**TSO**

**TSO Overview:**

* Time Sharing Option (TSO)
* TSO is interface that allows the users to **enter commands** to interact to the system
* Allows multiple users to logon and use a mainframe simultaneously.
* CPU time is divided into times slices to achieve this.
* Each user is provided with time slice in turn.
* Some languages like REXX also use TSO.
* Once you login into TSO session, do F3 then TSO command prompt / Ready prompt will open up (black screen) where we can enter TSO commands.

**Commands (in TSO command prompt/Ready prompt):**

* nslookup [www.facebook.com](http://www.facebook.com)
* ping [www.google.com](http://www.google.com) : (when we press enter) we can see it’ll give popup message operation not permitted. That permission is given by RACF (Resource Access Control Facility) id, it is used to keep mainframe system secure.
* date
* time
* send ‘type your message’ user\_id
* allocate dataset(NUHID.XXX.XXX) tracks space(2,1) recfm(f) lrecl(80) dsorg(ps)
* rename ‘old\_dataset\_name’ ‘new\_dataset\_name’
* listds ‘NUHID.XXX.XXX’ : it’ll show property of dataset
* delete ‘NUHID.XXX.XXX’
* help: to list all the tso commands
* ctrl+A : it’s an interrupt key, it’ll interrupt the running command if its running for long

**TSO Operation Modes:**

* **Foreground mode:** Interact directly with the TSO using commands. Line by line mode.

**Background mode:** TSO commands are run independent of the user. The command run under the OS using batch process.

* When we go to TSO command prompt from there we can give
  + **ISPF:** it’ll start another full screen application called ISPF
  + **OMVS:** it’ll start another full screen application called OMVS
* 3 ways to execute TSO command:
  + READY prompt
  + ISPF option 6
  + ISPF command line (TSO prefix is required)

**ISPF**

* ISPF is Interactive Service Productivity Facility.
* It’s a **menu driven interface** for interaction with the mainframe.
* ISPF executes native TSO commands.
* It allows you to do everything you would otherwise do in TSO.
* Introduced in 1974, earlier only TSO commands were used.

**PF Keys and customizing ISPF panel:**

* PF keys are the function keys in the ISPF.
* Function keys are used to perform certain actions in ISPF.
* There are 12 functions keys in keyboard (F1, F2, F3…), but can be extended to 24 by using shift command.
* Types **‘keys’** in ISPF command line, it’ll show all the function key to which it is assigned to.
* **Label**: it means what will you see on screen (F3: End) **Function**: what function that key will perform (F3: Go Back).

**DATASETS**

**What is a dataset:**

* A Record is just some data like phone number, employee details, insurance, tax details etc.
* A specific portion within a record is called a Field (row data in record is called field).
* A dataset is a file that contains one or more such records.
* In UNIX (LF), Mac (CR) and Windows (CR/LF), the files are byte-oriented, but on z/OS the dataset are record-oriented.
* In byte-oriented files, a delimiter like **CR (Carriage Return)/LF (Line Feed)** is required to separate records.
* **Line Feed:** to come to next line on the type writer is called line feed.
* **Carriage Return:** to come to the first character on that new line is called the carriage return.
* In z/OS we defined the **logical record length** while allocating the data set itself, we also define the other properties like space, organization of the dataset while allocating it.
* Apart from storing data, we also use data sets to store source programs, executable, system parameters etc.

**Dataset naming rules:**

* A dataset name consists of one or more parts connected by periods. Each part is called a qualifier. Ex: NUHID.A182174.CNTL. Here NUHID A182174 and File are called qualifiers.
* The first qualifier is called the high-level qualifier and last is called the low-level qualifier.
* Each qualifier must have 1 to 8 characters.
* Qualifier should always start with alphabets or special characters. Alphabets, numeric, hyphen (-) and special characters (@ # $) are allowed.
* The maximum size of a dataset name is 44 characters, including the periods.
* **To create dataset, goto ISPF** 
  + 3 (utilities) -> 2 (Dataset) -> in command line give A (allocate) -> then give dataset name in name line -> give the parameters of dataset

**Types of datasets:**

* **Physical Sequential data sets (PS Files)**
  + It is a simple file with records stored in the order that they are written.
  + If you want to access the 10th record in the file you cannot directly jump into it, you must traverse the file in a sequential manner starting from 1st record.
* **Partitioned datasets (PDS)**
  + A collection PS member.
  + It is a like a folder
* **Partitioned datasets extended (PDSE)**
  + It’s just a PDS with some extra features and better performance.
* **Generation Data Groups (GDG)**
  + It is a group of related files that can be referenced individually or as a group.
  + The individual files within a group have a generation number added to the end of the name to make each file name unique.
* **VSAM datasets**
  + PS file can only be accessed sequentially, to overcome this VSAM datasets are used.
  + VSAM datasets can be positioned at a particular record without traversing through its previous records. This makes the access to the data faster.
  + There are 4 types of VSAM dataset:
    - **KSDS**
    - **ESDS**
    - **RRDS**
    - **LDS**

