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How to Ensure You have all Your Mainframe Data Backed Up

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Session 10975

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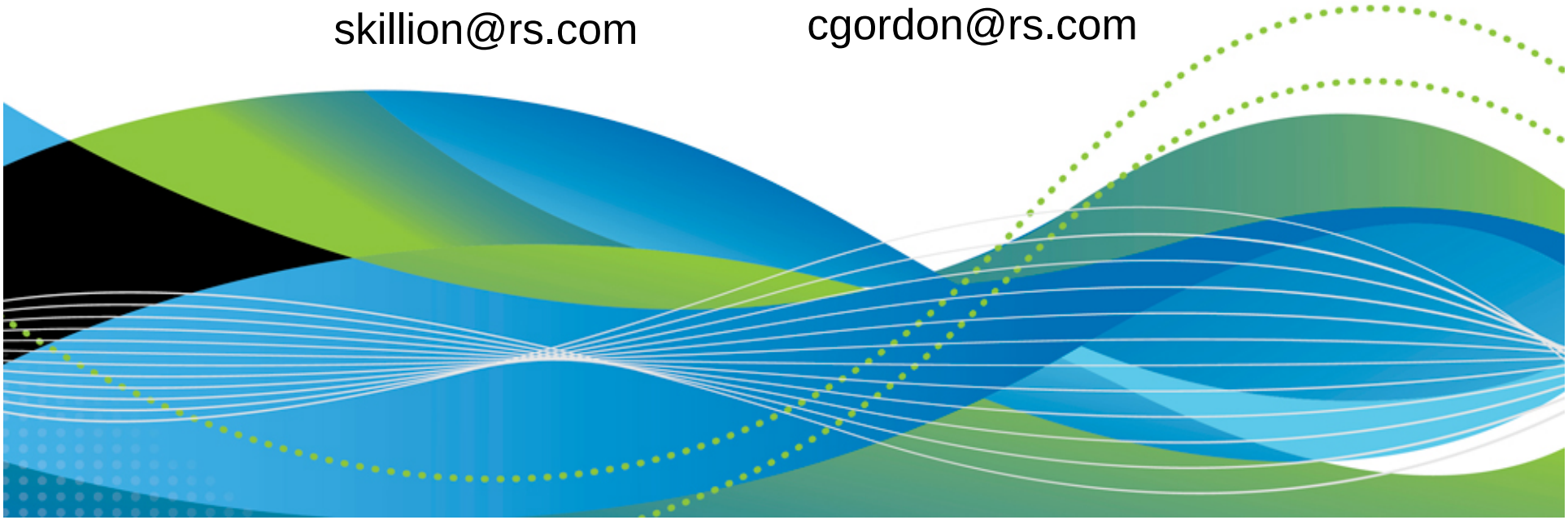

Agenda

- Application Outages
- Backup Technologies
- Data Identification and it's Challenges
- Automating Application Data Identification
- Application Data Backup Verification
- Automating DB2 and IMS Data Identification
- Summary

In the event of a disaster, either minor or catastrophic, you can't recover your data if you don't have it backed up!

What Causes Application Outages

"Based on extensive feedback from clients, we estimate that, on average, unplanned application downtime is caused:

- 20 percent of the time by hardware (e.g., server and network), OSs, environmental factors (e.g., heating, cooling and power failures) and disasters;
- 40 percent of the time by application failures including "bugs," performance issues or changes to applications that cause problems (including the application code itself or layered software on which the application is dependent); and
- 40 percent of the time by operator errors, including not performing a required operations task or performing a task incorrectly (e.g., changes made to infrastructure components that result in problems and incur unexpected downtime).

Thus, approximately 80 percent of unplanned downtime is caused by people and process issues, while the remainder is caused by technology failures and disasters. Improving availability requires a different strategy and set of investment choices for each of the three unplanned downtime categories." -- *Gartner Group"*

Database Downtime Drives Up Costs

Most organizations spend an extra $1.5M USD per year because of unplanned database downtime

Yearly Cost Metrics	Best-in-Class	Industry Average	Laggards
Business interruption events	.9	3	3.5
Time per business interruption event (hours)	1.3	4.7	8.4
Total disruption (hours)	1.2	14.1	29.4
Average cost per hour of disruption	$60,000	$110,000	$98,000
Total cost of business interruption events	**$72,000**	**$1,550,000**	**$2,880,000**

Source: Aberdeen Group, Month 2010

Very few organizations have perfect or near-perfect datacenter uptime

- ✓**Only 3% of organizations have uptimes of 100%**
- ✓ **Only 4% of organizations have uptimes of 99.9%**

Application Downtime Affects Your Business

Business

- Average cost of database downtime $1.5M USD/year
- Revenue at risk
- Customer satisfaction declines
- Missed service level agreements
- Brand damage and loss of goodwill

IT

- Time consuming, rarely used, manual backup/recovery procedures don't scale as data volumes grow
- Inability to backup all data because of shrinking maintenance windows and growing data volumes
- Difficult to get complete database backup without production impact

Various Backup Technologies

- Backup Types
  - Full volume dump
    - Requires manual identification of VOLSERS, setup and upkeep
  - Fast replication with subsequent volume dump to tape
    - Same as above except “instant” backup using fast replication
  - Logical data set backup
    - Manual identification of files by data set name or data set name mask
    - Various utilities including DFDSS, DFSMShsm, IDCAMS, IEBGENER, etc.
    - Requires setup and upkeep
  - Image copy for DB2 and IMS
    - Requires manual identification, setup and upkeep

Identifying the z/OS Environment for Local Backup

- Infrastructure
  - z/OS Operating System Volumes
    - System and application catalogs
      - *SMF data for forward recovery*
  - DFSMShsm (or other) Control Data Set and journal backups
  - 3rd party software product files
- Applications
  - Application and adhoc batch files
  - DB2 and IMS Database data
    - And other database backups, ie: ADABASE
  - Critical VSAM files

Data Identification Challenges

- What are the challenges associated with identifying data for local backup?
  - Manual identification of critical files
    - Data used by application batch jobs needed for rerun or restart
    - Tendency to use data set masking (HLQ.**)
      - *Includes large numbers of non-critical data and data that has been migrated*
    - Tendency to use volume-level identification
      - *Requires a backup synchronization point across all applications*
      - *Doesn't include tape or migrated data*
  - Missing data sets
    - No way to identify data that is missing a backup

Data Identification Challenges

WK	Mon (DAILY)	Tues (DAILY)	Wed (DAILY)	Thu(DAILY)	Fri(WEEKLY)	MONTHLY
1	A.DAILY(+1)	A.DAILY(+1)	A.DAILY(+1)	A.DAILY(+1)	A.DAILY(0) A.DAILY(-1) A.DAILY(-2) A.DAILY(-3) B.WKLY(+1)	
2	A.DAILY(+1)	A.DAILY(+1)	A.DAILY(+1)	A.DAILY(+1)	A.DAILY(0) A.DAILY(-1) A.DAILY(-2) A.DAILY(-3) B.WKLY(+1)	
3	A.DAILY(+1)	A.DAILY(+1)	A.DAILY(+1)	A.DAILY(+1)	A.DAILY(0) A.DAILY(-1) A.DAILY(-2) A.DAILY(-3) B.WKLY(+1)	
4	A.DAILY(+1)	A.DAILY(+1)	A.DAILY(+1)	A.DAILY(+1)	A.DAILY(0) A.DAILY(-1) A.DAILY(-2) A.DAILY(-3) B.WKLY(+1)	B.WKLY(0) B.WKLY(-1) B.WKLY(-2) B.WKLY(-3) C.MTHLY(+1)

