**IBM i workload migration using Go Save/Restore, Option-22,23**

1. **Objective**:

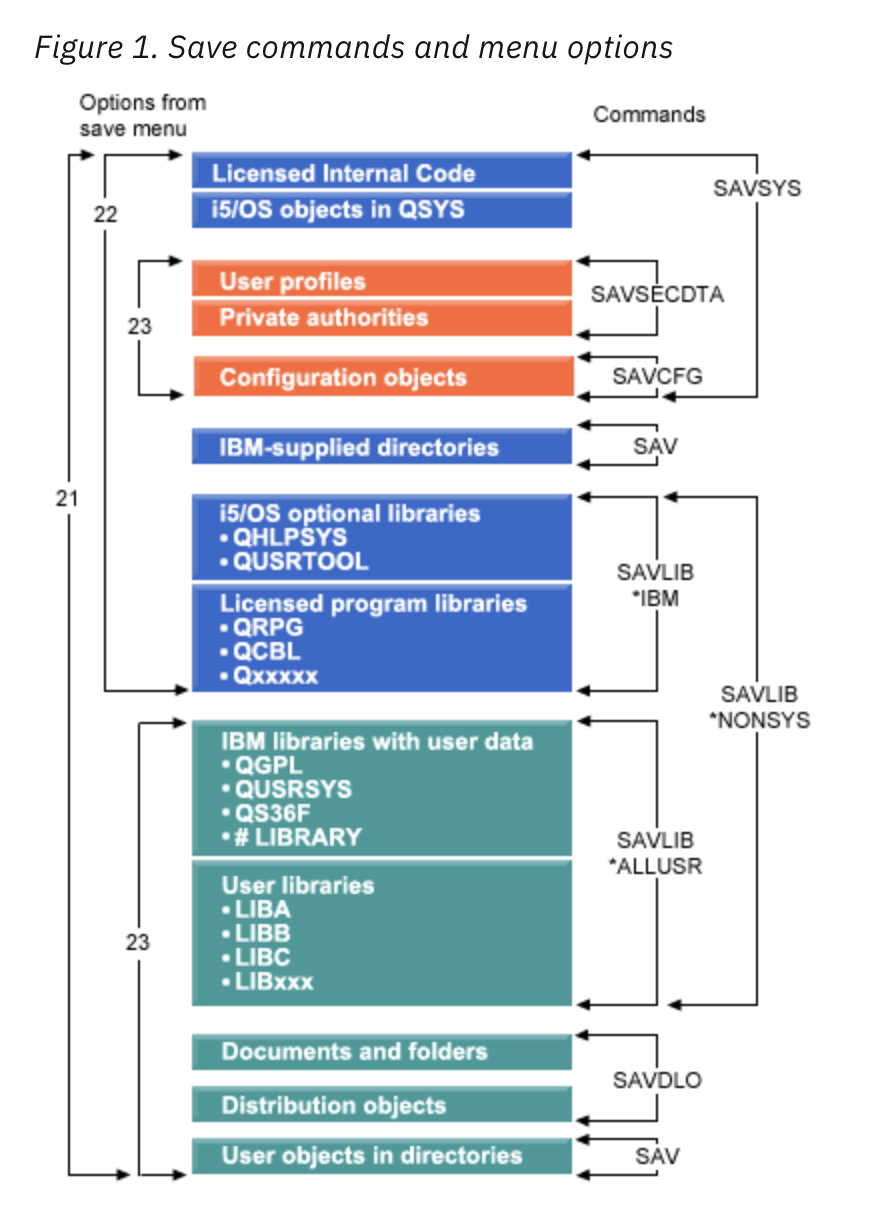
* Demonstrate how an IBM i workload can be migrated to Skytap cloud using Go Save, Option 22,23.
* Full-system recovery including LIC, OS installation

1. **Pre-requisites:**

* Install latest PTFs on IBM i
* Utilized ASP should be less than 48% in IBM i LPAR. Amount of disk space can be reduced by doing clean up as mentioned in below link:

<https://www.ibm.com/support/pages/reducing-system-asp-disk-space-dasd-storage-used>

* Azure storage account with blob storage container and valid SAS key
  + Insert detailed instructions here:
  + Create Azure storage account as required, and generate SAS token
  + AZCopy the virtual tapes from the NFS mounted directory into Azure object storage container.
* Linux / Windows server in on-premise network, preferably close to IBMi server, preferably Linux with desktop environment over Windows, no specific storage/compute requirements, installation of AZcopy utility



