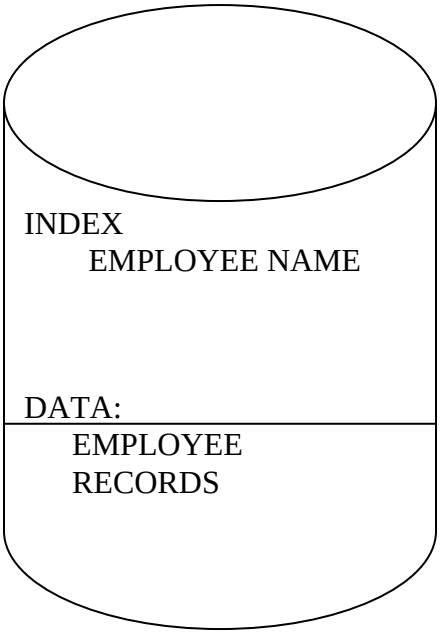
UNIT 5

Alternate Index

OBJECTIVES

- Reasons for having an alternate index.
- Describe the basic contents of an alternate index.
- Use a path to access base cluster records in alternate key sequence.
- Define, load and use an alternate index.
- Stating the impact of SHAREOPTIONS when opening a base cluster and associated alternate indexes.
- Describe programming and JCL considerations.

NEED FOR ALTERNATE INDEX



- ACCESS A KSDS BY KEY OTHER THAN THE PRIME KEY
- SOCIAL SECURITY NUMBER
- DEPARTMENT NUMBER
- EMPLOYEE NUMBER
- ZIP CODE
- ACCESS AN ESDS BY KEY

- Alternate indexes save sorting or maintaining duplicate data that might otherwise be required.
- An alternate index cannot be defined for an RRDS or LDS