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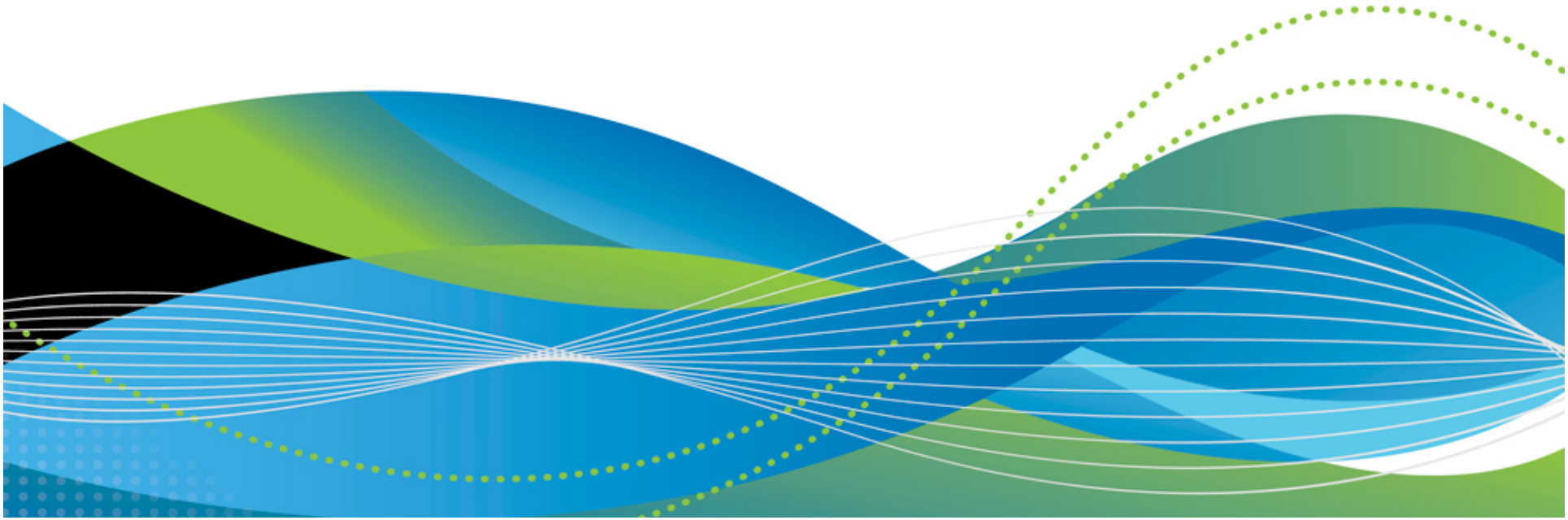
Automating Application Data Identification for Backup



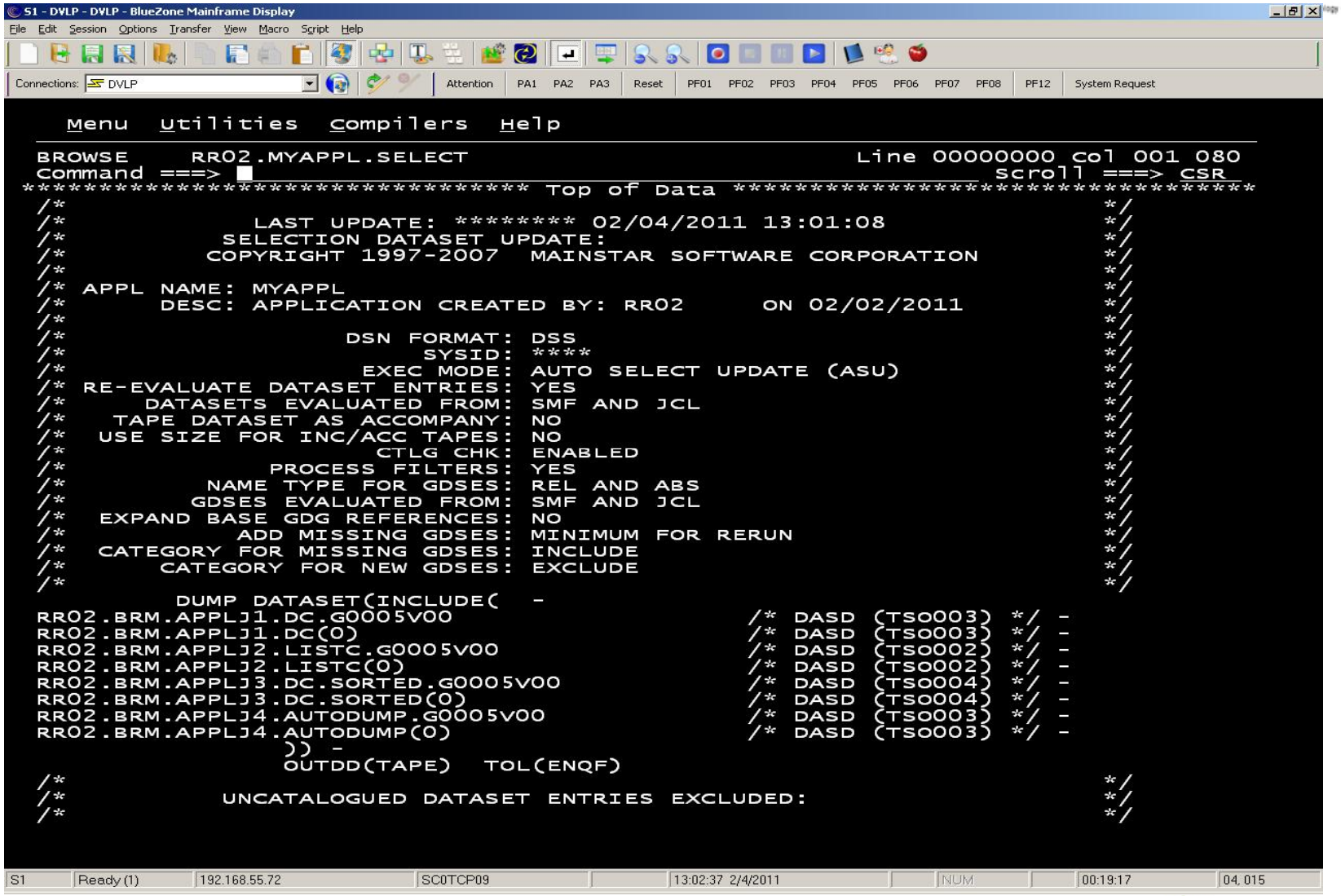
Identifying Production Application Batch Data with Automation

- Automation software identifies critical application files
  - Uses SMF data to determine:
    - What files were read in as input
    - Which files were created as output
  - Provides filtering logic to exclude data that applications should not backup
    - Database data
    - System and 3rd party software files, etc.
- Creates a list of critical files for input to your logical backup process
  - Various logical backup utilities
- Stores information about critical files in it's database
  - Information from SMF records

Benefits of Using Automation Software

- Identifies all data used by the application's batch process
  - Including data sets that belong to other applications
  - Data sets used in condition coded steps or weekly, monthly, quarterly and annual cycles
- Keeps the list of critical files current
  - Lists are created each time the batch process is executed therefore, they are always up-to-date
- Identifies only the data sets used by the application
  - Greatly reduces non-critical data being included in the backup
- Provides reporting capabilities about data used by applications
  - Can be compared to backup inventory to identify missing backups

