IBM System Z Storage Seminar

Tivoli software

Storage Management Landscape

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Agenda

- Roadmap
- Understanding the Foundation – DFSMS
- Extending the Foundation
- A New look for zSeries Tools
- Questions ?

The Roadmap

Comprehensive IBM System z Storage Management Architecture Components

Infrastructure Management

IBM Data Facility Product (DFSMSdfp)

IBM Removable Media Manager (DFSMSrmm)

IBM Tivoli OMEGAMON XE for Storage v4.1

IBM Tivoli Advanced Catalog Managment for z/OS v1.1

IBM Tivoli Allocation Optimizer v1.2

IBM Tivoli Tape Optimizer v1.2

IBM TPC for Disk

Allows administrators to manage data and a broad range of devices such as switches, tape, removable media and storage servers

Business Continuity

IBM Data Set Services (DFSMSdss)

IBM z/OS Global Mirror v1.1

IBM Backup and Restore Manager for z/VM v1.2

IBM Tivoli Advanced Backup & Recovery for z/OS v1.1

NEW

IBM TPC for Replication

Minimizes operational risk by ensuring business data meets backup and recovery objectives

Lifecycle and Retention

IBM Hierarchical Storage Manager (DFSMShsm)

IBM Tivoli Advanced Reporting for DFSMShsm

NEW

IBM Tape Manager for z/VM v1.2

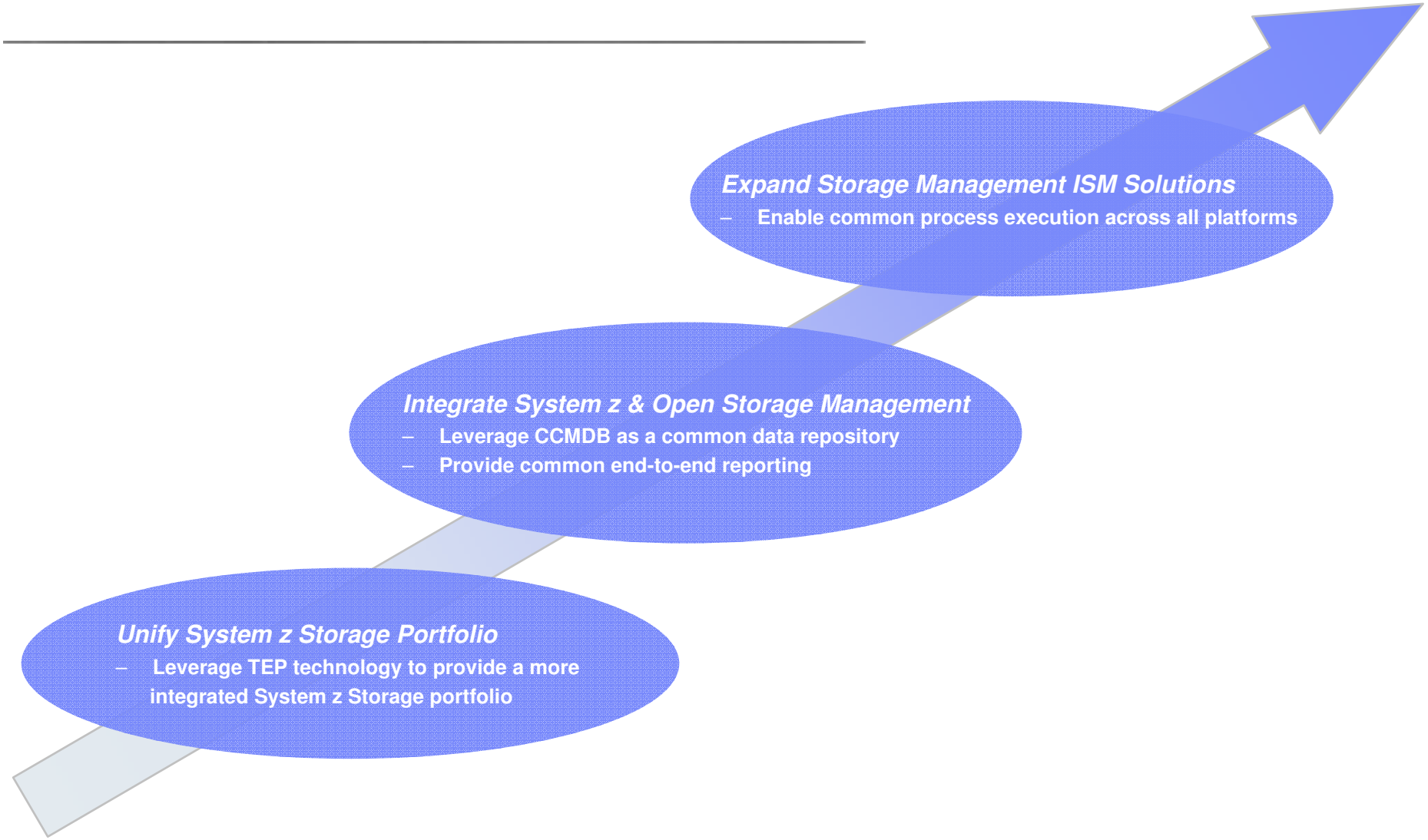
IBM Tivoli Advanced Audit for DFSMShsm v1.1

IBM Tivoli Automated Tape Allocation Manager v2.2

IBM Archive Manager for z/VM v1.1

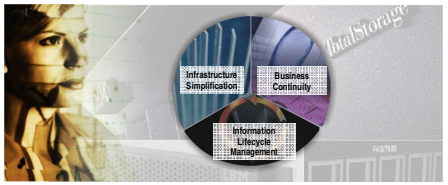
Helps control storage growth and control costs for data requiring long retention periods.

IBM End-to-End IBM Storage Management Direction

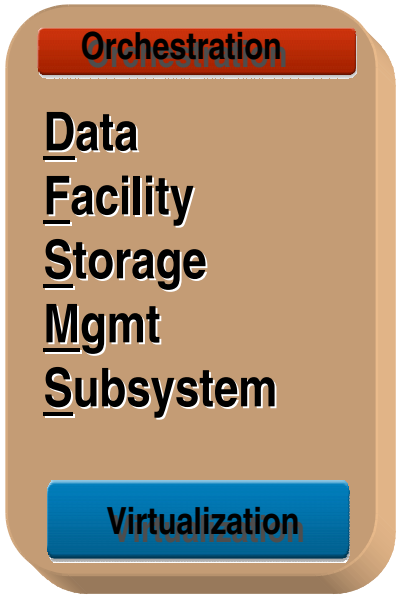


Understanding the Foundation - DFSMS

Systems Managed Storage on z/OS®



Today DFSMS is the standard methodology worldwide for managing data and storage on the z/OS platform



- **Business Continuity**
  - Nondisruptive Backup and Quick Recovery
  - Higher Availability
  - Improved Security
- **Infrastructure Simplification**
  - Scaling up with DFSMS
  - Support Customer Growth
  - Ease of Use (z/OS skilled resources are nearing retirement)
- **Information Life Cycle Management (ILM)**
  - DFSMS has provided life cycle management for OS/390® and z/OS data for over 17 years

DFSMS Components of z/OS

Automated and centralized storage management in the zOS environment

Function	Component
The capability to effectively access and manage data, programs, and devices. A policy based solution to automatically manage data	DFSMSdfp™ (part of base z/OS)
A reliable utility to move, copy, and backup data.	DFSMSdss™
Automatically backup, recover, and migrate all types of data. A disaster recovery solution that is automatic and policy based.	DFSMShsm™
A policy-driven solution for the management of removable media such as tape cartridges and reels	DFSMSrmm™
A utility for exchanging date between z/OS and Windows® and UNIX® platforms	z/OS NFS (part of base z/OS)

Extending the Foundation

- Allocation Optimizer
- Automated Tape Allocation Manager
- Tape Optimizer
- iRMM
- zVM Tools
- zTSM

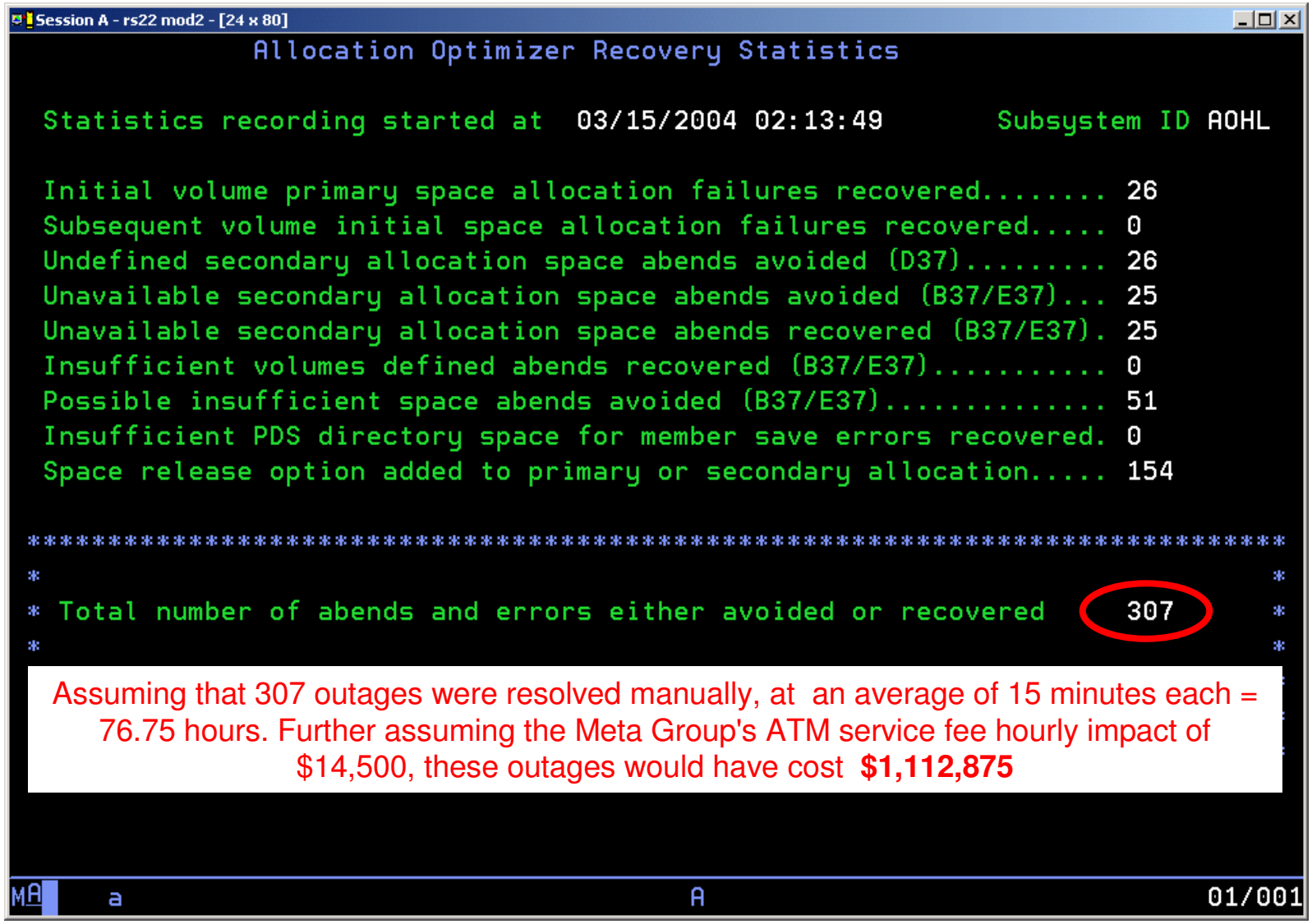
Tivoli Allocation Optimizer - Overview

(ICING)

- Intercepts space related job failures and corrects the problem in real time.
- Helps improve storage efficiency by releasing unused space and filling volumes intelligently
- Provides reporting to analyze prevented job failures in order to help establish best practices
- Competes against BMC's Stop-X37 and CA-Allocate

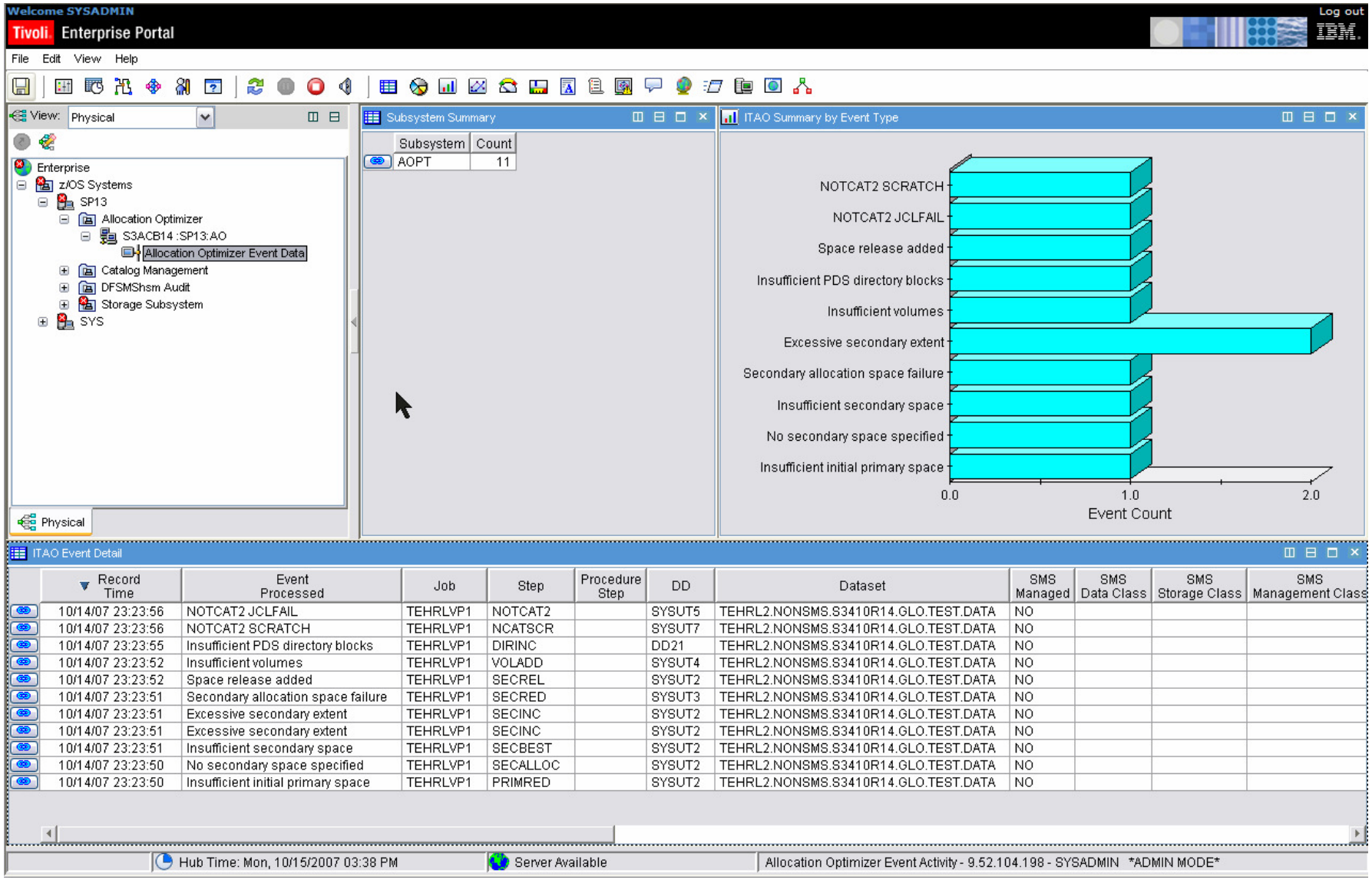
Tivoli Allocation Optimizer can save customers money by eliminating abends which can significantly increase batch windows and raise the cost of processing

