Multi Instant Logic Analyzer4VSAM v1.2+

http://www-03.ibm.com/servers/eserver/zseries/zvse/downloads/tools.html#vat

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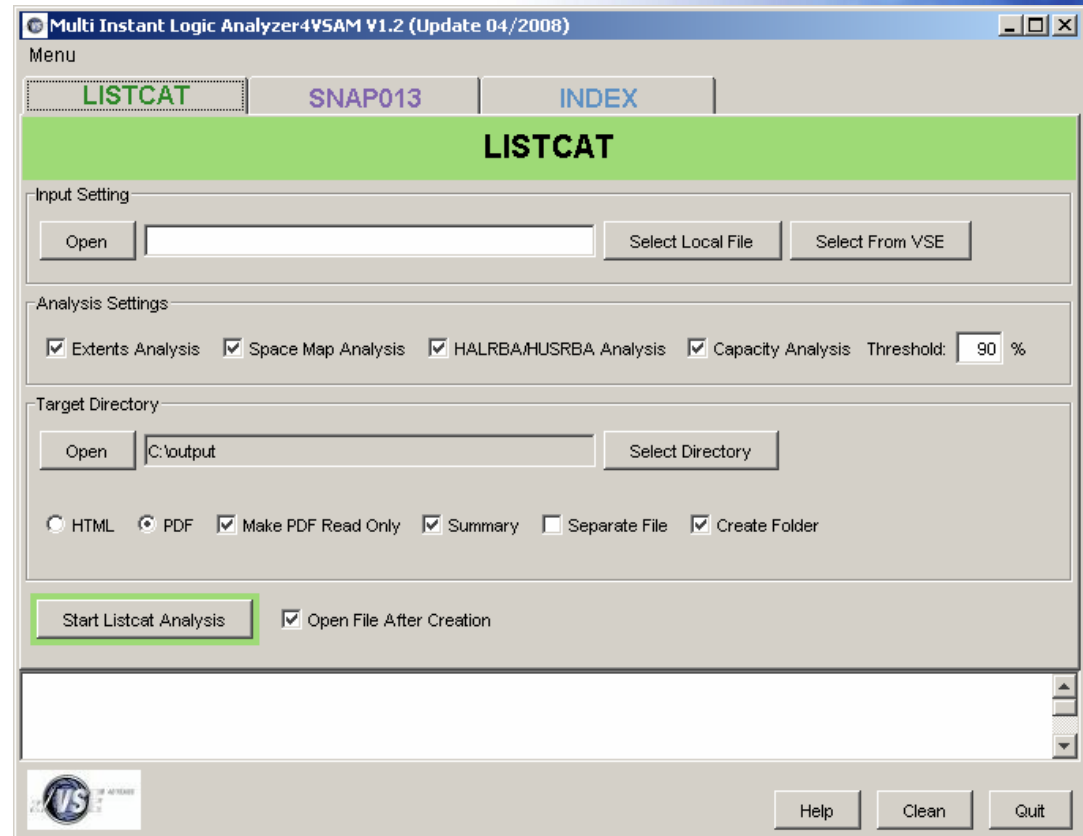
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WAVV

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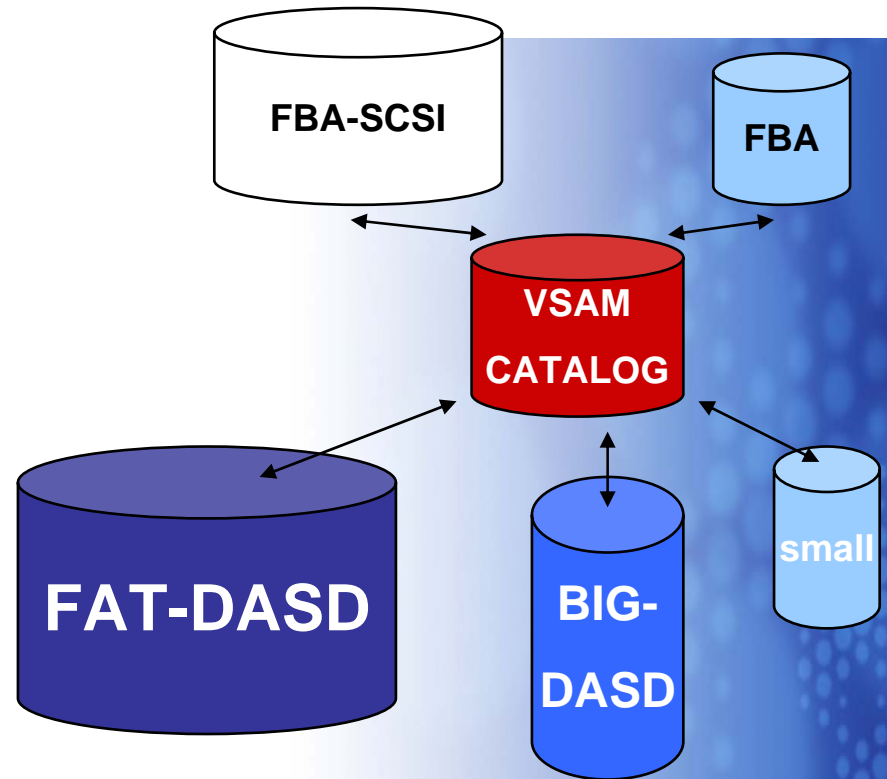
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Multi Instant Logic Analyzer4VSAM v1.2

What is MILA4VSAM ?

❖ A collection of tools to analyze VSAM data instantly

❖ Helps identifying & solving potential problems early

❖ Java based

❖ VSE Connector integration

❖ Available at no cost

❖ HTML / PDF output

AGENDA

❖ LISTCAT Analyzer

❖ SNAP013 Analyzer

❖ INDEX Analyzer

❖ New Features

❖ Samples

Multi Instant Logic Analyzer4VSAM v1.2

LISTCAT Analysis

- ❖ **EXTENT Analysis**
  - ❖ overlapping EXTENTs, invalid EXTENTs
- ❖ **SPACE-MAP Analysis**
  - ❖ detect defective areas (blocks/cylinders/tracks) within a VSAM space-map
- ❖ **RBA Analysis**
  - ❖ detect inconsistencies between HUSRBA and HALRBA
- ❖ **Capacity-Analysis**
  - ❖ check if a cluster/AIX reaches the following cluster limitations:
    - ❖ Max file size 4 GB or 123 extent
    - ❖ *NEW Unused-Space and Split-Byte-Ratio
    - ❖ *NEW scan for option IMBED and REPLICATE

EXTENT Analysis

Invalid EXTENT

❖ EXTENT inconsistencies inside of LISTCAT output

```
VOLSER-----------BADVOL        PHYREC-SIZE---------4096      HALRBA-OR-CI-----8847362
DEVTYPE------------3390        PHYRECS/TRK----------12       HUSRBA-OR-CI-----8110080
VOLFLAG-----------PRIME        TRACKS/CA------------15
EXTENTS:
LOW-CCHH-----X'00010000'       LOW-RBA-OR-CI----------0      TRACKS--------------150
HIGH-CCHH----X'0007000E'       HI-RBA-OR-CI-----7372799
```

