

Implementing and Using Extended Addressing Volumes (EAV)

Session 17448

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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?

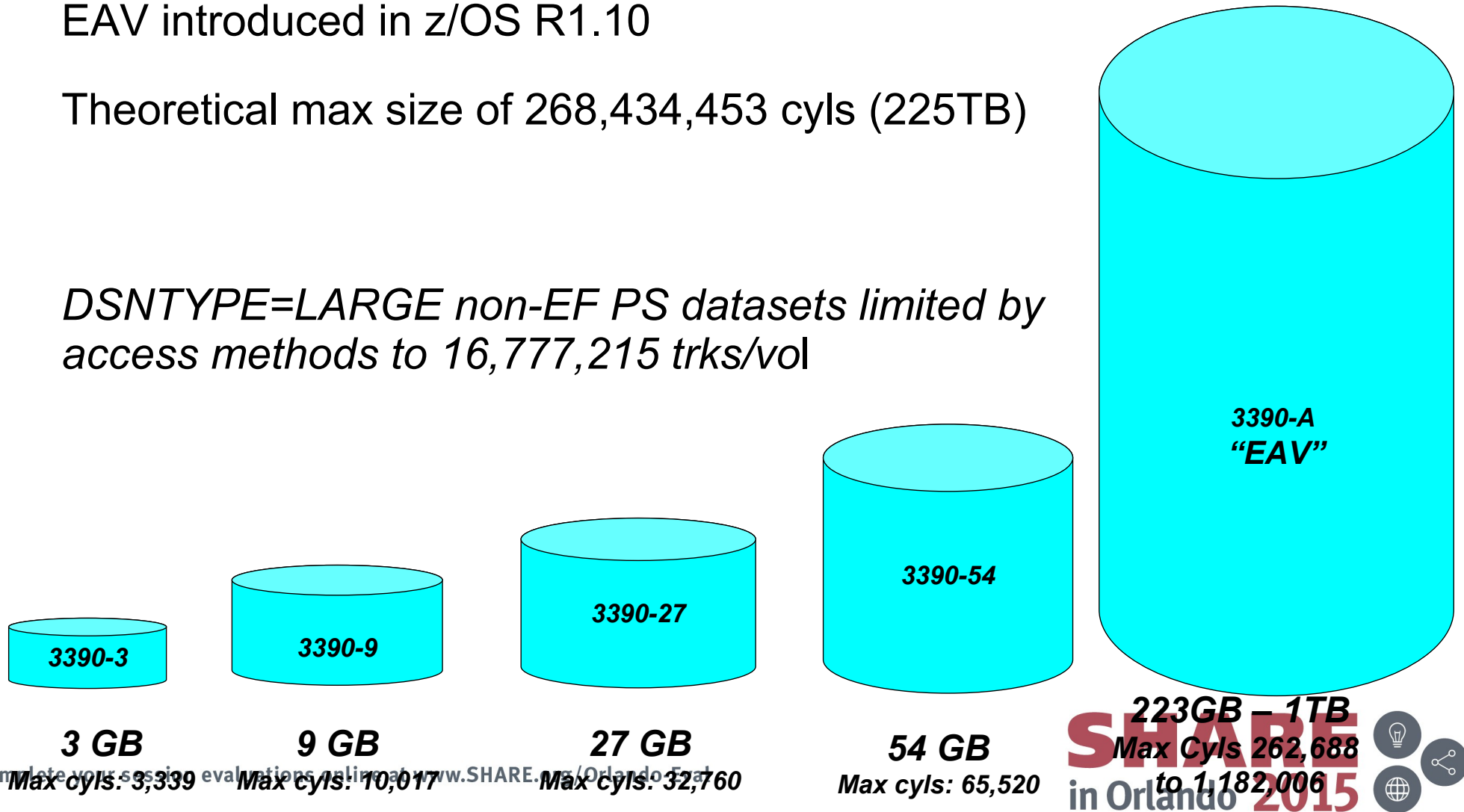
- Almost everything! (depending upon z/OS release)