Tivoli Allocation Optimizer – Quick Peek



Assuming that 307 outages were resolved manually, at an average of 15 minutes each = 76.75 hours. Further assuming the Meta Group's ATM service fee hourly impact of $14,500, these outages would have cost **$1,112,875**

AO – Summary Screen



Tivoli Allocation Optimizer - Strengths

(ICING)

- Simplified Parameter Syntax
- Standard Batch and Online Reporting
- PDS Support
- SMS and non-SMS Support
  - **Support for Extended Format Datasets**
- VSAM and non-VSAM Support
- Rapidly Growing Syntax Tree
- TEP Enablement

Complementary Products

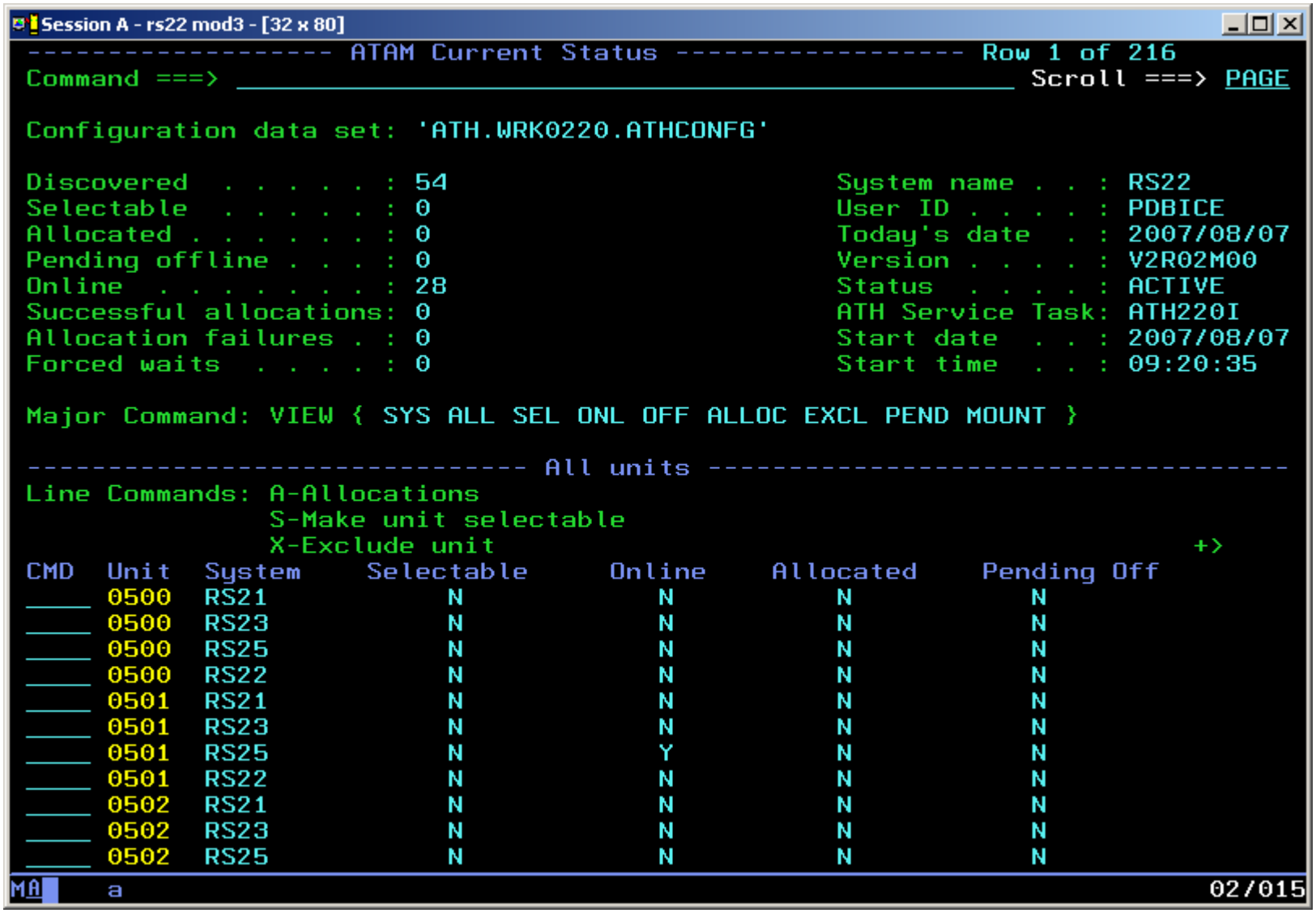
(ICING)

Tivoli Automated Tape Allocation Manager

- Allows multiple systems to share a common tape pool
- No dependency on sysplex or shared DASD
- Global command capability improves usability
- Competes directly against CA's MIM-MIA and BMC's TapeSHARE

ATAM can help customers reduce the cost of their tape environment by allowing them to share a common pool of tape devices across all of the zSeries systems in their environment

Current Status



Line commands can be entered to mark devices selectable or excluded

Tivoli Automated Tape Allocation Manager - Strengths

(ICING)

- Easy Installation
  - **Single exit point**
- Extremely Small Software Footprint
  - **Entire software package less than 3MB**
- Easy to Deploy
  - **No device ownership, ATAM uses what's there**
- No Single Point of Failure
- Flexible Configuration Options

Tivoli Tape Optimizer - Overview

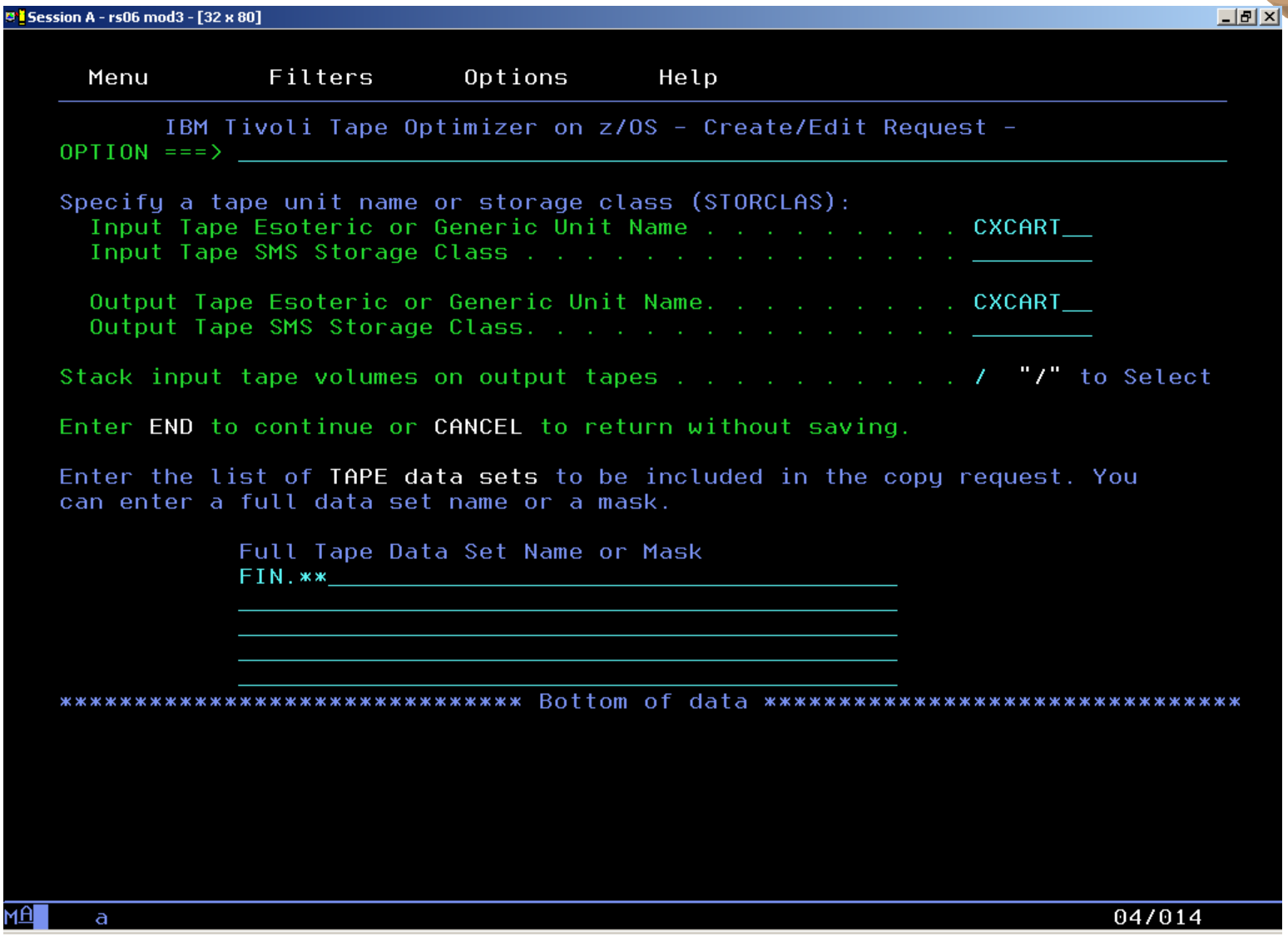
(ICING)

- DFSMSrmm Specific Tape Stacking and Media Migration Tool
  - **Our ISVs support DFSMSrmm, this is new for IBM**
- Common Requirement When Replacing CA's Tape Managers
- Helps Manage Implementation of New Tape Libraries
- Manage Migration Away From Older Media
- Improve Tape Utilization/ROI

Tivoli Tape Optimizer – Quick Peek

Complementary Products

(ICING)



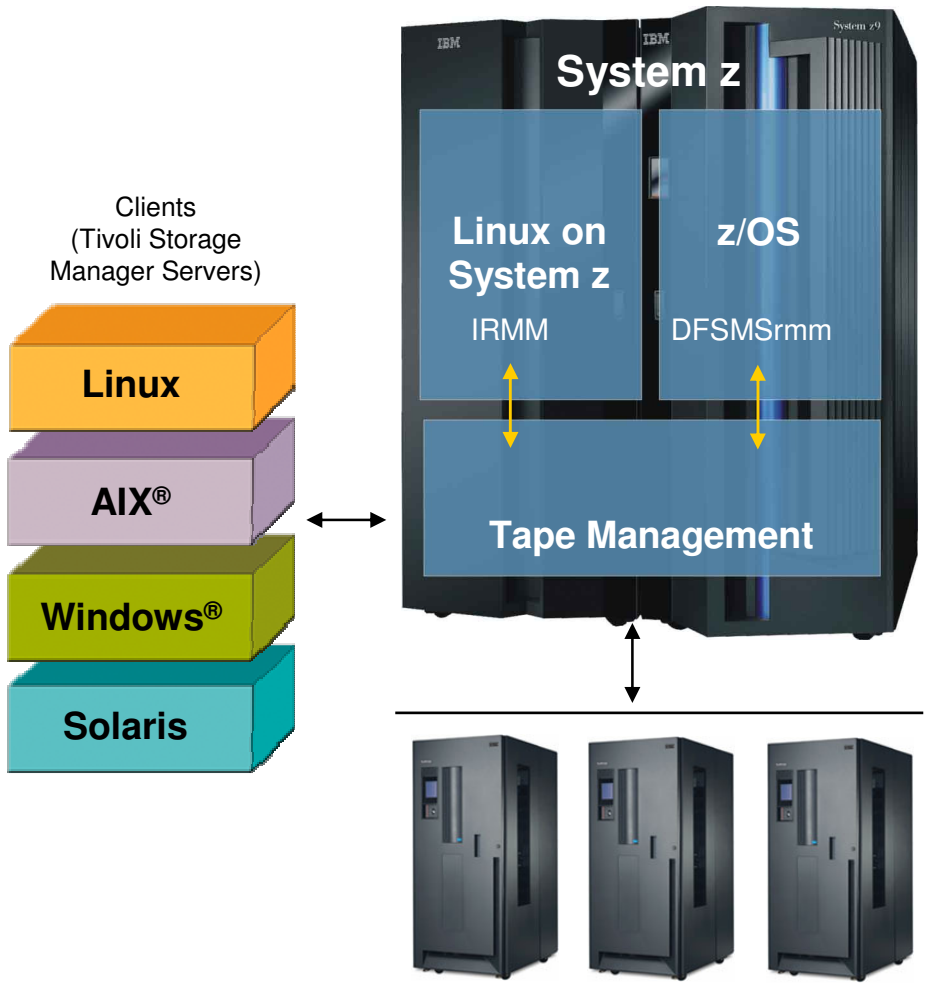
Tivoli Tape Optimizer - Strengths

(ICING)