Overlapping EXTENTs

❖ One EXTENT overlaps another EXTENT on the same volume

```
LOW-CCHH-----X'00030000'       LOW-RBA-OR-CI----7372800      TRACKS---------------30
HIGH-CCHH----X'04C0000E'       HI-RBA-OR-CI-----8847359
```

Cluster A

0001	0007

0003	04C0

Cluster B

EXTENT Analysis output

Result of Extent Analysis

Volume	Err	Cluster	Extent Start X'CCCCHHHH'	Extent End X'CCCCHHHH'	Error Type	Extent Start X'CCCCHHHH'	Extent End X'CCCCHHHH'	
TEST26	13		04BC0000	05E5000E	<<<<<<<< >>>>	05470000	0548000E	
			04BC0000	05E5000E	<<<<<<<< >>>>	05490000	054A000E	
			04BC0000	05E5000E	<<<<<<<< >>>>	054B0000	054C000E	
			09640000	0A8D000E	<<<<<<<< >>>>	09670000	0967000E	
			15650000	1756000E	<<<<<<<< >>>>	15C40000	15C4000E	
			15650000	1756000E	<<<<<<<< >>>>	15C50000	15C5000E	
			15650000	1756000E	<<<<<<<<	15C60000	15C6000E	

SPACE-MAP Analysis

Space marked as free in SPACE-Map but occupied by Cluster(s)

❖ EXTENT inconsistencies inside of LISTCAT output

```
DATASETS---------------1        FORMAT-1-LABEL:              ATTRIBUTES:
EXTENTS----------------2        CCHHR------X'012D000003'     SUBALLOC
SEC-ALLOC--------------0        TIMESTAMP                    EXPLICIT
TYPE--------------TRACK              2006.004   19:46:28
CLASS------------------0            X'BE29DF4C9940F326'
EXTENT-DESCRIPTOR:
TRACKS-TOTAL-------4514          BEG-CCHH-----X'00000001'     SPACE-MAP-------006EFD02D0FD0EC4
TRACKS-USED---------720


LOW-CCHH-----X'00010000'         LOW-RBA-OR-CI----7372800     TRACKS---------------30
HIGH-CCHH----X'0002000E'         HI-RBA-OR-CI----8847359
```

Space marked as occupied in SPACE-Map but not used by any Cluster

EXTENT ->>   `0001  0002`
SPC-Map ->   `6E        02D0        0EC4`
             `00`

SPACE-MAP Analysis output

Waisting SPACE ->>

Track(s) indicated as used but don't belong to a cluster	
Defect Start X'CCCCHHHH'	Defect End X'CCCCHHHH'
06370000	0638000E
064F0000	0653000E
06650000	066A000E
06890000	068A000E
07D20000	07D2000E
07DE0000	07E3000E
080C0000	080F000E
084E0000	0853000E
08590000	085C000E
08620000	0865000E
08680000	0868000E
0BCF0000	0BCF000E
0C110000	0C13000E
0C190000	0C1B000E
0C600000	0C61000E
0D000000	0D01000E

DANGER ->>

Cylinder indicated as free but in use by cluster(s)		
Defect Start X'CCCCHHHH'	Defect End X'CCCCHHHH'	Affected cluster(s)
16BE0000	16D2000E	
19D30000	19D4000E	
19D90000	1A7A000E	
26D00000	26D3000E	

Note: Please consider rebuilding every affected cluster in the table.

RBA Analysis

❖ **Analyze**   **all High-Used-RBA   (HUSRBA) and**
                     all High-Allocated-RBA   (HALRBA) values

❖ Identified problems are:

     ❖ HALRBA < HUSRBA

     ❖ No match between overall HUSRBA(AG) for Cluster and HUSRBA(VG) of specific VOLUME for the same cluster

     ❖ HUSRBA(VolumeGroup) > HUSRBA(AllocationGroup)

❖ **Identified Problem can mostly recovered by running IDCAMS VERIFY for specific VSAM clusters or rebuilding (delete/redefine) of single clusters**

RBA Analysis output

Portion	Volume	Type	Value		Type	Value
DATA		HUSRBA-OR-CI VG	2580480	>	HUSRBA-OR-CI AG	645120
DATA		HUSRBA-OR-CI VG	no match found		HUSRBA-OR-CI AG	645120
INDEX		HUSRBA-OR-CI VG	17920	>	HUSRBA-OR-CI AG	3584
INDEX		HUSRBA-OR-CI VG	no match found		HUSRBA-OR-CI AG	3584
DATA		HUSRBA-OR-CI VG	443105280	>	HUSRBA-OR-CI AG	434995200
DATA		HUSRBA-OR-CI VG	443105280	>	HUSRBA-OR-CI AG	434995200
DATA		HUSRBA-OR-CI VG	no match found		HUSRBA-OR-CI AG	434995200
INDEX		HUSRBA-OR-CI VG	938496	>	HUSRBA-OR-CI AG	915456
INDEX		HUSRBA-OR-CI VG	no match found		HUSRBA-OR-CI AG	915456
DATA		HUSRBA-OR-CI VG	2949120	>	HUSRBA-OR-CI AG	737280
DATA		HUSRBA-OR-CI VG	no match found		HUSRBA-OR-CI AG	737280
INDEX		HUSRBA-OR-CI VG	7680	>	HUSRBA-OR-CI AG	1536
INDEX		HUSRBA-OR-CI VG	no match found		HUSRBA-OR-CI AG	1536
DATA		HALRBA-OR-CI VG	no match found		HALRBA-OR-CI AG	55296000

Capacity Analysis Part 1

❖ **Max-#of-EXTENTs and Max-Bytes analysis based on Threshold**

123 EXTENT limit

```
STATISTICS
        REC-TOTAL--------4343444      SPLITS-CI--------------0      EXCPS-----------------9
        REC-DELETED-------786872      SPLITS-CA--------------0      EXTENTS-------------115
        REC-INSERTED------79890       FREESPACE-%CI----------0      SYSTEM-TIMESTAMP:
        REC-UPDATED-------768768      FREESPACE-%CA----------0          2006.300   22:22:28
        REC-RETRIEVED-----777777      FREESPACE--------6635520          X'BF9E2A3BD9903F00'
```

4.3 Gigabyte limit

```
ALLOCATION
        SPACE-TYPE------CYLINDER
        SPACE-PRI-------------10      USECLASS-PRI-----------0      HALRBA-OR-CI--4294000000
        SPACE-SEC-------------2       USECLASS-SEC-----------0      HUSRBA-OR-CI—4279878766
```

❖ ***NEW** check for options IMBED and REPLICATE*

*NEW Capacity Analysis Part 2

❖ **Unused-Space and Split-Byte-Ratio analysis for DATA & INDEX**

  ❖ Find unused space inside of High-Used-RBA

  ❖ Possible free Space inside CIs is considered

    ❖ e.g. CISIZE=2K, Recordsize=150 bytes ->> 13 recs and 90 bytes unused

    ❖ Calculation based on MAX REC-length

    ❖ No SPANNED Records

  ❖ Calculate Split-Byte-Ratio between

    ❖ identified unused space and

    ❖ Space allocated for CI/CA splits

DATA+INDEX Capacity Analysis

❖ **Capacity-Analysis (Reorganisation-Indicator)**

 During delete of data records only data component of cluster is updated but index
 component is unchanged

