E25

IMS FastPath Tool Pack

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Agenda

- IMS FastPath Basic Tools for OS/390
  - DBT V3 DEDB Unload/Reload enhancements
  - DBT V3 Pointer Checker enhancements
- IMS FastPath Online Tools for OS/390
  - Online Data Extract
  - Online Pointer Checker
- IMS DEDB Fast Recovery

IMS FastPath Basic Tools

- 5655-E30
- Package consists of:
  - DEDB Unload / Reload
  - DEDB Pointer Checker
  - DEDB Tuning Aid

Unload Reload Enhancements

- DBRC support
- ADS dynamic allocation support
- User Exit (compression/expansion) on Unload & Reload
- SDEP support
- FABCUR5
  - Create database definition record dataset (DURDBDFN)
- FABCUR6
  - Application API to create reload file
- FABCUR7
  - Application API to read unload file
- FABCRIMF enhanced
- FABCUR9
  - HDAM/HIDAM to DEDB, DEDB to HDAM/HIDAM conversion aid
  - also DEDB to DEDB, HDAM to HDAM, HIDAM to HIDAM
- Optional new unload file format

Unload Reload Enhancements

- DBRC support
  - Optional (DBRC=Y|N)
    - Default is N
  - Unload verifies:
    - Area not authorized for update
    - Area has no EEQEs
    - Area not RECOVERY NEEDED
    - Area has available ADS
    - If MADS in use, one ADS is selected for use in unload
  - Verification done twice
    - Start of Unload
    - End of Unload
  - MADS support: Reload can reload all registered ADSs
  - Reload verifies
    - Area is RECOVERY NEEDED
  - Reload Completion sets
    - ADS AVAIL
    - RECOVERY NEEDED OFF
    - IC RECOMMENDED ON

Unload Reload Enhancements

- Dynamic Allocation support
  - If DBRC=Y and Area registered
    - ADS DSN selected from DBRC
    - Can override via JCL (DSN must match DBRC)
  - If DBRC=Y and Area non registered
    - ADS DSN obtained from DFSMDA member
    - Can override in JCL
  - If DBRC=N
    - ADS DSN obtained from DFSMDA member
    - Can override in JCL
  - If DBRC=Y, RECONx can be dynamically allocated using DFSMDA members

Unload Reload Enhancements

- User Exit support on Unload & Reload
  - FABCUR1 (Unload)
    - EXITRTN=Exit-name
    - Loaded from EXITRTN DD statement
    - Invoked with EXPAND parameter
  - FABCUR3 (Reload)
    - EXITRTN=(Exit-name, function)
    - Loaded from EXITRTN DD statement
    - Function: EXP, CMP, EXC
      - EXP - Expand
      - CMP - Compress
      - Expand then Compress (call exit twice)
  - Note, this is not the same as the COMPRTN= specification on DBDGEN

Unload Reload Enhancements

- SDEP support
  - FABCUR1 (Unload)
    - SDEP = NO|LOGICAL|PHYSICAL
      - Default NO
    - LOGICAL
      - Unload via pointers
      - If root deleted SDEP segment not unloaded
      - segment timestamps reset on Reload
    - PHYSICAL
      - Unload in physical order between LB and LE
      - supports marker segment processing
      - segment timestamps preserved
      - segment unload even if parent root deleted
      - can't change CI Size on reload
      - Compressed SDEP segments not expanded
      - Can expand SDEP portion of the Area on reload

Unload Reload Enhancements

- SDEP support
  - FABCUR3 (Reload)
    - No control card, triggered by SDEP segments in unload file
    - CI format depends on DBD in ACBLIB (NEWACB, OLDACB)
      - Can unload V5 and reload V6 format, or vice versa
      - V6 and higher CI Prefix will show c'FPTOOL ' as subsystem.
    - LOGICAL Reload sets segment timestamps to Logical Begin Timestamp unloaded from DMAC
    - LOGICAL Unload requires SORT before Reload
      - FABCUR1 generates SORT control card
    - LOGICAL reload requires new DURSDWRK DD
      - work file, equal in size to total SDEP segments unloaded
    - PHYSICAL REORG mode only (NEWACB not allowed)
      - (no change to Area Structure)
  - FABCUR6, FABCUR7 (Application read/write UR file)
    - Support SDEP segment type

