State-of-the-Art

z/OS Catalog Management
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INTERCHIP AG

- Services large scale data centers in Germany, Austria, and Switzerland
- Distributor for high quality software
- Development and worldwide support of z/OS system software
Software Development

- 1989 Optical Disk Storage Control
- 1989 GoSMS (incl. STOPX37 II)
- 1990 Space Guard
- 1994 MainControl
- 1995 RTD RealTime Defrag
- 1995 RTS RealTime Standards
- 1995 SWB SMS Workbench
- 2008 RTM
Software Distribution

- 1989 Softworks  > Catalog Solution
- 1990 Serena    > ChangeMan
- 1994 Tivoli    > Tivoli
- 1998 Mainstar  > Catalog & Storage Management
- 2004 IntelliMagic > DASD I/O Performance Management
- 2007 Dino      > T-REX
- 2010 Zephyr    > Passport
Product Portfolio

- **Storage Management**
  - RTD
  - T-REX / TERADON / REORGADON / VELOCI-RAPTOR

- **Workload Automation**
  - Stonebranch OpsWise

- **Software Change Management**
  - ISPW

- **IT Library Management**
  - iSolve / iMatch

- **Terminal Emulation**
  - Passport
DINO-Software Corp.

- Specialists in OS/390 and z/OS mainframe VSAM record management, catalog management, storage management and disaster recovery
- Original authors of VSAM MECHANIC, CATALOG SOLUTION, CAT SCAN, VVDS FORWARD RECOVERY, I/O PLUS, PERFORMANCE ESSENTIAL, Tape/Copy
Experienced

- All (5) original developers of CSL on staff
- PM, 3 Senior developers of CR+ on staff
- Over 25 years experience (average per dev)
- 24x365 support
- Zero turnover since inception (2002)
Education

- ICF Catalog Recovery Seminars
  - North America
  - Europe
  - Asia

- Technical Publications
  - ICF Catalog Structures
  - SMF Forward Recovery
Other Dino Products

- **REORGADON** - online HSM reorg
- **TERADON** - online repro mergecat
- **VELOCI-RAPTOR** - performance buffering
- **XTINCT** - DASD/tape initialization
- **DAN** - Dino Healthcheck Analysis for Networker (Legato)
- **SENTINEL** - realtime FTP management
Catalog Structures
Basic View

BCS

VVDS

VTOC

VTOC
Catalog Management
Yesterday

- EXPORT / IMPORT
- ICFRU
- BCS REORG
- REPRO MERGECAT
- ANALYZE
  BCS ↔ VVDS ↔ VTOC
- LISTCAT
Catalog Management
State-of-the-Art

• Flexibility
• Depth
• Performance
• Automated Auxiliary Actions
• Built-in Safeguards
• Scope
# T-REX Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Command</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANALYZE</td>
<td>EXPORT</td>
<td>REORG</td>
</tr>
<tr>
<td>AUDIT</td>
<td>ICFRU</td>
<td>REPORT</td>
</tr>
<tr>
<td>COMPARE</td>
<td>IMPORT</td>
<td>REPRO</td>
</tr>
<tr>
<td>DELETE</td>
<td>INTEGRITYCHECK</td>
<td>RESTORE</td>
</tr>
<tr>
<td>DIAGNOSE</td>
<td>LISTCAT</td>
<td>SCRUB</td>
</tr>
<tr>
<td>DISPLAY</td>
<td>LISTHSM</td>
<td>SYNCH</td>
</tr>
<tr>
<td>DRIMPORT</td>
<td>MODIFY</td>
<td>TAPEAUDIT</td>
</tr>
<tr>
<td>DUMP</td>
<td>PRINT</td>
<td>TAPEREPOR</td>
</tr>
<tr>
<td>EXAMINE</td>
<td>REFORMAT</td>
<td>ZAP</td>
</tr>
</tbody>
</table>
Flexibility

EXPORT

- Multiple OBJECT support - BCS, VVDS, KSDS, ESDS, VRRDS, RRDS and LINEAR
- Bypass the index (if present)
- ALIAS support for catalogs
- Portable dataset record support
  - No manual redefinition
  - No building of IDCAMS control cards
- Invocation of DIAGNOSE and EXAMINE
Flexibility
EXPORT