        ❖ High performance during record delete since index stays untouched

        ❖ Overhead during read via index (max 5 index levels)

        ❖ Possible unnecessary I/Os while reading a KSDS via index

SOLUTION:

        ❖ capacity-analysis will identify the real number of used index records

        ❖ check if reorganization is necessary or recommended for a cluster

Capacity Analysis output

Result of Capacity Extent Analysis

Cluster Name	Warning	Value
	Cluster defined as IMBED or REPLICATE	
	Cluster defined as IMBED or REPLICATE	
	Data part extents reached the threshold (90%)	113 Extents (92%)
	Index part extents reached the threshold (90%)	114 Extents (93%)

Summary

	(HUSRBA(16,220,160 B) - Used Data Space(3,737,346 B))= Data UnSp ->	12,482,814 B (76.96 %)
	(reused Space(3,737,346 B) / Split Space(21,446,656 B))= Data SBR ->	17.43 %
	(HUSRBA(58,880 B) - Used Index Space(15,479 B))= Index UnSp ->	43,401 B (73.71 %)
	Index SBR - could not be computed due to insufficient data.	
	(HUSRBA(645,120 B) - Used Data Space(283,699 B))= Data UnSp ->	361,421 B (56.02 %)
	Data SBR - could not be computed due to insufficient data.	
	Only 1 EXTENT or less.	
	Index SBR - could not be computed due to insufficient data.	
	(HUSRBA(302,561,280 B) - Used Data Space(60,156,432 B))= Data UnSp ->	242,404,848 B (80.12 %)
	(reused Space(60,156,434 B) / Split Space(365,938,688 B))= Data SBR ->	16.44 %
	(HUSRBA(2,188,800 B) - Used Index Space(458,824 B))= Index UnSp ->	1,729,976 B (79.04 %)
	Index SBR - could not be computed due to insufficient data.	
	Only 1 EXTENT or less.	
	Data SBR - could not be computed due to insufficient data.	
	Only 1 EXTENT or less.	
	Index SBR - could not be computed due to insufficient data.	
	(HUSRBA(147,732,480 B) - Used Data Space(86,228,168 B))= Data UnSp ->	61,504,312 B (41.63 %)
	(reused Space(86,228,168 B) / Split Space(66,746,368 B))= Data SBR ->	100.00 %
	(HUSRBA(1,059,840 B) - Used Index Space(622,745 B))= Index UnSp ->	437,095 B (41.24 %)
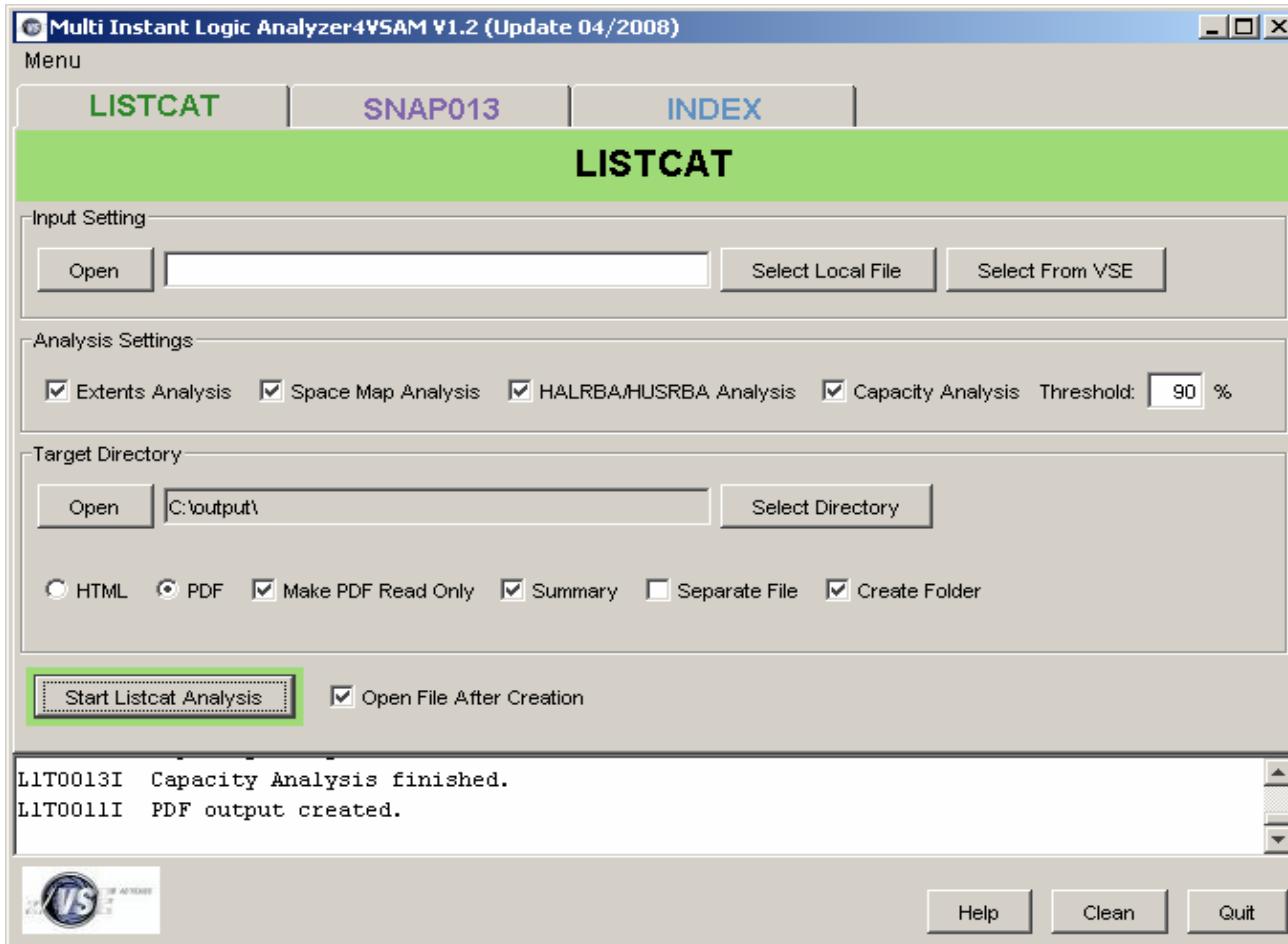
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LISTCAT Analyzer

LISTCAT Analysis Summary

Status	Details
OK	did not show any error(s).
Error	did show critical error(s).
	263 error(s) found during Extent Analysis.
	5 defective space map(s) found.
	5 defective space map(s) found.
Error	did show critical error(s).
	1 defective space map(s) found.
	14 HALRBA/HUSRBA error(s) found.
	4 capacity warning(s) found.
Warning	did show some uncritical error(s).
	1 capacity warning(s) found.
Warning	did show some uncritical error(s).
	1 capacity warning(s) found.

