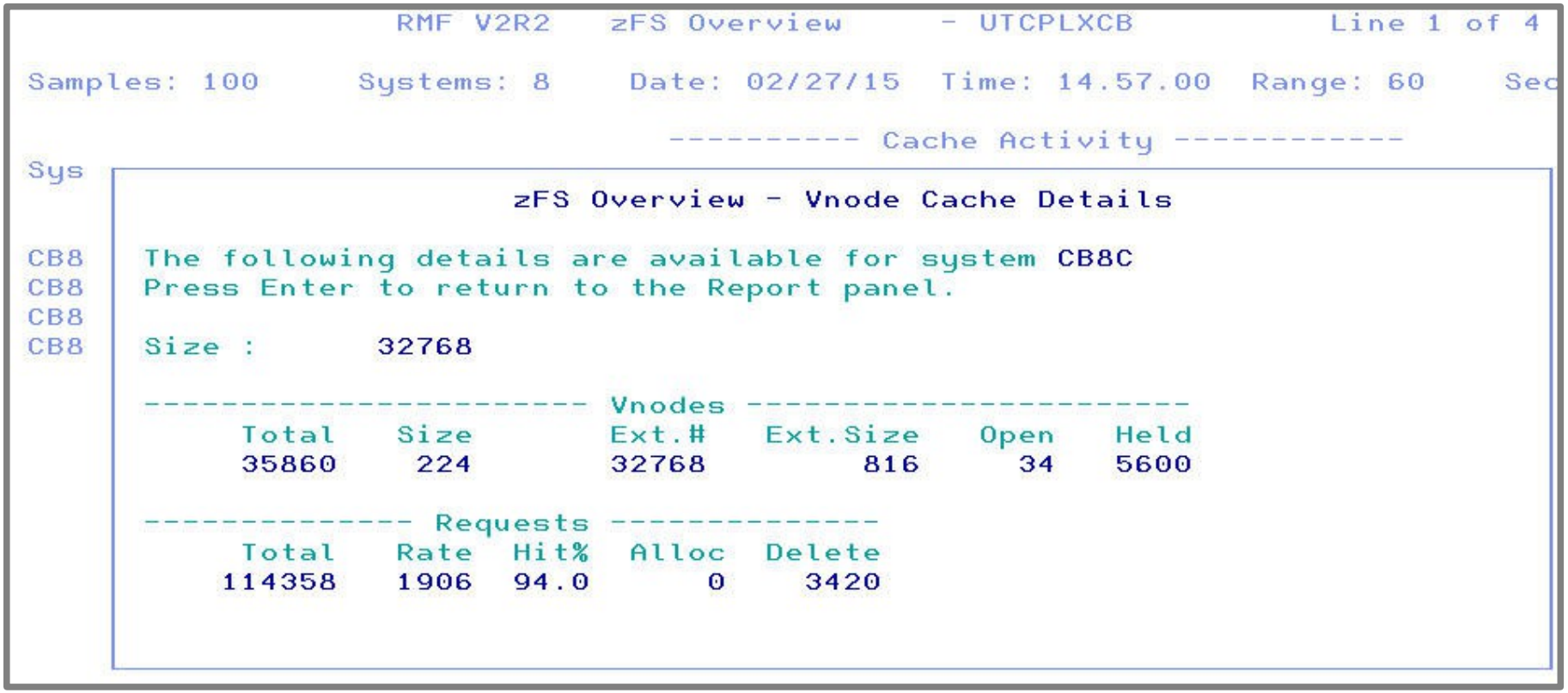
Usage & Invocation: RMF Monitor III ZFSOVW – User Cache Pop-up

- The Monitor III ZFSOVW – User cache pop-up panel displays details of the user file cache activity. In zFS, the user file cache is used to cache all “regular” files.



