Implementing and Using Extended-Addressing Volumes (EAV)

Session 17063

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Agenda

- What are EAV Volumes?
  - History and current status
  - Architecture and addressing
- z/OS changes for EAV
  - DSCBs, program support, DFSMS
  - SRS, ACC, and vendor support of EAV
- How to Create and Use EAV
- Advantages and Disadvantages

Why EAV?

- Running out of addressable disks
  - 4-digit device number limits total available devices
- Larger Volumes
  - More data under one roof
    - Fewer total volsers to manage

What is an EAV Volume?

- More than 65,520 (x'FFF0') cylinders on volume
  - IBM 3390-A (DS8000 lic 4.0) or equiv (UVM, VMAX,etc)
  - Introduced in z/OS 1.10 for up to 223 GB
  - Track format and tracks/cyl identical to current 3390
  - SMS or non-SMS
  - Volume divided into two areas:
    - Track-managed space
    - Cylinder-managed space

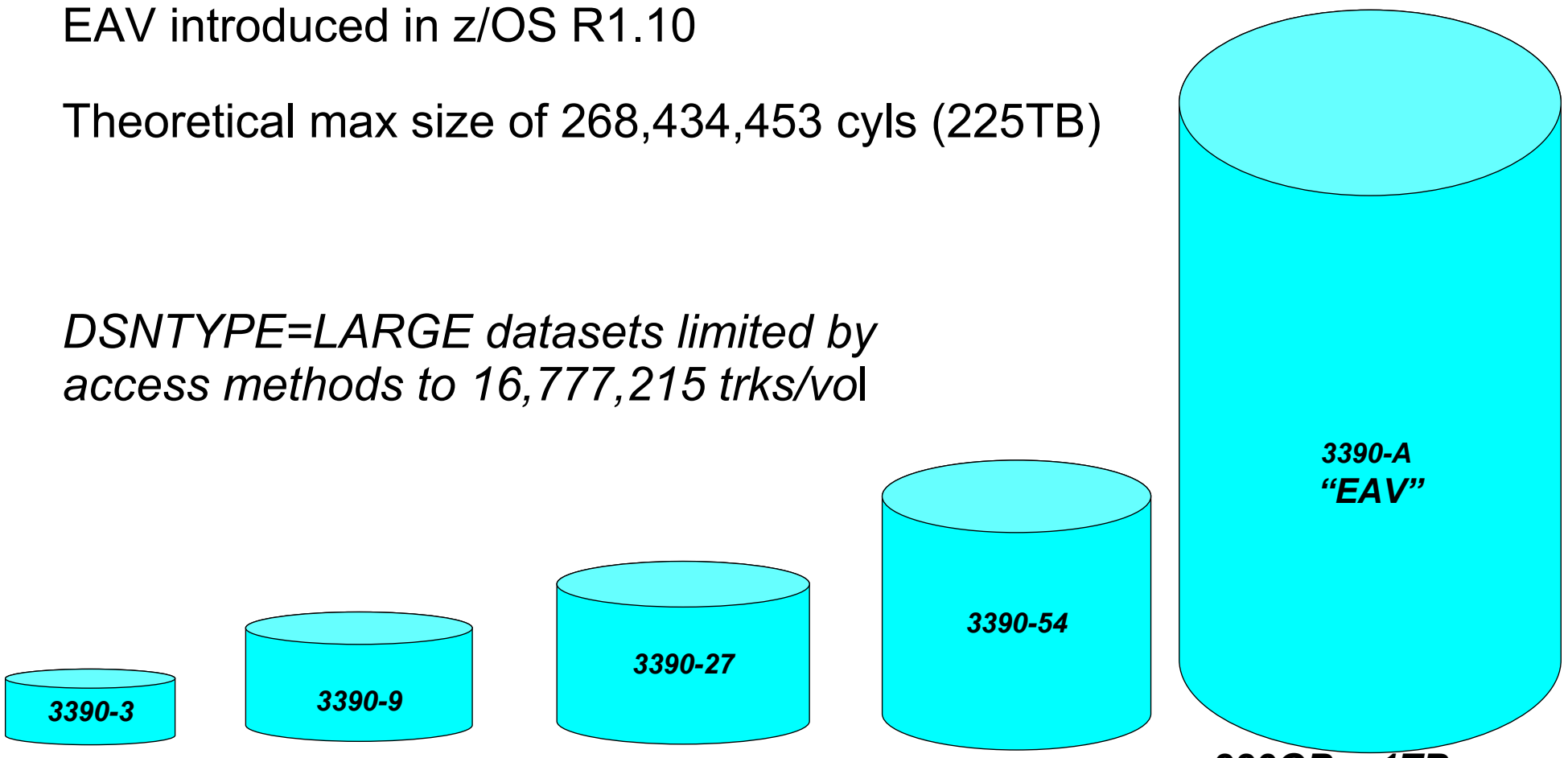
- What Data Can Reside on an EAV?
  - Almost everything! (depending upon z/OS release)