Multi Instant Logic Analyzer4VSAM v1.2

SNAP013 Trace Analysis

❖ VSAM SNAP Traces produce a great amount of data to be analyzed
Exclusive Control Conflicts, Record Management problems and more

```
// EXEC IKQVEDA
   ENABLE SNAP=013
/*
```

❖ SNAP013 will analyze this data and provide HTML or PDF output

❖ The SNAP013 Analyzer tool also allows to transform
any „raw-Dump" into a „printed hex-Dump"

❖ Input can be any DUMP from a PC as well as any Dump available in a VSE
(Dump)Library (Online Instant access via VSE Connectors)

❖ *NEW Support of SNAP013 Versions 0, 1 and 2 (December 2007)

What is SNAP013 ?

❖ Incore Wrap-around Trace

❖ Enabling SNAP013 via IKQVEDA does not create external output,
on either SYSLOG or SYSLST

❖ trace entries are written into an incore wrap-around trace table

❖ At open time a unique SNAP013 Trace Table is defined for each AMBL

❖ SNAP013 can be enabled for another partition. For instance, the job can be run in
batch, enabling SNAP013 for on-lines files. (close and re-open of files required to
enable SNAP013)

ENABLE SNAP=013,PART=F2

❖ SNAP013 trace table defaults size is 2048 bytes, and can be adjusted (larger or
smaller)

ENABLE SNAP=013,SIZE=8K,PART=F2

❖ Either all currently active SNAP traces (1-15) or only one specific can be disabled
DISABLE SNAP=013 -or- *DISABLE SNAP=ALL*

SNAP013

❖ SNAP013 can be enabled for a specific file or "ALL"
ENABLE SNAP=013,SIZE=2K,DDNAME=(KSDS,ESDS),PART=F2

❖ Following JOB will active file KSDS with a tracetable of 12K and for ALL other files with a trace table size of 512 bytes

```
// JOB ENABLE SNAP013
// EXEC IKQVEDA,PARM='SYSIPT'
   ENABLE SNAP=013,DDNAME=KSDS,SIZE=12K
   ENABLE SNAP=013,DDNAME=ALL,SIZE=512
/*
/&
```
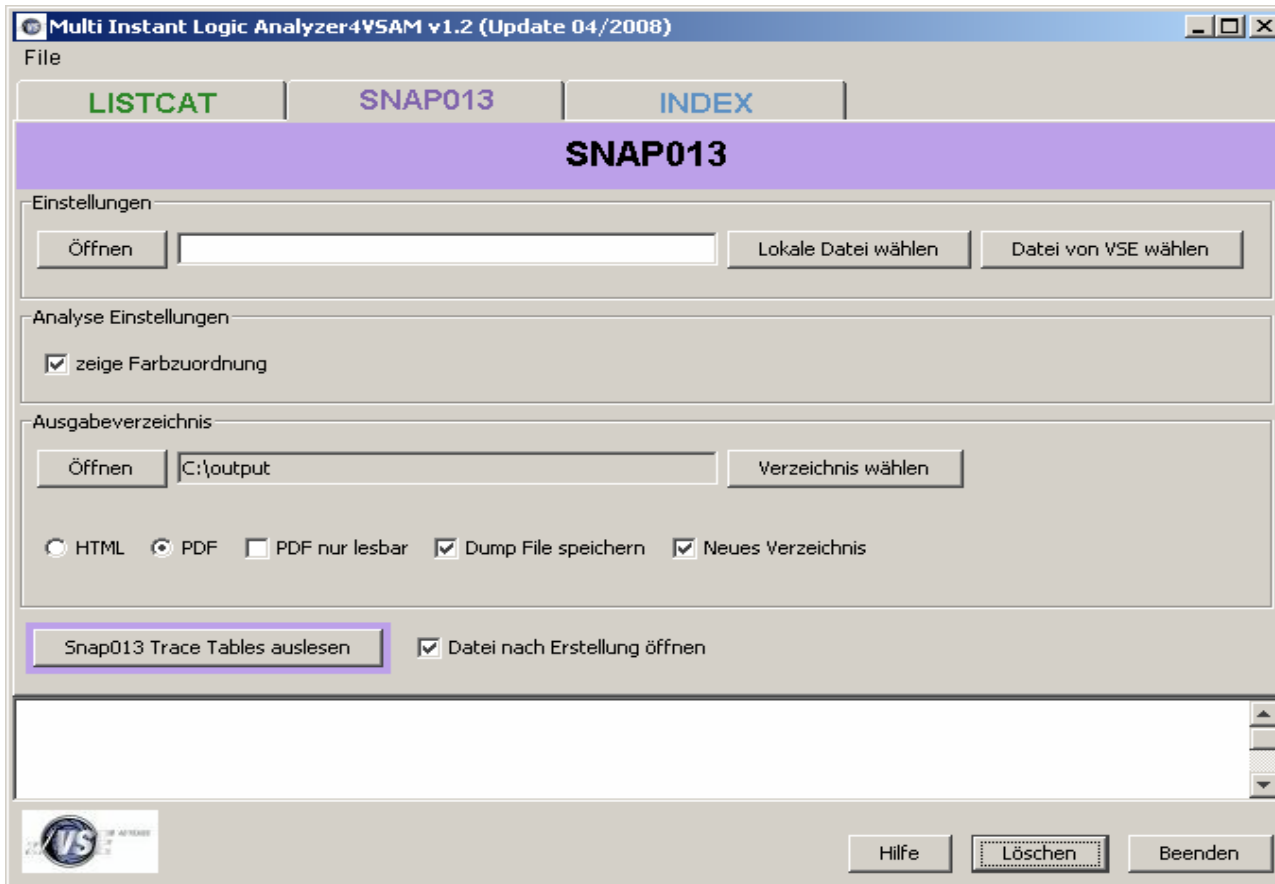
❖ **Trace entries for every of the following entry types:**

OPEN / INPUT (from User Application) / UPGRADE RESET / RETURN / LOCK / UNLOCK / RSCB / Exclusive Control (SHR4) / IKQBFC / EXCPAD   Return from EXCPAD / Catalog Update

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SNAP013
Analyzer

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SNAP013 Analysis Output

Time	Type	Information
0,0ms	PsydoOPEN	D76CBE1F 06A027C4 00662098 DAA01108 00E3F390 40880400 00201000 00000000 P%.....D...q.....T3._h.......... VSE Task ID: 27 ACB Address: 00662098 ACB MACRF: DAA0 Access data via IX / Access without IX / Sequential processing / Direct processing / Put, Write / Local shared res. / Skip seq accessing SHAREOPTION: 40 SHR 2 Cross Partition AMDATTR2: 00
		... entries overwritten ...
33m 12s 350,8ms	IKQBFC	C26CC58B 14632709 0A86FC18 00000100 00000000 0A000000 03652454 37480000 B%E......f................... VSE Task ID: 27 String Number: 10 / RPL Address: 86FC18 Tracepoint: 09 IKQBFC50 entry (Release USB lock if Reg0 = '1', or Space Lock if Reg0 = '2') PARMSW: 01 Request was for redirected VSAM access
33m 12s 350,9ms	UNLOCK	F56CC58B 146A2709 0A86FC18 00000000 E5C1C8D2 F4F0F600 0FA90004 0A000000 5%E......f......VAHK406..z...... VSE Task ID: 27 String Number: 10 / RPL Address: 86FC18 Tracepoint: 09 IKQBFC50 Unlock DTL Name: E5C1C8D2F4F0F6000FA90004 "VAHK406" Return Code (Reg15): 00 Successful