Unload Reload Enhancements

- FABCUR5
  - Can be used to create a DURDBDFN file from ACBLIB
  - Useful for moving DEDB area between systems
  - Useful for reloading from Online Data Extract file

Unload Reload Enhancements

- FABCUR6
  - Callable application API to create reload file(s)
  - Simple API: three calls
    - INIT
      - Input : DBDNAME
    - PUT
      - Input: SEGMENT NAME, SSP data, SEGMENT DATA
    - EOJ
  - Creates a reload file per Area in DB
  - API compatible with OEM APIs

Unload Reload Enhancements

- FABCUR7
  - Callable application API to read unload file(s)
  - Can read 1 or 2 unload files
  - Simple API: three calls
    - INIT | INID
      - Single or Dual mode
    - GET | GET1 | GET2
      - Single mode or GET from file1|2
      - Returns segment data, status code, segment information (type, rootkey, etc)
    - EOJ
  - API compatible with OEM APIs

Unload Reload Enhancements

- FABCUR9
  - Conversion or Migration Aid
    - BMP,DLIBATCH,DBDBATCH
      - BMP required if loading DEDB
    - Accepts both DBT UR formats or HDAM/HIDAM Unload as input
      - HD Unload to DEDB
      - HD Unload to HIDAM or HDAM
      - DEDB Unload to HDAM or HIDAM
      - DEDB Unload to DEDB
    - Remap Segment names, or change Segment RECFM (F|V)
    - Can REPL Segments in existing DB from data in unload file.
    - Can use any PSB with appropriate DB & sensitivity
      - Assembler PSB with COMPAT=N not required
      - Target DB can be anywhere in PSB

Unload Reload Enhancements

- FABCRMIF enhancement
  - API to invoke randomizer from application program
    - including outside of IMS
  - Useful to sequence files, DB2 tables, in RAP order
  - Simple API:
    - INIT call
      - Input DBD name
    - CALC call
      - Input key
      - Output Area# RAP#
  - Requires ACBLIB DD statement in invoking job
  - Enhanced to in DBT V3 to allow up to 16 different DBDs in same job

Unload Reload Enhancements

- New Unload File Format
  - FABCUR1 FMT=TFMT|DBT
  - FMT=TFMT
    - Prefix (SCSQ data) trimmed to minimum for segment level defined in DB.
    - Smaller output file.
    - Compatible with OEM for applications that read unload file natively.
      - Header record (Area Control Record) still present
  - Default is FMT=DBT
  - FABCUR3 detects reload file format automatically

Pointer Checker Enhancements

- DBRC support
- Dynamic Allocation support
- Compatibility change for AREA= keyword
- FABARMIF enhancement

Pointer Checker Enhancements

- DBRC support
  - DBRC=Y|N and FORCE=Y|N
    - Default DBRC=N
  - DBRC=Y Verifies Area:
    - Not authorized for update
    - No EEQEs
    - Not RECOVERY NEEDED
    - Registered DSN vs DARVSAM DD or <area> DD DSN
  - FORCE=Y and DBRC=Y
    - Continue processing if some or all of the above, after issueing an error message

Pointer Checker Enhancements

- Dynamic Allocation support
  - Use DFSMDA member if provided
    - ADS and RECONs
  - Not obtained from DBRC

Pointer Checker Enhancements

- AREA keyword change
  - VSAM not coded and AREA= coded
    - Image copy input, verified against AREA= value
  - VSAM and AREA= coded
    - ADS input, verified against AREA= value
  - VSAM coded, AREA= not coded
    - ADS input, using Area Name from DMAC of ADS input
  - Neither VSAM nor AREA= coded
    - If DARVSAM coded, ADS input
    - Otherwise, DFSUDUMP expected, Image Copy input
  - Change made for OEM compatibility