Automated Critical Data Set List



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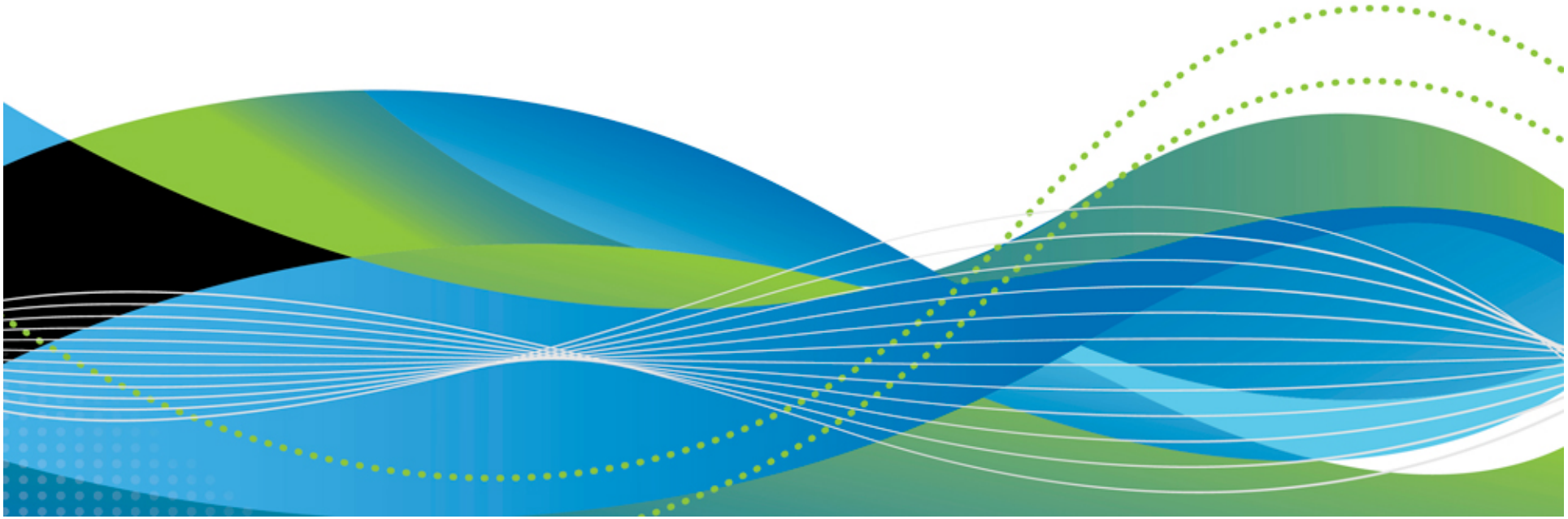
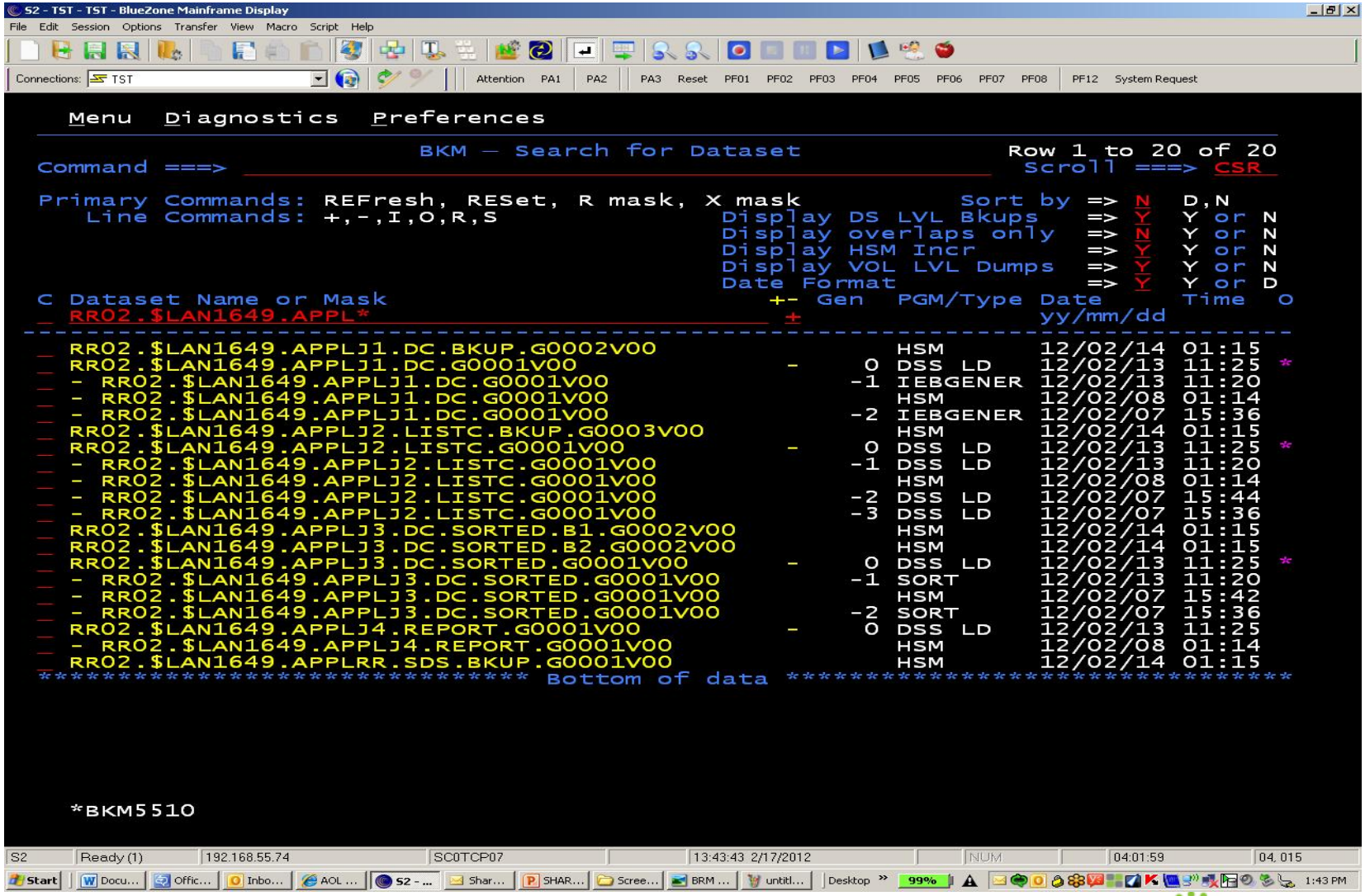
Application Data Backup Verification



Backup Inventory

- Your automated solution should include an inventory database of all backup types
  - Full volume dumps
  - Logical backups created in application batch jobs or by DFSMSdss, DFSMShsm ABARS, etc.
  - Backups created by DFSMShsm, FDR, CA-Disk, etc.
  - System and user generated backups
- Automated solutions should have feature to compare lists of critical files to what's backed up
  - Identify data that doesn't have a current backup
  - Identify data that has multiple redundant backups