Maximum Volume Sizes

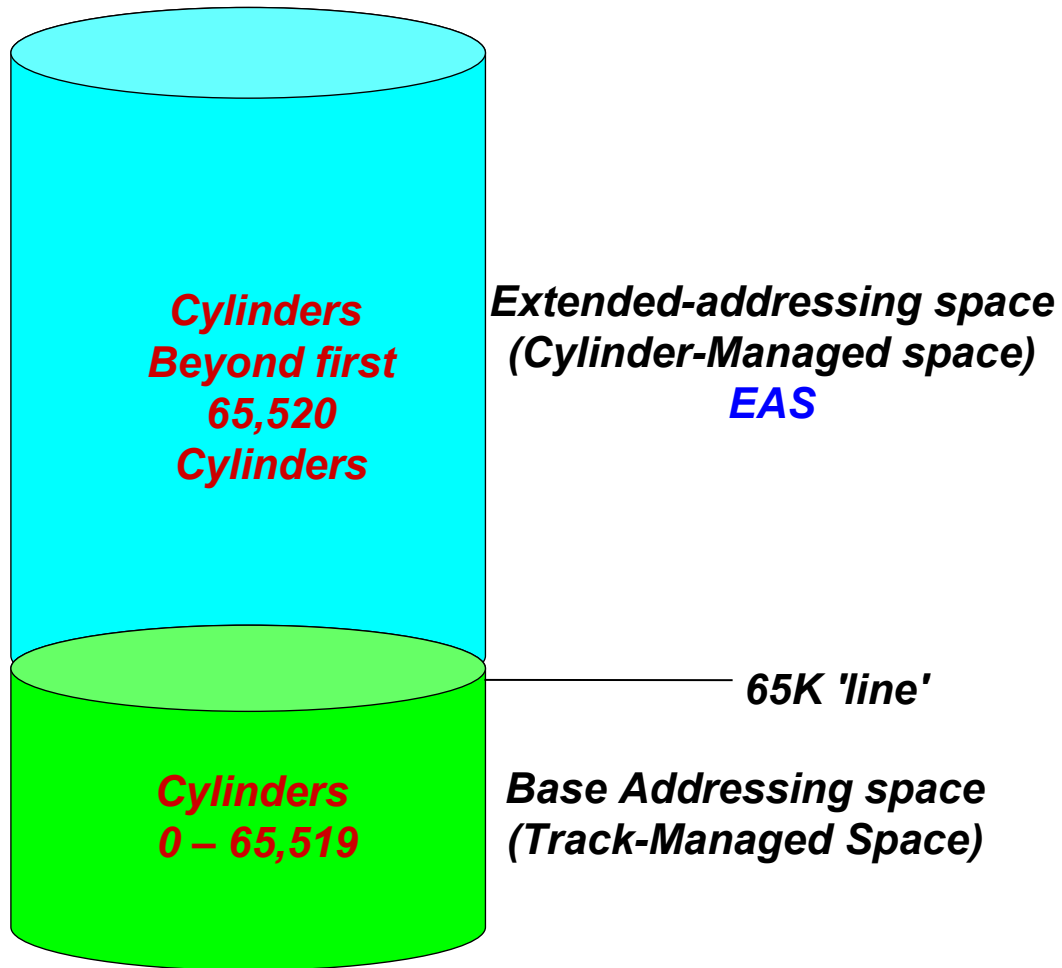
EAV introduced in z/OS R1.10

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

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