Pointer Checker Enhancements

- FABARMIF enhancement
  - Support added for up to 16 different DBDs in single run
  - Same as FABCRMIF in Unload/Reload

IMS FastPath Online Tools

- 5655-E31
- IMS FastPath Basic Tools is a prerequiste.
- Package conists of:
  - Online Data Extract
  - Online Pointer Checker

Online Data Extract

- Select and extract data from online DEDB area
  - Selection by
    - Segment name
    - Segment name and offset, length, data comparator
    - Selection is hierarchical
      - If higher level segment qualifed, qualification must match for lower level segments to be considered
    - SDEP segment type is supported
  - Output
    - Entire segment
    - Segment fragments by offset, length
    - Mutiple output file formats
      - Standard
      - Both DBT Unload | Reload formats
      - Format suitable for sort on root key

Online Data Extract

- Runs as IFP Utility region
  - TYPE TOOL
  - EXITNAME EXTRACT
- Uses IMS Services to read and lock data
  - UOW mode locking
  - SHR locks only
  - Reads entire UOW in one operation
    - Locks held while pointer chains followed
    - IOVF CIs read individually as required
- Guarantees consistent view of data being updated concurrently by online work

Online Data Extract

- Multiple Area processing
  - Can process multiple areas serially in single utility run
    - Same as other IFP utilites (SCAN, DELETE, HSREORG)
  - Output can be combined into a single output file, or can be written to a unique file per Area processed.
  - Control statements (SELECT, OUTPUT) can be specified at the run level or at the area level.
    - Area level requires a separate input file per Area
    - Input file DDNAME = Area Name
  - Unload | Reload format output requires separate output file per area

Online Data Extract

- SDEP Processing
  - Similar to SDEP Scan
  - Pointer chains NOT used
    - Root does not have to match SELECT criteria
    - Root may not even exist (deleted).
  - Can select by timestamp
    - Can recover from SDEP processing errors by extracting logically deleted SDEPs (if not yet overwritten).
    - Default timestamp is Area Logical_Begin_Timestamp so normally deleted SDEPs not extracted.
  - Considerations:
    - SDEP segments written at end of extract file, not immediately following the root
    - Not supported for DBT UR output format

Online Data Extract

- Compression Exit support
  - EXPAND=Y|N
    - Y = Segment expanded prior to applying select criteria, and segment, or segment fragment, expanded in ouput file.
    - N = Segment not expanded. Can still select by compressed value if desired.
  - Exit must be loadable via STEPLIB
  - Exit can't use or depend on IMS Control Region services or control blocks.
  - Exit only required if a compressed segment is selected for evaluation and EXPAND=Y.
    - Don't require exit to navigate segment hierarchy

Online Data Extract

- Optimzed access via Randomizer
  - If root segment SELECT is qualified, and qualification is EQ compare on root key
  - Randomizer used to determine and limit UOWs read
  - Randomizer load module not required in STEPLIB.
    - IMS's copy of the randomizer is used.
    - Ensures same randomizer in effect.
    - Randomizer can't use IMS services or access IMS control blocks other than MMRB as documented in Customization Guide.

Online Data Extract

- Security
  - RACF validation
    - CLASS(IMSTODE)
    - ENTITY(imsid.dbname.areaname)
    - ATTR=READ

Online Data Extract

- Application I/O Interface Routine FPXGXDR0
  - Isolate application programs which read ODE output file from knowledge of ODE file format and future changes
  - Supports up to 9 ODE files
  - "DL/I like" interface
    - INIT | INIx
    - GET | GETx
    - EOJ | EOJx
  - API similar to existing OEM product
  - FPXGXDR0 is driver that actually invokes FPXGXDR1
    - No future need to relink if FPXGXDR1 changes