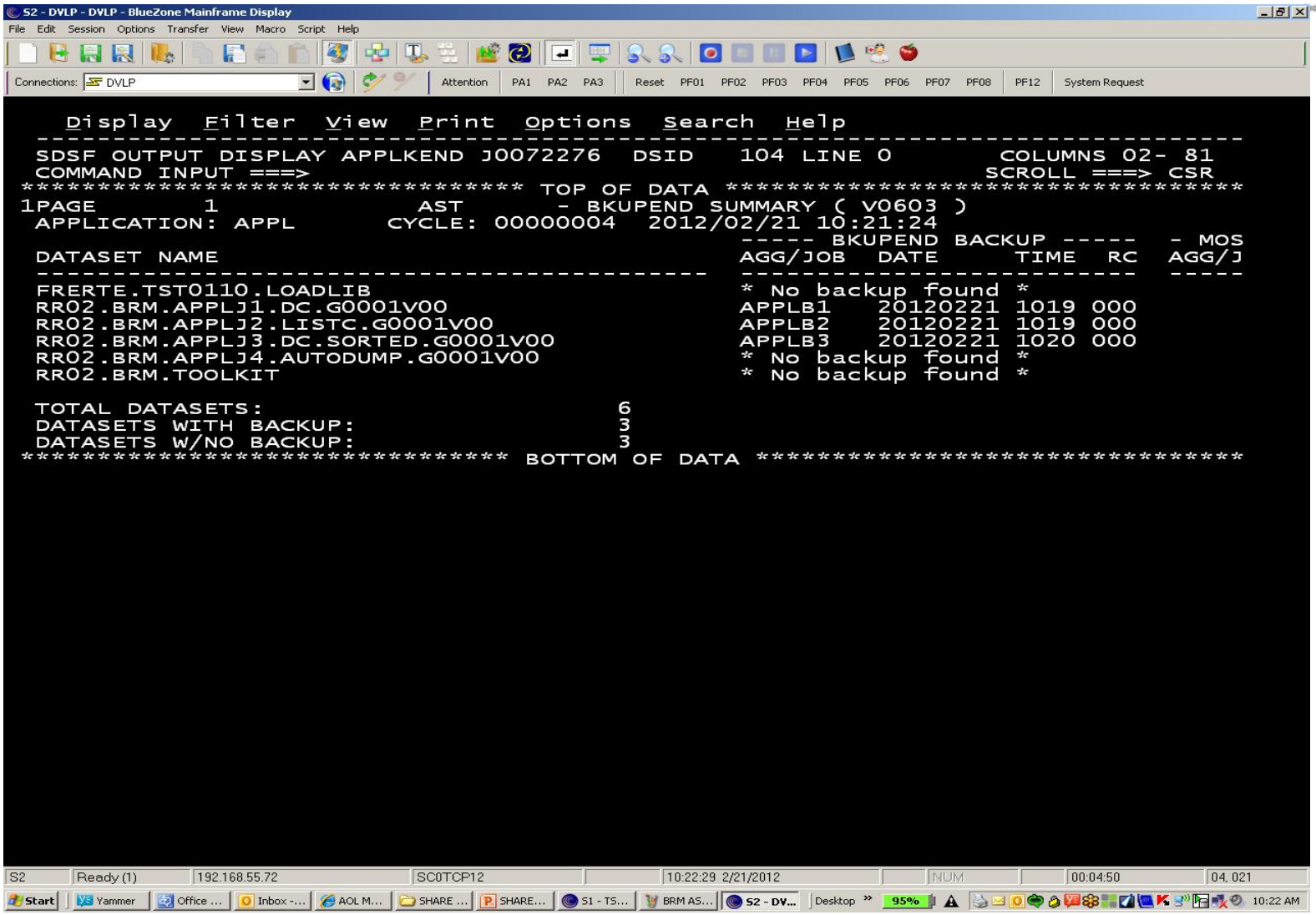
All/Star Tracked Backups



Backup Verification Automation

- Output from critical file identification automation tool is compared to the backup inventory
  - Reports on critical files and their associated backup(s)
  - Identifies data that doesn't have a backup
- When using volume-centric backup methodologies
  - Compares data in the backup inventory towards:
    - All DASD volumes in the environment
      - *Exclude capability to exclude test, system volumes*
- Ability to identify critical files without a backup
- Ensures all critical non database files are backed up

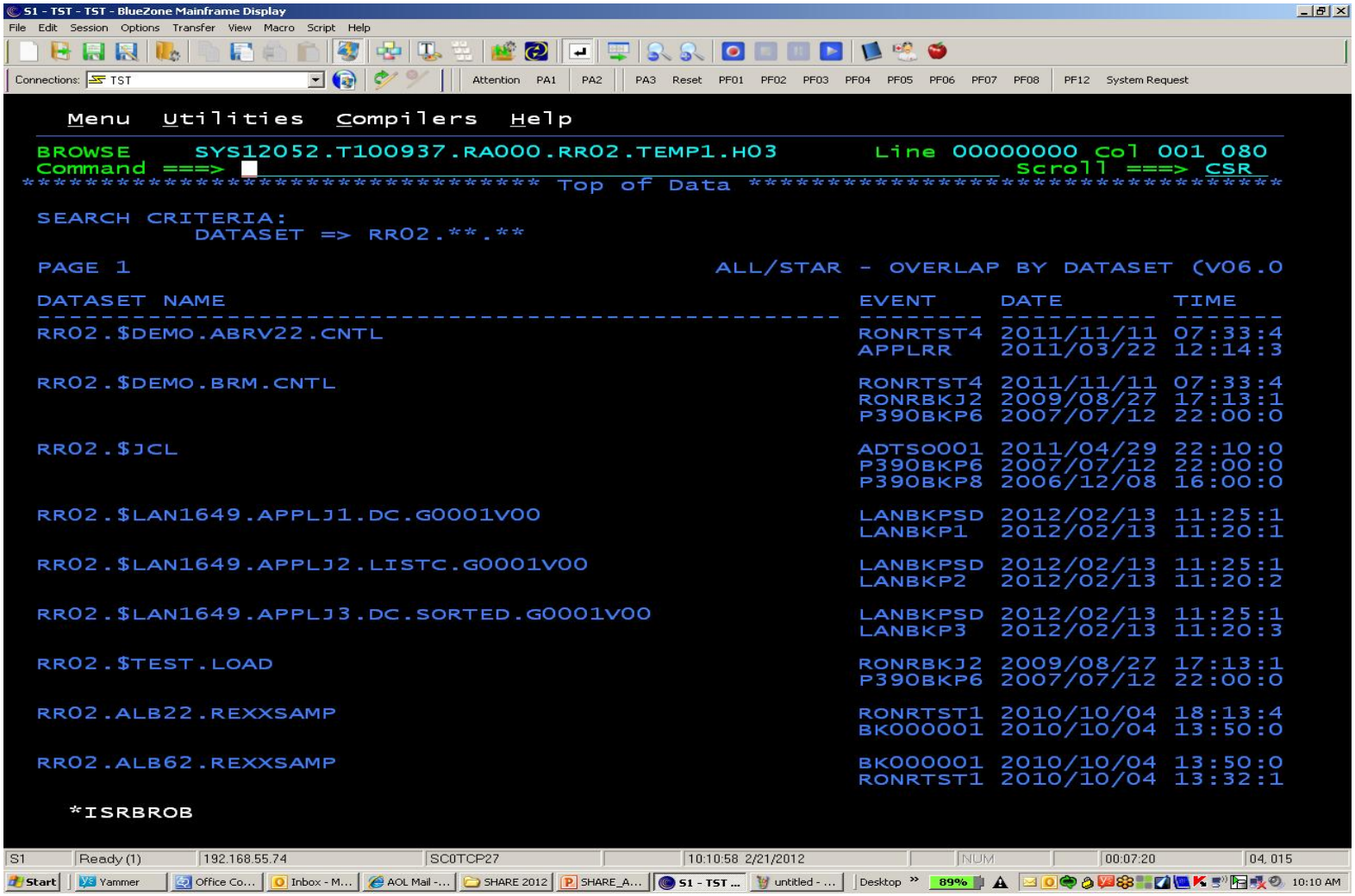
Missing Backup Report



Redundant Backup Identification

- Many customers report backing up production non-database data
  - By applications and…
  - By DFSMShsm (or other) and…
  - By Full Volume Dumps!
- Complete inventory of all backups identifies files that are redundantly backed up
  - Report on data with multiple backups
  - Reduce redundant backups to save resources