1. **High level Steps:**

* Save Option 22 on optical media to create an ISO image
* Save QGPL and QUSRSYS and append to existing ISO
* Save Remaining data to virtual tape(s) via option 23 save
* Restore Option 22 with ISO
* Restore QUSRSYS and QGPL to get network
* Restore remaining data via virtual tape

1. **Determining size to be backed up on ISO optical image**
   * + Go Disktasks, Option-1 to collect disk space information

OR, same can be run using RTVDSKINF command

* + - RTVDSKINF job will be submitted in WRKACTJOB, depending on the system size, command completion may vary system to system
    - Once the job completes, print information using PRTDSKINF or Go Disktasks, Option 2.
    - In report type, select library
    - WRKSPLF, display PRTDSKINF report
    - Review QUSRSYS, QGPL, QSYS, LIC and IBM libraries size. Accordingly, create the optical media size

1. **Create virtual optical media**

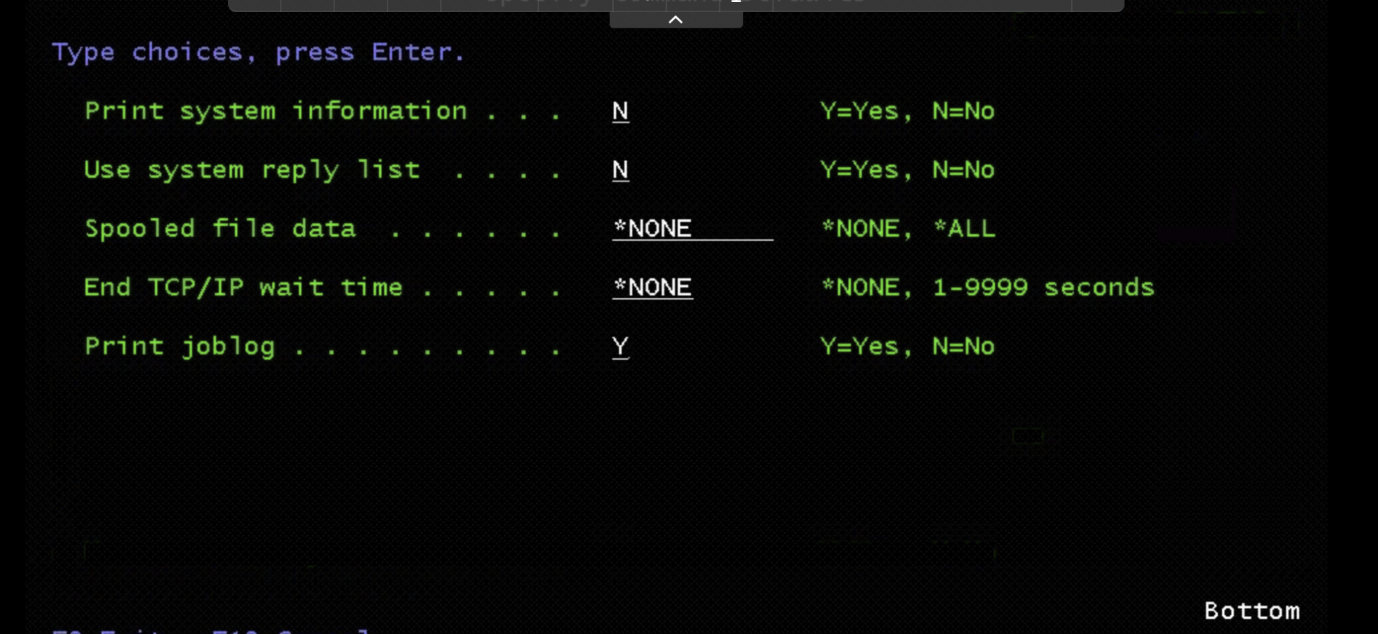
<https://www.ibm.com/docs/en/i/7.2?topic=storage-setting-up-virtual-optical>

* + CRTIMGCLG IMGCLG(skytap30GB) DIR('/skytap30GB')
  + ADDIMGCLGE IMGCLG(skytap30GB) FROMFILE(\*NEW) TOFILE(skytap30GB.iso) IMGSIZ(30000)
  + CRTDEVOPT DEVD(skyopt30gb) RSRCNAME(\*VRT)
  + VRYCFG CFGOBJ(skyopt30gb) CFGTYPE(\*DEV) STATUS(\*ON)
  + LODIMGCLG IMGCLG(skytap30GB) DEV(skyopt30gb)
  + INZOPT NEWVOL(MYVOLUMEID) DEV(skyopt30gb) CHECK(\*NO) TEXT(DESCRIPTION)