EAV Architecture Terms



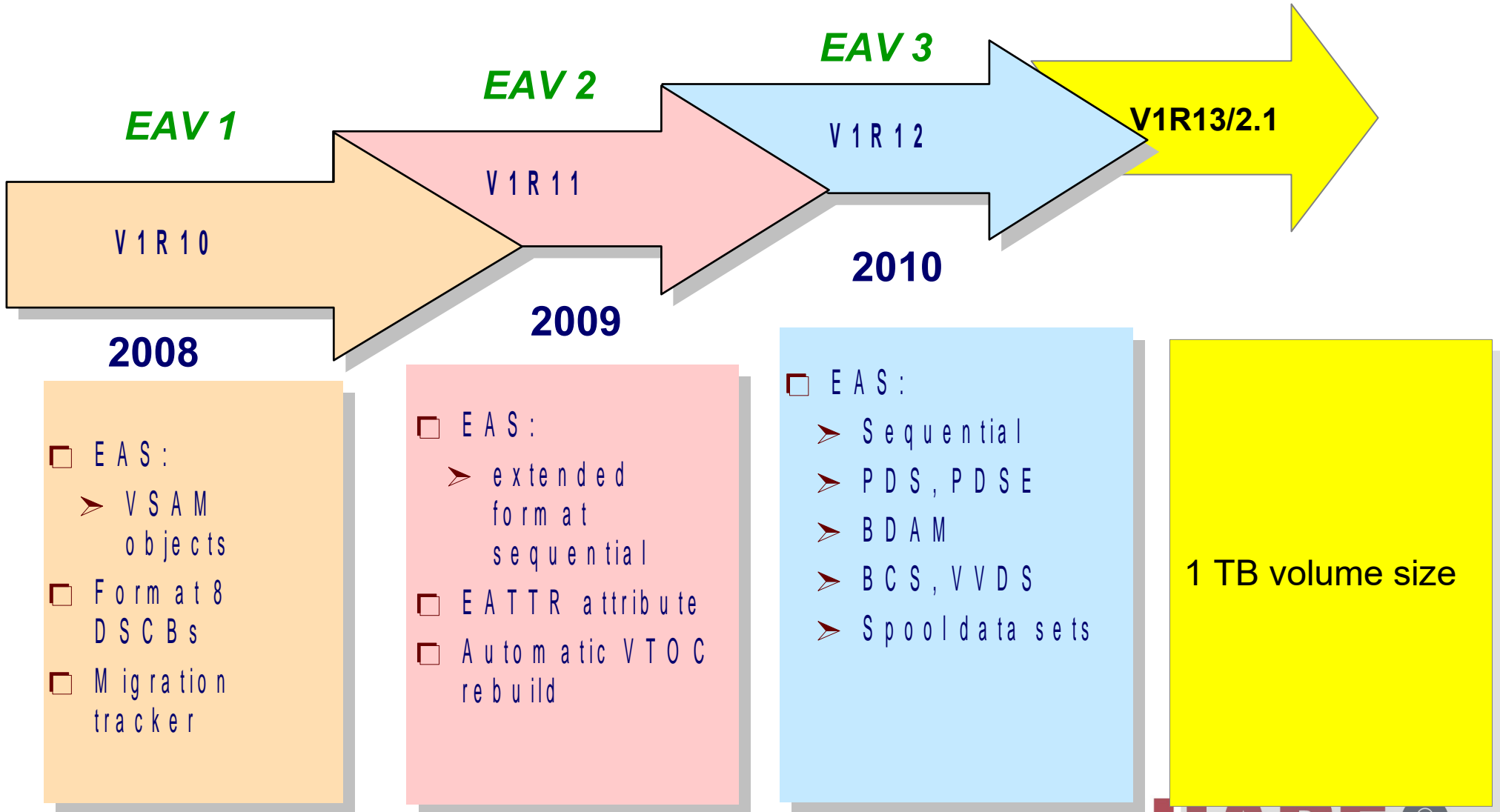
- Multicylinder Unit (MCU/MAU) = 21 cylinders
- BreakPointValue (BPV)
- EAS-eligible – can reside anywhere on EAV