ALTERNATE INDEX EXAMPLE

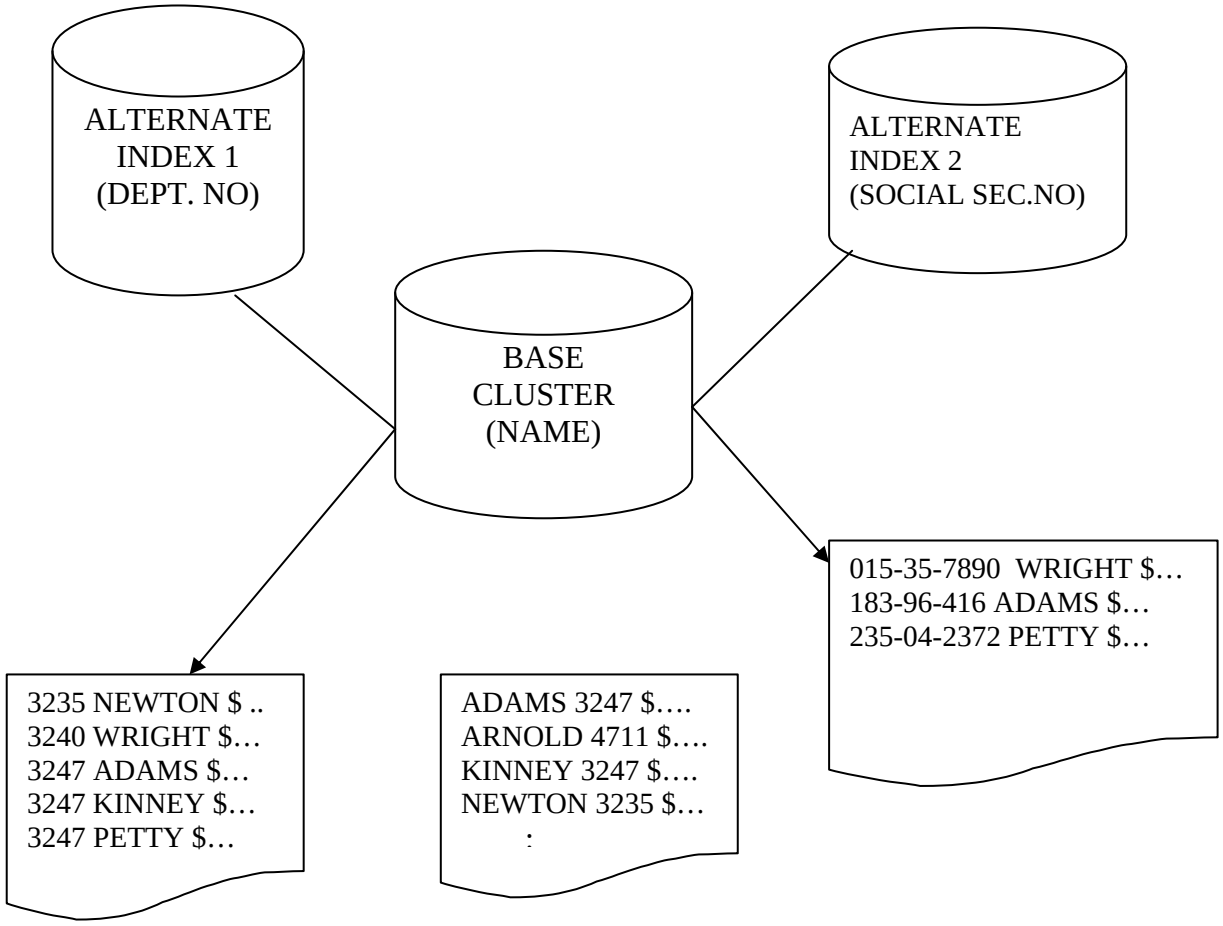


Figure 5-1.

- Multiple alternate indexes (AIXs) may be defined over a base cluster.
- If the user is sequentially retrieving records using AIX1, then records are retrieved in logical sequence by department number
- Access via AIX2 with an alternate key of social security number results in the retrieval of base cluster records in social security number sequence.