Maximum Volume Sizes

EAV introduced in z/OS R1.10

Theoretical max size of 268,434,453 cyls (225TB)

DSNTYPE=LARGE datasets limited by access methods to 16,777,215 trks/vol



3 GB
Max cyls: 3,339

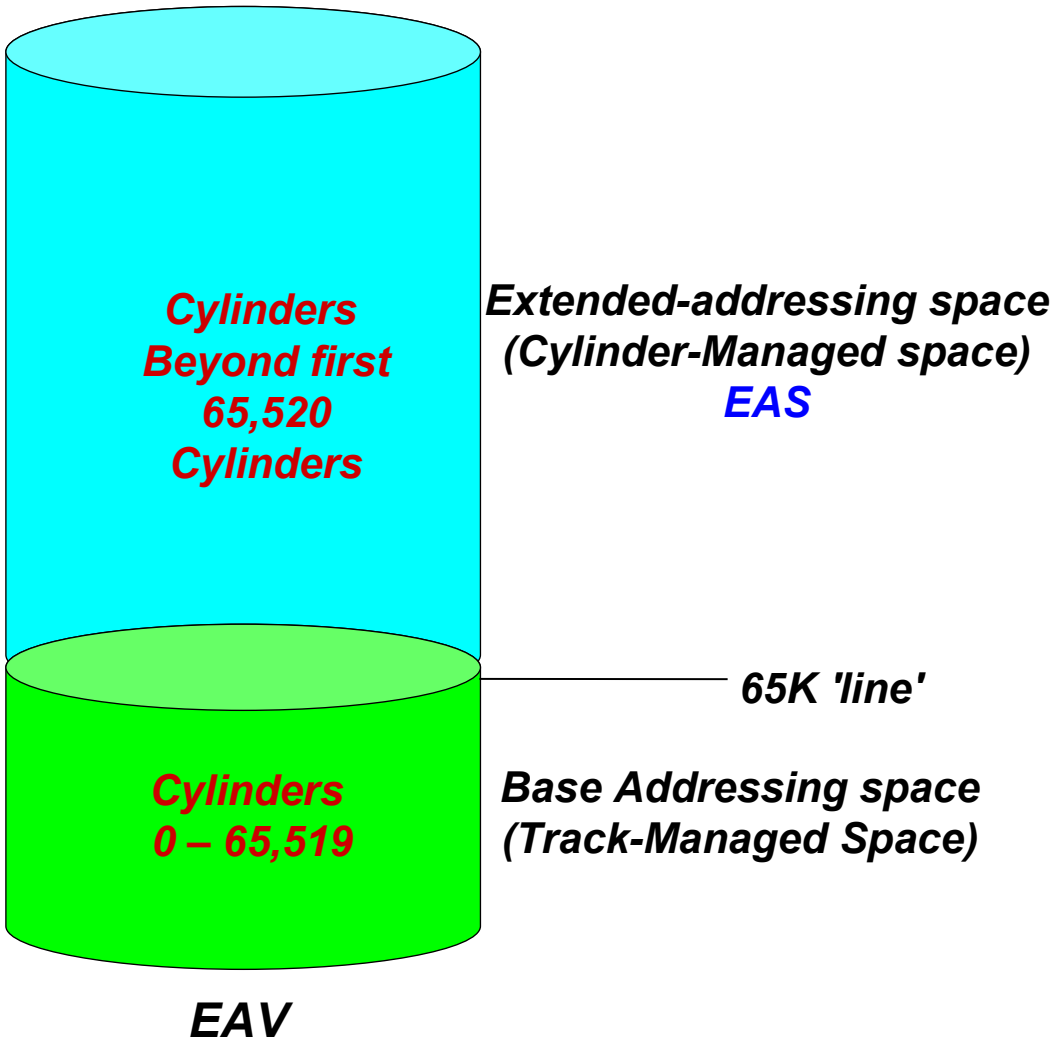
9 GB
Max cyls: 10,017

27 GB
Max cyls: 32,760

54 GB
Max cyls: 65,520

223GB – 1TB
Max Cyls 262,688 to 1,182,006

