E13

VSAM Tools 2007
Multi Instant Logic Analyzer4VSAM v1.1

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

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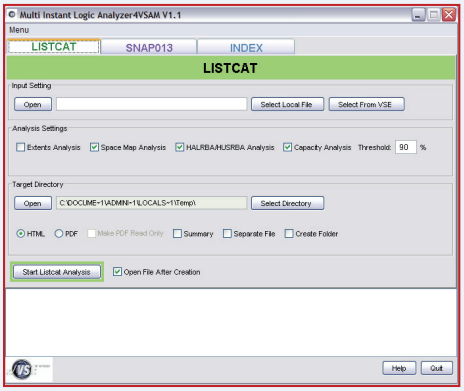
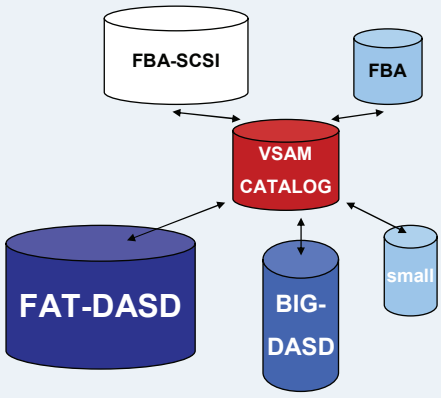
Multi Instant Logic Analyzer4VSAM v1.1

- **What is the Multi Instant Logic Analyzer4VSAM ?**
  - **A collection of multiple tools to analyze VSAM data instantly**
  - **Java based**
  - **VSE Connector integration**
  - **Available internally and to customers**
  - **Helps identifying & solving potential problems early**
  - **HTML / PDF output**
  - **First Version released Oct. 2006**



AGENDA

- LISTCAT Analyzer
- SNAP013 Analyzer
- INDEX Analyzer
- Features



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LISTCAT Analysis

- **EXTENT Analysis**
  - overlapping EXTENTs, invalid EXTENTs
- **SPACE-MAP Analysis**
  - detect defective areas (blocks/cylinders/tracks) within a VSAM space-map
- **Capacity-Analysis**
  - check if a cluster/AIX reaches the following cluster limitations:
    - Maximum file size of a cluster/AIX is 4 GB (except extented-addressed KSDS data comp XXL)
    - Maximum number of extents in the data/index component is 123

EXTENT Analysis

Invalid EXTENT

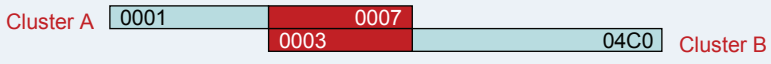
- EXTENT inconsistencies inside of LISTCAT output

```
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
```