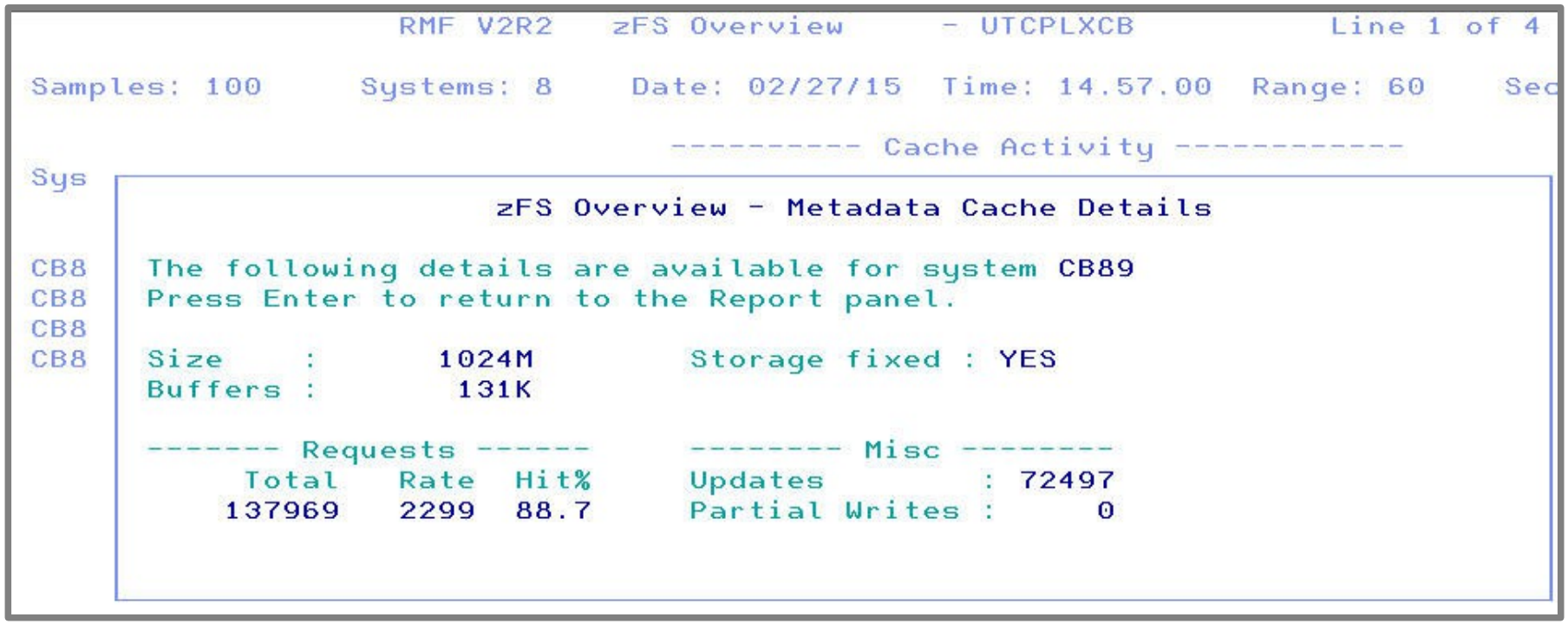
Usage & Invocation: RMF Mon III ZFSOVW – Vnode Cache Pop-up

- The Monitor III ZFSOVW – Vnode cache pop-up panel displays details of the Vnode cache activity. This zFS cache operates on vnodes, the data structure to represent file system objects.