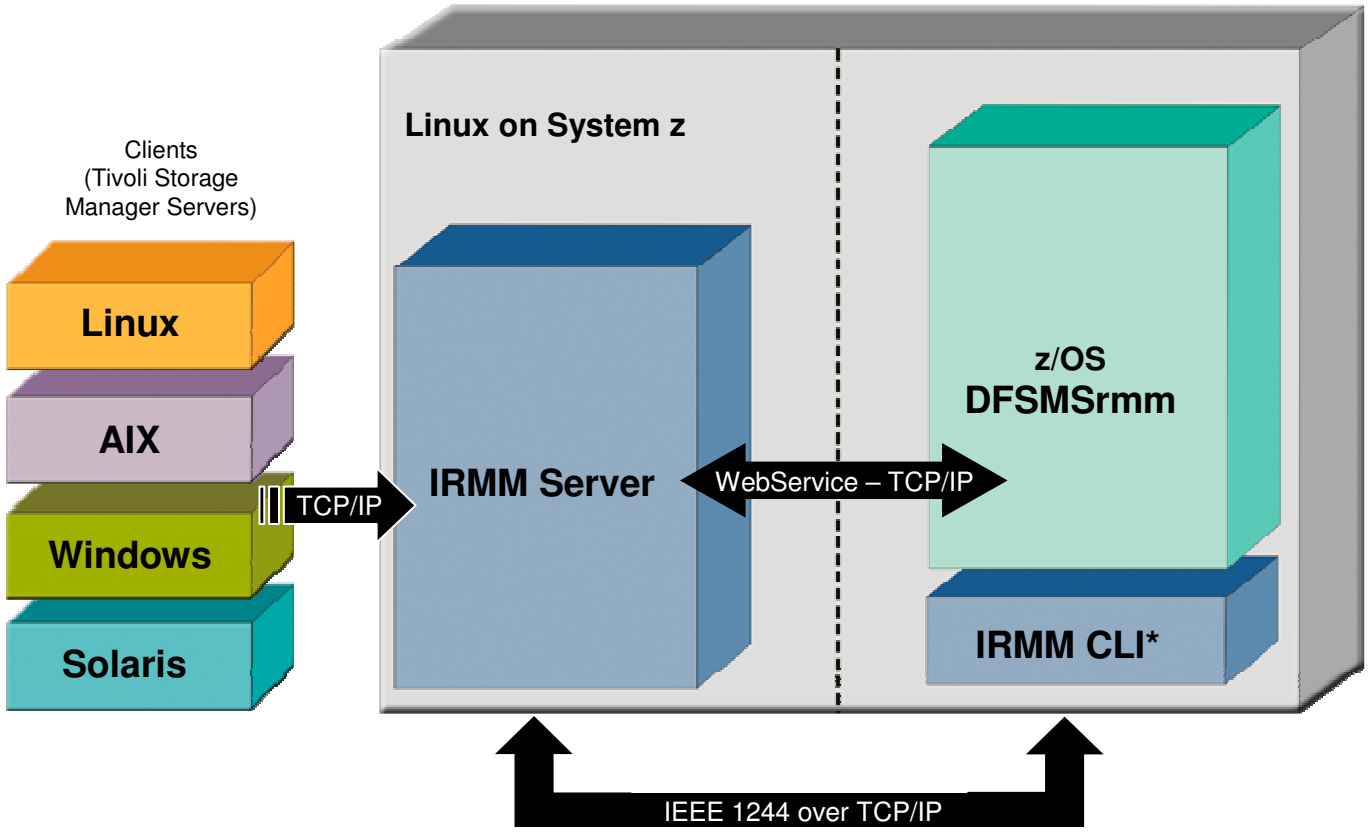
- Easy to Use ISPF Interface
- Ability to Build Control Cards Allows For Easy Task Definition Outside of ISPF
- Flexible Selection Criteria
- Ability to Consolidate Active Data To Improve Tape Utilization

Enterprise Tape Management - iRMM

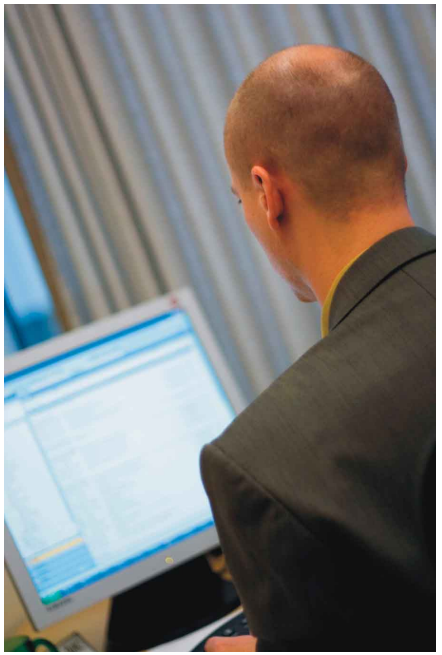
- **Reduction of TCO for Removable Media Infrastructure by:**
  - **Centralizing management, administration and reporting services**
  - **Enhancing resource utilization through intelligent, dynamic sharing of libraries, drives and cartridge pools**
  - **Virtualizing libraries, drive pools and cartridge pools**
  - **Helps to eliminate changes or downtime for upgrading storage technology**
- **Enabling enhanced Media Protection and Security by:**
  - **Tracking of access throughout the whole media lifecycle enables audit trails**
  - **Security model including access control supports regulation compliance**
- **ILM Integration of Removable Media by:**
  - **Seamlessly integrating Removable Media in the On Demand storage environment**
  - **Movement of data according to management policies**



Integrating IRMM and DFSMSrmm

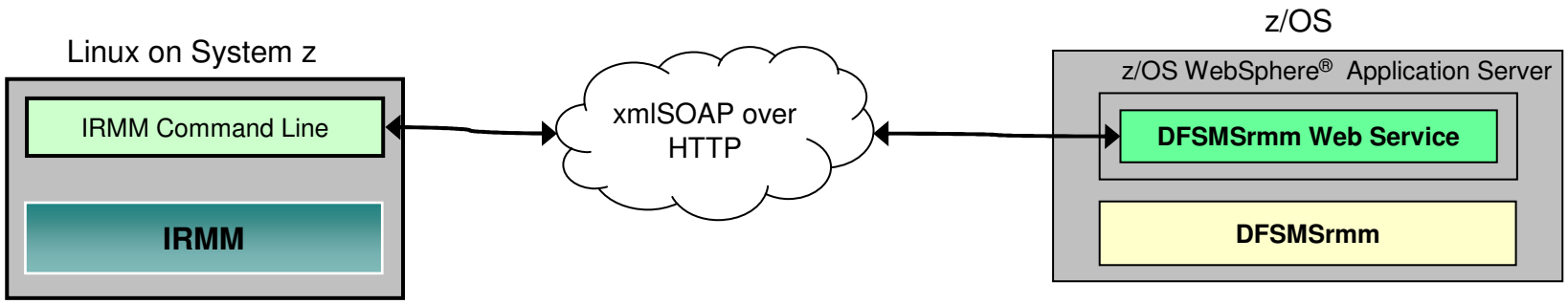


* Can run on Linux on System z as well



Operator can use z/OS to manage both z/OS and distributed environment!

Integrating IRMM and DFSMSrmm (continued)




```
ermmtool> lsrmmvol -s 9.11.214.154
Volume  Type    Owner   State   HLOC    Voltype
=================================================
A00001  ETC     CHKEIL  MASTER  SHELF   PHYSICAL
A00003  ETC     ERMM    USER    SHELF   PHYSICAL
483AFQ  ETC     ERMM    USER    SHELF   PHYSICAL
485AFQ  ETC     ERMM    USER    SHELF   PHYSICAL
486AFQ  ETC     ERMM    USER    SHELF   PHYSICAL
488AFQ  ETC     ERMM    USER    SHELF   PHYSICAL
490AFQ  ETC     ERMM    USER    SHELF   PHYSICAL
491AFQ  ETC     ERMM    USER    SHELF   PHYSICAL
495AFQ  ETC     ERMM    USER    SHELF   PHYSICAL
```

```
                DFSMSrmm Volumes (Page 1 of 2)              Row 1 to 9 of 9
Command ===> _                                              Scroll ===> PAGE

Enter HELP or PF1 for the list of available line commands
Use the RIGHT command to view other data columns
   Volume          Assigned   Expiration S                 Dest-    Tr- Data
S  serial Owner    date       date       R Status  Location ination  ans sets
-- ------ -------- ---------- ---------- - ------- -------- -------- --- -----
__ A00001 CHKEIL   2006/116   2006/121     MASTER  SHELF              N   0
__ A00003 ERMM     2006/116   2006/121     USER    SHELF              N   0
__ 483AFQ ERMM     2006/116   2006/121     USER    SHELF              N   0
__ 485AFQ ERMM     2006/116   2006/121     USER    SHELF              N   0
__ 486AFQ ERMM     2006/116   2006/121     USER    SHELF              N   0
__ 488AFQ ERMM     2006/116   2006/121     USER    SHELF              N   0
__ 490AFQ ERMM     2006/116   2006/121     USER    SHELF              N   0
__ 491AFQ ERMM     2006/116   2006/121     USER    SHELF              N   0
__ 495AFQ ERMM     2006/116   2006/121     USER    SHELF              N   0
******************************* Bottom of data ********************************
```

- **Consolidated view on tape resources**
- **Open systems interface to DFSMSrmm**

- **Consolidated view on tape resources**
- **Centralized retention, movement and vaulting capabilities**
- **Policy-based management of all cartridges (z/OS and open)**

IRMM Summary

- **IRMM is a new robust middleware product for Linux on System z that is designed to:**
  - **Help significantly reduce operational costs by centralizing pro-active tape resource management**
  - **Provide new efficiencies through its tape library virtualization technology and through integration with z/OS and DFSMSrmm**
  - **Enables enhanced media protection and security by providing audit trails and access control that support regulation compliance**
- **IRMM is based on technology that already has proven its value in everyday production use in large environments**
  - **IBM Service Offerings have been in use by customers since 3Q2005**
- **For additional information:**
  - **IRMM – www.**ibm.com/**nnn/nnn/**
  - **Linux on System z – www.**ibm.com/**systems/z/os/linux**
  - **z/OS – www.**ibm.com/**servers/eserver/zseries/zos/**
  - **z/VM® – www.**ibm.com/**eserver/zseries/zvm**

z/VM Tools

- Tape Manager for z/VM
- Backup and Restore Manager for z/VM
- Archive Manager for z/VM
- Operations Manager for z/VM*

Tape Manager for z/VM - Overview

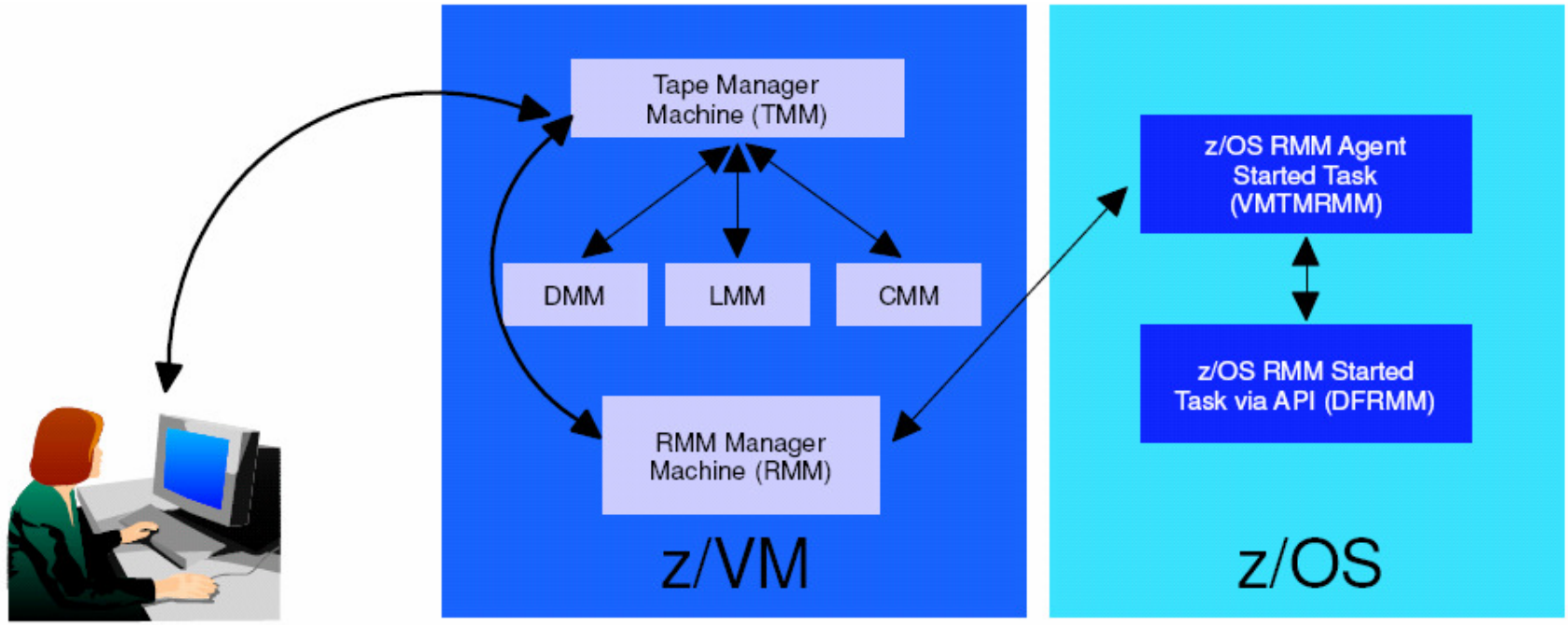
Complementary Products

(ICING)

- Dynamic sharing of existing tape devices between multiple images
  - Devices must be assignable and not using multiuser attach feature of z/VM
- Effective management of tapes in ATLs
  - Granular access control
  - Expiration processing
  - Notification of low threshold for tape resource
    - Utilization information provided per pool
    - Report created and sent to administrator after expiration processing
- Improved accuracy of manual tape processing
  - Automatic request and notification of manual mounts
  - Internal label verification at attach/give and detach
  - Read/Write verification
- Optional use of RMM as the tape catalog
  - Tapes, access control, and retention managed by existing RMM catalog
  - Accessible via commands on z/VM