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

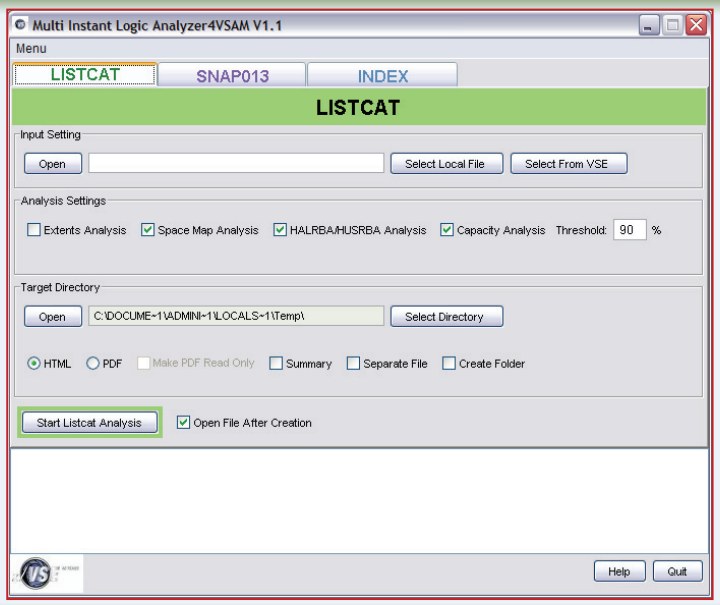
Capacity Analysis

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
```



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LISTCAT Analyzer

LISTCAT Analysis Output

Result of Space Map Analysis

Track(s) indicated as used but don't belong to a cluster	
Defect Start X'CCCCHHHH'	Defect End X'CCCCHHHH'
00010000	00010004

Note: The Track(s) in the table aren't an imminent danger.
They're only marked as used, but no cluster is affected.

Track(s) indicated as free but in use by cluster(s)		
Defect Start X'CCCCHHHH'	Defect End X'CCCCHHHH'	Affected cluster(s)
00070000	0007000E	VSAM.COMPRESS.CONTROL

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

Summary
2 defective space map(s) found.

LISTCAT Analysis Output

Result of Capacity Analysis

Cluster Name	Warning	Value
DLIUCAT	Data part extents reached the threshold (1%)	2 Extents (02%)
	Index part extents reached the threshold (1%)	134 Extents (109%)
VSAM.COMPRESS.CONTROL	Data part extents reached the threshold (1%)	1 Extents (01%)
	Index part extents reached the threshold (1%)	1 Extents (01%)

Summary

4 capacity warning(s) found.

Summary

Catalog Name	Status	Details
DLIUCAT	Error	did show critical error(s).
		4 error(s) found during Extent Analysis.
		2 defective space map(s) found.
		2 defective space map(s) found.
		4 HALRBA/HUSRBA error(s) found.
		4 capacity warning(s) found.

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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)

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 S13)
  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 (1-13) or only one specific can be disabled
  DISABLE SNAP=013 -or- *DISABLE SNAP=ALL*

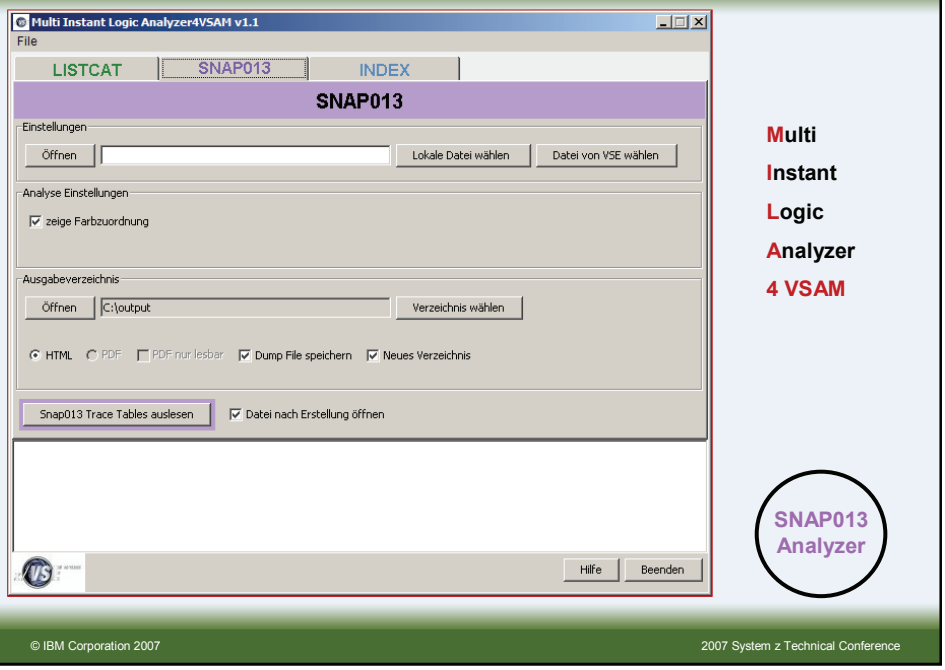
SNAP013

- 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



SNAP013 Analysis Output

Time	Type	Information