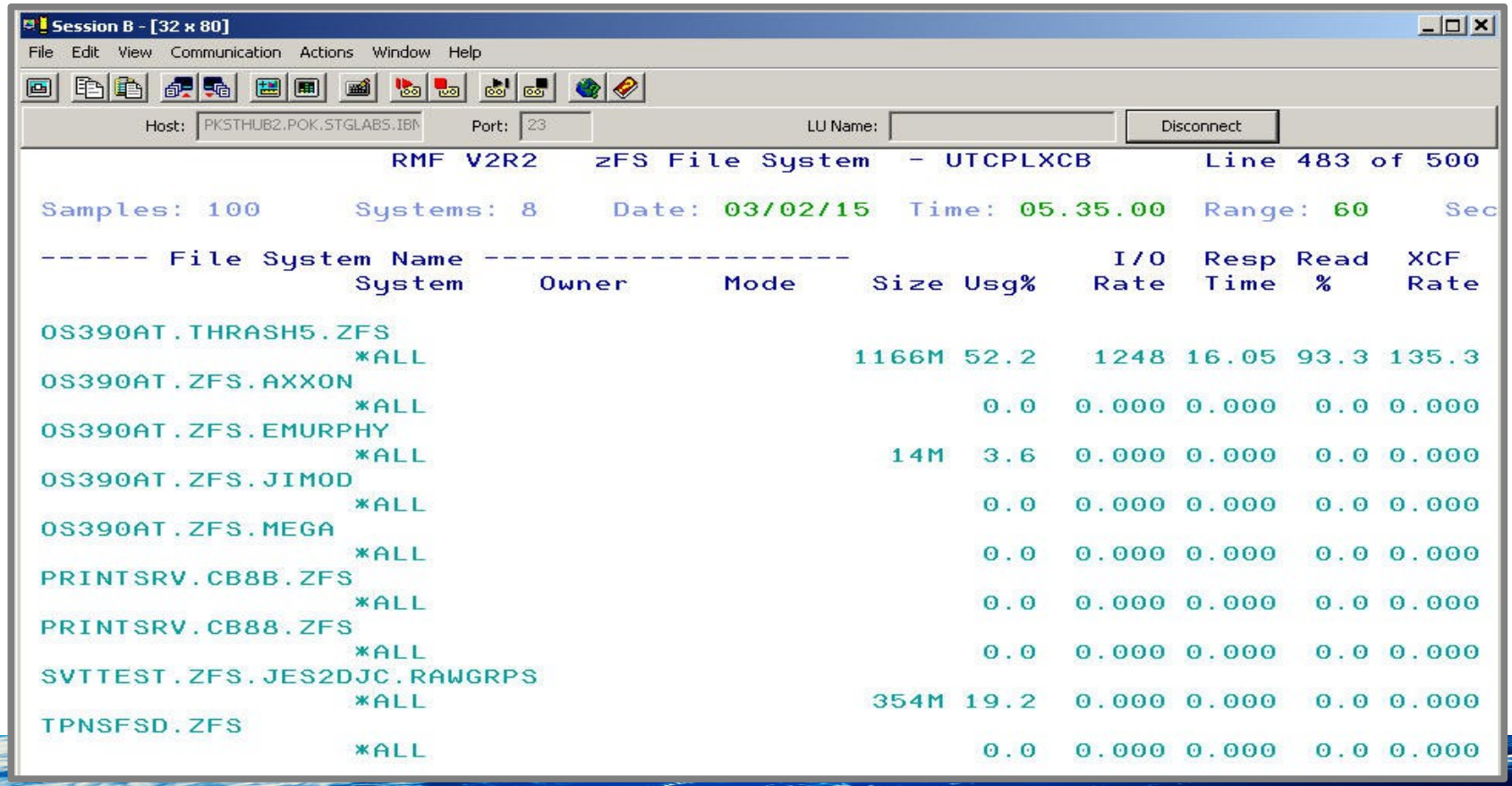
Usage & Invocation: RMF Mon III ZFSOVW – Metadata Cache Pop-up

The Monitor III ZFSOVW – Metadata cache pop-up panel displays details of the Metadata cache activity. This zFS cache contains all file system metadata, e.g. directory contents and file status information.



Usage & Invocation: RMF Monitor III ZFSFS Report

- The Monitor III ZFSFS report provides detailed measurements of zFS activity on the basis of single file systems. This helps to monitor performance and capacity limits of file systems.