1. **Save, Option 22 to virtual optical media**

* Bring system to restricted state using ENDSBS \*ALL \*IMMED
* Go Save, Option22 and take below parameters on the command





* Save QGPL and QUSRSYS and append to existing ISO in Optical device
* SAVLIB, F4 to prompt: (QGPL first, then QUSRSYS)
  + Choose Existing Optical device
  + F10 for more options
  + Change parameters:
  + Spooled file data = \*NONE, to not include output queues
  + Save file data = \*NO
* STRSBS QCTL to bring system out of restricted state
* Create NFS export on directory where image catalog is loaded, so you can copy the ISO to a machine where it can be uploaded to Assets
* ENDNFSSVR \*ALL
* CHGNFSEXP OPTIONS('-F -O RW=,ANON=0') DIR('/skytap30GB')
* STRNFSSVR \*ALL
* Begin uploading the ISO to Assets –
  + Mount NFS exported directory from IBMi server to Linux/Windows machine. (INSERT EXAMPLE NFS MOUNT COMMAND HERE)
  + Load skytap portal in browser of desktop session on Linux/Windows machine
  + Log into Skytap, Click on ‘Assets’
  + Upload ISO to Skytap account, select region where your LPAR(s) to be restored in Skytap will be hosted.

1. **Create virtual tape media**

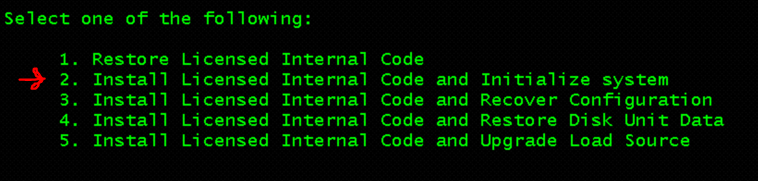
* Create virtual tape image Catalog for Option 23 data

<https://www.ibm.com/docs/en/i/7.3?topic=tape-setting-up-virtual-storage>

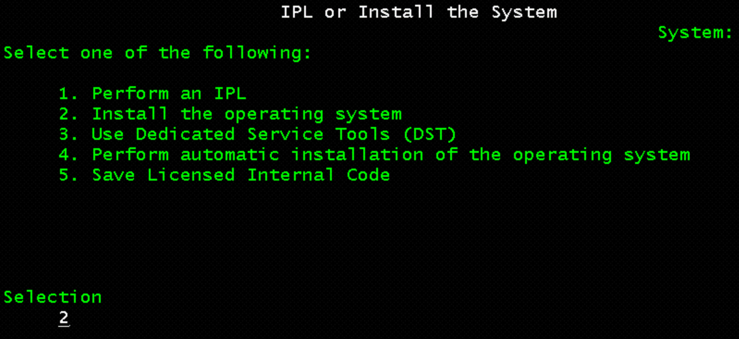
* Determine tape size based on over-all data size, you must pre-create each tape required for the total Option 23 save.
* Bring system to restricted state and start Go SAVE, Option23
* Set up NFS exports for AZCopy Linux server to Azure
  + - ENDNFSSVR \*ALL
    - CHGNFSEXP OPTIONS('-F -O RW=,ANON=0') DIR('/directoryWhereTapeImageCatalogIsLocated')
    - STRNFSSVR \*ALL
* Mount NFS directory above to Linux server in same network as source IBM i LPAR
  + e.g. mount -o nfsvers=3 10.0.0.1:/scratchASP/vtapes /home/skytap/scratchasp
* Install AZCopy utility as required download here: <https://docs.microsoft.com/en-us/azure/storage/common/storage-use-azcopy-v10>
  + extract AZCopy archive to directory
    - e.g. tar -xvf azcopy\_linux\_amd64\_10.12.2.tar.gz
  + Copy save files from NFS mounted location to Azure blob storage container https://docs.microsoft.com/en-us/azure/storage/common/storage-use-azcopy-blobs-upload?toc=/azure/storage/blobs/toc.json#upload-a-directory
    - azcopy copy '<local-directory-path-of-NFS-mount>' 'https://<storage-account-name>.<blob or dfs>.core.windows.net/<container-name>' --recursive
    - ./azcopy copy ‘/home/LinuxUser/localNFSDirectory’ ‘[https://myStorageAccount.blob.core.windows.net/containerName?](https://csajscottv2.blob.core.windows.net/testecmdi?sp=rw&st=2021-04-20T15:36:09Z&se=2021-04-27T23:36:09Z&spr=https&sv=2020-02-10&sr=c&sig=Qvbwtf0kkB7b3qIKlPZnq0Qja5Oy9Yb16WYkDHESMgc=%E2%80%99)<SAS-Key> --recursive