Tape Manager for z/VM enables system controlled tape sharing in a z/VM environment

Tape Manager with DFSMSrmm – Quick Peek



- Communication within z/VM is via SMSG/IUCV
- Communication between z/VM and z/OS is via TCP/IP

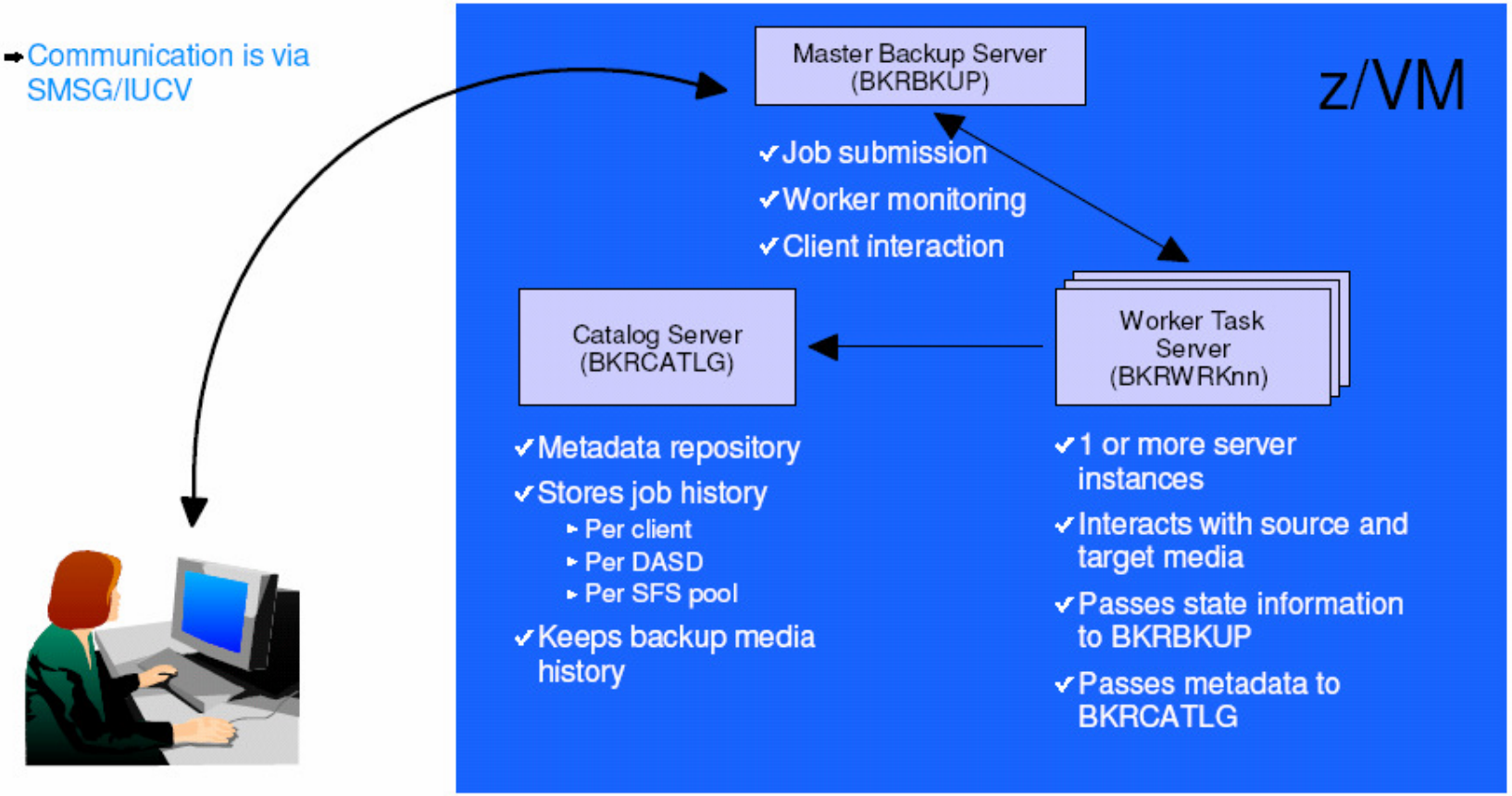
Backup and Restore Manager for z/VM - Overview

(ICING)

- Modular design with an eye to the future
  - Data handlers for each data type (minidisk, SFS, ECKD, reader)
  - Media drivers for each media type (tape, twin tapes, CMS file)
- Standard CMS interfaces
  - Support for new hardware when CMS supports it
  - Backup/restore catalog housed as a hierarchical structure in SFS
- Documented interfaces to data packaging tools
- Review of a defined backup job before submission
- Reduced backup window with concurrent processing
  - Multiple service machines sharing the job
  - Assigned by master server
  - Backups to tape mean 1 server for each tape drive available
- Automatic aging and pruning of the backup catalog

Backup and Recovery Manager for z/VM enables centralized backup management on z/VM

Backup and Restore Manager – Quick Peek



Archive Manager for z/VM - Overview

(ICING)

- Based on design of Backup and Restore Manager
  - Modular data handlers and media drivers
  - Catalog housed as a hierarchical structure in SFS
  - Standard CMS interfaces
  - Recalls with original date
  - Expiration processing
- Asynchronous user interface
  - Immediate (synchronous) notification if no files found to archive
  - User warned not to modify files until archive complete
  - User notified when archive or recall is complete
- Concurrent processing available when tapes are involved
  - Multiple service machines available
  - 1 job assigned to 1 service machine
  - Assigned by master server
- Automatic aging and pruning of the archive catalog and data
  - Tape consolidation available to remove gaps created by expired archives

Archive Manager for z/VM enables Advanced Storage Management on z/VM

Archive Manager – Quick Peek

➡Communication is via SMSG/IUCV

z/VM

Master Archive Server (AMVARKIV)

- ✔Initial job processing
- ✔Archive staging
- ✔Worker monitoring
- ✔Client interaction
- ✔Owns DASD and SFS repository media for archive content

Worker Task Server (AMVWRKnn)

- ✔1 or more server instances
- ✔Interacts with tape media
- ✔Passes state information to AMVARKIV
- ✔Passes metadata to AMVCATLG

Catalog Server (AMVCATLG)

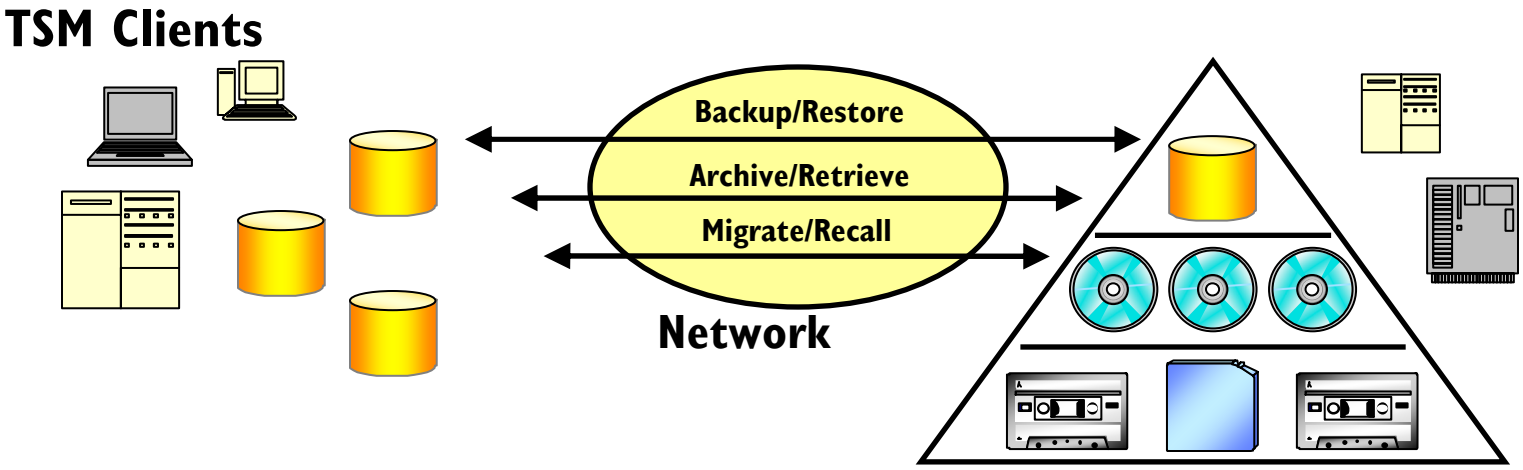
- ✔Metadata repository
- ✔Stores job history
  - ▸Per client
  - ▸Per storage class
  - ▸Per resource
- ✔Keeps archive to tape media history

z/VM Tools - Strengths

(ICING)

- Demand Increasing for z/VM Solutions due to growth of zLinux Popularity
- Offering IBM Alternatives to ISV offerings
- Extending z/OS Capabilities to z/VM
- Leverage z/OS Tools
  - ATAM
  - DFSMSrmm

zTSM



Data Management Services

- Backup/Recovery
- Archive/Retrieve
- Backup/Archive API
- Hierarchical Storage Management

Storage Management Services

- Hierarchical Storage Management
- Reclamation
- Collocation

zTSM - Overview

- Backup and Recovery Solution for Distributed Data
- Policy Based Controls
- Advanced Application Interfaces
  - **Backup while open**
  - **Enhanced coordination with data owning applications**
- Exploit Hardware Capabilities
  - **Lan Free functionality**

zTSM enables the functionality of TSM, but leverages mainframe resources and practices.

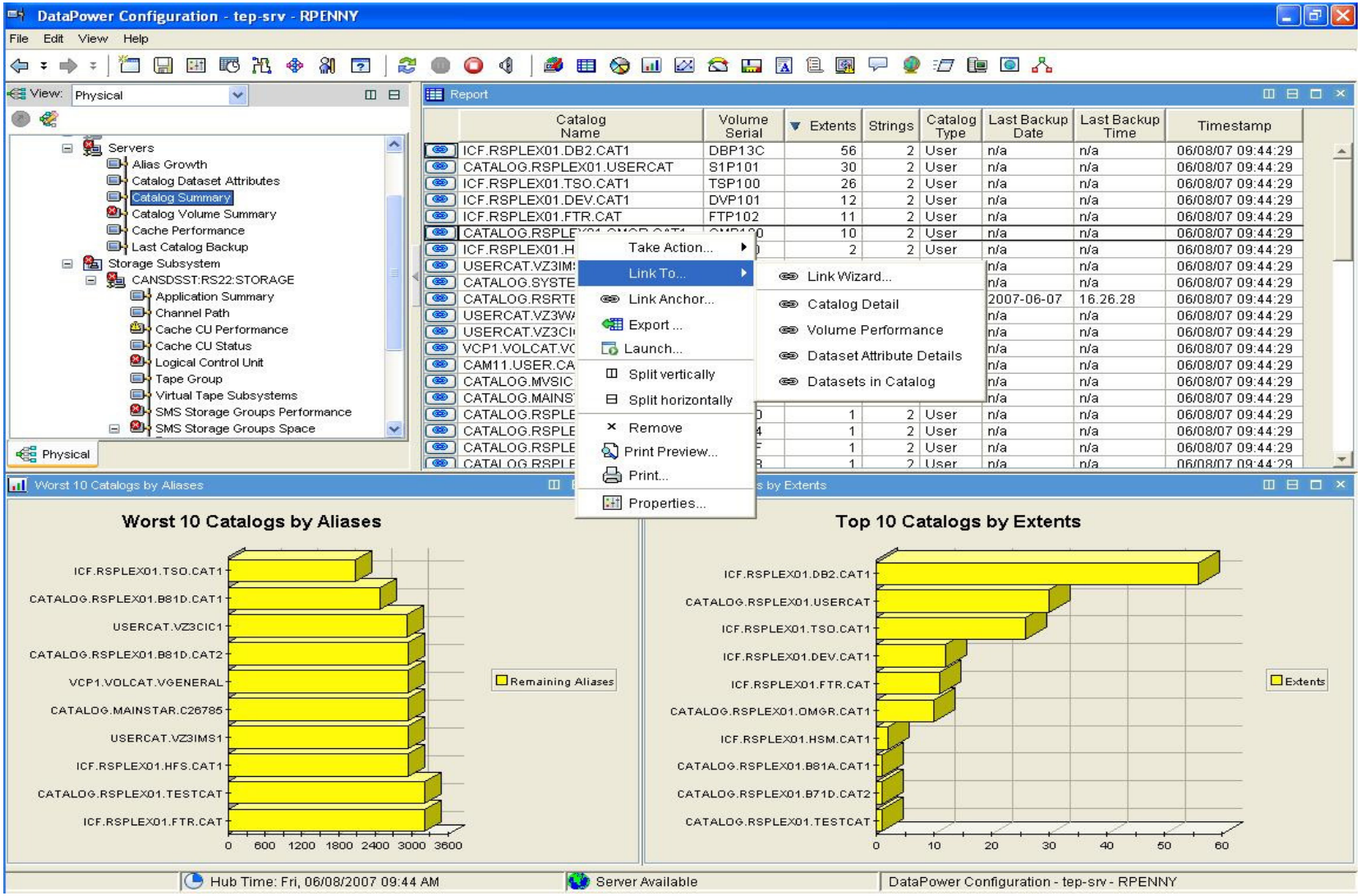
zTSM - Strengths

- Improved Application Availability
  - Speed recovery of files, file systems or bare machines
  - Include file recovery in a comprehensive data disaster recovery plan
- Optimized Storage Resource Utilization
  - Optimize backup granularity
  - Store backup copies in a hierarchy of lower-cost storage – the specific level chosen to optimize cost against recovery time objective
- Enhanced Storage Personnel Productivity
  - Create a single point of control, administration and security for file recovery