Usage & Invocation: RMF Monitor III ZFSFS - Fields

Field Heading	Meaning
File System Name	File system name.
System	Name of the system connected to the file system. In the first data line for a file system, the name is '*ALL' to indicate that this line shows the SYSPLEX view of the data rather than a single system view.
Owner	Name of owning system.
Mode	Mount mode of the file system. Possible values are: **RW** mounted in read-write mode. **RO** mounted in read-only mode. **NM** not mounted. **QS** not available because the aggregate is quiesced. The mount mode is followed by an **S** if the file system is using zFS sysplex sharing (RWSHARE).
Size	Maximum logical size of the file system (in Bytes).
Usg%	Percentage of currently used space by the file system.
I/O Rate	The rate of read and write requests per second (directory and file) made by applications to this file system.
Resp Time	Average response time in milliseconds for read and write requests made by applications to this file system.
Read%	Percentage of read operations contained in 'I/O Rate'.
XCF Rate	The rate of read and write XCF calls per second to the server.

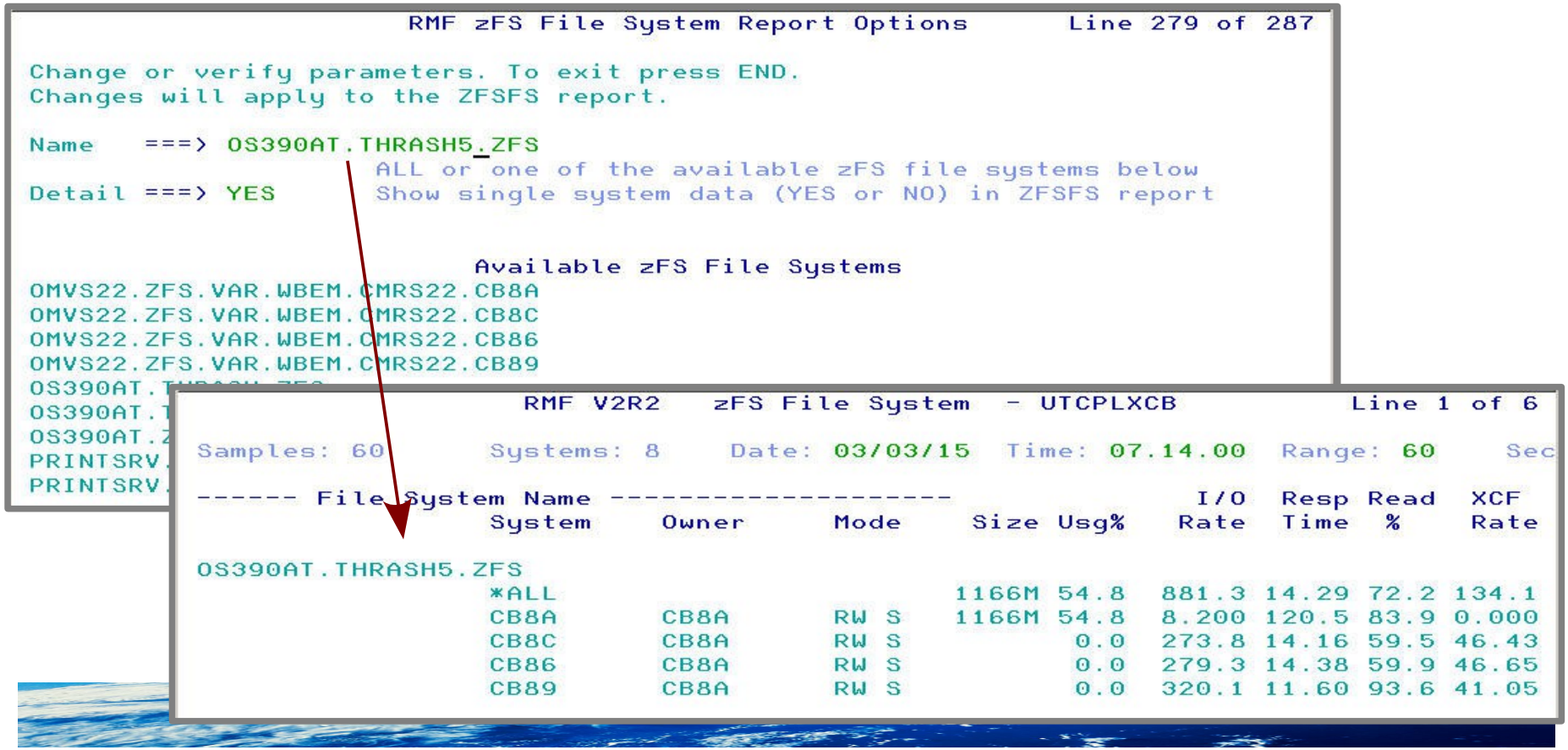
Usage & Invocation: RMF Mon III ZFSFS – File System Details Pop-up