1. **Deploy IBM i in Skytap cloud**

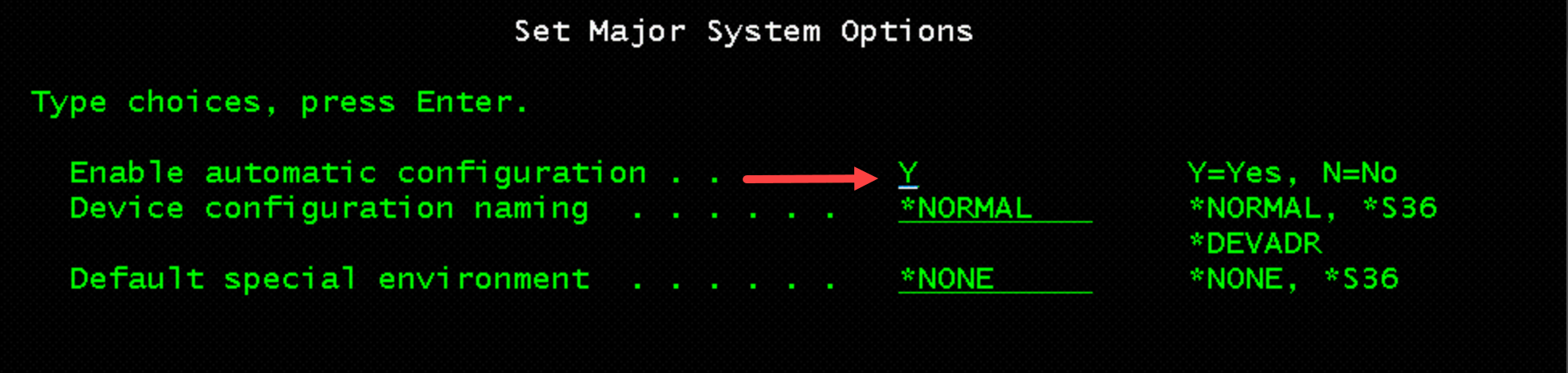
* Deploy IBM i from template
* Delete load source drive from hardware settings in Skytap GUI
* Add new disk(s) for System ASP
* Set boot mode to D Manual mode in hardware settings
* Boot LPAR from Skytap UI and wait to reach C200 4130 boot code (No Load source Found)
* Click button in UI to mount Option 22 ISO from Assets to LPAR
* On Install LIC screen, take Option 2 to Install LIC and Initialize system



* Post LIC installation, do disk configuration
* Initialize non configured disks and add to ASP
* Install OS using below option:



* Enable automatic configuration – Y on set major system option screen.