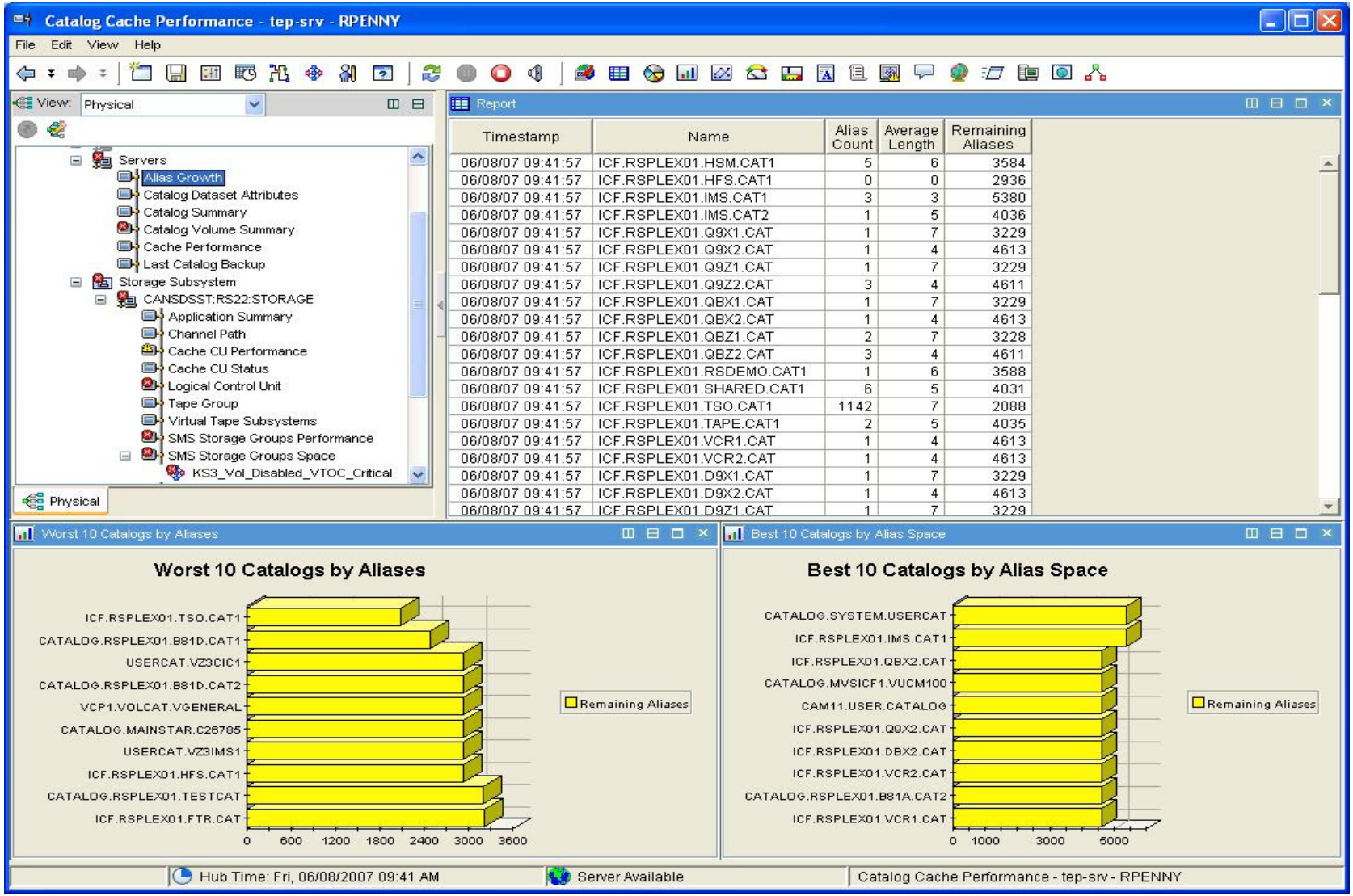
A New Look for zSeries Tools

Tivoli Advanced Catalog Management for z/OS

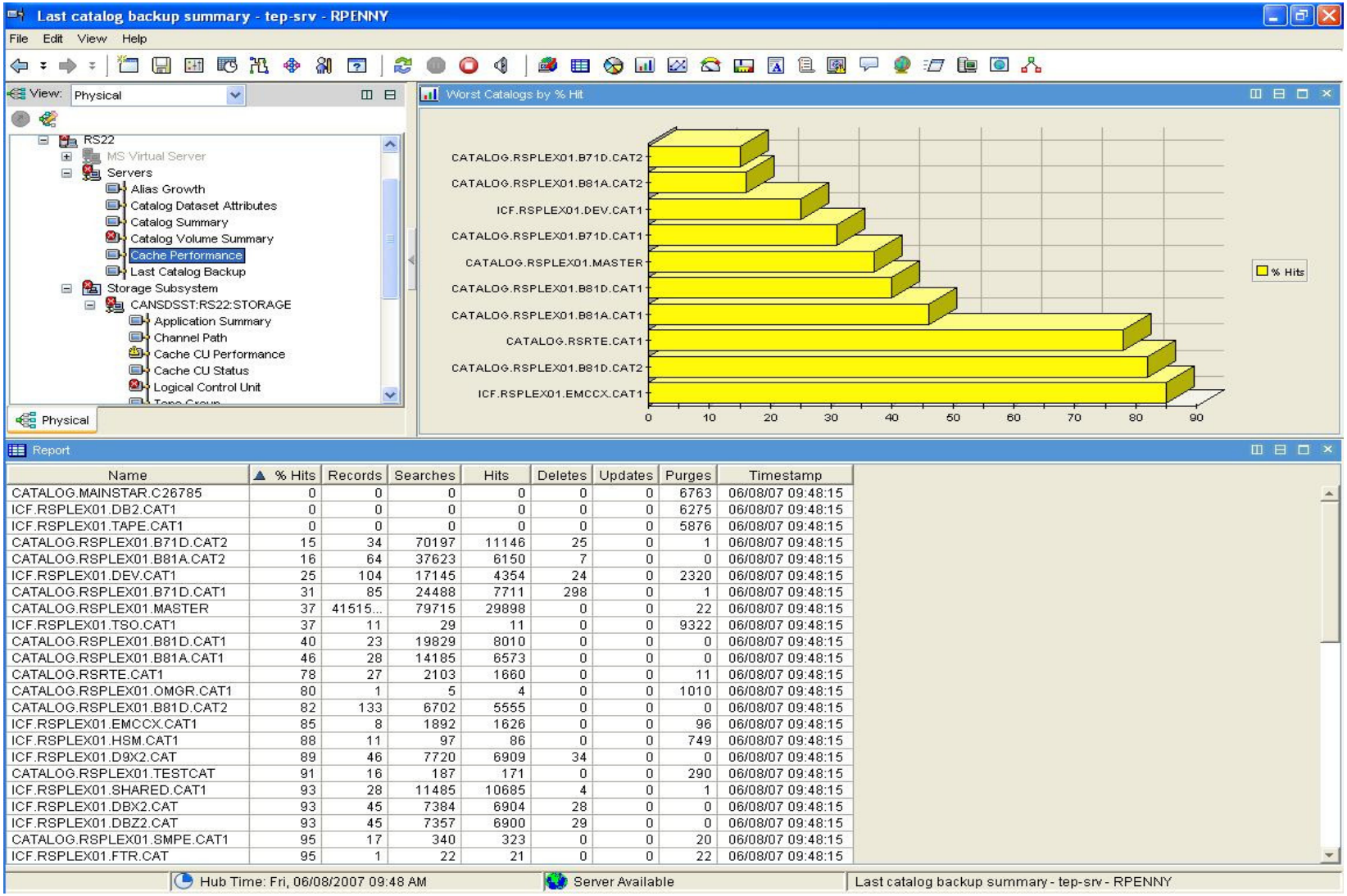
ACM – Catalog Summary



ACM – Catalog Alias Info

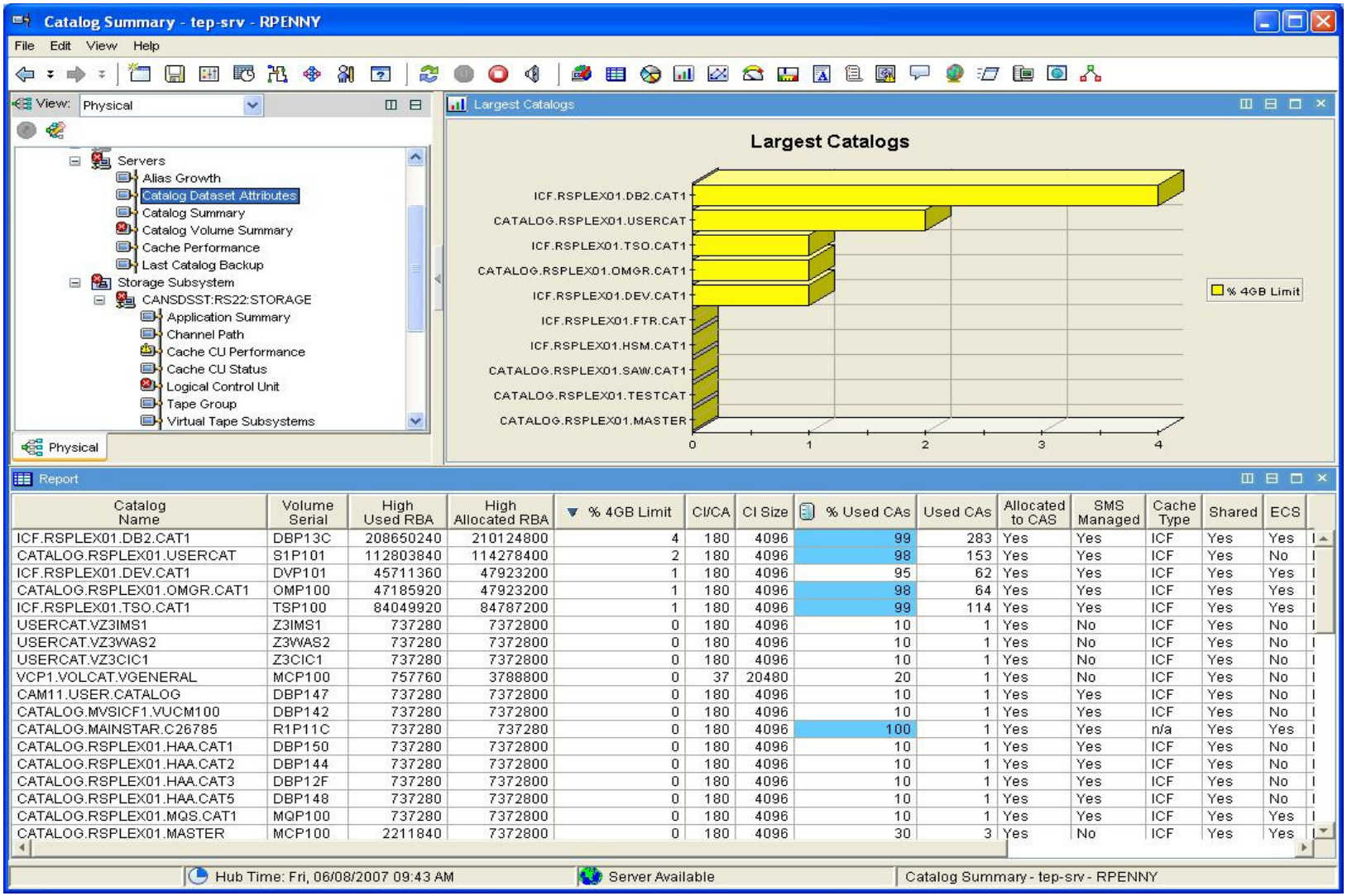


ACM – Catalog Activity

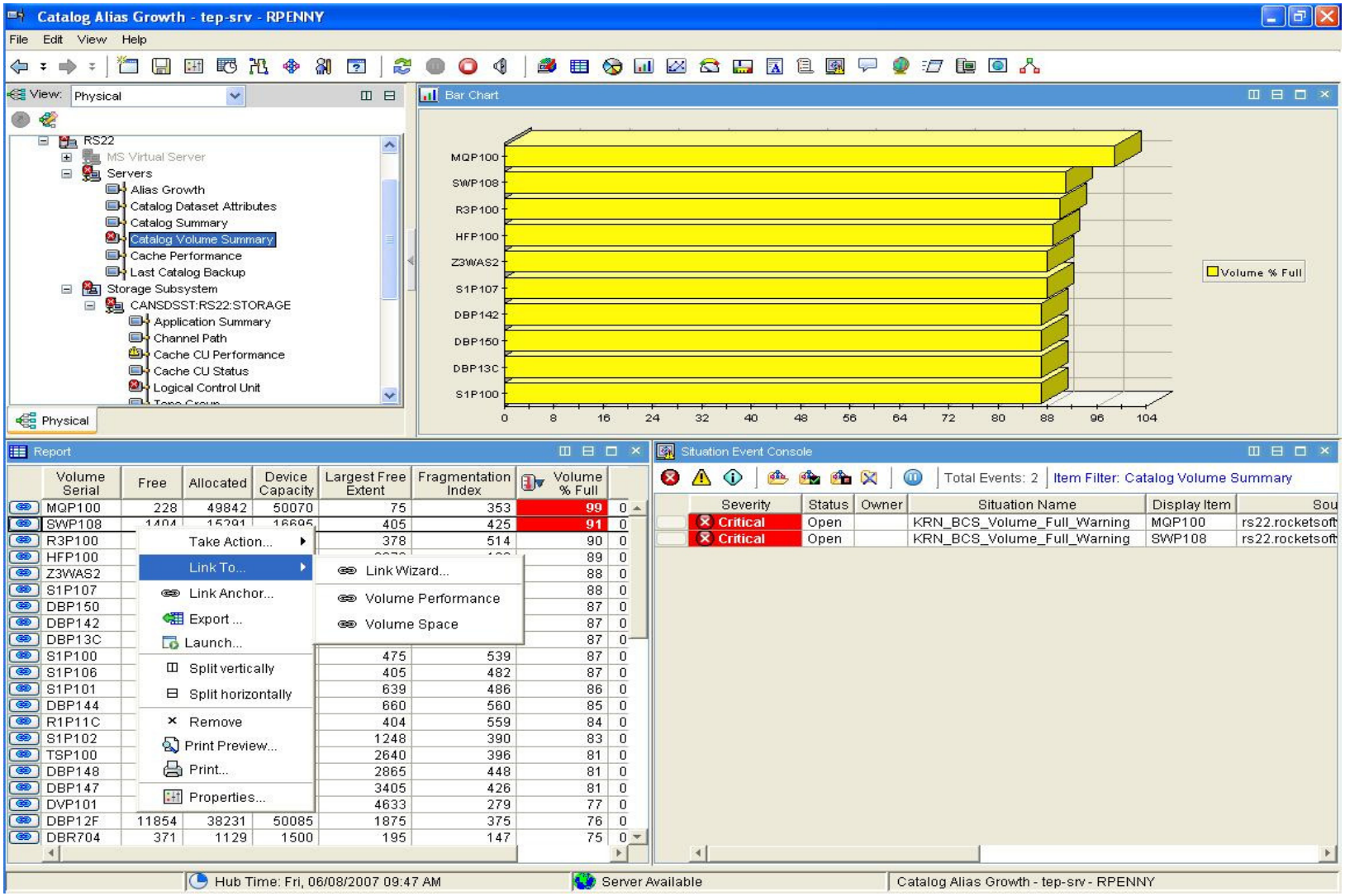


Name	% Hits	Records	Searches	Hits	Deletes	Updates	Purges	Timestamp
CATALOG.MAINSTAR.C26785	0	0	0	0	0	0	6763	06/08/07 09:48:15
ICF.RSPLEX01.DB2.CAT1	0	0	0	0	0	0	6275	06/08/07 09:48:15
ICF.RSPLEX01.TAPE.CAT1	0	0	0	0	0	0	5876	06/08/07 09:48:15
CATALOG.RSPLEX01.B71D.CAT2	15	34	70197	11146	25	0	1	06/08/07 09:48:15
CATALOG.RSPLEX01.B81A.CAT2	16	64	37623	6150	7	0	0	06/08/07 09:48:15
ICF.RSPLEX01.DEV.CAT1	25	104	17145	4354	24	0	2320	06/08/07 09:48:15
CATALOG.RSPLEX01.B71D.CAT1	31	85	24488	7711	298	0	1	06/08/07 09:48:15
CATALOG.RSPLEX01.MASTER	37	41515...	79715	29898	0	0	22	06/08/07 09:48:15
ICF.RSPLEX01.TSO.CAT1	37	11	29	11	0	0	9322	06/08/07 09:48:15
CATALOG.RSPLEX01.B81D.CAT1	40	23	19829	8010	0	0	0	06/08/07 09:48:15
CATALOG.RSPLEX01.B81A.CAT1	46	28	14185	6573	0	0	0	06/08/07 09:48:15
CATALOG.RSRTE.CAT1	78	27	2103	1660	0	0	11	06/08/07 09:48:15
CATALOG.RSPLEX01.OMGR.CAT1	80	1	5	4	0	0	1010	06/08/07 09:48:15
CATALOG.RSPLEX01.B81D.CAT2	82	133	6702	5555	0	0	0	06/08/07 09:48:15
ICF.RSPLEX01.EMCCX.CAT1	85	8	1892	1626	0	0	96	06/08/07 09:48:15
ICF.RSPLEX01.HSM.CAT1	88	11	97	86	0	0	749	06/08/07 09:48:15
ICF.RSPLEX01.D9X2.CAT	89	46	7720	6909	34	0	0	06/08/07 09:48:15
CATALOG.RSPLEX01.TESTCAT	91	16	187	171	0	0	290	06/08/07 09:48:15
ICF.RSPLEX01.SHARED.CAT1	93	28	11485	10685	4	0	1	06/08/07 09:48:15
ICF.RSPLEX01.DBX2.CAT	93	45	7384	6904	28	0	0	06/08/07 09:48:15
ICF.RSPLEX01.DBZ2.CAT	93	45	7357	6900	29	0	0	06/08/07 09:48:15
CATALOG.RSPLEX01.SMPE.CAT1	95	17	340	323	0	0	20	06/08/07 09:48:15
ICF.RSPLEX01.FTR.CAT	95	1	22	21	0	0	22	06/08/07 09:48:15