- Supports multiple backup copies
- Masking for OBJECT and output DDName
  - BCS((BACK*,**))
  - BCS((BACK*,ICFCAT.**),(BACKDR,TEST.**))
  - VVDS((BACK0*,PROD*))
  - DSN((BACKVS,PROD.CLUS*.**))
Depth

- Comprehensive set of parameters
- Most optional
- Special options for special situations
Depth
INTEGRITYCHECK (1)

- Our own set of DIAGNOSTICS
- BCS, VVDS and VTOC
- Master Catalog, BCS and ALIAS relationships
- Emphasis on detection and correction of problems, not just identification
Customer requests:

- Do more than generate corrective control cards
- Detect and dynamically correct mismatched catalog entries
- Support multivolume VSAM and non-VSAM objects
- Decrease diagnostic elapsed time
Depth
INTEGRITYCHECK (3)

• Catalog Relationships
  • OBJECT(BCS)
  • OBJECT(VVCR)
  • OBJECT(CATALOGSTRUCTURE) – FOCUS(BCS)
  • OBJECT(CATALOGSTRUCTURE) – FOCUS(VOL)
Depth
INTEGRITYCHECK (4)

- **OBJECT(BCS) and OBJECT(VVCR)**
  - SYS1.VVDS.Vvolser validation
  - Verification of dual pointers
  - Cross reference of all related VSAM and non-VSAM entries
  - Cross reference of related catalogs
  - Removal of obsolete VVDS references
Depth
INTEGRITYCHECK (5)

- **OBJECT(CS) FOCUS(BCS)**
  - Invokes OBJECT(BCS) processing
  - Validates the VTOC and VVDS relationships for every entry in a BCS (extent, RBA and record validation)
  - Two way validation of information
  - DELETE NOSCRATCH
Depth
INTEGRITYCHECK (6)

- **OBJECT(CS) FOCUS(VOL)**
  - Invokes OBJECT(VVCR) processing
  - Validates the VTOC and VVDS relationships for every entry on a volume (extent, RBA and record validation)
  - Two way validation of information
  - Processes volumes with or without a VVDS
  - DEFINE
Depth
INTEGRITYCHECK (7)

- ALIAS Relationships
  - OBJECT(ALIAS)
  - FOCUS(BCS)
  - FOCUS(CROSS-SYSTEM)
  - FOCUS(MASTERCAT)
  - FOCUS(MASTERCAT-BCS)
Depth

INTEGRITYCHECK (8)

- **OBJECT(ALIAS) FOCUS(BCS)**
  - List related aliases for each BCS
  - List number of datasets/alias
  - Uses existing MLA value
  - Optional removal of alias entries without any related datasets
  - ALTERNATEMASTER option
Depth

INTEGRITYCHECK (9)

- **OBJECT(ALIAS) FOCUS(CROSS-SYSTEM)**
  - Synchronize alias entries relating to a BCS across two or more master catalogs
  - CONTROLMASTER
  - Redefinition of missing aliases
  - Unlimited MASTERCATALOG specification
Depth

INTEGRITYCHECK (10)

• First product to offer
  • AUTOFIX capabilities
  • Support the recataloging of multivolume VSAM and non-VSAM objects
  • Multitasking to process multiple catalogs, VVDSs and VTOCs at once

• Comprehensive validation regardless of the “FOCUS”
Performance

• **Multitasking**
  - Up to 32 concurrent subtasks
  - DYNAMIC subtask specification
    • One job optimal for all environments
  - Each subtask processes a separate object
  - Dynamic load balancing of subtasks

• **Patent-pending “I/O burst” technology**
EXPORT
Single-thread

Other Products

BCS1  ➔  BCS2  ➔  BCS3  ➔  BCS200
Performance EXPORT

T-REX Multi-Thread (9 subtasks)

BCS1 → BCS10
BCS2 → BCS12 → BCS14
BCS3
BCS4
BCS5 → BCS13
BCS6 → BCS15
BCS7
BCS8 → BCS11
BCS9

• • • BCS200
Performance

CUSTOMER TESTING – T-REX runs in approximately half the elapsed time as the competition.
REORG