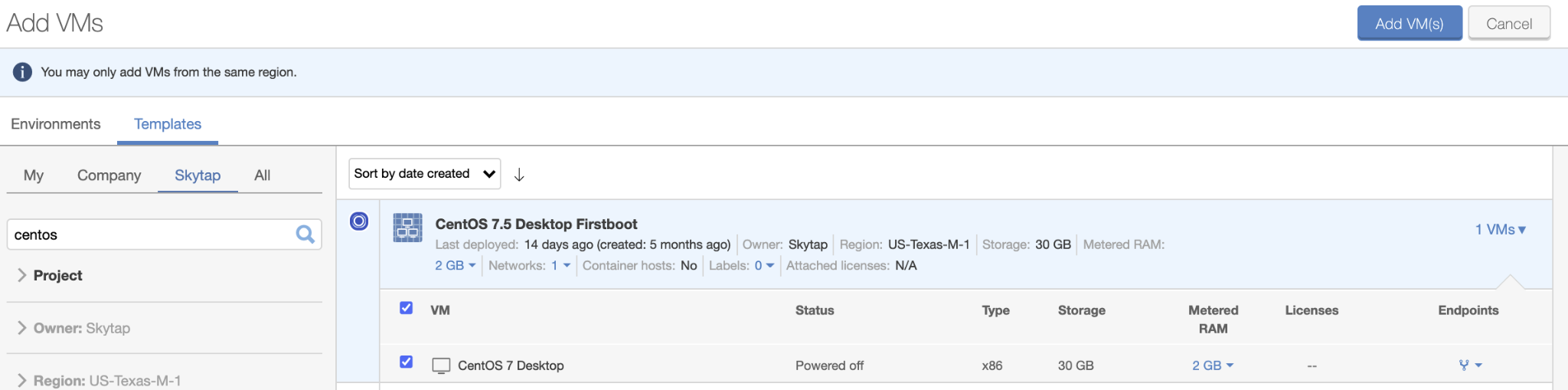


* Change following on next screen:
* Start print writers = N
* Start system to restricted state = Y
* Set major system options = Y
* Define or change system at IPL = Y
* Select Option 3 twice to change the following system values:
* QALWOBJRST \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \*ALL
* QFRCCVNRST \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 0
* QINACTITV \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \*NONE
* QJOBMSGQFL \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \*PRTWRAP
* QJOBMSGQMX \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 30 (minimum, 64 recommended)
* QLMTDEVSSN \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 0
* QLMTSECOFR \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 0
* QMAXSIGN \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \*NOMAX
* QPFRADJ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2
* QPWDEXPITV \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \*NOMAX
* QSCANFSCTL \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \*NOPOSTRST
* QVFYOBJRST \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1
* Press F3 twice and change the QSECOFR password. Note: the current QSECOFR password will be QSECOFR (capital letters)
* Restore QGPL and QUSRSYS
  + RSTLIB, F4 to prompt
  + Select QGPL and QUSRSYS
  + Select existing optical Device
  + Select ALWOBJDIF as \*All and MBROPT as \*All

1. **Network configuration**

* WRKHDWRSC \*CMN, check resource name of ethernet port
* Delete existing Ethline
* Create new Ethline
* Configure default route and DNS
* IPL the LPAR in normal mode