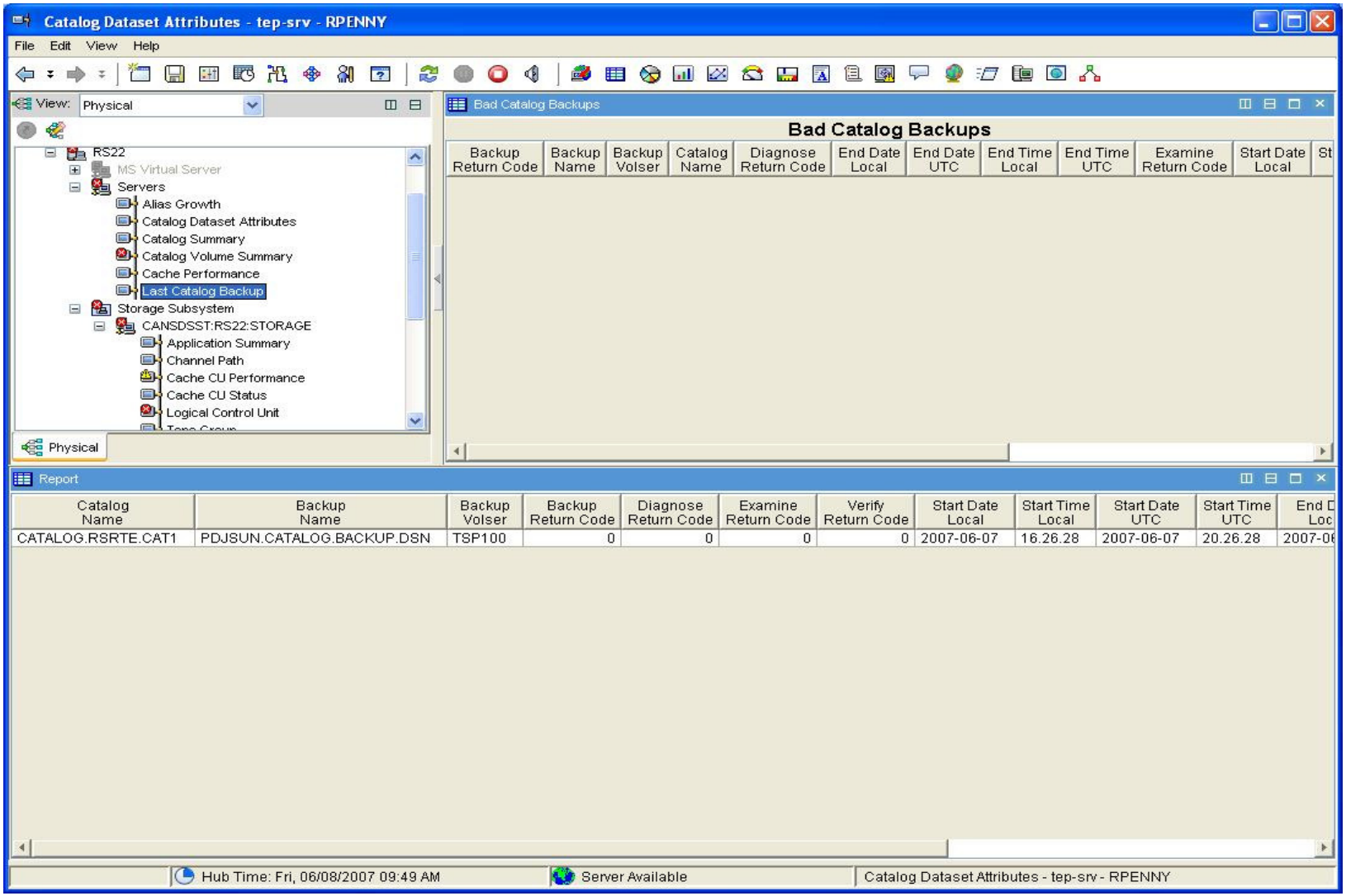
ACM – Catalog Size



ACM – Catalog Volume FreeSpace



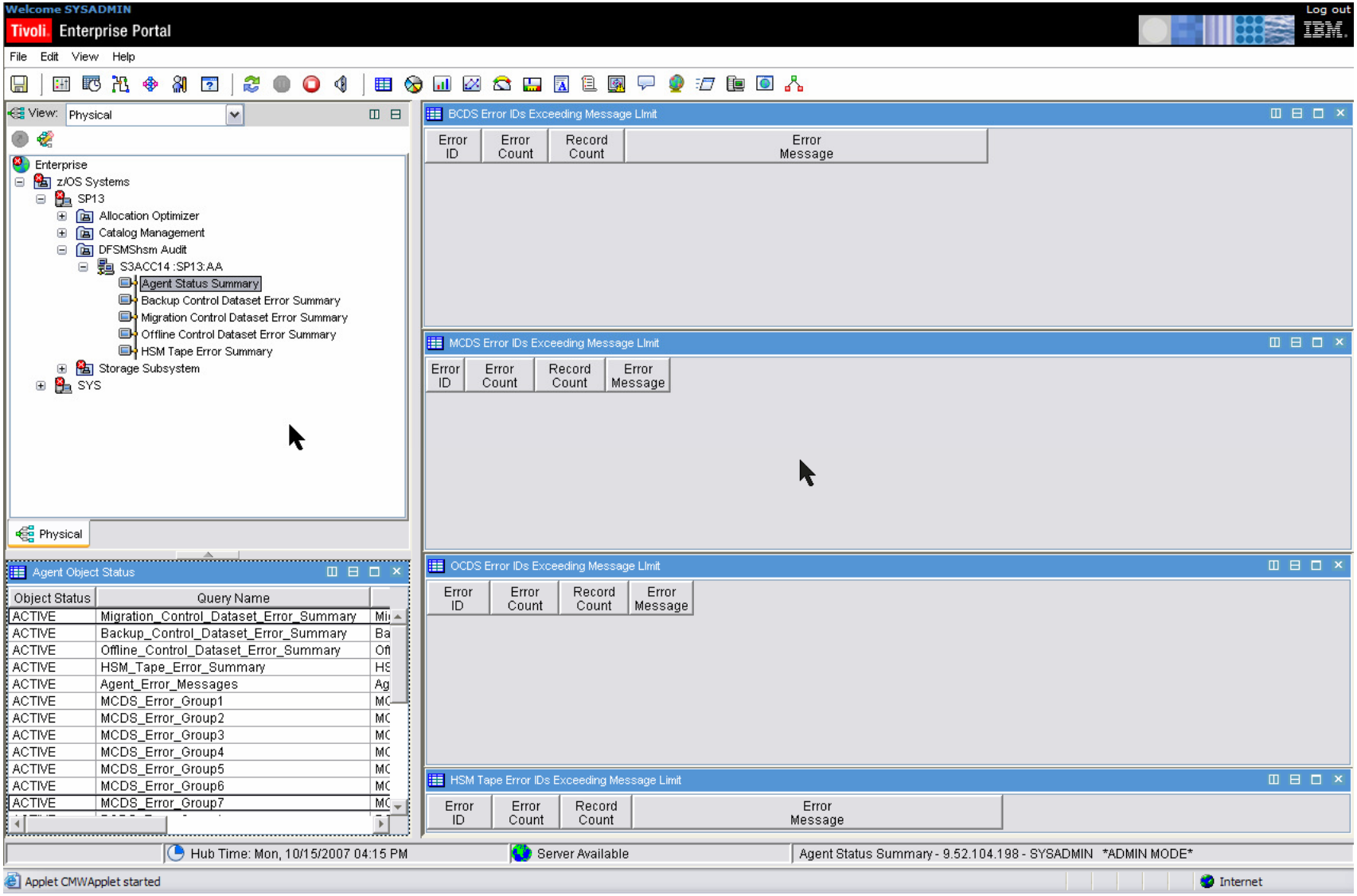
ACM – Catalog Backups



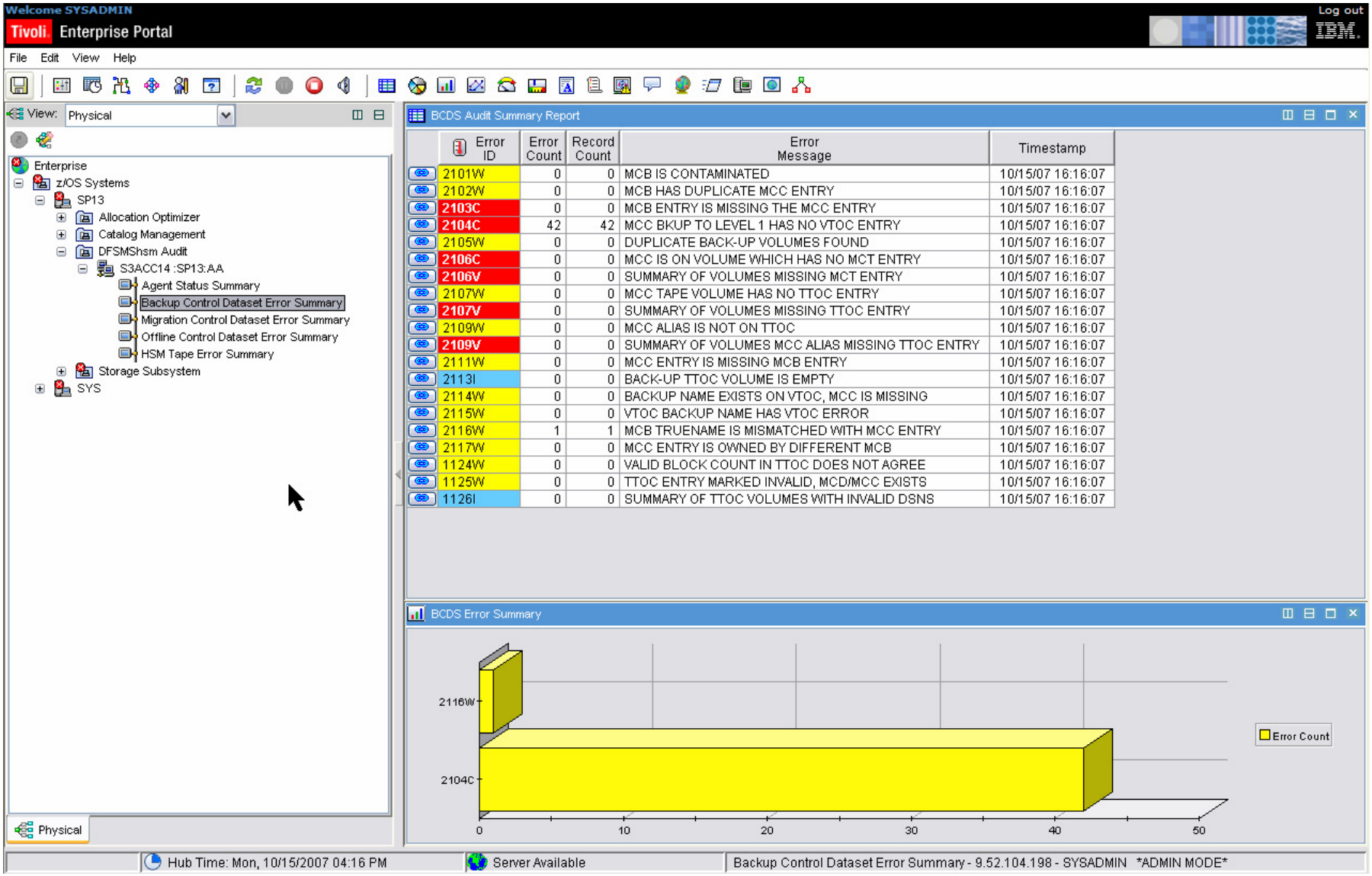
A New Look for zSeries Tools

Tivoli Advanced Audit for DFSMShsm

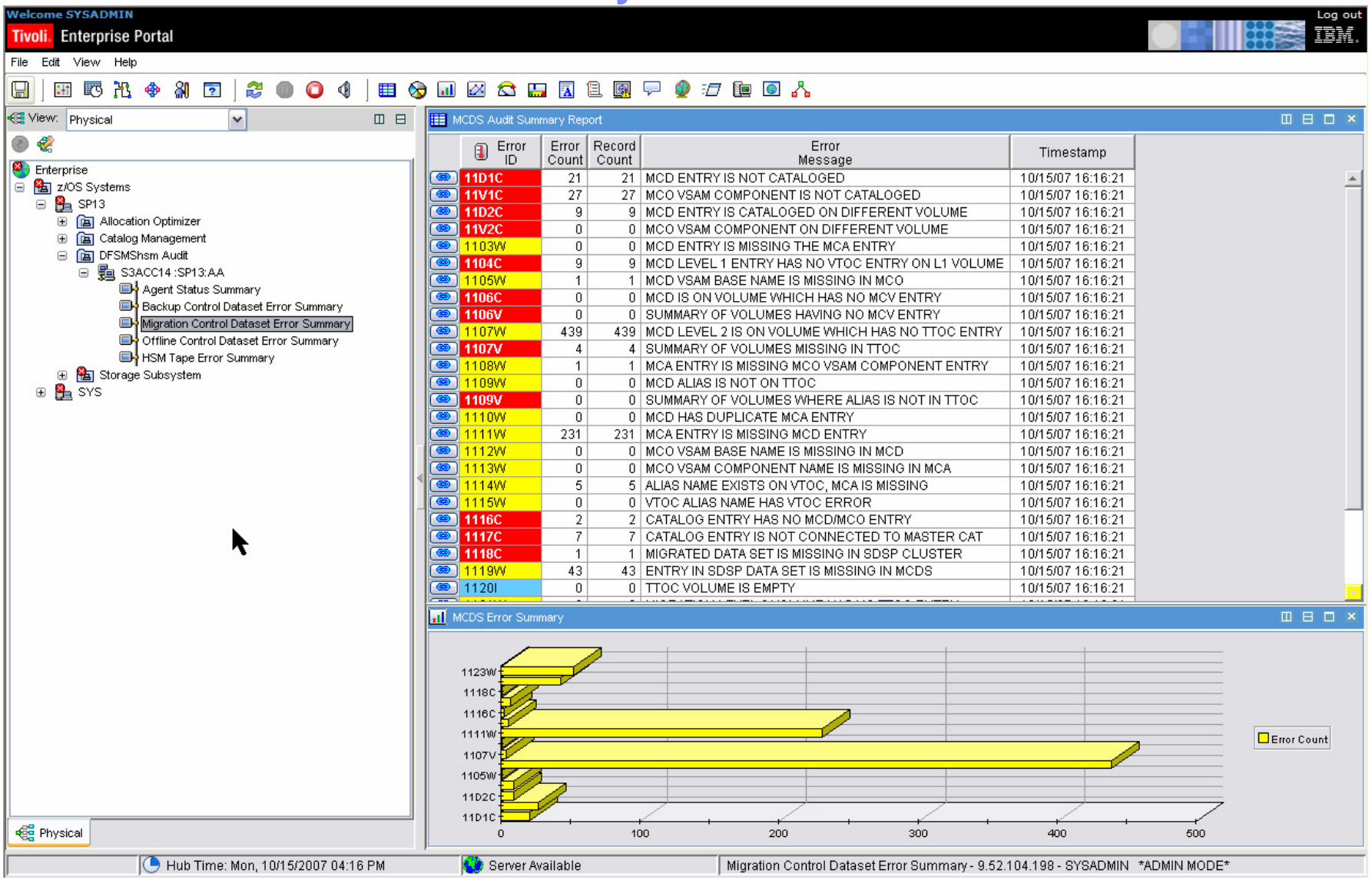
AAH – Agent Status Summary



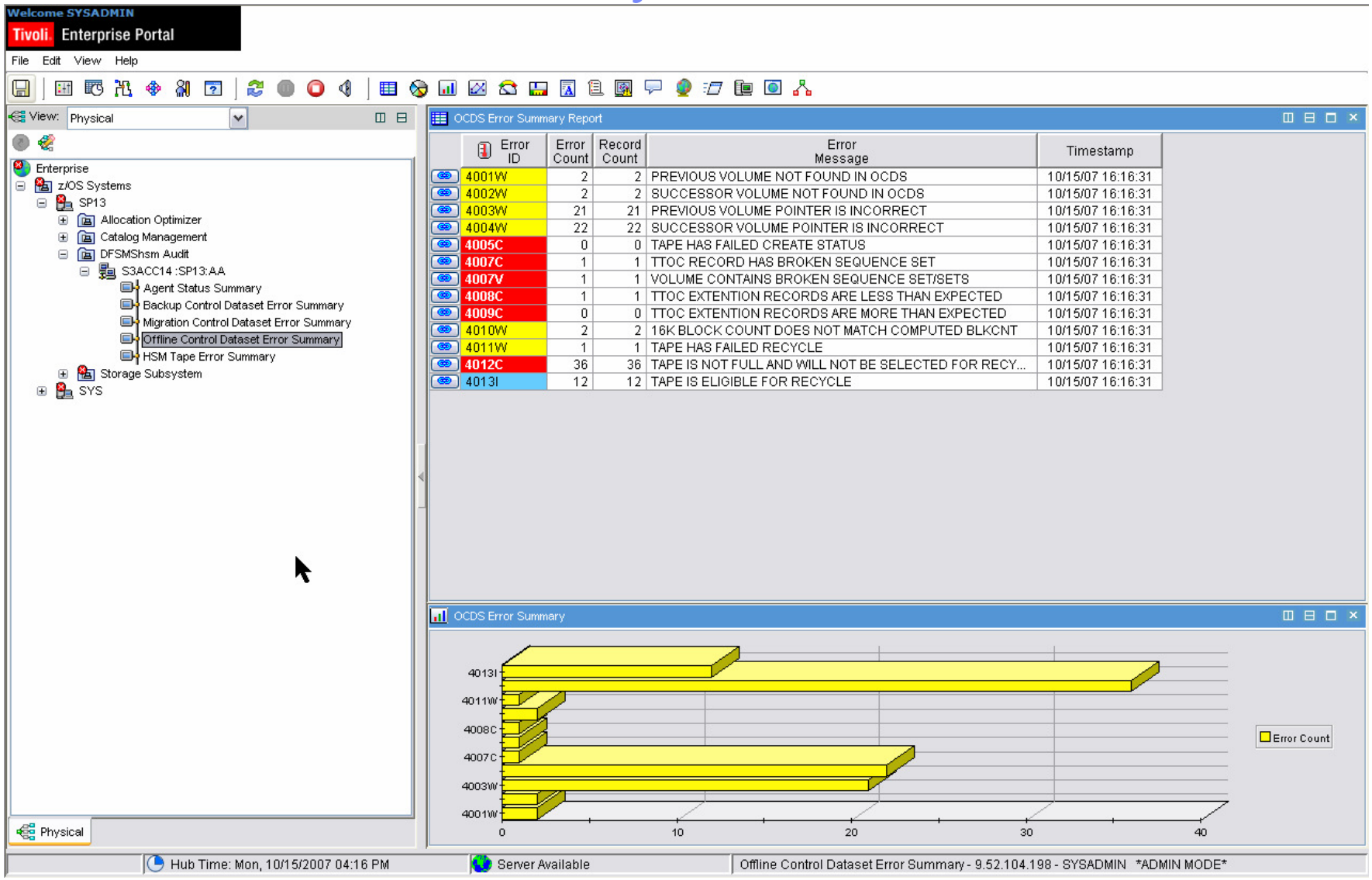