Redundant Backup Report



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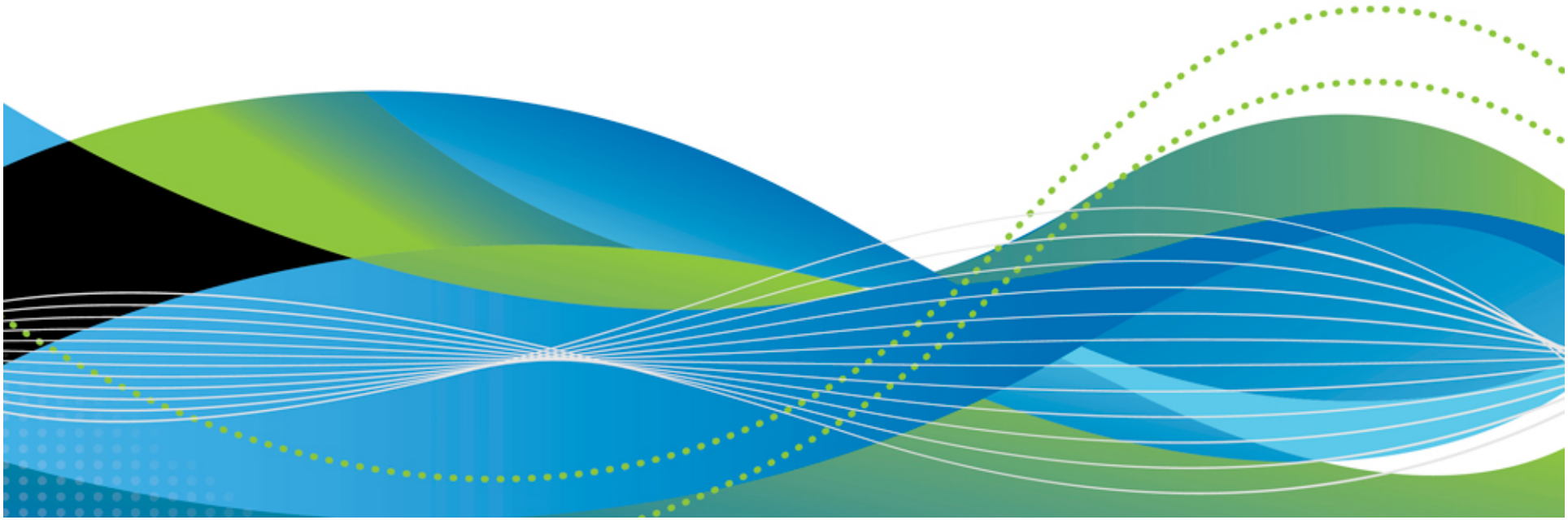
Data Identification for Databases



Database Data

- DB2
  - Data is known as Table Spaces and Index Spaces
  - One or more sets of Table Spaces and Index Spaces make up a database
  - Each Table Space and Index Space has a unique data set name
- IMS
  - Data is known as databases
  - A database is one or more VSAM Clusters
    - Data component, index component, secondary (alternate) index component
  - Each component of a VSAM Cluster has a unique data set name

Backing up DB2 and IMS with Image Copy

- Image Copy Backup
  - DB2 & IMS
    - Requires individual Table Space, Index Space, database names to be specified in the Image Copy backup job's JCL
    - Requires manual upkeep
      - *Whenever Table Spaces, Index Spaces and databases are added or deleted*
      - *Creates exposure*
        - *Manual nature of upkeep can cause data to be accidently omitted*

Identifying Database Data using Automation

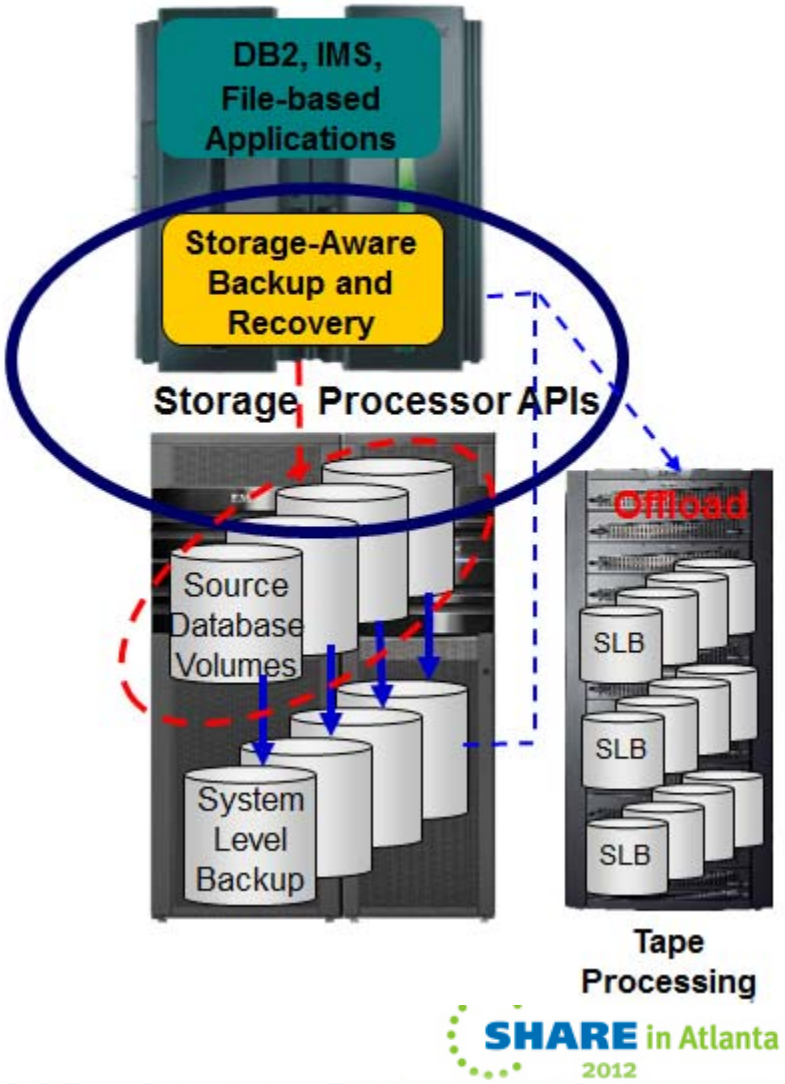
- Storage-aware data management software such as Rocket Database Backup and Recovery (DBR)
  - Interrogates DB2 or IMS to discover all system and application data sets and maps to corresponding storage volumes
- Eliminates the need to:
  - Manually identify individual DB2 Table Spaces/Index Spaces and IMS databases for backup
  - Maintain Image Copy batch jobs over time
  - Execute Image Copy backup jobs for recovery purposes