ALTERNATE INDEX DATA RECORD FORMAT

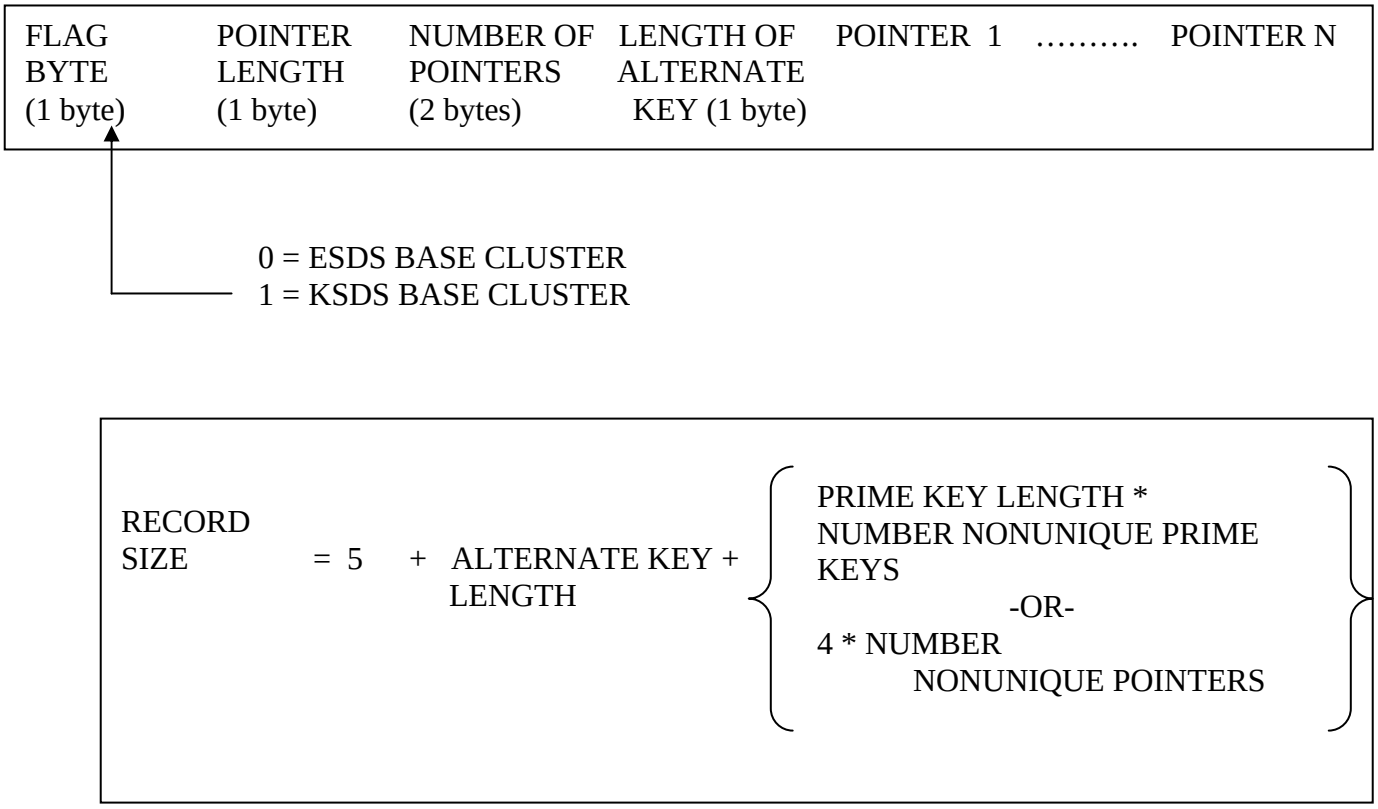


Figure 5-2.

- Each AIX data record is variable length and contains system header information, the alternate key, and at least one pointer to the base cluster.
- AIXs are spanned record data sets, since there may be many base cluster records associated with a given alternate key.
- Pointers to the base cluster are of two forms, either an RBA(for an ESDS base cluster) or a prime key (for a KSDS base cluster). The pointers are the same type throughout the entire AIX.

STEPS TO CREATE AN ALTERNATE INDEX

Creating an ALTERNATE INDEX requires three separate steps

1. Define the alternate index using the IDCAMS DEFINE AIX command.

2. Specify an alternate index PATH using the IDCAMS command. The path forms the connection between the alternate index and the base cluster.

3. Build the alternate index and populate it with records using IDCAMS BUILDINDX command.

Creating An Alternate Index

```
DEFINE   ALTERNATEINDEX –
         (NAME(AIX name) –
         RELATE (base cluster name) –
         KEYS (length offset) –
         UNIQUEKEY | NONUNIQUEKEY –
         UPGRADE | NOUPGRADE
         RECORDSIZE(avg max) –
         VOL (volser) –
         CYL | TRK | REC (pri sec))
```

NAME specifies the name of the AIX

KEYS parameter defines the length and offset of the alternate index key

UNIQUEKEY | NONUNIQUEKEY indicates whether the alternate index can be duplicate in multiple base cluster records

RECORDSIZE parameter specifies the average and maximum length of each alternate index record

DEFINE ALTERNATE INDEX EXAMPLE

```
//STEP1 EXEC PGM=IDCAMS
//SYSPRINT  DD  SYSOUT = *
//SYSIN DD *
      DEFINE ALTERNATEINDEX(UESR1.KSDS.AIX) –
            VOLUME(VOO1)     -
            RELATE(USER1.KSDS.CLUSTER)  -
            UPGRADE-
            CYLINDERS(2 1)   -
            KEYS(25 9)-
            RECORDSIZE(70 110)    -
            FREESPACE(20 10)-
            NONUNIQUEKEY     -
      DATA
            (NAME(USER1.KSDS.AIX.DATA))-
      INDEX
            (NAME(USER1.KSDS.AIX.INDEX))
```