0,0ms	PsydoOPEN	D76CBE1F 06A027C4 00662098 DAA01108 00E3F390 40880400 00201000 00000000 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 14632708 0A86FC18 00000100 00000000 0A000000 03652454 37480000 VSE Task ID: 27 String Number: 10 / RPL Address: 86FC18 Tracepoint: 08 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 146A2708 0A86FC18 00000000 E5C1C8D2 F4F0F600 0FA90004 0A000000 VSE Task ID: 27 String Number: 10 / RPL Address: 86FC18 Tracepoint: 08 IKQBFC50 Unlock DTL Name: E5C1C8D2F4F0F6000FA90004 "VAHK406" Return Code (Reg15): 00 Successful
33m 12s 351,1ms	EXCPAD	C56CC58B 147A2710 0A86FC18 00FA4E00 00000000 00000000 03652454 0086FC18 VSE Task ID: 27 String Number: 10 / RPL Address: 86FC18 Tracepoint: 10 IKQIOD (EXCP) CCB Address: 00FA4E00
33m 12s 367,2ms	Return from EXCPAD	C66CC58B 18632710 0A86FC18 00F0C8C4 00000000 00000000 03652454 0086FC18 VSE Task ID: 27 String Number: 10 / RPL Address: 86FC18 Tracepoint: 10 IKQIOD (EXCP) CCB Address: 00F0C8C4
33m 12s 367,3ms	RSCB	E26CC58B 186B2721 0A86FC18 00F0C898 03658C70 E2A9D000 FFFFFFFF 00000000 VSE Task ID: 27 String Number: 10 / RPL Address: 86FC18 Tracepoint: 21 IKQBFA Label CIFRE010 release RSCB lock RSCB Address: 03658C70 Previous RBA value: E2A9D000 New RBA value: FFFFFFFF
33m 12s 367,4ms	RETURN	D96CC58B 18722700 0A86FC18 0C990000 E2A9D802 00000000 00000000 00000000 VSE Task ID: 27 String Number: 10 / RPL Address: 86FC18 Tracepoint: 00 Normal Exit (IKQVSM) PLH Condition Flags: 00 PLHDSW: 00 PLHDSW1: 00 PLHUSE: 00 PLH invalid / Prev record / Not EOD / No I/O pending / Do not skip / No restart / Not first time RPLFDBK: 000000 Record Mgmt Internal Return code: 00
33m 12s 367,5ms	INPUT	C96CC58B 187A2700 09865E88 04A8A006 E2A9D802 3114691C 00001C40 DAA00000 VSE Task ID: 27 String Number: 9 / RPL Address: 86565E8 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

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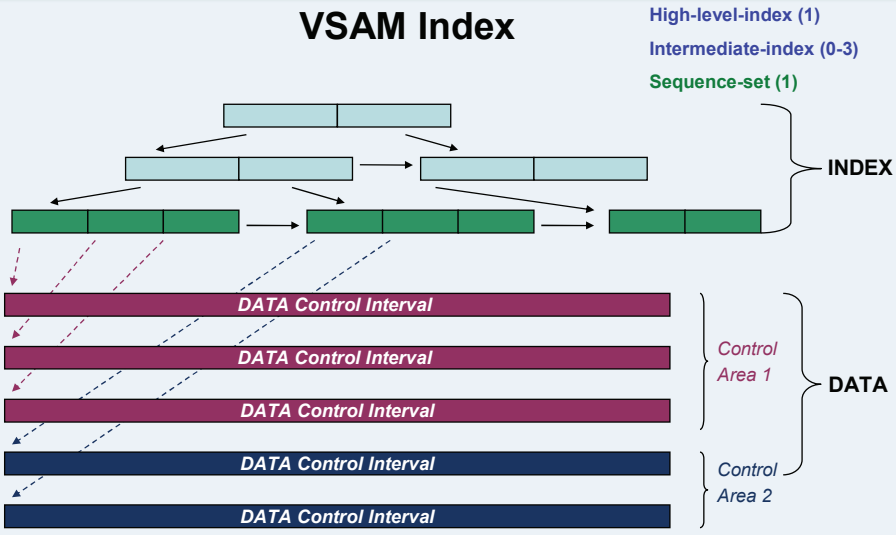
NEW

INDEX Analysis

Analysis of INDEX component of a single VSAM CLUSTER.

- **Error Analysis**
  - Check for logic errors in the index part of a cluster:
    - Duplicate CI pointer(s)
    - 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))