- The Monitor III ZFSFS – File System Details pop-up panel displays the details of a single file system's activity on one system of the sysplex.

```
                              zFS File System Details
_
 File System Name : OS390AT.THRASH5.ZFS
 Mount
 Point : /thrashmegazfs5

 System : CB8A                 Owner : CB8A                  Mode : RW S

 -------------- Read --------------     -------------- Write --------------
 --- Appl ---  ---- XCF ----   Aggr     --- Appl ---  ---- XCF ----   Aggr
  Rate   Resp    Rate   Resp   Rate      Rate   Resp    Rate   Resp   Rate
         Time          Time                    Time           Time
 145.6  0.981   0.000  0.000   278K     16.38  232.8   0.000  0.000   433K

 Vnodes                 :  4981         USS held vnodes          :   163
 Open objects           :     0         Tokens                   :   103
 User cache 4k pages    :   220         Metadata cache 8k pages  :  121K

 ENOSPC errors          :     0         Disk I/O error           :     0
 XCF comm. failures     :     0         Cancelled operations     :     0

 Press Enter to return to the Report panel.
```

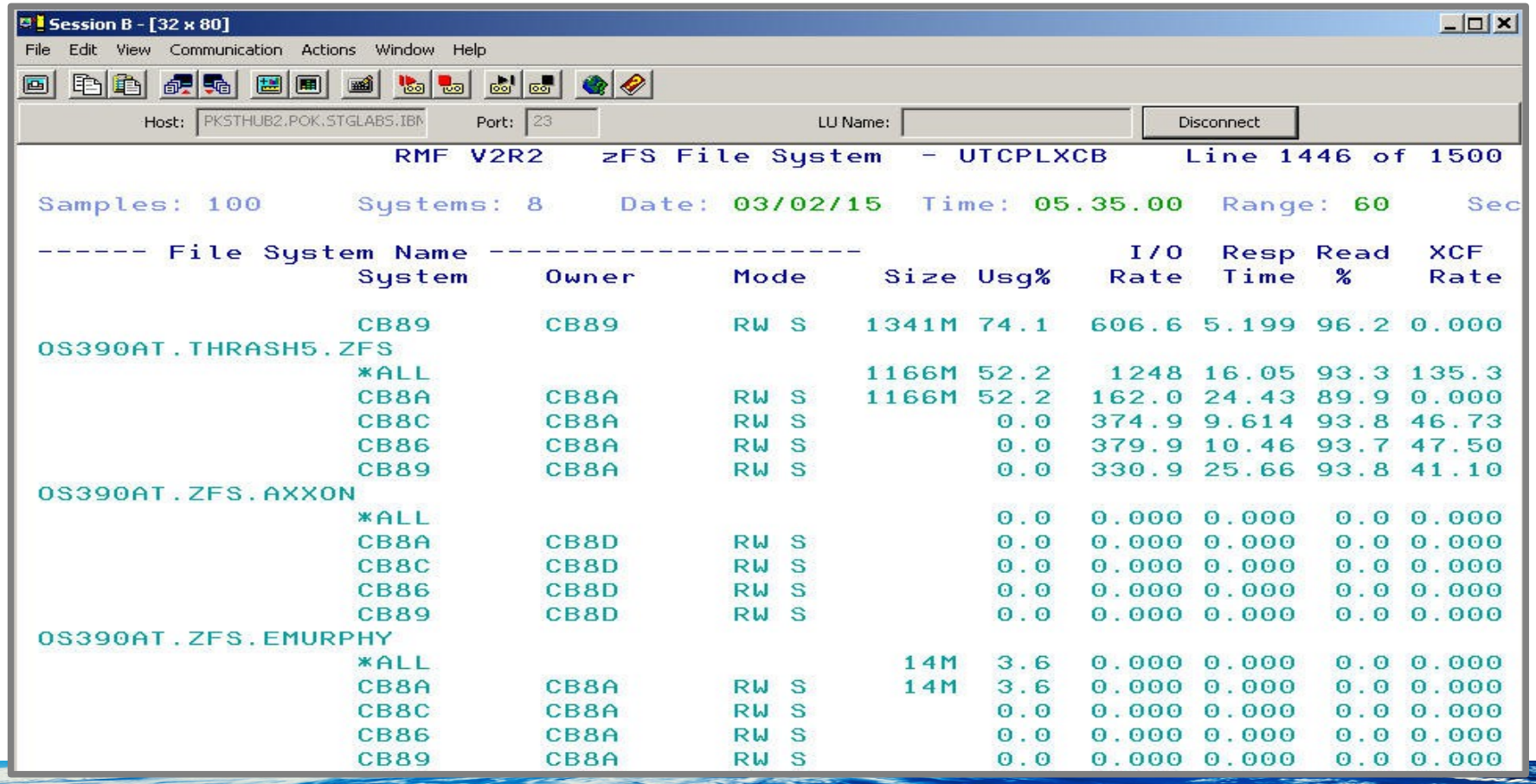
Usage & Invocation: RMF Monitor III ZFSFS - Report Options

- The contents of the Monitor III ZFSFS report can be tailored by report options (invoke with RO command on ZFSFS panel).
- Example: Detailed statistics for one file systems



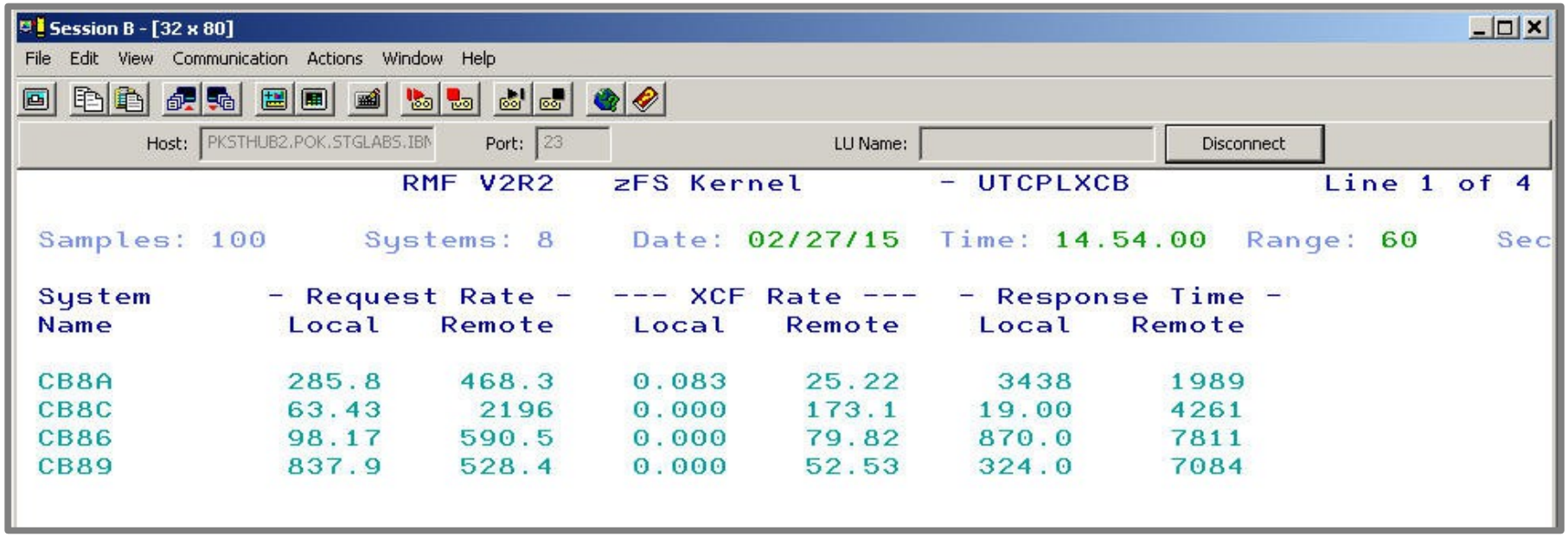
Usage & Invocation: RMF Monitor III ZFSFS - Report Options (2)