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



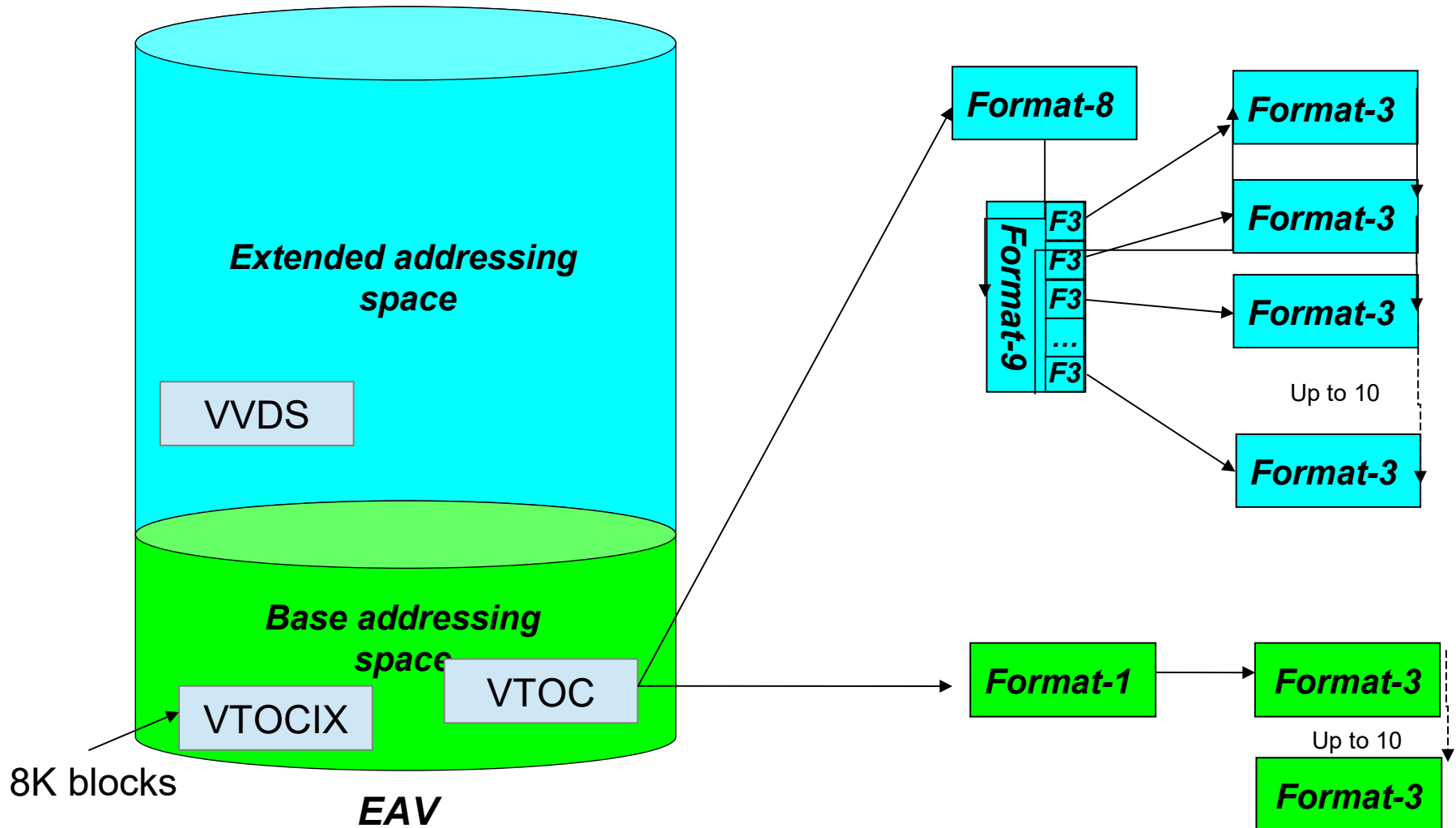
Non-EAS-Eligible Data

- Must still reside in track-managed space
 - VTOC, VTOCIX, HFS, page datasets
 - Certain XRC (control) 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

Max cyl
65,520

maximum value x'FF F0 00 0F'