AAH – BCDS Summary



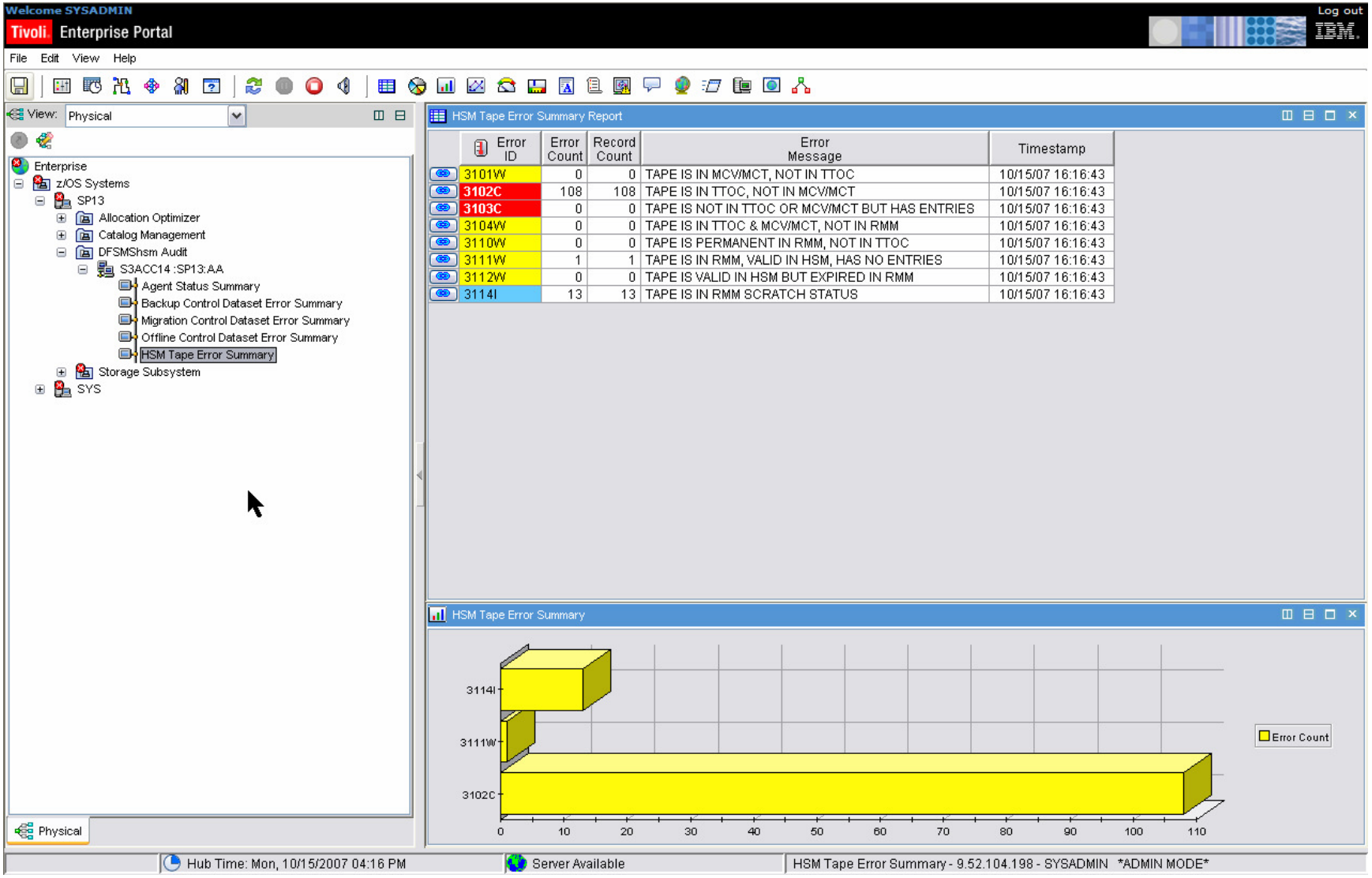
AAH – MCDS Summary



AAH – OCDS Summary



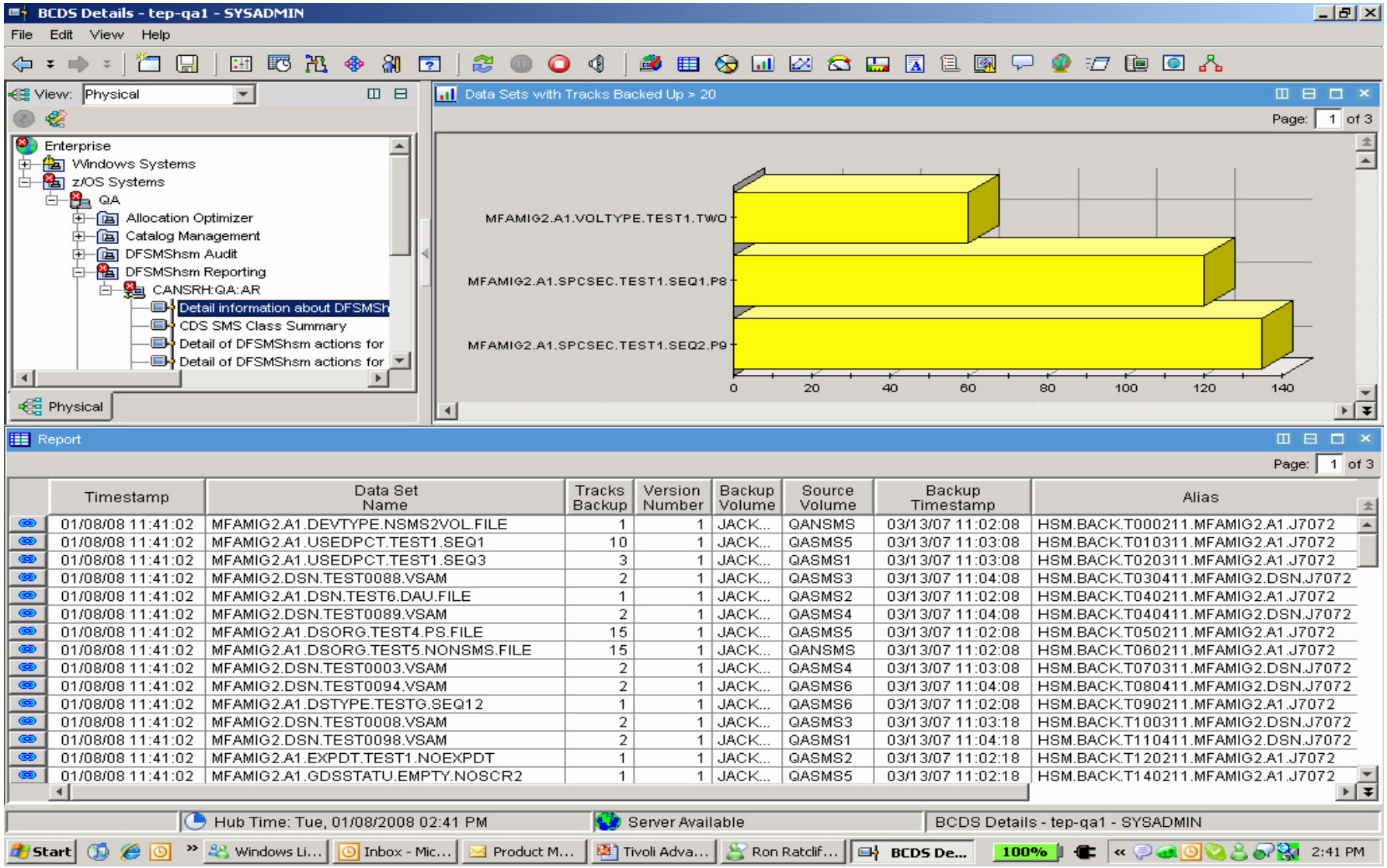
AAH – Tape Error Summary



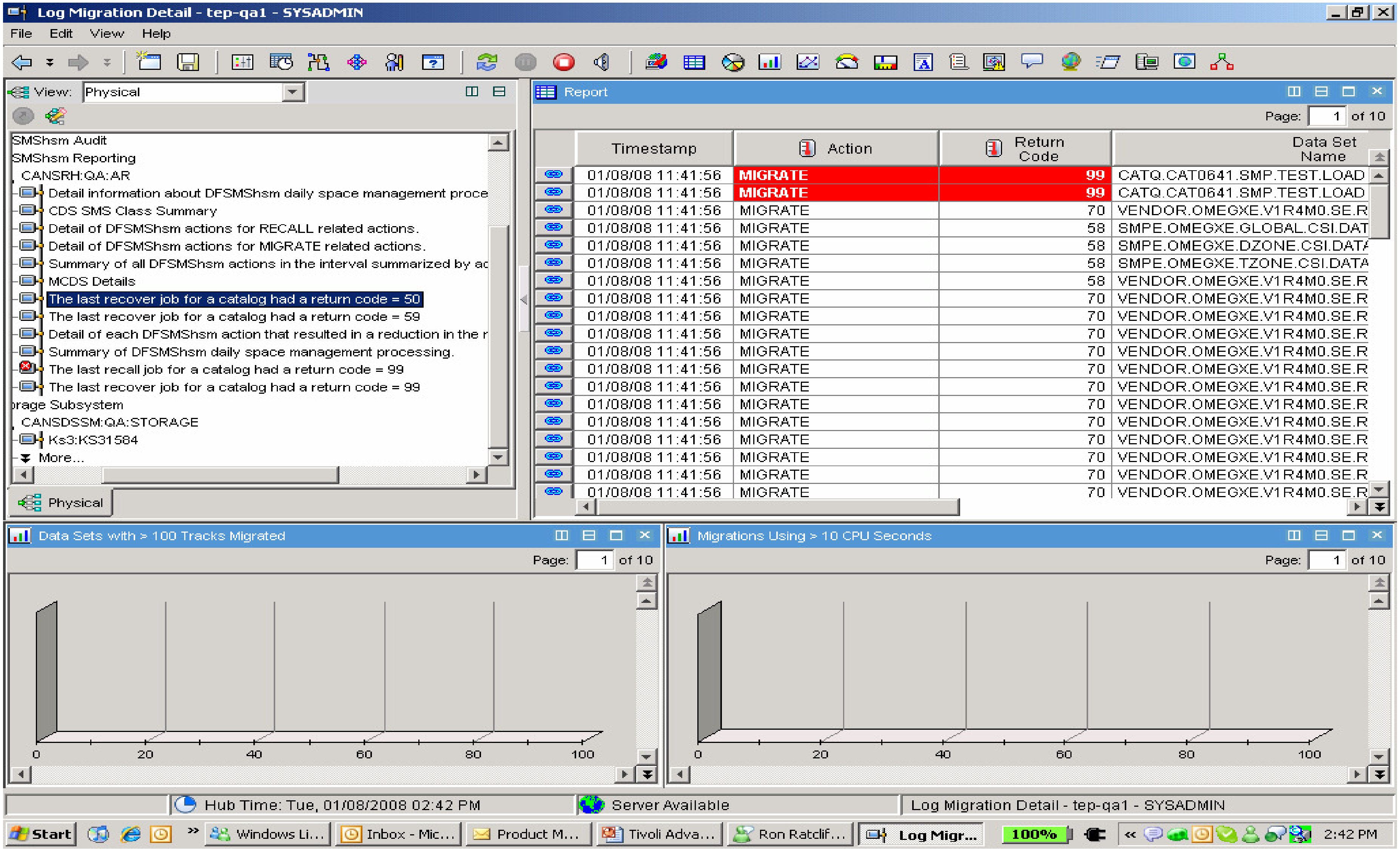
A New Look for zSeries Tools

Tivoli Advanced Reporting for DFSMShsm

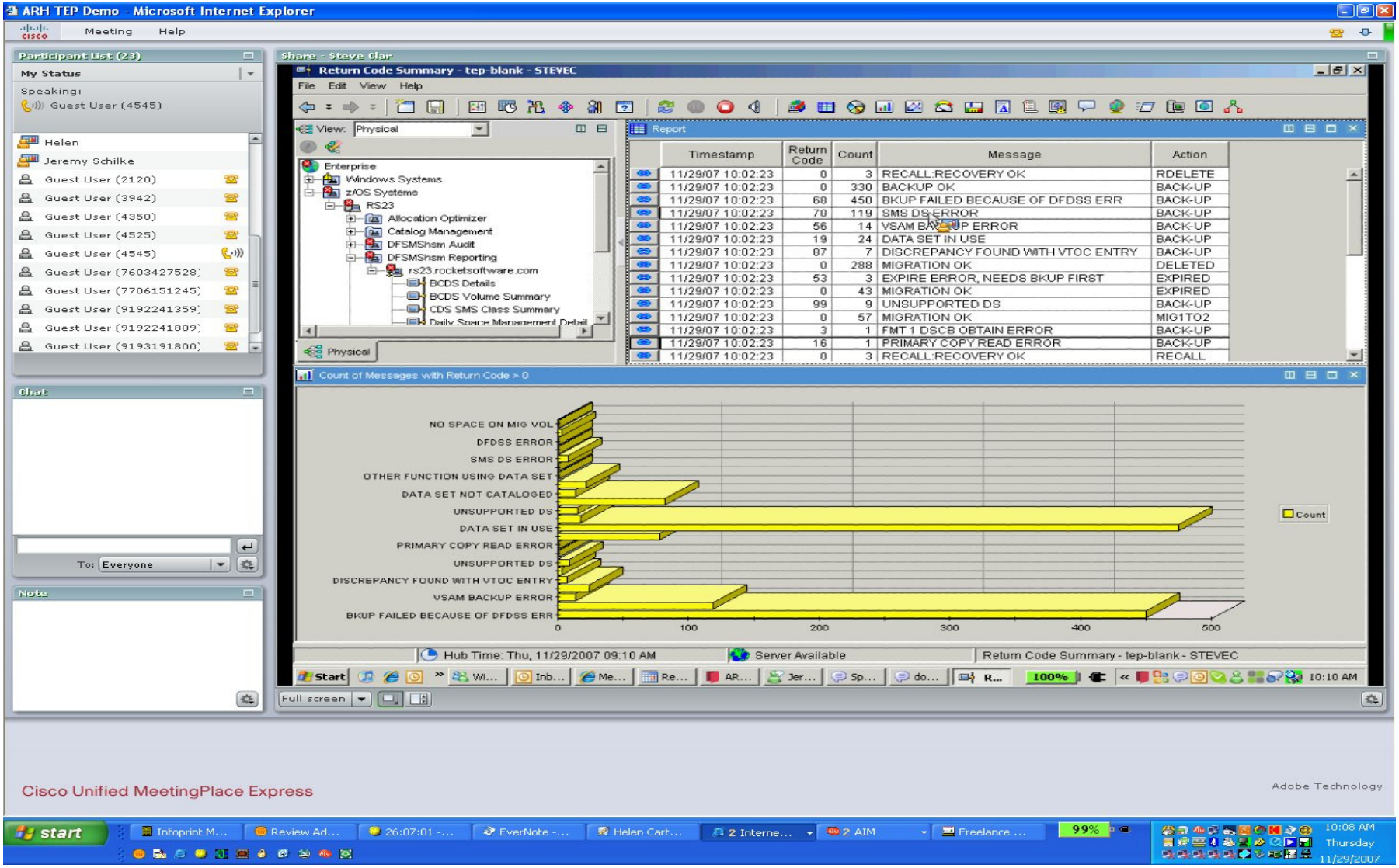
ARH - BCDS Dataset Details