**Creating new PS and PDS dataset:**

* These are the parameters while creating new PS or PDS dataset:
  + **Logical record length (LRECL)**
    - Maximum total length of one record in a file
  + **Block size**
    - **When a program reads a file, it will take a block of data and put it into the memory.**
    - **Let suppose the record length of the file is 88, so if we assign a block of size 88, that means that program will load only one record at a time in the memory**
  + **Space**
    - **Primary Quantity:** The amount of space allocated during the allocation of dataset.
    - **Secondary Quantity:** Once primary gets filled then space is allocated to secondary quantity.
    - **Space = Primary quantity + (15 X Secondary quantity)**
  + **Space unit**
    - can be KB, MB, Bytes, Blocks, Tracks, Cylinder
    - 1 track = 56,664 bytes
    - 1 block = 27,998 bytes
    - 1 cylinder = 849,960 bytes
    - 1 KB = 1000 MB
    - 1 MB = 1000 bytes
  + **Average record unit**
    - It is just a multiplier, for example U (1 KB), K (1000 KB), M (1,000,000 KB)
  + **Record format**
    - **Fixed:** Blocksize and record length are same.
    - **Fixed Block:** Blocksize is some multiple of record length
    - **Variable:** Record length is variable; a **Record Descriptor Word (RDW)** defines length of every record.
    - **Variable Block: The size of the block is variable (variable block)** are blocked togetherwith a **Block Descriptor Word (BDW)** for each block.
    - **Undefined:** No define internal structure.
  + **Directory block**
    - This decides the number of members in the PDS.
    - It is multiplied by 3 to 21 depending on the system.
    - If I want 60 members in PDS I’ll give 20 directory blocks.
  + **Dataset name type**
    - Defines the type of the dataset.
    - Blank for PS dataset.
    - PDS for allocating PDS dataset.
    - LIBRARY for allocating a PDSE dataset.

**OPERATIONS ON DATASETS**

**Copy data from one dataset to another:**

* Data can be copied from:
  + 3 (utilities) -> 3 (Move/Copy) -> C in command line -> give from and to dataset
  + **PS to PS**
    - Data will be appended to the already existing dataset.
  + **PS to PDS member**
    - While copying from PS to PDS member, we need to create a new member we cannot copy to already existing member. For copying into old member just select replace like-name members. (Data will be overridden, it won’t append)
  + **PDS member to PS**
    - Data will be appended to the dataset.
  + **PDS member to PDS member**
    - Data will be overridden, it won’t append.

**Move Data from one dataset to another:**

* Data can be moved from:
  + 3 (utilities) -> 3 (Move/Copy) -> M in command line -> give from and to dataset
  + **PS to PS**
    - Data will be appended to the already existing dataset, but source dataset will be deleted.
  + **PS to PDS member**
    - Data will be overridden; it won’t append but source will be deleted.
  + **PDS member to PS**
    - Data will be appended to the dataset, and source will be deleted.
  + **PDS member to PDS member**
    - Data will be overridden; it won’t append and source will be deleted

**Rename a dataset:**

* 3 (utilities) -> 2 -> R in command line to rename -> give dataset name u want to rename -> enter -> give new name
* Goto 3.4 -> infront of dataset name give R -> give new name

**Delete a dataset:**

* 3 (utilities) -> 2 -> D in command line to rename -> give dataset name u want to rename
* Goto 3.4 -> infront of dataset name give D

**COMMANDS**

**ISPF commands:**

* **START:** start new tab
* **SPLIT:** to split screen
* **SAVE:** to save data
* **CANCEL:** to cancel any changes done in the file
* **HEXON/HEXOFF:** hex detail of the data
* **RES:** if given some command to copy but now changed your mind give RES to reset ispf
* **FIND:** Find data in dataset
* **FIND c’word’:** c denotes case sensitive
* **EXCLUDE:** it will data which u have given
* **CHANGE ‘x’ ‘y’ / CHANGE ALL ‘x’ ‘y’:** it will change data from one thing to another
* **SORT 8 10 / SORT 8 10 d:** column number 8 to 10 will sorted in ascending order/descending order
* **CUT code1:** give CC infront of line, then type cut it’ll copy the data and u can paste it anywhere you want by PASTE command. If u want to cut multiple lines then give PASTE code1 (code1 is clipboard).
* **CUT DISPLAY:** how many clipboards you created
* **DEL ALL X:** to delete excluded lines
* **DEL ALL NX:** delete all lines in the dataset
* **DOWN/UP:** F8 or F7 command to go down and up
* **LEFT/RIGHT:** F10 orF11 command to go left and right
* **DOWN N/UP N:** to go N lines down or up
* **DEL / NSCR:** delete migrated file which can’t be recalled

**ISPF EDIT LINE COMMANDS**

* **CONFIRM ON/CONFIRM OFF:** confirm command is use to display the confirm delete panel, if confirm off then it’ll delete without warning.
* **RESET or RES:** the function of reset is to see the excluded lines from the data.
* **LC:** list colour is used to change colour of datasets.
* **SRCHFOR:** it is used to find particular string in multiple datasets.
* **SRCHFOR X’40’:** it is used to find hexadecimal value.
* **SRCHFOR ‘STrinG’:** when panel will open up select ‘Mixed Mode’ it’ll search for exact string.
* **7 (Dailog Test) -> 5 (Log):** it’ll show the log of all the ISPF commands u have used recently.
* **REFRESH / REF:** it is used to refresh the list, like windows refresh.
* **APPEND ‘NUHID.XXX.XXX’:** goto 3.4 you opened your datasets, then you give append command u can append datasets to your already existing list.
* **EXCLUDE XYZ ALL:** goto 3.4 open your datasets, then give this command it’ll hide all the datasets containing XYZ in their qualifiers.
* **SORT:** goto 3.4, by default the datasets are sorted by name order. We can use SORT VOLUME D, SORT TRACKS A.
* **MEMBER member\_name:** goto 3.4 then give the command, if you want to search you member in your PDS.
* **SAVE dataset\_name:** goto 3.4, open any PDS then give this command, this will save all your pds member name into a PS file.