EAV Architecture Terms



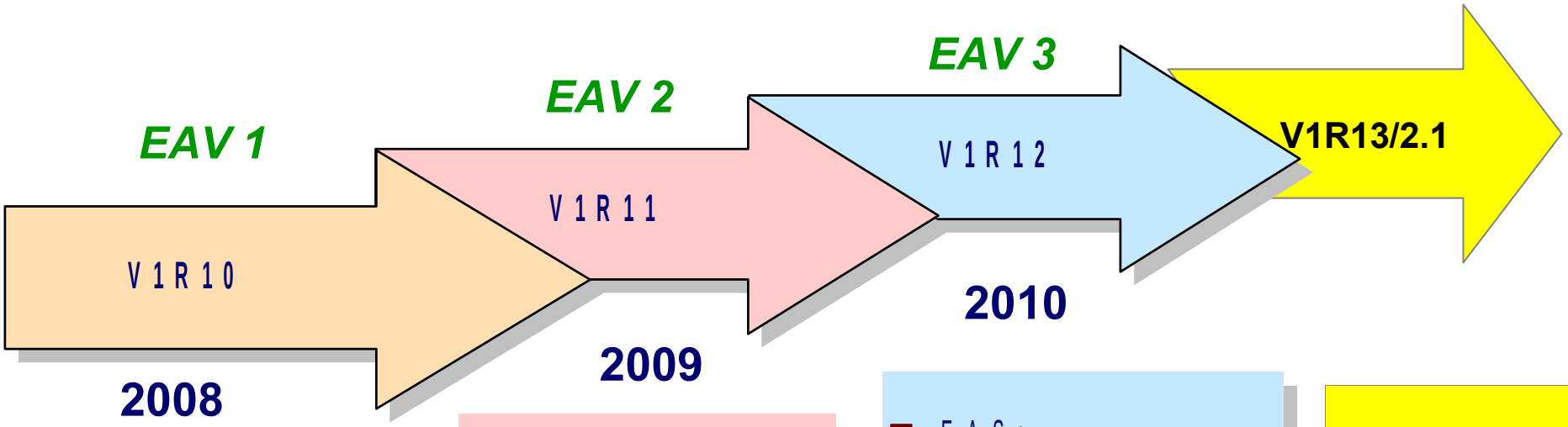
- Multicylinder Unit (MCU/MAU) = 21 cylinders
- BreakPointValue (BPV)
- EAS-eligible – can reside anywhere on EAV

Changes due to EAV

- Changes in DSCBs
- Changes in size of VTOC, VTOCIX, VVDS
- Changes in track addressing format
- Changes in program parameters and processing
- Changes in report field sizes