- Example: Using ALL for 'Name' and Details=YES, complete information for all file systems on all systems is provided.



Usage & Invocation: RMF Monitor III ZFSKN Report

- The Monitor III ZFSKN report provides measurements counting the calls made to zFS from z/OS UNIX and the average response time of zFS requests.



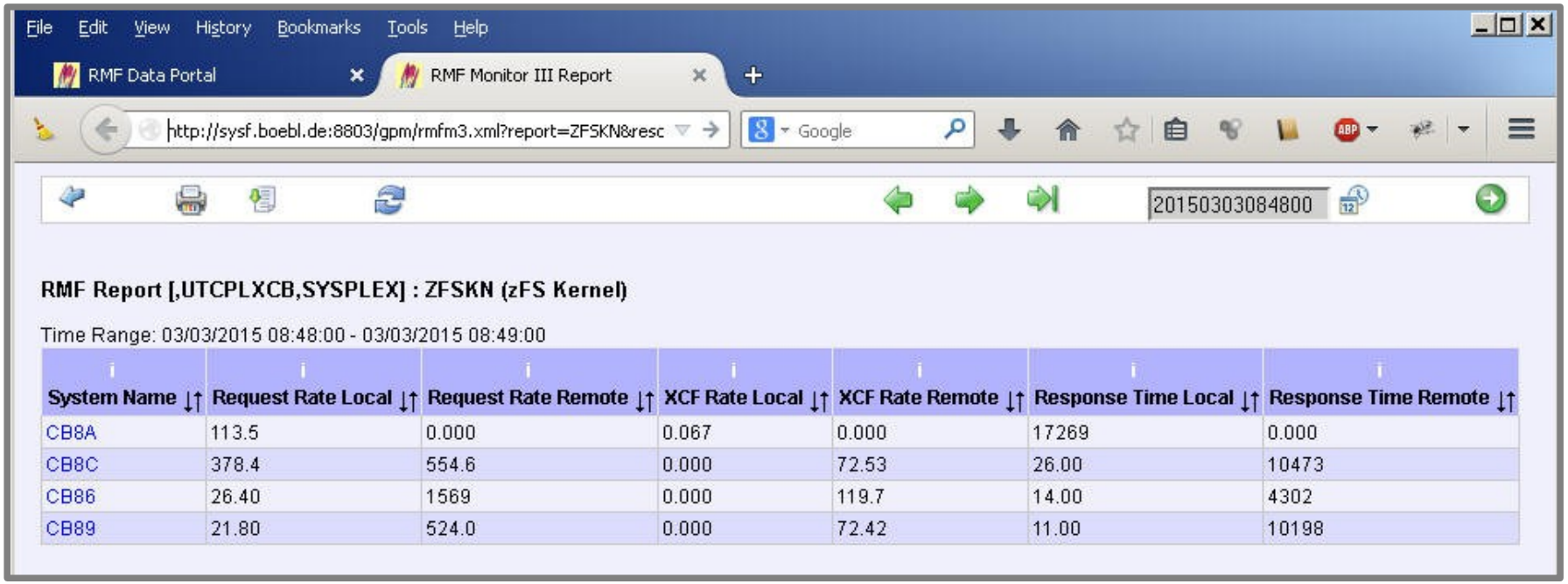
Usage & Invocation: RMF Monitor III ZFSKN - Fields