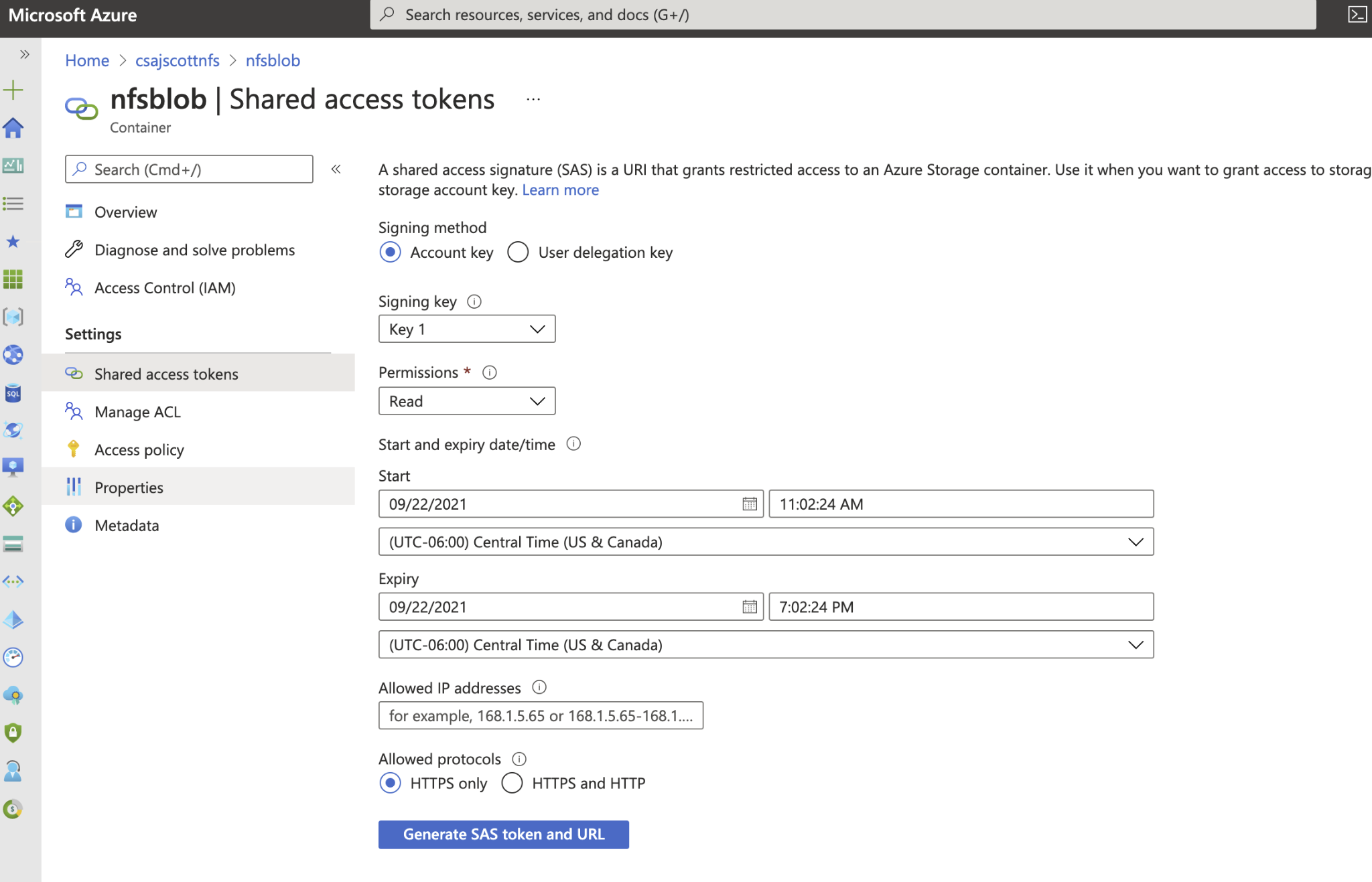
1. **Go Restore, Option 23**

* Create NFS export directory on scratch ASP
* ENDNFSSVR \*ALL
* CHGNFSEXP OPTIONS('-F -O RW=,ANON=0') DIR('/directoryWhereScratchASPisMounted')
* STRNFSSVR \*ALL
* Deploy Centos Desktop Machine from Template into Environment
  + 
* Boot and configure root and secondary users in CentOS
* Mount NFS directory from IBMi server in Skytap on Linux machine:
* mount -o nfsvers=3 10.0.0.1:/scratchASP/vtapes /home/skytap/scratchasp
* Install AZCopy utility, download here: <https://docs.microsoft.com/en-us/azure/storage/common/storage-use-azcopy-v10>
  + extract AZCopy archive to directory
    1. e.g. tar -xvf azcopy\_linux\_amd64\_10.12.2.tar.gz

Copy save files from Azure blob storage container to mounted NFS export directory on target IBMi server in Skytap https://docs.microsoft.com/en-us/azure/storage/common/storage-use-azcopy-blobs-upload?toc=/azure/storage/blobs/toc.json#upload-a-directory

* + 1. azcopy copy 'https://<storage-account-name>.<blob or dfs>.core.windows.net/<container-name>/<directory-path>' '<local-directory-path>' --recursive
    2. ./azcopy copy ‘[https://myStorageAccount.blob.core.windows.net/containerName?](https://csajscottv2.blob.core.windows.net/testecmdi?sp=rw&st=2021-04-20T15:36:09Z&se=2021-04-27T23:36:09Z&spr=https&sv=2020-02-10&sr=c&sig=Qvbwtf0kkB7b3qIKlPZnq0Qja5Oy9Yb16WYkDHESMgc=%E2%80%99)<SAS-Key> ‘/home/LinuxUserinSkytapCentos/localNFSDirectory’ --recursive
* Create virtual tape image catalog in /scratchASP/vtapes
* Add virtual tape(s) to image catalog in directory above
* GO Restore Option 23 from virtual tape image catalog above

APPENDIX:



Example commands:

* mkdir /mydir
* sudo or su to root
* mount -o nfsvers=3 10.0.0.1:/scratchASP/vtapes /home/skytap/scratchasp
* You can check to see the directory is exported with this command if the mount is not successful:
* showmount -e 10.0.0.1 (IP address for IBMi LPAR)
* Create virtual tape image catalog
* Run AZCopy to copy virtualtape(s) from Azure storage to the NFS mount
  + Examples here: <https://docs.microsoft.com/en-us/azure/storage/common/storage-use-azcopy-blobs-download>
* Go Restore, option 23
* Choose virtual tape device, and other parameters as below:



* Check for joblog once the restore is completed using DSPJOBLOG
* Save the joblog using DSPJOBLOG Output(\*Print)
* Restore any not saved object
* Data Restoration is complete at this point
* Check PTF status and change the system values as required