- New LISTDSI REXX variables, changes to LSPACE, CVAF, and more

EAS-Eligible Datasets



- EAS:
  - VSAM objects
- Format 8 DSCBs
- Migration tracker

- EAS:
  - extended format sequential
- EATTR attribute
- Automatic VTOC rebuild

- EAS:
  - Sequential
  - PDS, PDSE
  - BDAM
  - BCS, VVDS
  - Spool data sets

1 TB volume size

Non-EAS-Eligible Data

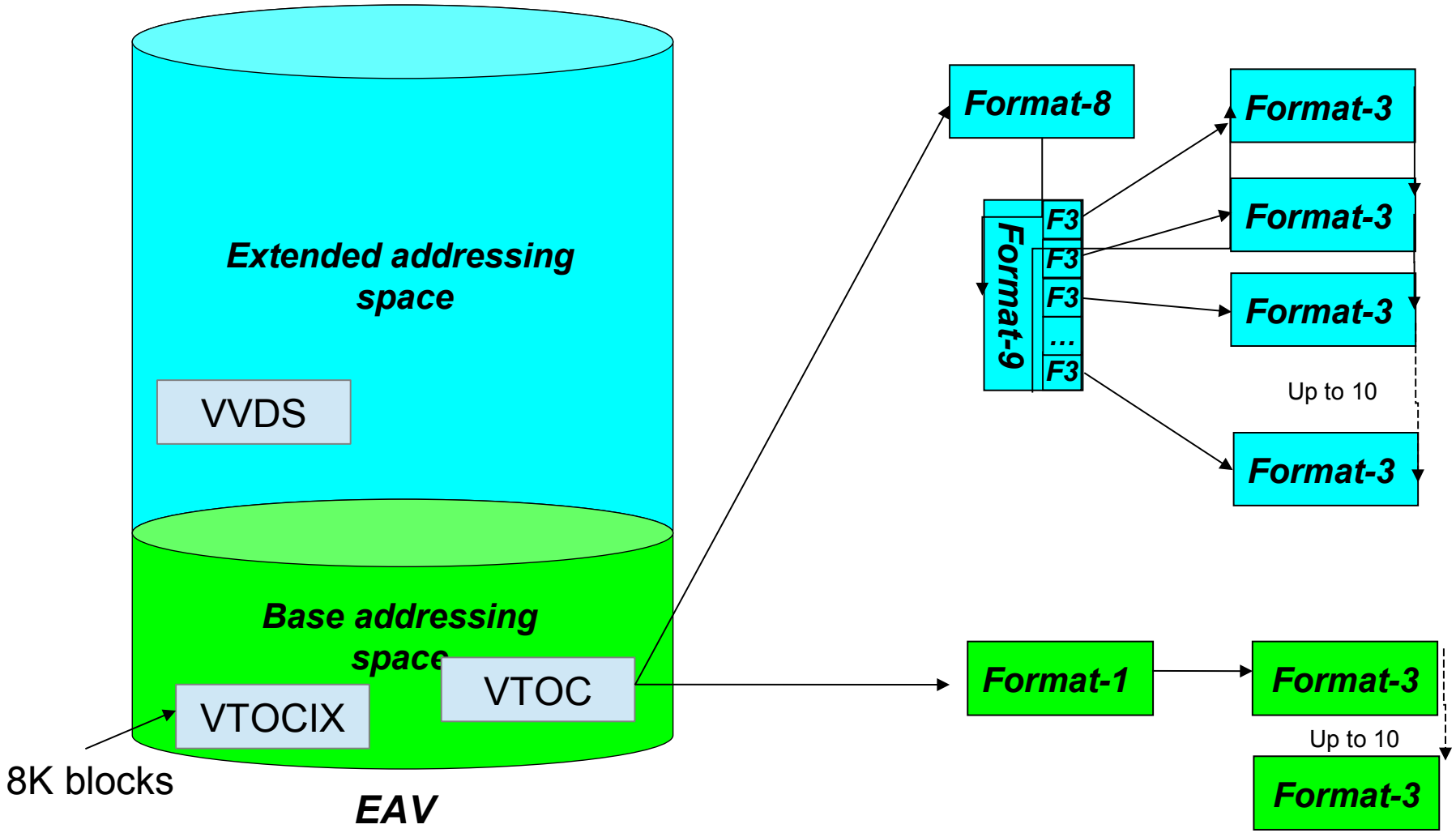
- Must still reside in track-managed space
  - VTOC, VTOCIX, HFS, page datasets
  - Certain XRC and SYS1
  - VSAM imbed/keyrange, or incompatible CA size (old alloc not 1,3,5,7,9,or 15)

- Just about all user data is now EAS-supported
  - Including DB2, IMS, CICS, zFS, NFS
  - FTP support (in 1.11 for EF, 1.13 for non-EF,cs)

DSCB Changes

- Format-4
  - EAV indicator, cylinder count, MAU
- Extended-Attribute DSCBs (EADSCBs)
  - Format-8
    - Similar to F1DSCB, chains to F9DSCB
  - Format-9
    - Similar to F3DSCB, but:
      - Can point to additional F3DSCB or F9DSCB
      - Direct pointers to F3DSCBs
      - Additional metadata: jobname, stepname, crtime, vendor.