- REORG of a BCS “WHILE OPEN”
- “INPLACE”
  - Use current allocation/attributes
- Delete/define the object
  - Modify attributes
    - Data/Index Allocations (primary and secondary)
    - CA/CI Freespace
    - CI Size
    - ...
  - Same or new volume
- Shared BCS fully supported
REORG

Synchronization

EXPORT

“In Place” vs DELETE/DEFINE

IMPORT

Synchronization

64 bit memory
Automated Actions
REORG

• Identify related systems via SYSTEMS keyword
• AMTREXRG proc is started on each system
• Each system locally serializes access to the catalog
• Each system notifies main REORG task synchronization is complete
• REORG is performed after all systems have replied
• Automatic REORIENTATION if the BCS has moved to a new volume
• Post-REORG verification
Built-in Safeguards
Simulation

- **SIMULATE** supported for all action commands
- **SIMULATE=YES**
  - Default (user option)
  - Prevent unintentional actions
Simulation REORG INPLACE

- Verify communications with each system
- Backup BCS
- Benchmark for backup phase only (No reload performed)
Simulation

REORG REDEFINEOBJECT

• Verify communications with each system

• Backup BCS

• SIMCAT – Target BCS
  • ACS routines invoked
  • BCS reloaded to target
  • ALIASes not changed
  • Post-REORG validation

• Benchmark all phases except ALIAS processing
Simulation
REPRO MERGECAT

- Selection logic verified
- BCS record relationships verified
- Duplicate entries detected
- ENQ conflicts detected
Catalog Structures Today

- BCS
- VVDS
- VTOC
- VTOC
- HSM
- TMC

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Scope

BCS ↔ MCDS

- Simple to compare entries
- But, is migrated dataset recallable?
HSM/E AUDIT
MCDS Structure - nonVSAM

MCA Record
- key
- ...
- dsn
- ...

MCD Record
- Key (dsn in BCS)
- volume
- flags
- migration date
- original volume
- devicetype
- migration name
- ...
- blocks
- TTOC extension #
- ...

MCV Record
- key
- devicetype
- flags
- ...

TMC

DASD

SDSP or ML1

OCDS TTOC Record
- key
- unit
- block count
- previous volume
- next volume
- migration dataset 1
- migration dataset 2
- ...

TAPE

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Scope
HSM/E AUDIT

- HSM BCDS/MCDS/OCDS Auditing
- Structural/RECALL (MCDS)
- Optional validation by record type
- Generation of corrective control cards
  - FIXCDS and IDCAMS
- HSM/E ISPF panels to correct errors
Scope
RAPTOR (1)

Tape Management Systems supported:

- RMM – z/OS 1.12 and older
  - OS/390 2.10 and older
- Control-M Tape – R6.3 and older
- CA1 – R11.5 and older
- TLMS – R11.5 and older
- ZARA – R1.7 and older
TAPEAUDIT:

- BCS to TMC and TMC to BCS validation
- Selection by catalog, DSN, range and volume
- Lists uncataloged data sets residing on tape
- Lists BCS tape data set entries that no longer exist on tape
- Lists tapes recorded in the TMC as being/not being SMS managed and are out-of-sync with the SMS managed tape BCS entries
Scope
RAPTOR (3)

Lists tapes recorded in the TMC as residing / not residing in a robotic / virtual tape library and are out-of-sync with the robotic/virtual library database

- IBM LCS z/OS R1.12 and older
- Oracle/Sun/STK HSC R6.2 and older
- CA Vtape R11.5 and older
Summary

- Seat Belts (2-point)
- Automatic Seat Belts (3-point)
- Headrests
- 8 Airbags
- ABS
- ASR
- ESP
T-REX

T-REX is marketed and distributed in D, A, and CH by:

INTERCHIP AG
Elektrastraße 6
D-81925 München

Tel.: +49 - 89 - 99 14 99 0
Support@interchip.de
www.interchip.de

T-REX is owned and developed by:

DINO-Software Corp.
1912 Earldale Ct., S-200
Alexandria, VA 22306
USA

www.DINO-Software.com
Questions?