Type	Information
PsydoOPEN	D7161802 53C87260 007868F0 5C801108 006A81AC 40810580 00401000 00000000 P....H.-....0*.....a._a.... ..... VSE Task ID: 72 ACB Address: 007868F0 ACB MACRF: 5C80 Access without IX / Sequential processing / Direct processing / Get, Read / Local shared res. SHAREOPTION: 40 SHR 2 Cross Partition AMDATTR2: 00
	... entries overwritten ...
RETURN	D9166741 1C107200 0296B0E8 04A8A000 007E28F4 00000000 020E87A8 800010FF R.......o.Y.y...=.4......gy... VSE Task ID: 72 String Number: 2 / RPL Address: 96B0E8 Tracepoint: 00 Normal Exit (IKQVSM) Return to caller (IKQVSM / ERX) User BUFF size: 020E87A8 RPLREQ: 04 RPLOPTCD: A8A0 THBFLGBY: 00 PLH Condition Flags: 80 Status PLHUSE: FF PLH set / Next record / EOD reached / I/O pending / Skip CNV / Restart / First time RPLRBA: 007E28F4 PLHDSW: 00 PLHDSW1: 00 RPLFDBK: 000000 Record Mgmt Internal Return code: 00
INPUT	C9166741 1C107200 0296B0E8 04A8A001 007E28F4 F0F5F9F3 F4F3F0F0 5C800000 I.......o.Y.y...=.405934300*.. VSE Task ID: 72 String Number: 2 / RPL Address: 96B0E8 Tracepoint: 00 Single RPL (IKQVSM / IKQVSMTR) RPL Request Type: 04 Get request RPL Option Codes: A8A0 Keyed access / Sequential / Asynchronous / Search Key GT/EQ / Note string position / Forward Seq. / Any request RPLARG: F0F5F9F3F4F3F0F0 "05934300"

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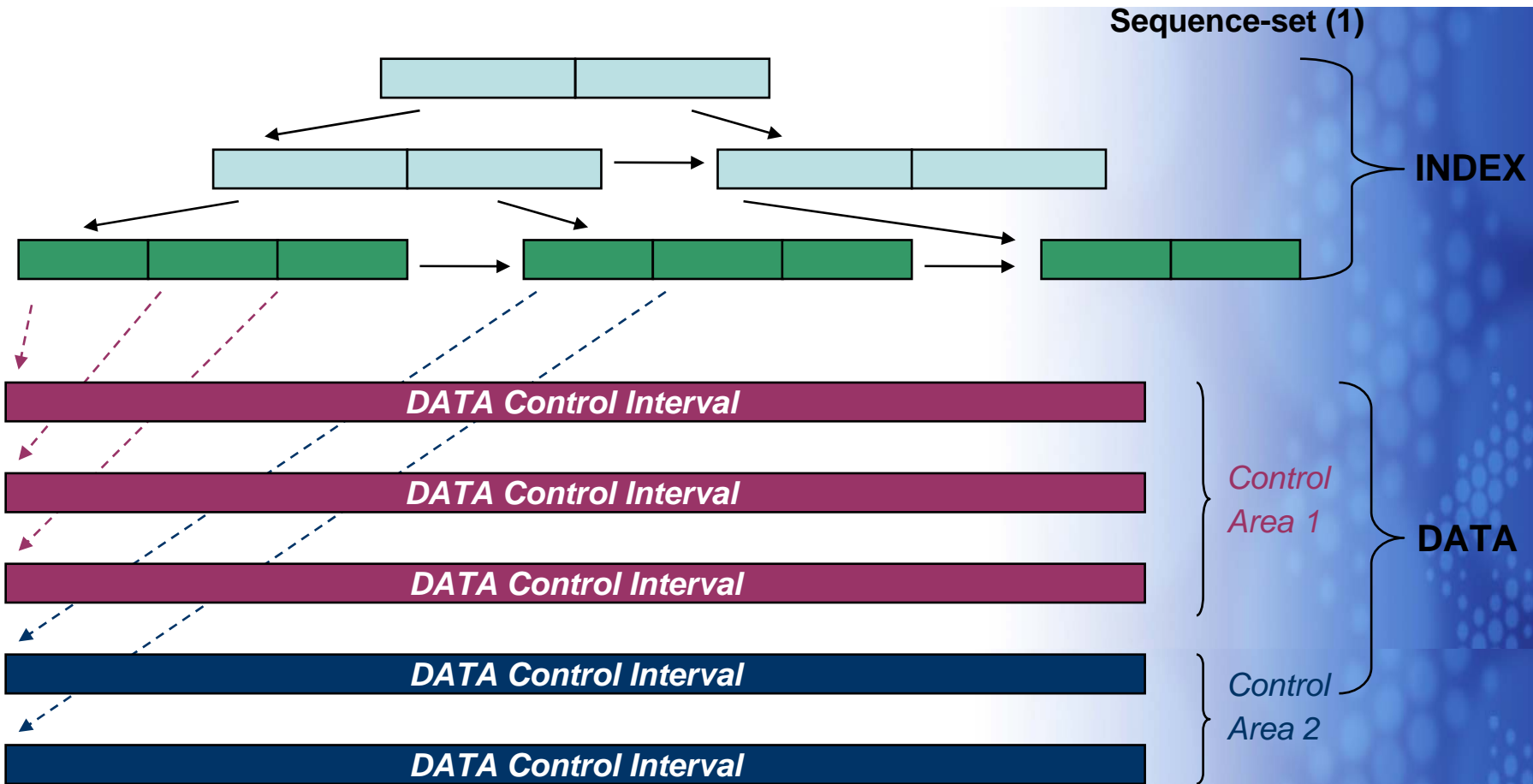
INDEX Analysis

Analysis of INDEX component of a <u>single</u> VSAM CLUSTER.