DSCB Changes



EAV Addressing

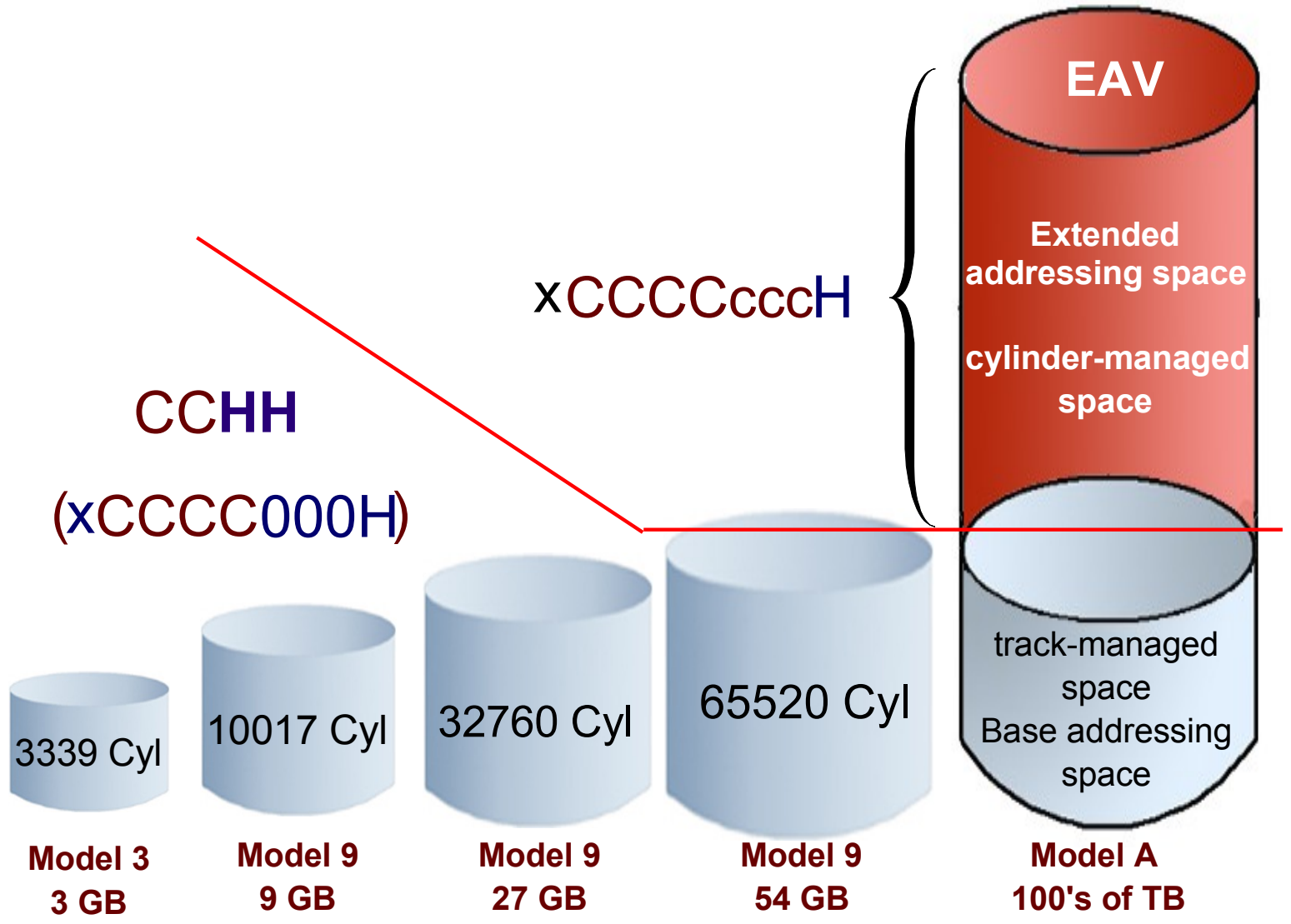
- Old 16-bit Cylinder Addressing Format
  - CC HH

maximum value x'FF F0 00 0F'

C C H H

- New 28-bit Cylinder Addressing Format
  - The '000' in the HH field becomes *high order* cylinder number
    - X'CCCCcccH' – as stored
    - X'cccCCCCH – as used
    - cccCCCC:H – normalized (i.e, as printed)

