# Virtual Storage Access Method (VSAM)
Extended Format and Extended Addressability

JK - 2005

What is VSAM Extended Format? It is a technique that affects the way count key data[1] (CKD) is stored on a 3390/3380 logical track. An extended format dataset can be thought of as having the same characteristics as a physical sequential data set. Extended format was first introduced to implement data striping and it increases the performance and the reliability of an I/O process. In general for VSAM, it is usually suggested you convert your data sets to extended format for better performance, additional functionality and improved reliability. A good time to convert to extended format is when you reorganize your VSAM data set.

All VSAM data set types can be defined in extended format, this includes KSDS, ESDS, RRDS, VRRDS, and LDS. The benefits available to extended format data sets include:

  * Data compression
  * Enhanced space management
  * System-managed buffering
  * Data striping
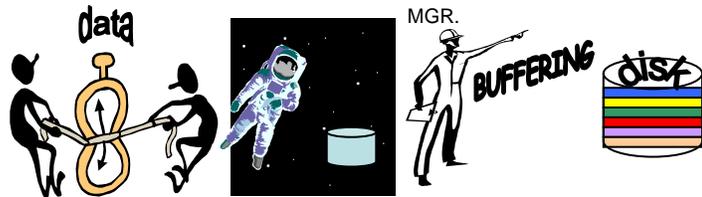
Extended format datasets must be system managed, that is, administered under the DFSMS (SMS) rule policy. They are actually described in the catalogue with a striped dataset count as one. When a dataset is allocated as an extended format data set, the data and its index are in extended format. Any alternate indexes related to an extended format cluster are also in the extended format.

As a side bar - when a dataset is in extended format, there is no support for the key-range VSAM option nor hiperbatch. KEYRANGE is no longer supported due to enhanced RAID controllers.

There are instances where Extended Format can not be used for KSDS data sets such as System Datasets since during initial IPL phases SMS is not available, ICF Catalog structures and Temporary Datasets.

If a dataset is allocated as an extended format dataset an additional 32 bytes is placed to each physical block which will increase the overall size of the dataset. This additional structure is transparent to the applications and does not require modifications to use the new data set format.

VSAM Dataset must be either extended or non-extended format. To convert a non-extended format dataset to extended format, or to allocate an extended format dataset, the DASD administrator will need to create an SMS Data Class with the DATASETNAMETYPE parameter equal to EXT and assign the datasets to that data class.

Extended format (EF) also improves VSAM function. The VSAM I/O driver Media Manager only writes channel programs to exploit extended format. All the new VSAM functions are supported by media manager, therefore, EF is a prerequisite.

It is vital to mention that VSAM extended format (EF) and extended addressability (EA) are not the same. Extended format is a means of storing data on a logical DASD volume and extended addressability is the means to allow VSAM Data Sets greater addressability beyond the 4GB address constraint (2^{32}). This was due to the Relative Byte Address (RBA) limitation imposed by the architecture. An RBA max is 4 bytes 'FF FF FF FF'.
NOTE - Extended Format is the prerequisite to Extended Addressability (EA).

How large can a VSAM dataset be under EA? One means for sizing is to take the Control Interval (CI) size and multiply it by the RBA limitation of 4GB. If you had a 4K (4096) CI size and multiplied it by 4GBs it produces a data set size of 16 Terabytes (TB). A 4K CI is a popular size for performace reasons since MVS Pages and Pagesets use this range.

VSAM EA datasets also need to be placed under an SMS environment.
There is no increase in processing time implementing Extended Format nor Extended Addressibility.

[1] **Count-Key-Data Format -** The blocks are written with hardware keys. The key area (1 to 255 bytes) contains a record key that specifies the data record, such as the part number, account number, sequence number, or some other identifier.

Only ISAM, BDAM, BSAM, CVOL catalogs, EXCP, and partitioned data set directories support blocks with hardware keys. IBM recommends that you not use hardware keys, because they are less efficient than software keys, which are supported by VSAM.