C C H H

- New 28-bit Cylinder Addressing Format

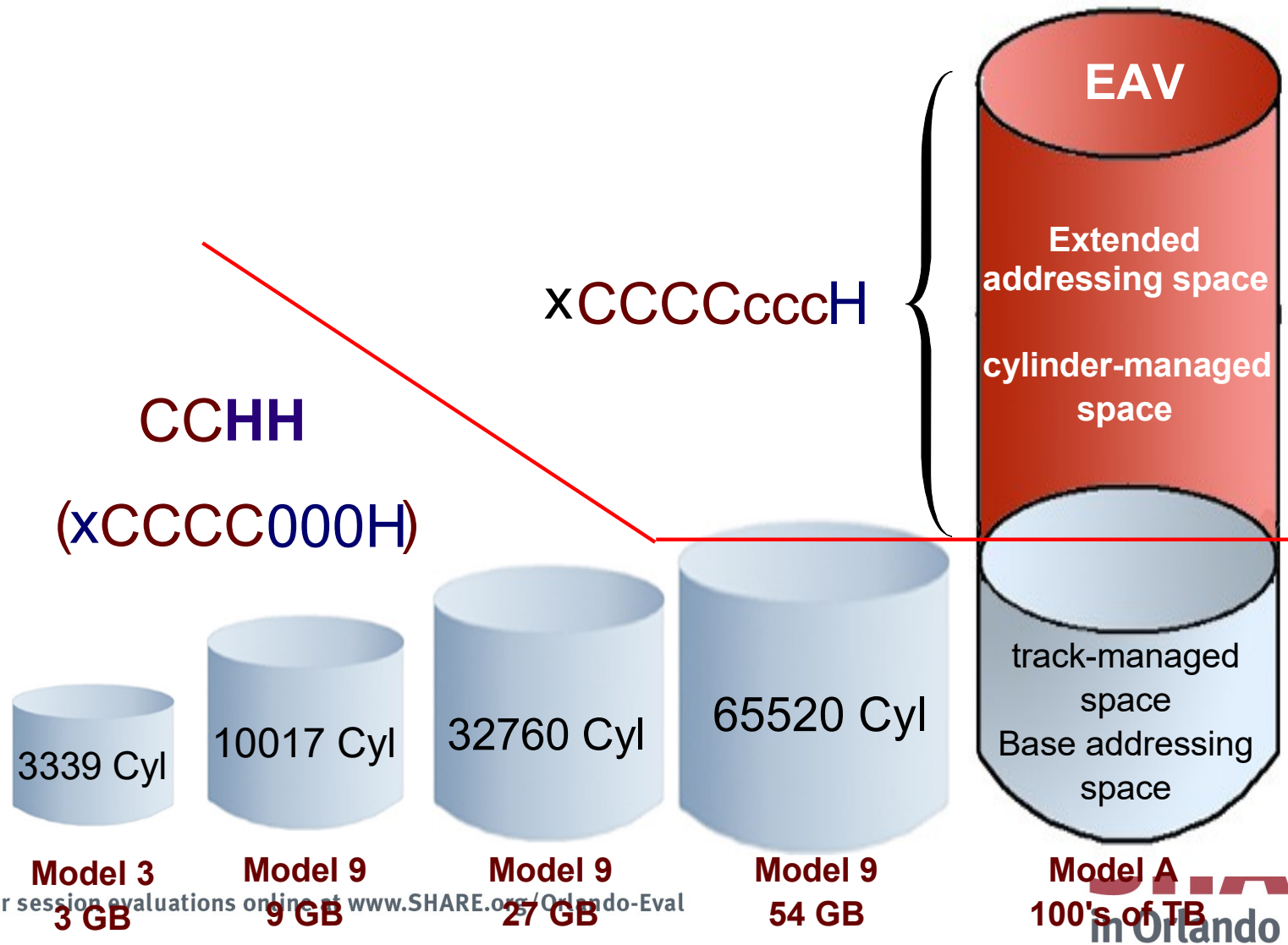
- The '000' in the HH field becomes *high order* cylinder number

- 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 00 21' =00249F0,1 - cylinder 150000, track 1

- TRKADDR macro or IECTRKAD routine

- Converts, compares, calculates normalizes track addr

- “possible” for programs to do 28-bit calculations

EAV Free Space

Two sets of free space statistics

- Track-managed free space (all volumes)
- Cylinder+track-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
- **ADDDVOL TRACKMANAGEDTHRESHOLD(hi lo)**

EAV Space

Idle Space Release

- Down to MAU boundary (21 cyls)