Online Data Extract

```
//IFP.SYSIN DD *
    TYPE  TOOL
    AREA  ACCOUNT1
    EXIT    EXTRACT
    GO
/*
//FPXCTL DD *
  FPXCTL OUTPUT=STD,EXPAND=YES,OFILE=FILE1
  SELECT SEG=ACCOUNT,FIELDS=(1,6,GT,X'000999')
  SELECT SEG=BALANCE,FIELDS=(1,3,GE,X'0010000C')
  OUTPUT SEG=NAME,FIELDS=(1,20,25,5)

//FILE1 DD DSN=EXTRACT.OUTPUT.FILE
```

Online Data Extract

```
//IFP.SYSIN DD *
    TYPE  TOOL
    AREA  ACCOUNT1
    EXIT    EXTRACT
    GO
    AREA  ACCOUNT2
    EXIT    EXTRACT
    GO
/*
//FPXCTL DD *
  FPXCTL OUTPUT=STD,EXPAND=YES,OFILE=FILE1
  SELECT SEG=ACCOUNT,FIELDS=(1,6,GT,X'000999')
  SELECT SEG=BALANCE,FIELDS=(1,3,GE,X'0010000C')
  OUTPUT SEG=NAME,FIELDS=(1,20,25,5)

//FILE1 DD DSN=EXTRACT.OUTPUT.FILE
```

Online Data Extract

```
//IFP.SYSIN DD *
    TYPE  TOOL
    AREA  ACCOUNT1
    EXIT    EXTRACT
    GO
    AREA  ACCOUNT2
    EXIT    EXTRACT
    GO
/*
//ACCOUNT1 DD *
  FPXCTL OUTPUT=STD,EXPAND=YES,OFILE=ACC1
  SELECT SEG=ACCOUNT,FIELDS=(1,6,GT,X'000999')
  SELECT SEG=BALANCE,FIELDS=(1,3,GE,X'0010000C')
  OUTPUT SEG=NAME,FIELDS=(1,20,25,5)
//ACCOUNT2 DD *
  FPXCTL OUTPUT=STD,EXPAND=YES,OFILE=ACC2..
  <etc>
//ACC1 DD DSN=EXTRACT.OUTPUT.ACCOUNT1.FILE
//ACC2 DD DSN=EXTRACT.OUTPUT.ACCOUNT2.FILE
```

Online Data Extract

```
SELECT SEG=*

SELECT SEG=MYSEG,FIELDS=(1,2,EQ,C'ME'),ANDFIELD,
  (10,1,EQ,C'Y'),ANDFIELD,(15,2,EQ,X'0000')

SELECT SEG=BALANCE

SELECT SEG=MYSEG,STOPAFT=5
SELECT SEG=MYSEG,SKIP=10,STOPAFT=5
SELECT SEG=MYSEG,EVERY=2

SELECT SEG=MYSDEP,FIELDS=(1,2,EQ,C'AA'),
   AFTERTIME=X'B4D7B2D3A37792B2'

   AFTERTIME=yyyy.ddd.hh.mm.ss.t
```

Online Data Extract

OUTPUT SEG=*

OUTPUT SEG=MYSEG,FIELDS=(1,2,10,5,20,2)

OUTPUT SEG=MYSEG

```
FPXCTL INDOUBT=YES    <extract InDoubt SDEP segments>
       IOVFPOOL=nn    <IOVF Pool size>
       OFILE=filename   <output file name, default FPXOFILE>
       OUTPUT = UR|STD|SORT
```

Online Data Extract

- DBT Reload considerations
  - DURDBDFN dataset required
    - can be created by FABCUR5 utility (FP Basic Tools)
  - No SDEP support

Online Pointer Checker

- Extension of FP Basic Tools Pointer Checker and Tuning Aid
  - Collect data online for offline processing by FP Basic Tools Pointer Checker and|or Tuning Aid
- Quick verification of DB integrity
  - PTRSCAN option. No DBT records created.
- Create Image Copy while validating DB
  - DBRC registration optional
  - "fuzzy" (Concurrent) type Image Copy
- SNAP up to 10 error CIs to DD SNAPPIT
  - automatic if DD statement present