28-bit Cylinder Addressing Format



EAV Addressing

- Track-managed space
  - The high-order cylinder no. is zero

```
X'05 DC 00 0E' =0005DC0,E - cylinder 1500, track 14
X'FF F0 00 0E' =000FFF0,E - cylinder 65520, track 14
X'FF F0 00 FE' =000FFFF,E - cylinder 65535, track 14
X'00 00 00 1E' =0010000,E - cylinder 65536, track 14
X'49 F0 02 01' =00249F0,1 - cylinder 150000, track 1
```

- TRKADDR macro or IECTRKAD routine
  - Converts, compares, and calculates track addresses
  - Possible for programs to do 28-bit calculations

EAV Free Space

Two sets of free space statistics

- Track-managed free space (all volumes)
- Cylinder-managed free space (EAV only)
- Affects many programs
  - LSPACE, ISMF, IEHLIST, DITTO, SMF19
  - DCOLLECT 'VL' and 'V' records

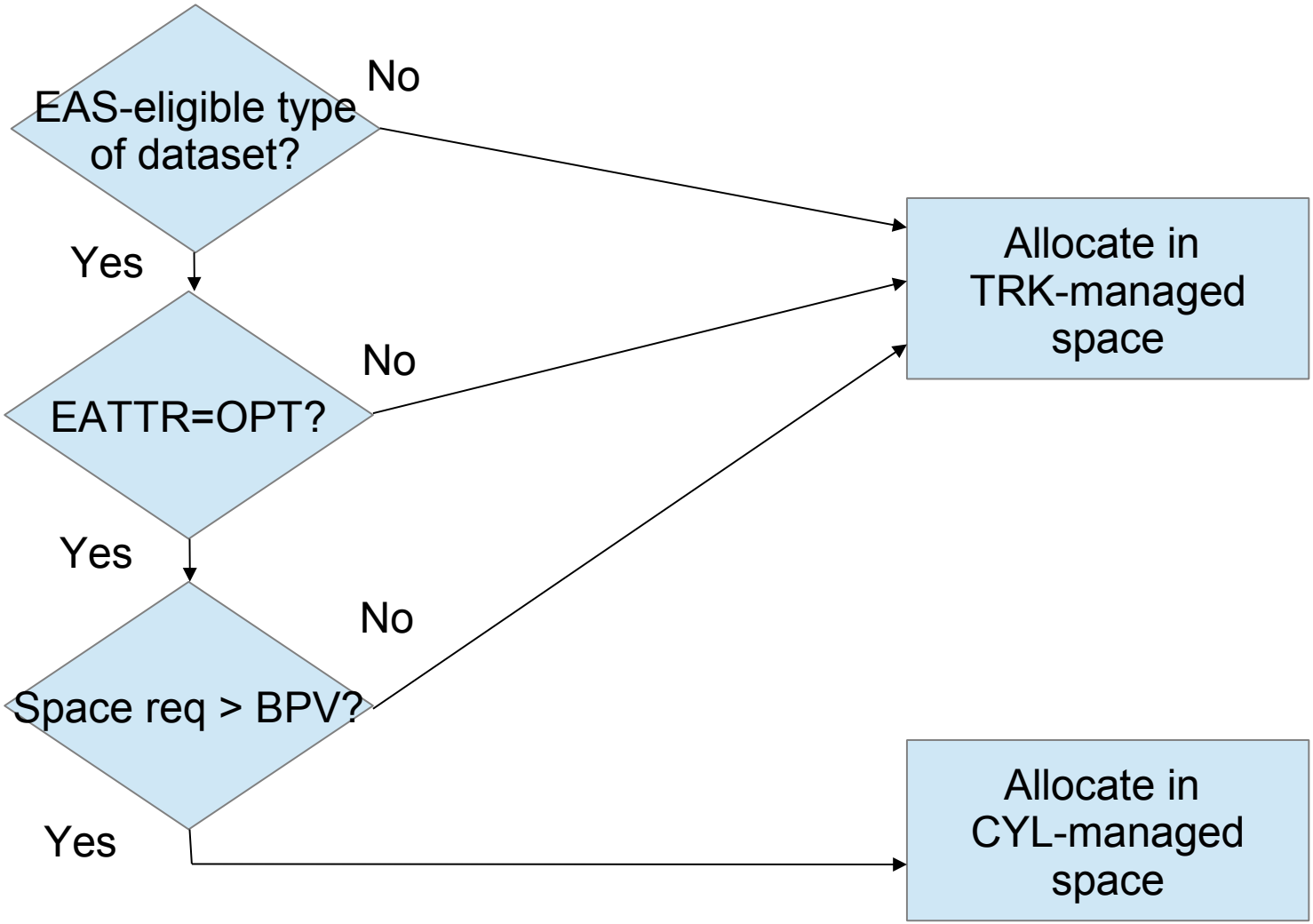
Two sets of DFSMShsm Thresholds

- SMS Track-managed free space threshold
- SMS Volume free space threshold
- ADDVOL TRACKMANAGEDTHRESHOLD(hi lo)

EAS Attribute

- EATTR= NO/OPT/blank
  - Added in z/OS 1.11, recorded in F1DSCB
  - Use to prevent downlevel (1.10, 1.11) systems from failing when restoring EAS datasets
    - by forcing non-EAS alloc if EATTR=NO
  - Available via
    - JCL, dataclas
    - Dynalloc
    - IDCAMS DEFINE / ALTER
  - 2.1 new ACS r/o variable available &EATTR=

EAS Dataset Allocation



EAV Programming Support

- Changes for new DSCBs, cylinder addressing
- EADSCB=OK keyword
  - Indicates program understands F8/F9/28-bit cyls
  - OBTAIN, CVAF macros (CVAFDIR/FILT/SEQ, etc.)
  - DCBE (for EXCP open, VTOC open)

EAV Programming Support

- Other programs
  - Any channel program without OPEN
    - Usually, VTOC readers
  - Size calculations or track addresses with CCHHR
  - LSPACE, DEVTYPE – new keywords and plists
  - Any readers of VVDS, or DEB extents

EAV Programming Support

- New SMF fields
  - SMF14EADSCB → EADSCB=OK on DCBE