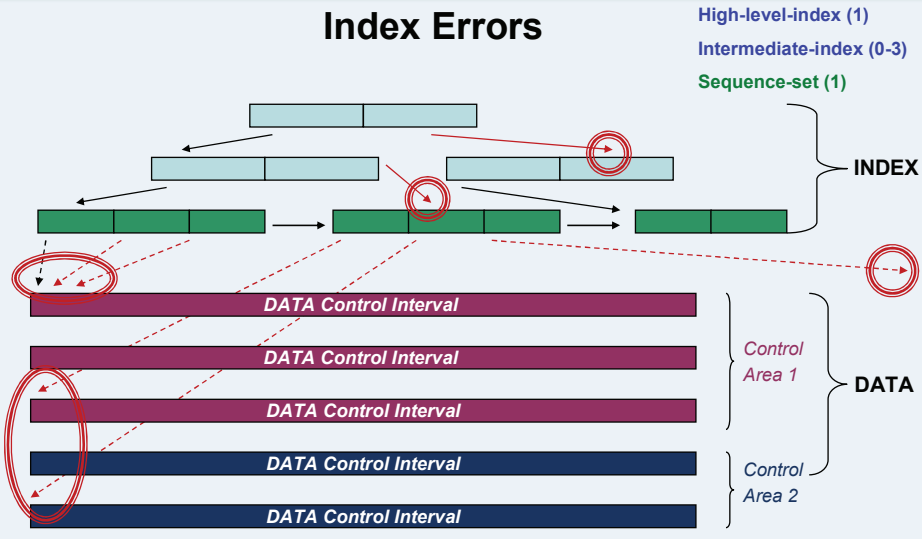
VSAM Index



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



NEW INDEX Analysis

Capacity-Analysis (Reorganisation-Indicator)

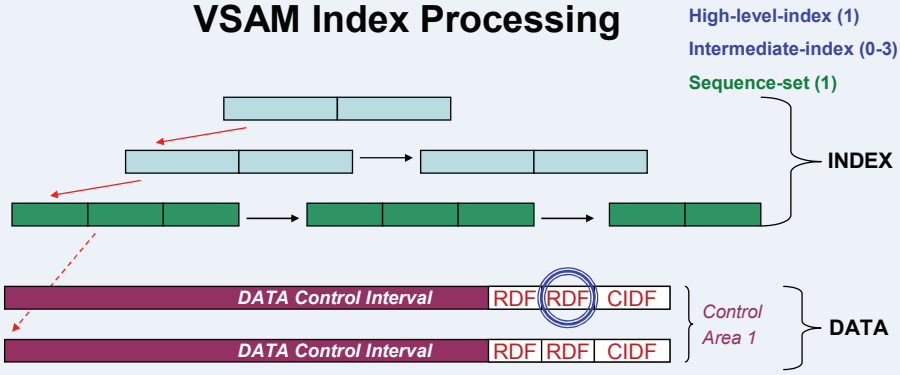
During delete of data records only data component of cluster is updated but index component is unchanged

- 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

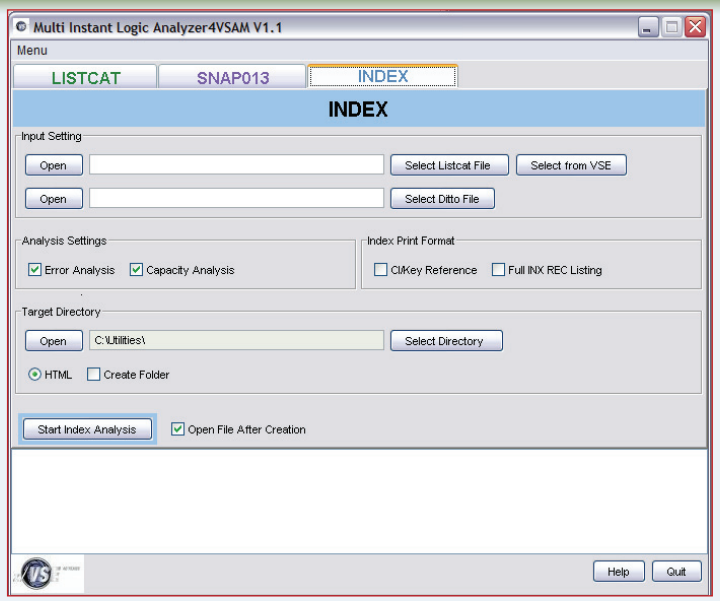
SOLUTION:

- capacity-analysis will identify the real number of used index records and provide an „% used reorganisation indicator“
- check if reorganization is necessary or recommended for a cluster

VSAM Index Processing



- 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)

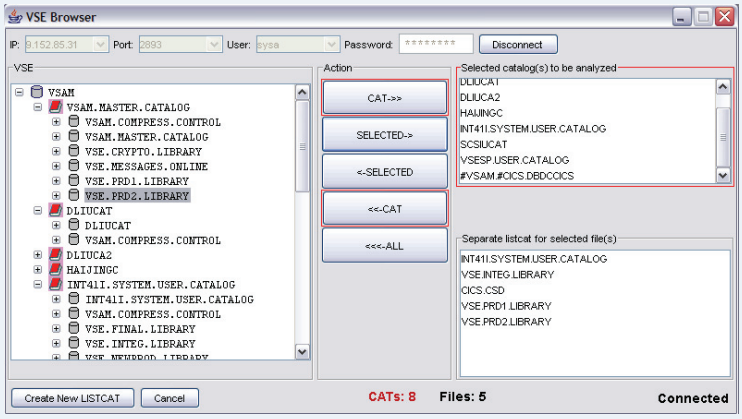
Result of Capacity Analysis

Based on our index calculations at least 47% of the file space is unused.

Note: our calculations are based on MAXLRECL. If most records in this particular file have a size smaller then MAXLRECL, the free % can even be higher.

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 ***NEW***
- possibility to specify password for access protected VSAM catalogs ***NEW***
- 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***



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VSE BROWSER

XML Configuration File

```
<?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 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="xxxxxxxx" />
  <LCInputCat catalog="DLIUCAT" password="xxxxxxxx" />
  <LCInputCat catalog="DLIUCA2" password="xxxxxxxx" />
  <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

VSAM Tools Outlook

- MILA4VSAM enhancements
  - **Tool performance,**
  - **PDF output for INDEX Analyzer** *available with v1.2*
  - **VSAM statistics,**
  - **POWER JECL adaption** *available with v1.2*
  - **CATALOG record browser...**
  - YOUR Ideas and Requests
- Prototype/SAMPLE how to use, control and monitor a VSE System via Lotus Notes

Multi Instant Logic Analyzer4VSAM v1.1

QUESTIONS ?

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