UPGRADE SET

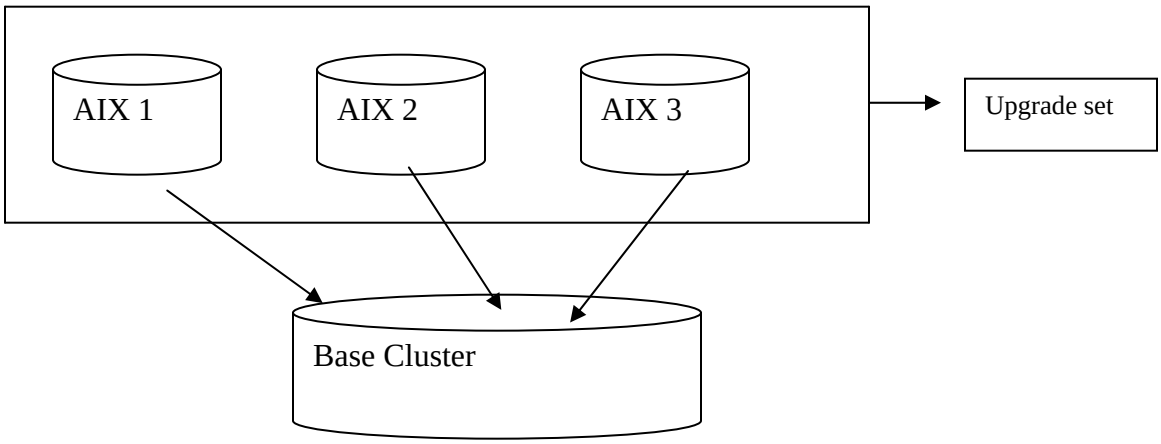


Figure 5-3.

- UPGRADE specifies that the records in the alternate index be to be updated automatically whenever the records in the base cluster are updated.
- The use of UPGRADE makes the alternate index part of the cluster's so-called "upgrade set".

PATH Concept

- Once you have defined any alternate indexes you must define a separate path for each one, using the IDCAMS DEFINE PATH command.

- This path name is the dataset name that you use in the JCL when processing an alternate index. It is a separate catalog entry and forms a logical connection (path) through the alternate index to the base cluster.

DEFINE PATH

```
DEFINE    PATH(NAME(PATH NAME)  -
          PATHENTRY  (AIX NAME) -
          UPDATE     | NOUPDATE)
```

- NAME specifies the name of the PATH.
- PATHENTRY associates the AIX with the path name.
- UPDATE | NOUPDATE SPECIFIES WHETHER ALL OF THE UPGRADE SET SHOULD BE MAINTAINED BY VSAM when accessing through this path.

DEFINE PATH EXAMPLE

```
DEFINE     PATH  (     -
           NAME(USER1.KSDS.PATH) -
           PATHENTRY(UESR1.KSDS.AIX)   -
           UPDATE      )
```

BUILD INDEX

```
BLDINDEX                          -
{INFILE(ddname)|INDATASET (base cluster name)}   -
{OUTFILE(ddname)|OUTDATASET (AIX name)}     -
[EXTERNALSORT  |   INTERNALSORT]      -
[WORKFILES(ddname  ddname)]
```

- INFILE | INDATASET IDENTIFIES THE BASE CLUSTER.
- OUTFILE | OUTDATASET identifies the aix to be loaded
- INTERNALSORT requires AMS to build the alternate index records within the user's address space if possible
- EXTERNALSORT indicates that two ESDS work files are to be used by AMS for the sort
- WORKFILES specifies the ddnames to be used instead of the default names

BLDINDEX EXAMPLE

```
BLDINDEX INDATASET(USER1.KSDS.CLUSTER)-
         OUTDATASET(UESR1.KSDS.AIX)
```

ALTERNATE INDEX RESTRICTION

- NO ALTERNATE INDEX FOR RRDS AND LDS
- BASE CLUSTER MUST NOT BE EMPTY FOR BULDINDEX
- LENGTH OF THE ALTERNATE INDEX NOT EXEEED 255
- MAXIMUM NUMBER OF ALTERNATE KEY POINTERS IS 42K
- RECORDS LARGER THAN 42760 NOT SUPPORTED BY REPRO/EXPORT

DD STATEMENTS

```
//DD1 DD DSN=PAYROLL.MASTER, DISP=SHR

//DD2 DD DSN=PAYROLL.DEPT.AIX, DISP=SHR

//DD4 DD DSN=PAYROLL.DEPT.PATH, DISP=SHR
```

DD1 provides access to the base cluster using the primary key for direct or sequential processing.
DD2 provides access to the alternate index ONLY.
DD4 provides access to the base cluster using the alternate key for direct or sequential processing.