❖ **Error Analysis**

  ❖ Check for logic errors in the index part of a cluster:

    ❖ Duplicate CI pointer(s)

    ❖ *NEW Duplicate IXKEY(s)

    ❖ *NEW IXKEY length out of range

    ❖ Invalid pointer(s) inside of Index Component

    ❖ Invalid pointer(s) from Index to Data Component (RBA Error(s))

    ❖ Invalid pointer(s) from Index to Data Component (CI Pointer Error(s))

  ❖ *NEW Single Record Analysis

VSAM Index

High-level-index (1)

Intermediate-index (0-3)

Sequence-set (1)

INDEX

DATA Control Interval

DATA Control Interval

DATA Control Interval

DATA Control Interval

DATA Control Interval

Control Area 1

Control Area 2
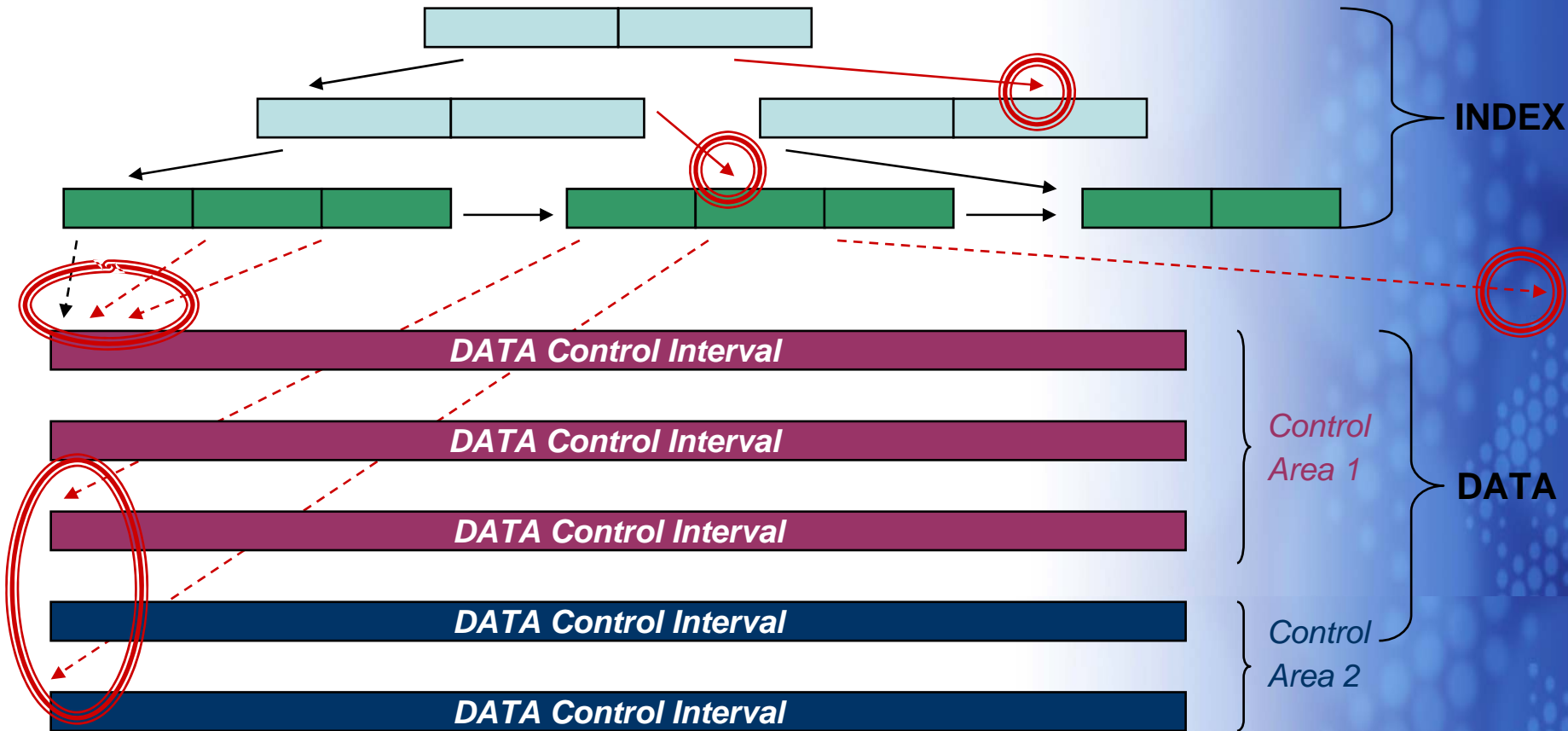
DATA

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Index

- ❖ Max 5 index levels
- ❖ High- Intermediate-levels index records point to lower index records only
- ❖ Lowest-level index records point to data records (sequence set)
- ❖ 1 index sequence set entry points to 1 data CI
- ❖ 1 index sequence set record points to all data CIs of 1 data CA
- ❖ 1 index record per index CI
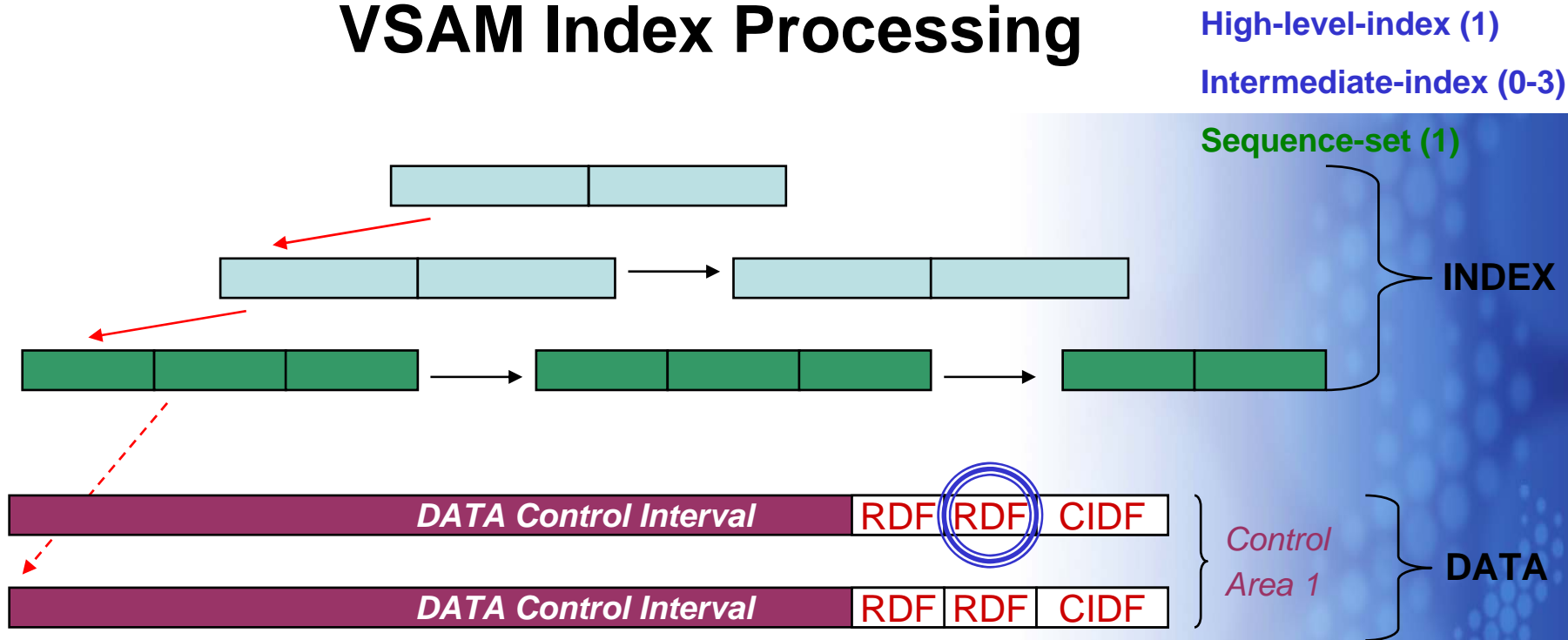- ❖ Different index records point to different data Control Areas