  - SMF14EXCPBPAM → BSAM/QSAM and EXCP
  - SMF19 → LSPACE statistics expanded
  - SMF6x → VSAM cylinder numbers expanded
  - SMF74-1 → new RMF device capacity field

Migration Assistance Tracker

- Uses Console ID tracking facility (APAR II13752)
  - SETCON and D OPTDATA, TRACKING commands

- Identify VTOC access errors needing EADSCB=OK
  - OBTAIN, CVAFxxx, OPEN VTOC, OPEN EXCP
- Identify programs that may need new services
  - LSPACE, DEVTYPE, IDCAMS DCOLLECT
- Warn of possible errors parsing 28-bit cyls
  - IEHLIST LISTVTOC, IDCAMS LISTCAT, LISTDATA PINNED

Setting Up EAV

- SYS1.PARMLIB(IGDSMSxx)
  - USEEAV = YES/NO
  - BreakPointValue=cyls
    - May be specified in SG definition
- ICKDSF INIT volume or use Dynamic Volume Expansion
    - DEVSUPxx REFVTOC=ENABLE automatically expands VTOC for DVE
- Set dataclas EATTR=OPT if needed
- Allocate and copy/move data

Vendor Products and EAV

- Allocation Control Center
  - Dataset allocation management
    - SET EATTR
    - Device selection and pooling
- Storage Control Center MONitor
  - Dataset and device reporting and monitoring

Cautions

- Insure sufficient DSCBs when INITializing EAV
  - max DSNs = EAV cyls / (VTOC trks*50)
  - ICKDSF REFORMAT EXTVTOC or NEWVTOC
  - IGGCATxx VVDSSPACE sets VVDS size
  - Max VVDS size 5460 **trk** → 5825 **cyl**
- Enable HyperPAV to prevent queuing on 1 UCB
- Use EATTR=NO to prevent restore problems with EAS datasets restored to pre-z/OS 1.12 systems

Further Reading and Documentation

- Redbooks
  - z/OS V2.1 *Technical Update* SG24-8190
  - z/OS V1.11 *Implementation* SG24-7229

- Manuals
  - *DFSMSdfp Advanced Services* SC26-7400
    - Chapter 7.6 – TRKADDR macro
    - Appendix C – Using the EAV Migration Assistance Tracker
  - *DFSMS Using the New Functions* SC26-7473

Questions?

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