DISP = SHR allows the SHAREOPTIONS parameter to govern the sharing of the data set.

SHAREOPTION IMPACT

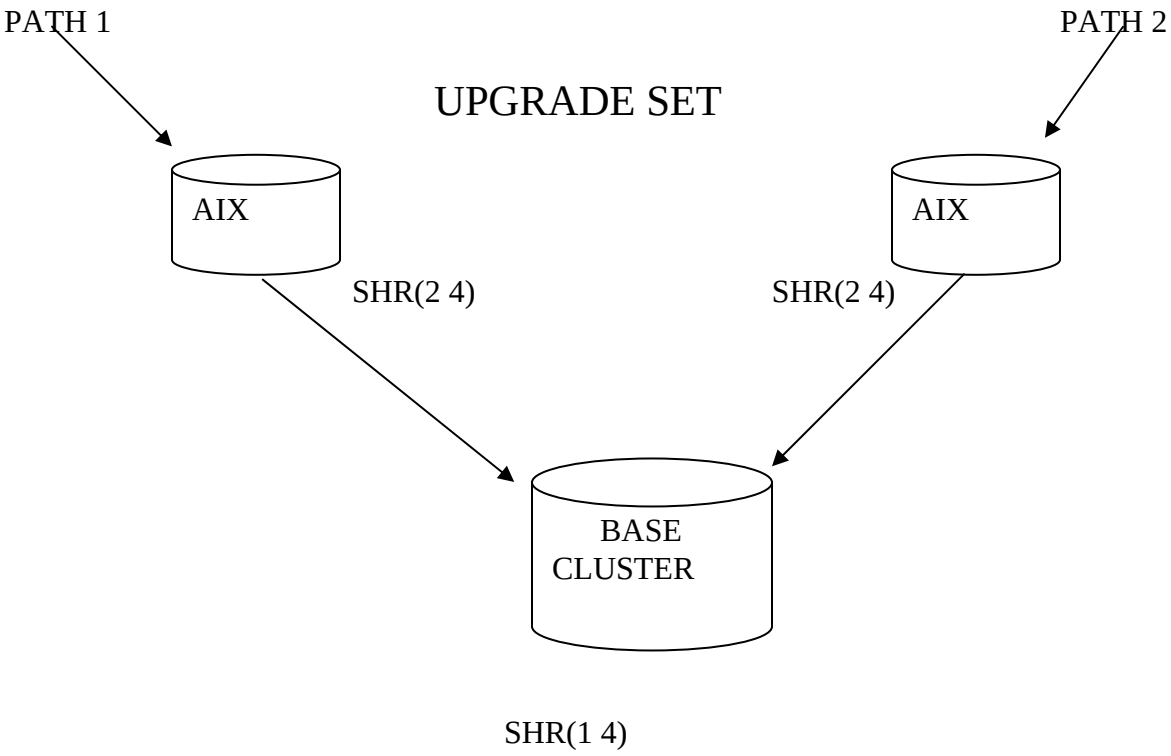


Figure 5-4.

If PATH1 were open for output, the open of PATH2 would fail.

SHAREOPTION (2 4) for the base cluster is less restrictive:

- Multiple read only users
- One update user
- Add/deletes/update should be made through either the base cluster or path, but not both

Unit 5 Exercises

Unit 5 Lab Exercises

1. ***Create an Alternate Index for the KSDS called USERID.VSAM.KSDS.AIX with Name as the alternate key.***

   - ***Allocate 1 BLOCK for Primary and Secondary extents.***
   - ***Let the Volume be the same as the KSDS.***
   - ***Give a Record length of 80.***
   - ***Specify the index to be Unique.***
   - ***Name the Path as USERID.EMP.KSDS.PATH***
   - ***List all Catalog information related to the data set.***

Notes