Online Pointer Checker

- PTRSCAN mode
  - Fast scan of Area Integrity
    - Checksum
    - Follows Pointer Chains
  - Can be combined with Image Copy
  - Processing logic
    - Reads all RAA UOWs and attempts to follow pointer chain, including reading IOVF CIs as required.
    - Reads all IOVF CIs in space map range blocks (120 CIs)
      - Space map CI SHR lock allows validation of freespace chains in IOVF CIs. Lock held only during read of remaining 119 CIs.
    - SDEP CIs read in larger of UOW or 120 CI blocks
      - Only if SDEP keyword specified
      - Segments deblocked and analyzed
    - Additionally, all CIs read are validated for
      - CI type code, CIDF/RDF
      - Freespace to segment overlaps

Online Pointer Checker

- PTRSCAN mode
  - Partial Analysis possible with STARTUOW STOPUOW
  - Errors written to report file
  - Condition Code 4 if any errors detected
  - MAXERROR option
    - STOP or ABEND after MAXERROR errors detected
    - Default 100.
  - ERRORACT option
    - STOP or ABEND when MAXERROR errors detected.
  - Image Copy
    - If any errors detected, DBRC registration of Image Copy will be bypassed.
    - For routine use, suggest MAXERROR=1 and ERRORACT ABEND
      - Ensures you will be aware of any pointer errors
    - Not valid with STARTUOW STOPUOW

Online Pointer Checker

- PTRSCAN errors detected:
  - Pointer RBA invalid (outside valid numeric ranges)
  - CI Type code invalid
  - Data at pointer RBA not expected segment type
  - Physical Child Last pointer not pointing at last child
  - Root to SDEP pointer outside SDEP RBA range
  - Twin key not ascending
  - Invalid subset pointer
  - Access to an IOVF CI from more than one UOW
  - V5 SDEP CI (warning)
  - SDEP CI full bit not set (warning)
  - InDoubt SDEP segment
  - SDEP CI FSEOF error (not pointing after last segment)
  - IOVF CI ownership error
  - Checksum error
  - CIDF or RDF error

Online Pointer Checker

- IMAGE COPY
  - Image Copy is treated as Concurrent Copy
    - Same file format
  - DBRC registration supported
    - Will not occur if any pointer errors detected.
    - DBRC=Y|N
    - Requires RECONx DD statements in JCL or DFSMDA members in STEPLIB
  - Dual Image Copy output supported

Online Pointer Checker

- SECURITY
  - RACF VALIDATION
    - CLASS(IMSTOPC)
    - ENTITY(imsid.dbname.areaname)
    - ATTR=READ

Online Pointer Checker

- Interface to FP Basic Tools Pointer Checker and Tuning Aid
  - OPC creates the same records as FABADA1
    - Detailed pointer analysis
    - Detailed freespace analysis
    - PTRSCAN function always performed
    - FABADAx invoked offline
    - Image Copy valid with any of these options
    - SDEP keyword if SDEP integrity is to be checked
  - TYPRUN=PTRALL
    - Produce records for detailed pointer checking
  - TYPRUN=FS
    - Produce records for freespace analysis
  - TYPRUN=RPT
    - Function of both PTRALL and FS
  - TYPRUN=MODEL
    - Same as RPT, but root key appended to all records for use by DBT DEDB Tuning Aid

Online Pointer Checker

- AREA REORG Considerations
  - FP Basic Tool Pack Tuning Aid can create Partial Reorg control cards for standard IMS DEDB Online Reorg
    - Based on OPC Input
  - STARTUOW STOPUOW cards

DEDB Fast Recovery

- 5655-E32
- Separate Product
  - Handle /ERE or IMS FDBRfailures
  - Reapply DEDB updates from last checkpoint to log EOF
    - Same processing as Emergency Restart
  - Supports datasharing, VSO, SDEPs
  - Also recovers MSDBs
- Potentially, save large outage while Areas recovered offline

Software Prereqs

- IMS FastPath Basic Tools for OS/390
  - Supports IMS V5, IMS V6, IMS V7
- IMS FastPath Online Tools for OS/390
  - Supports IMS V6 and IMS V7
  - Enabling apar required:
    - V6: PQ34416
    - V7: PQ34417