Index Errors

High-level-index (1)

Intermediate-index (0-3)

Sequence-set (1)

INDEX

DATA Control Interval

DATA Control Interval

Control Area 1

DATA Control Interval

DATA

DATA Control Interval

Control Area 2

DATA Control Interval

VSAM Index Processing

INDEX

DATA

| DATA Control Interval | RDF | RDF | CIDF |

| DATA Control Interval | RDF | RDF | CIDF |

Control Area 1

- ❖ RDF (Records Definition Field) keeps indicator if record is valid or invalid(deleted)

- ❖ Index records and record entries do NOT posses any indication about record validity

- ❖ ratio between High-Used-RBA & High-Allocated-RBA form a LISTCAT is NO indicaton about Index utilization

- ❖ Index will be not reduced in size even if all records in a VSAM file are deleted
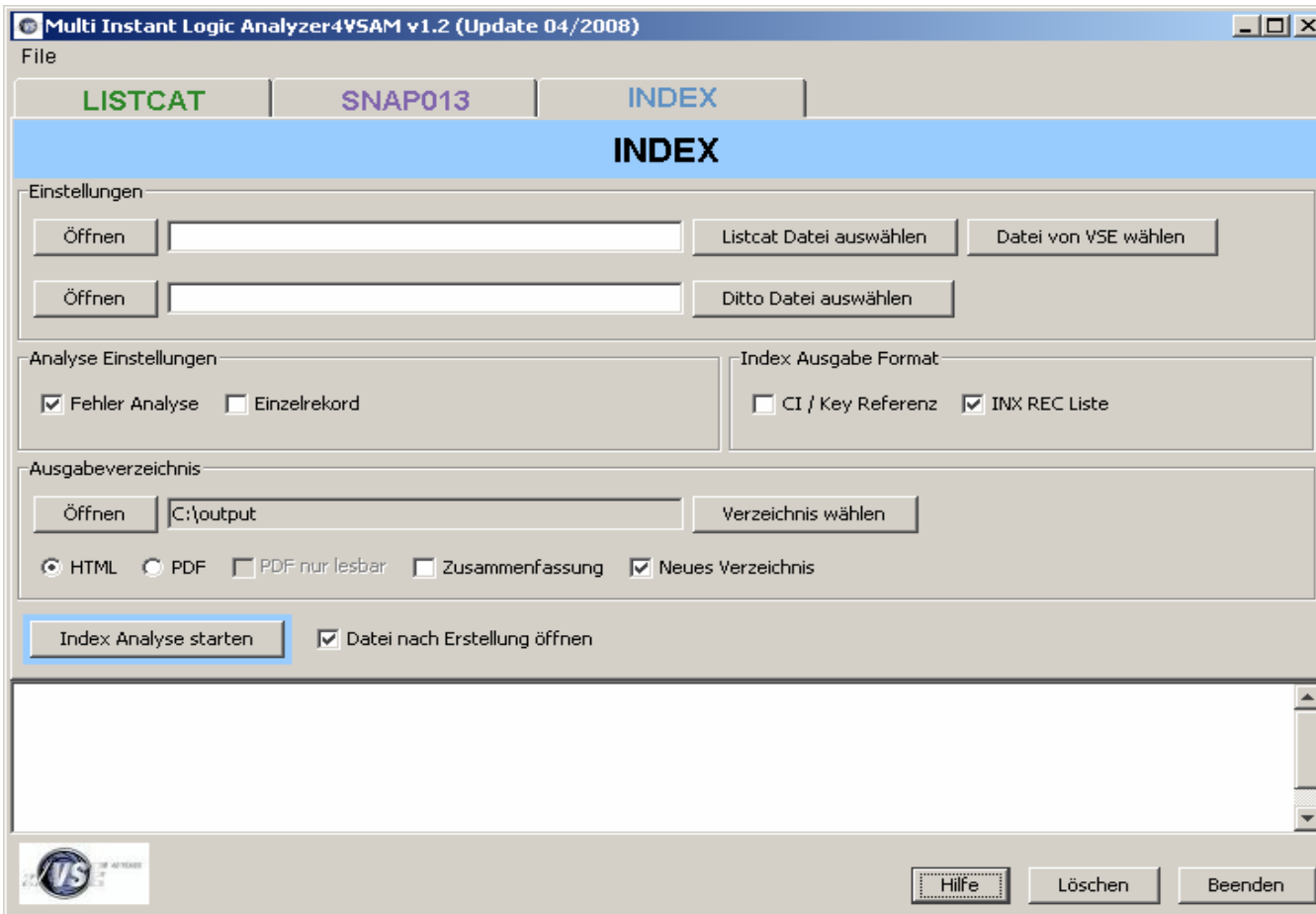
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INDEX Analyzer

INDEX Analysis Output

Invalid pointer(s) inside of Index Component

CYL-HD-REC	points to RBA	Error Description
00257-02-001	==> 1433	Invalid horizontal point (1433 % 1536(CISIZE) ≠ 0)
00257-02-002	==> 4026536448	> 23040(Index HUSRBA-OR-CI)

Summary
2 error(s) found.

Invalid pointer(s) from Index to Data Component (RBA Error(s))

CYL-HD-REC	Error IXKEY	points to RBA ((CI# * CISIZE) + IXBASRBA)	> (HUSRBA - 1)
00257-02-014	X'C5F4D5F4F1'	==> 8005632 ((X'2B' * 6144) + 7741440)	> (8000000 - 1)
	X'C5F4D5F4'	==> 8011776 ((X'2C' * 6144) + 7741440)	> (8000000 - 1)
	X'C5F4D5F5F8'	==> 8017920 ((X'2D' * 6144) + 7741440)	> (8000000 - 1)
	X'C5F4D5F6F7'	==> 8024064 ((X'2E' * 6144) + 7741440)	> (8000000 - 1)
	X'C5F4D5F7F8'	==> 8030208 ((X'2F' * 6144) + 7741440)	> (8000000 - 1)