System-level Backup

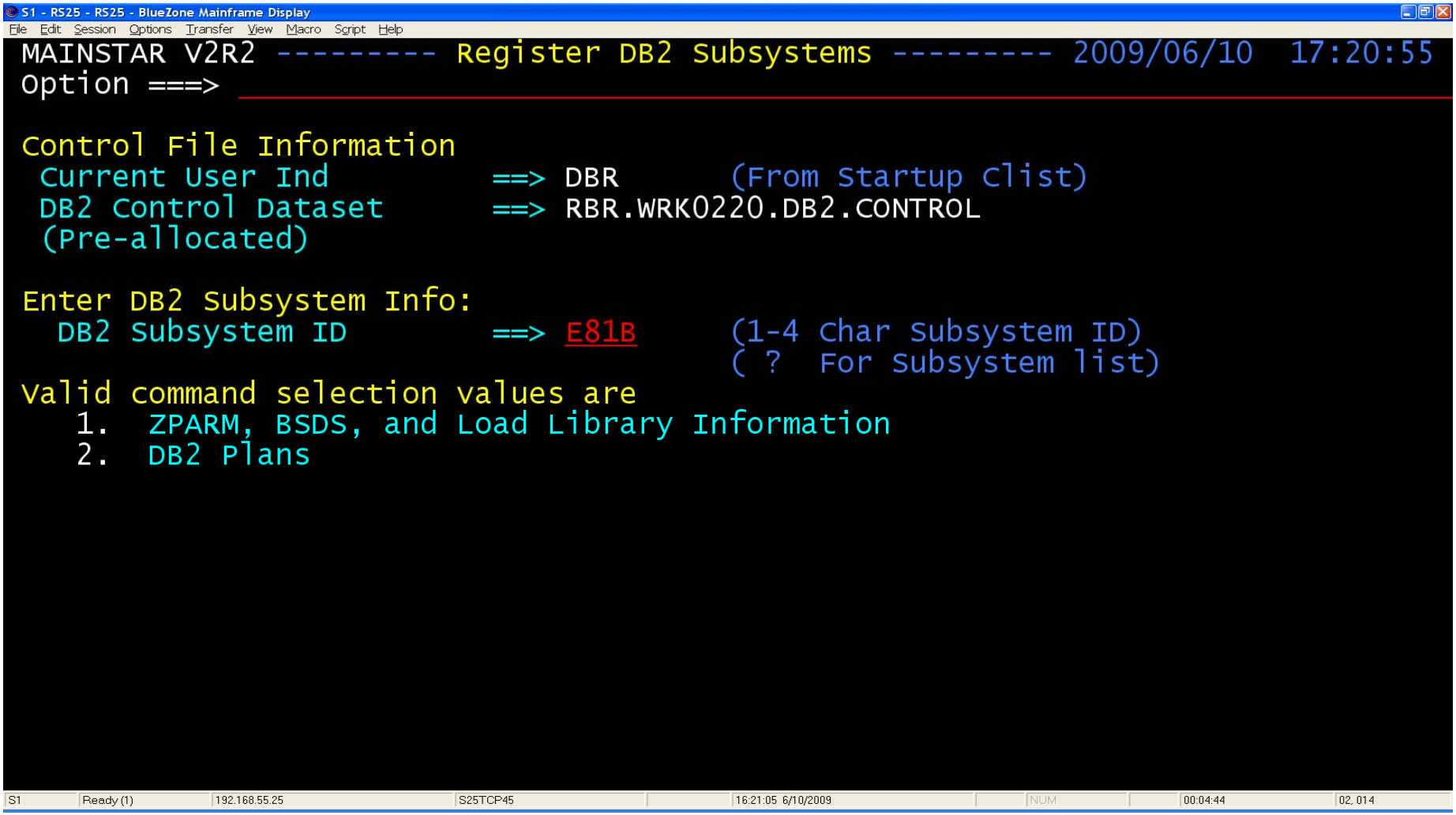
- Backup complete database systems (IMS or DB2) as a unit without affecting applications
  - Backup components include:
    - Active and archive logs
    - Recovery metadata (IMS RECONs, DB2 BSDS)
    - All database data sets
    - Appropriate libraries, and system data sets
    - IMS system data sets including ACBLIBs, DBDLIBs, PGMLIBs, etc.
    - All associated ICF User catalogs
  - Backups performed instantly using storage-based fast replication
  - Does not require DB2 BACKUP SYSTEM, DFSMShsm, or FlashCopy

Storage-aware Backup Process Overview

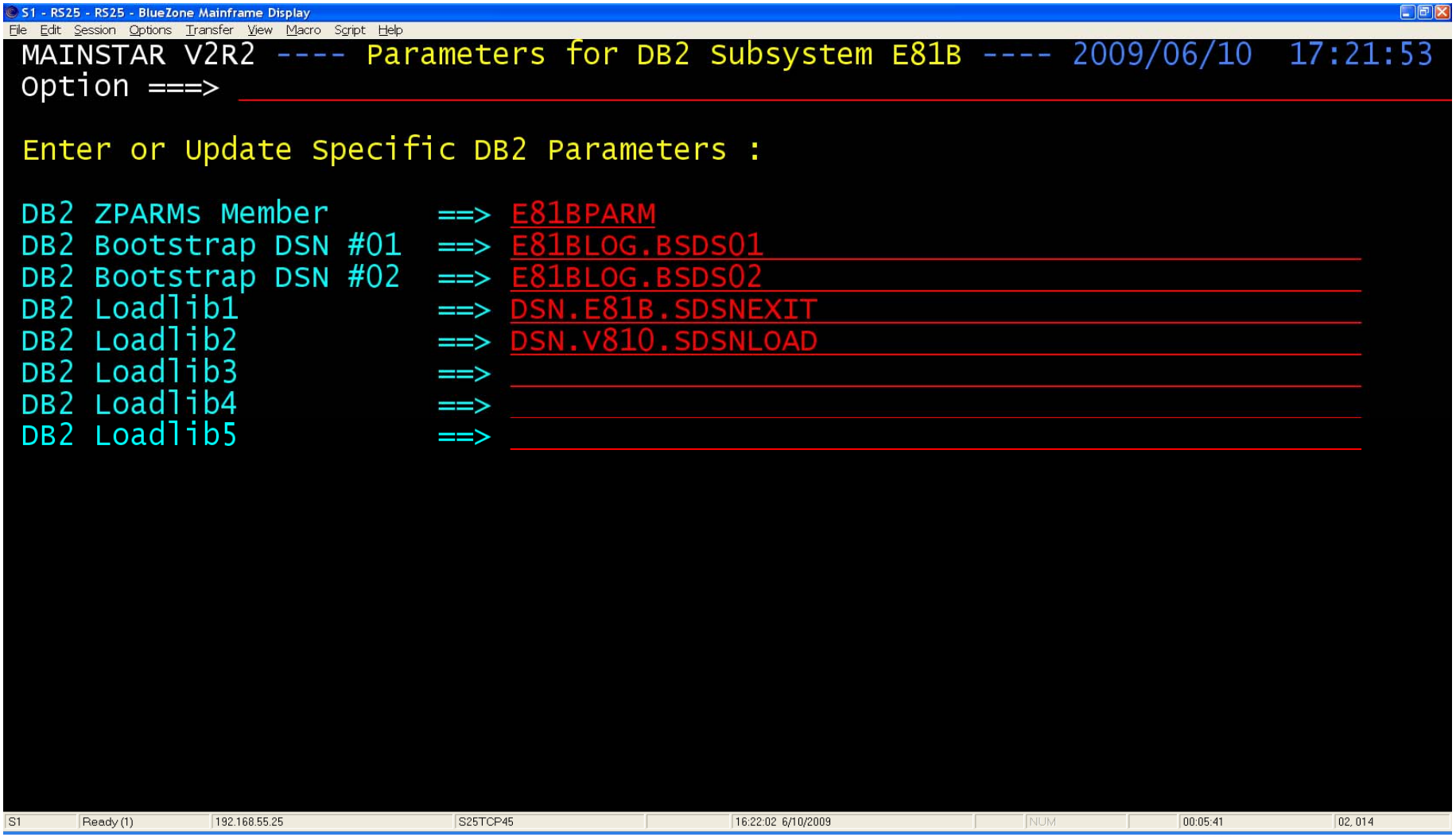
- Fast replication is used to backup applications and database systems
  - Full system backups complete in seconds
  - Backup performed without host CPU or I/O
  - Supports all storage vendor products
- Back up large groups of databases with no application affect or down time
  - Backup windows are reduced or eliminated
  - Extend online or batch processing windows
- Data consistency ensured
  - Database suspend process (DB2 or IMS)
  - Storage-based consistency functions
  - Application quiesce
- Automated backup offload management