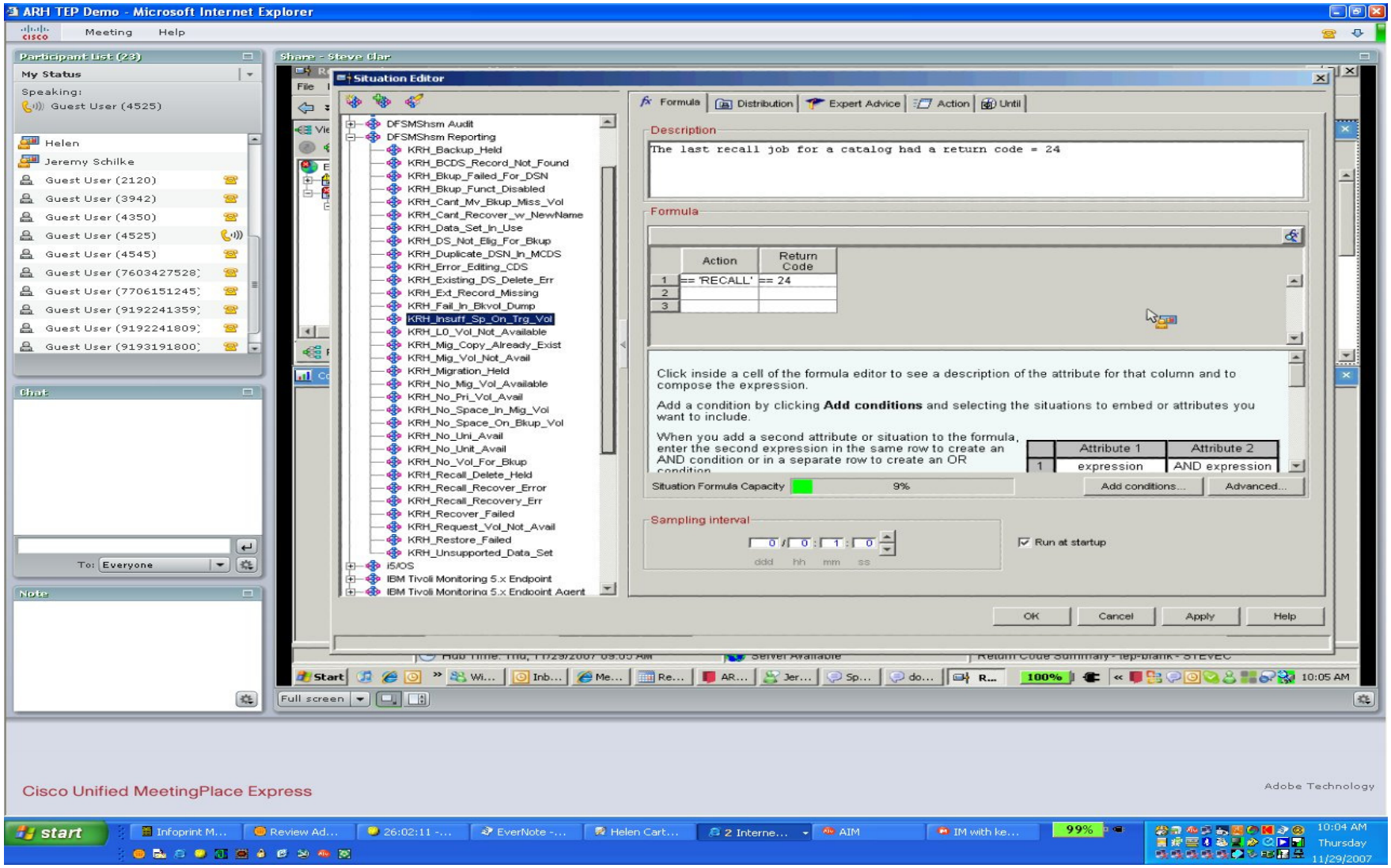
ARH - Migrate NE to ZERO



ARH – Return Code Summary



ARH - Situations



धन्यवाद

Hindi

多謝

Traditional Chinese

ขอบคุณ

Thai

Спасибо

Russian

Gracias

Spanish

Thank You

English

شكراً

Arabic

Obrigado

Brazilian Portuguese

多谢

Simplified Chinese

Danke

German

Grazie

Italian

Merci

French

நன்றி

Tamil

ありがとうございました

Japanese

감사합니다

Korean