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VSE BROWSER
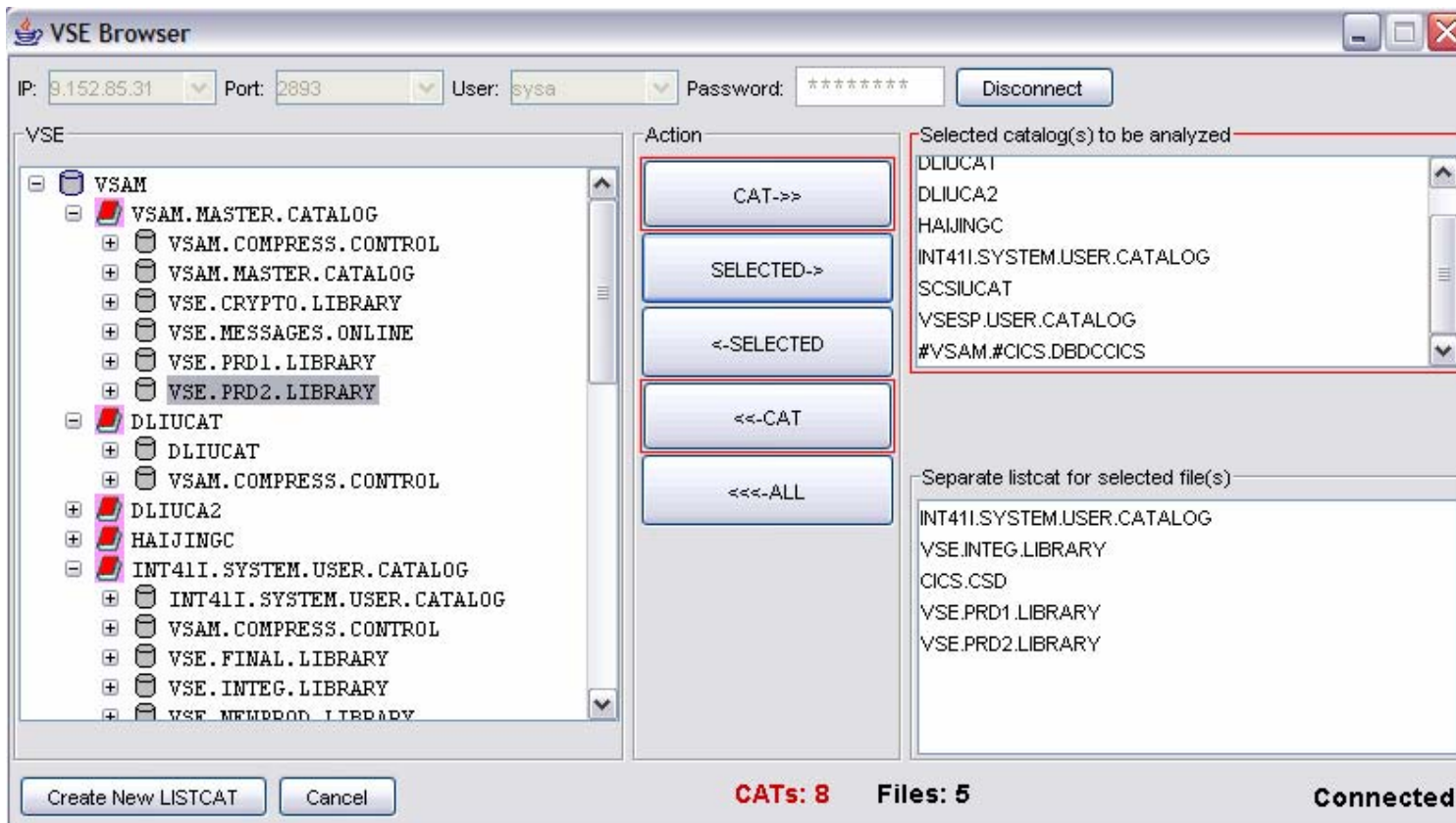
XML Configuration File

```xml
<?xml version="1.0" encoding="UTF-8" ?>
- <MILASettings version="2.0">
  - <ListCatSettings>
    - <Analyses>
        <ExtentsAnalysis enable="false" />
        <SpaceMapAnalysis enable="true" />
        <HALRBAHUSRBAAnalysis enable="true" />
      - <CapacityAnalysis enable="true">
          <Threshold>90</Threshold>
        </CapacityAnalysis>
    </Analyses>
  - <Output createFolder="true" autoOpen="true" type="pdf">
      <ExtendPDF summary="true" readOnly="false" />
      <ExtendHTML summary="false" separate="false" />
      <Path>C:\output</Path>
    </Output>
  </ListCatSettings>

    ...
```

DEFAULT-settings
ListCatSettings
Snap013Settings
IndexSettings

Analysis-settings
Output-settings

Batch Processing

```xml
<?xml version="1.0" ?>
- <MILAActions>
  - <ListCatActions>
    - <LCAction inputType="vse" serverip="111.222.333.444" serverport="5678"
        username="sysa" password="xxxxxxx">
      - <ListCatSettings>
        - <Analyses>
            <ExtentsAnalysis enable="true" />
        ... <SpaceMapAnalysis enable="true" />

        </Analyses>
      - <Output createFolder="true" autoOpen="true" type="pdf">
          <ExtendPDF summary="true" readOnly="false" />
          <ExtendHTML summary="false" separate="false" />
          <Path>C:\Documents and Settings\Administrator\Local
            Settings\Temp\</Path>
        </Output>
      </ListCatSettings>
      <LCInputCat catalog="VSAM.MASTER.CATALOG" password="xxxxxxx
      <LCInputCat catalog="DLIUCAT" password="xxxxxxx" />
      <LCInputCat catalog="DLIUCA2" password="xxxxxxx" />
      <LCInputCat catalog="SCSIUCAT" password="" />
      <LCInputCat catalog="VSESP.USER.CATALOG" password="" />
  </LCAction>
```

BATCH-settings
LCAction – Listcat Action
IAction – Index Action
analyze-settings
Output-settings
InputType=„vse"
LCInputCat - Listcat input
IInputCat - Index input

inputType=„file"
LCInputFile - Listcat
IInputFile – Index

Features

❖ All 3 tools have direct access to VSE systems using the VSE Connectors

❖ LISTCAT and/or DITTO JCL will be generated by the tools itself, transmitted to the selected VSE System executed and analyzed

❖ Batch-processing for LISTCAT- & INDEX Analysis via XML

❖ possibility to specify password for access protected VSAM catalogs

❖ profile to save user settings like TCPIP, PORT and USERID for multiple VSE Systems

❖ Analysis of multiple VSAM catalogs (LISTCAT) in a single step

❖ analysis summary for multiple catalogs

❖ MILA4VSAM does support German, English and Chinese language

❖ SCSI & FAT-DASD Support

*NEW Features with MILA4VSAM v1.2

- Added POWER JECL feature
- Index analysis can produce PDF output.
- Handle older Listcat formats for Listcat analysis
- Linux Support
- Added tracking information while running the batch function.
- Additional information added into the footer of PDF/HTML output.
- Index error processing expanded from 4 to 6 different error types
- handle single index record
- Summary for Index analysis.
- In Index analysis, it is possible to select multiple index files at once
- iText Libraries Versions from 1.4.8 up to 2.0.8 are now supported.
- Inter-File links between summary and output for Listcat and Index analysis
- Performance enhancements on Linux.
- More detailed error information for invalid or missing XML parameters.
- Listcat DATA&INDEX Capacity Analysis added
- Check for options IMBED & REPLICATE
- New SNAP013 Version 1 supported

VSAM Tools Outlook

❖ YOUR Ideas

❖ YOUR Requirements

Multi Instant Logic Analyzer4VSAM v1.2+

QUESTIONS ?

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