DB2 System Identification



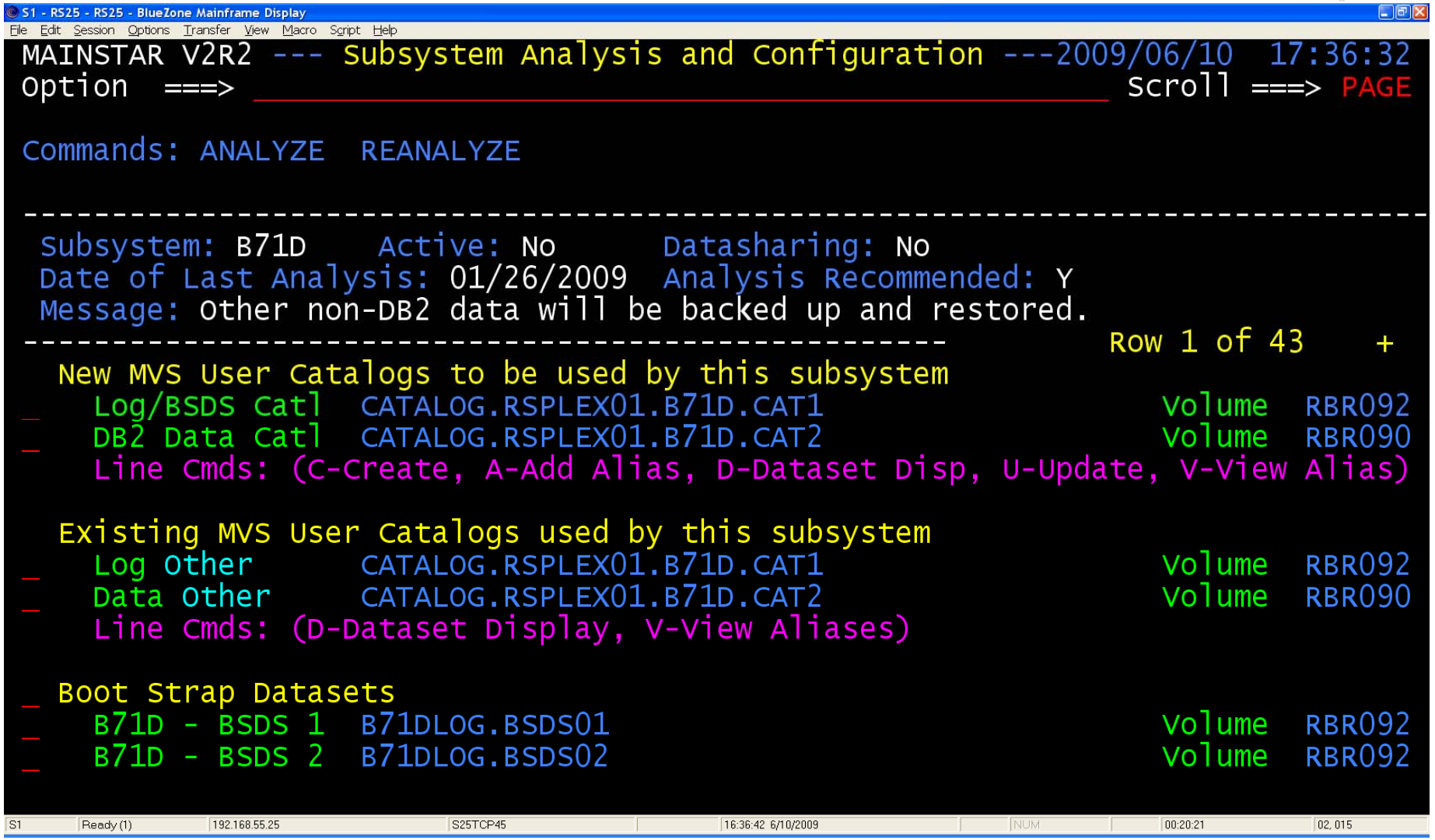
DB2 System Identification



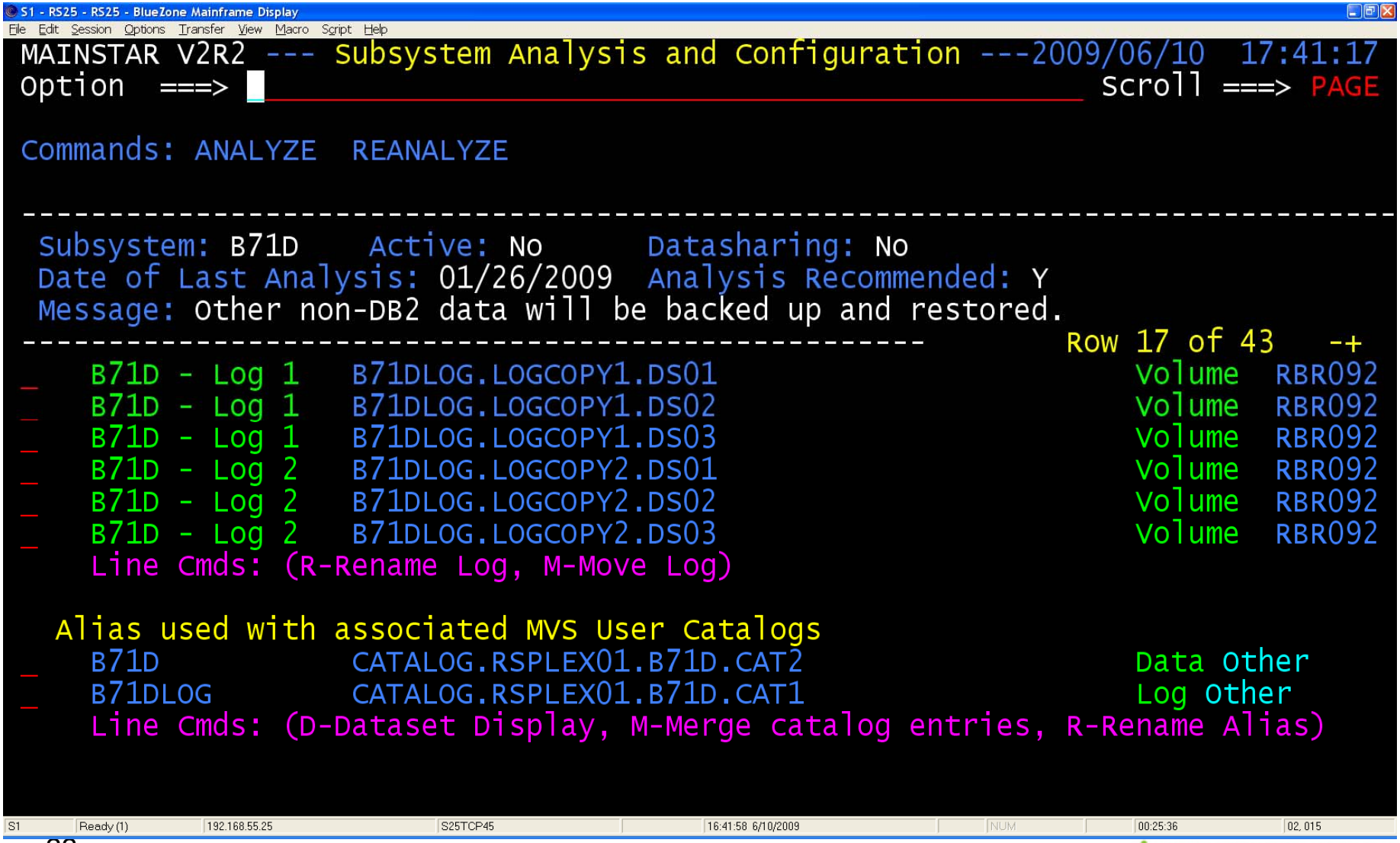
DBR for DB2 or IMS

- Discovers and analyzes DB2 or IMS subsystem
  - Displays an interactive report showing DASD volume usage
  - Identifies non-DB2 or IMS data also on those volumes
    - Can include ADABASE, CICS VSAM Files and other database data on these volumes for backup
- Segregates DB2 log and object data to support a system backup methodology
  - Generates JCL to move DB2 data sets to appropriate segregated volumes
  - Automates separating DB2 data and log data sets into their own ICF catalogs

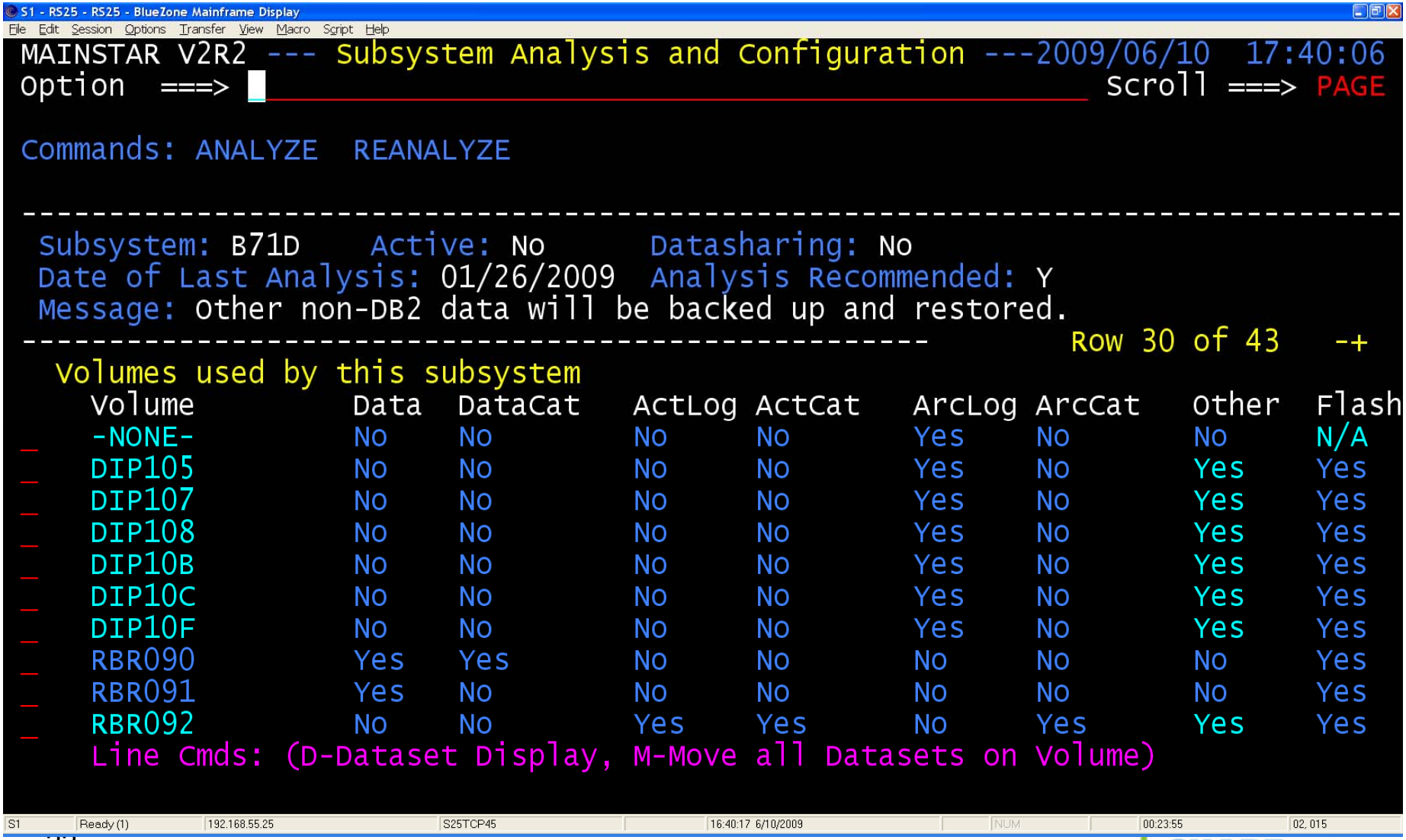
DB2 User Catalogs Support



DB2 Log Files and Associated Catalogs



Identification of Non-DB2 Data on Volumes



DB2 and IMS Database Backup

- Using automation to identify DB2 and IMS data ensures all database data is included in the backup
- Using System-Level backup for DB2 and IMS systems ensures a synchronized point-in-time backup
  - Either individually or across DB2 and IMS
- System-Level backup uses fast replication technologies
  - No application downtime or “read-only” mode
  - Backup to disk is instantaneous
  - I/O is done by the storage controller not on your business class machine

Summary

- Software automation enables customers to easily identify data and manage backups required for local recovery
  - Critical data set identification and backup inventory
- Reporting that identifies:
  - Critical application data by data set name
  - DB2, IMS and other database data
    - All volumes to be included in the backup
  - Data that doesn't have a backup
    - To be corrected by the application
  - Data backed up multiple times
    - By multiple applications, multiple data movers
- Software automation helps customers ensure all their mainframe data is backed up

Abstract for Session 10975

- In the event of a disaster, either minor or catastrophic, you can't recover your data if you don't have it backed up! Whether your group is responsible for ensuring your company's data assets are backed up or not; it is important for you to attend this session to understand how your business can ensure all critical data is identified, backed up and a backup copy is vaulted for recovery. Mirroring your data to a remote site? Local recovery for applications, DB2, IMS, CICS and user data still needs to be addressed. The speakers will discuss using solutions from Rocket Mainstar to ensure all of your data is identified, backed up and recoverable in the event of a disaster.