Field Heading	Meaning
System Name	Name of the system running zFS. In the context of requests against file systems, this is the name of the requesting system.
Request Rate	Rate of zFS requests during the report interval for file systems which are locally and remotely owned. A file system is locally owned if the requesting system is also the owner of the file system. It is remotely owned if the owner of the file system is not the requesting system.
XCF Rate	Rate of zFS requests during the report interval requiring data from another system via XCF, both for locally and remotely owned file systems.
Response Time	Average time in milliseconds required for the completion of the zFS requests during the report interval for locally and remotely owned file systems.

Usage & Invocation: RMF DDS Full Report Support

- Alternatively to ISPF, the browser based version of ZFSOVW, ZFSFS and ZFSKN can be requested from the RMF Distributed Data Server (DDS) by using the following URL (example is for ZFSKN):

  http://sysf.boebl.de:8803/gpm/rmfm3.xml?report=ZFSKN&resource=",,SYSPLEX"



RMF Report [,UTCPLXCB,SYSPLEX] : ZFSKN (zFS Kernel)

Time Range: 03/03/2015 08:48:00 - 03/03/2015 08:49:00

System Name	Request Rate Local	Request Rate Remote	XCF Rate Local	XCF Rate Remote	Response Time Local	Response Time Remote
CB8A	113.5	0.000	0.067	0.000	17269	0.000
CB8C	378.4	554.6	0.000	72.53	26.00	10473
CB86	26.40	1569	0.000	119.7	14.00	4302
CB89	21.80	524.0	0.000	72.42	11.00	10198

Usage & Invocation: RMF DDS zFS Metrics

- All performance metrics from the new zFS sysplex reports are added to the ZFS resource in the DDS and are promoted to the SYSPLEX resource as well.

(Example is for AGGREGATE resource, a child of ZFS)

Migration & Coexistence Considerations

- The RMF Monitor III data gatherer option default changed with V2R2 from NOZFS to ZFS.

  If you do not want to gather zFS activity data, you have to switch from ZFS to NOZFS when you use the shipped PARMLIB member ERBRMF04.

- The single system RMF Monitor III zFS reports ZFSSUM and ZFSACT are no longer being maintained. To monitor zFS activity, the new reports ZFSOVW, ZFSFS and ZFSKN have to be used.

Presentation Summary

- The new Monitor III zFS Reports ZFSOVW, ZFSFS and ZFSKN present detailed sysplex-wide zFS file system usage statistics.
- The reports are available as new standard ISPF reports in a Monitor III Reporter session.
- Alternatively, the browser based version of the reports can be requested from the RMF Distributed Data Server (DDS).
- All metrics contained in the reports can be selected as individual metrics for continuous monitoring from the following applications:
  - RMF Data Portal for z/OS
  - z/OSMF Resource Monitoring

Appendix

- RMF website: www.ibm.com/systems/z/os/zos/features/rmf
  - Product information, newsletters, presentations, etc.
  - Downloads
    - RMF Spreadsheet Reporter
    - RMF Postprocessor XML Toolkit
    - RMF PM Java Edition
- 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