Dataset Extents

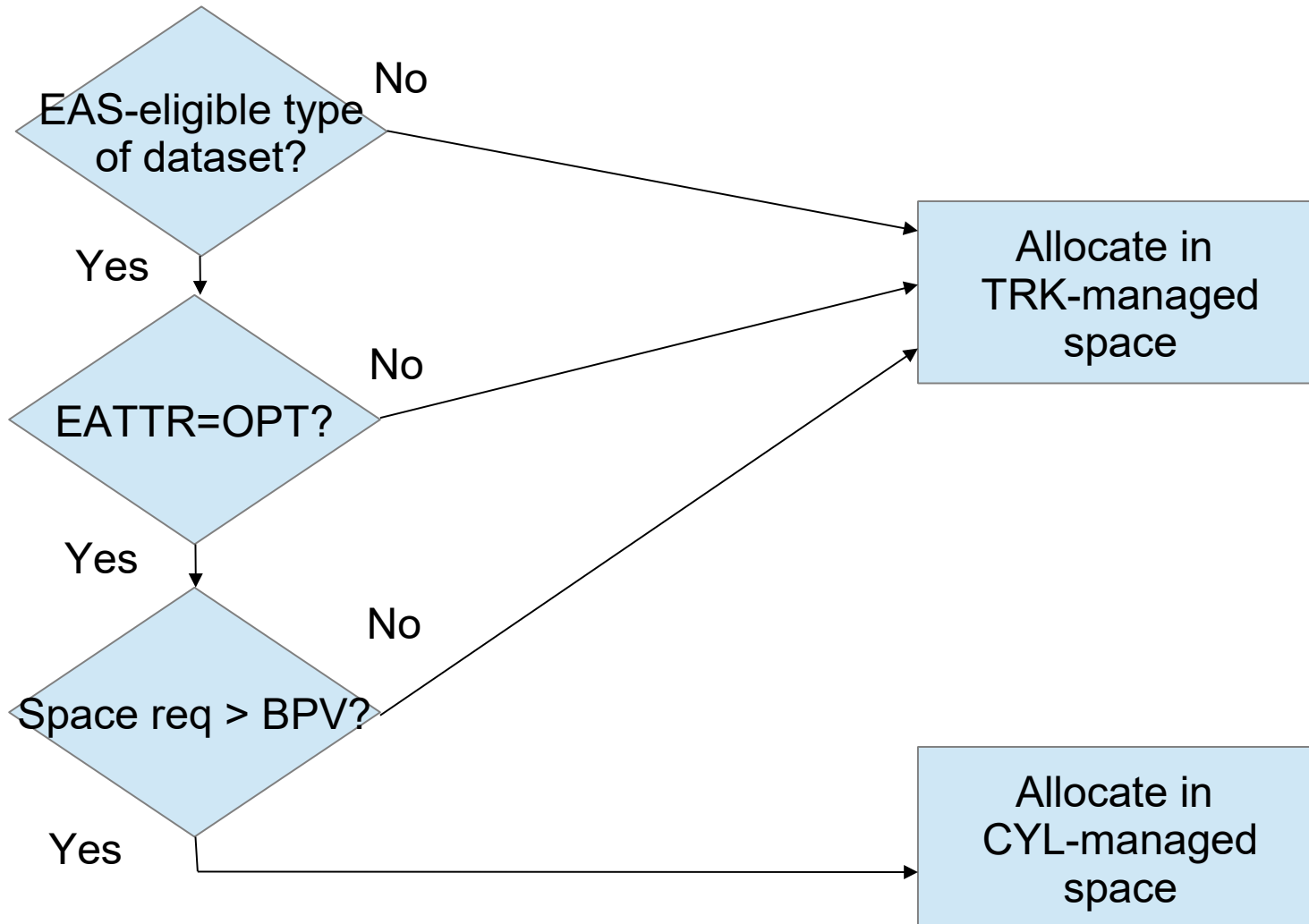
- Can span Cyl and Trk managed space
- Multivolume can extend between EAV / nonEAV

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)

LISTDSI variables

- SYSCREATETIME/STEP/JOB
- SYSEATTR, SYSEADSCB
- (also multivolume info!)

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

z/OS 2.1 IEC190I message if DCBE incomplete at OPEN

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 II113752)
 - SETCON and D OPTDATA, TRACKING commands
- Or in 2.1, The **Generic Tracker**, GTZ
 - EXCLUDE, STATUS, DEBUG, and more
- 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

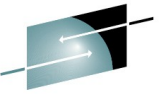
- **SYS1.PARMLIB(IGDSMSxx)**
 - USEEAV = YES/NO
 - BreakPointValue=cyls
 - May be specified in SG definition
- **ICKDSF INIT volume or use Dynamic Volume Expansion**
 - DEVSUPxx REFVTOC=ENABLE automatically expands VTOC for DVE
- Set dataclas EATTR=OPT if needed
- Allocate and copy/move data

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
 - $\text{max DSNs} = \text{EAV cyls} / (\text{VTOC trks} * 50)$
 - ICKDSF REFORMAT EXT VTOC 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 V1.13 / V2.1 *Technical Update* SG24-8190
- z/OS V1.11 / 1.12 / **1.13** *Implementation* SG24-7229

- Manuals

- *DFSMSdfp Advanced Services* SC26-7400
 - Chapter 7.6 – TRKADDR macro
 - Appendix C – Using the EAV Migration Assistance Tracker
 - or Tools and Service Aids (Generic Tracker Facility)
- *DFSMS Using the New Functions* SC26-7473

Questions?

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