Power Virtual Server VTL Overview

DSI RESTORE VTL Solution Overview

The DSI RESTORE VTL solution on PowerVS is designed to follow a well-established architecture that is used by many IBM i customers today on-prem. Most IBM i customers today use some form of tape to backup up their solution and traditionally that is attached via Fibre Channel. These appliances are hardware solutions that integrate software, servers, and storage. For the PowerVS solution, it was decided to try to replicate the on-prem solution by providing a SW VTL appliance that can be dynamically provisioned in the IBM Cloud.

Sizing Considerations

As part of the solution there are considerations for compute, storage, and networking. The following is a general guideline: To get an accurate sizing, please contact DSI at IBMsizing@dynamicsolutions.com for sizing help.

The first sizing that needs to be determined is the amount of data that needs to be retained. There are a variety of methods to determine this, but it's recommended that if you are using the IBM i BRMS product that you use the reports that are built into the product. For more information see: BRMS VTL Sizing Guidlines After you size the amount of data that needs to be retained, you can calculate the repository size by dividing by a deduplication rate. A commonly used rate for sizing is 15:1. In this example, if you divide your data retained size by 15 you will get your repository size. This is the number that you will enter during the VTL creation for the 'Licensed repository capacity (TB)' field. The licensed repository capacity can be increased but is not allowed to be decreased.

The repository size influences several other sizing factors. The first is the machine type. Only a repository less than 400TB should go on the S922, if a bigger repository is needed it should go on the E980 systems. This is due to the memory requirements. For every TB of repository space, you need 2GB of memory and 32 GB of base memory.

The CPU requirements are guidelines for starting points. You may need to adjust depending on the VTL configuration and usage.

1 - 12 TB Repository = 2 CPU
13 - 72 TB Repository = 4 CPU
> 72 TB Repository = 8 CPU

When you deploy the VTL, it will only have the OS boot disk. The VTL requires 4 other types of disks to be assigned.

1. All VTLs require a 20 GB config drive.
2. An index drive of ~10% of the repository size
3. The landing space or tape space. This is specific to the usage of the VTL. This space must take into consideration all the current backups that could be run at a given time.
4. Repository space is where the backups are retained. This is the space needed after you consider deduplication and compression. There are two options for the repository space; it can be stored on the block storage in Power Virtual Server or it can utilize IBM Cloud Object Storage.

If you are going to use Cloud Object Storage (COS) for the repository you will need to connect your Power Virtual Server account to the IBM Cloud Classic Infrastructure through a proxy server. See this link on information on connecting to COS over Direct Link.

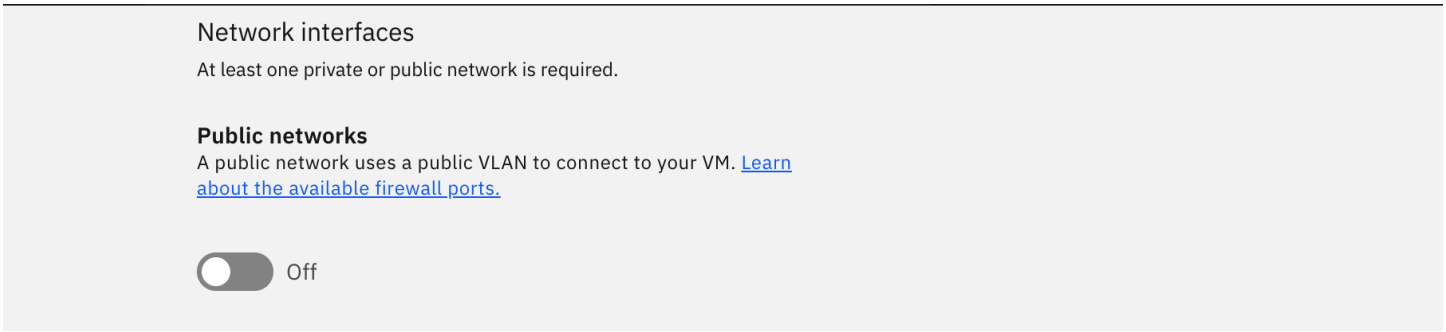
For information on establishing a network connection to COS see this link on how to use Cloud Connections. If Cloud Connections is not available, see how to establish a Direct Link.

You have a choice of which tier to deploy the VTL. The tier will change the performance of the VTL saves and restores. It has been observed that tier3 storage can be in the 30-40% slower throughput than tier1. Actual differences may vary based on the type and size of objects being saved or restored.

The VTL also requires a console that runs on top of a Windows OS. The Windows OS instance needs network connectivity to the VTL and can be either on-prem or on IBM Cloud. It is recommended that the Windows VM has at least 2 vcpu and 8GB of memory.

DSI RESTORE VTL Networking Considerations

There is an option to configure the VTL to have a public facing IP, normally there is not a reason to do this.



If you choose to use the public IP, it will go through the default PowerVS firewall and only these ports will be open:

- 22 (SSH)
- 443 (HTTPS)
- 992 (IBM i5250 emulation SSL)
- ICMP traffic

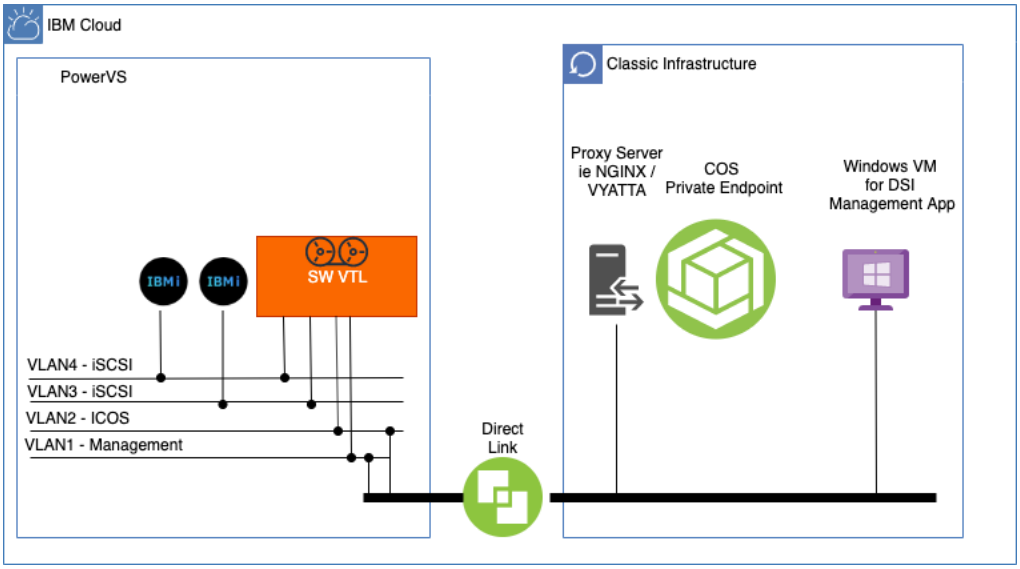
The following firewall ports are also open, typically used for IBM i logical partitions (LPARs):

- 2005
- 2007
- 2010
- 2012
- 9470
- 9475
- 9476

The VTL will communicate on private vlans within PowerVS. There are several options on how you want your traffic to flow.

Whether or not you use separate vlans to isolate the network traffic is up to your implementation, but the following network connectivity is required.

1) Network connectivity between the VTL and a windows machine for VTL management
2) (Optional)Network connectivity between the VTL and COS for repository access
3) (Optional) Network connectivity between the VTL and another VTL in another site for DR
4) Network connectivity between the VTL and IBM i for iSCSI traffic (option to put each client on different vlans)



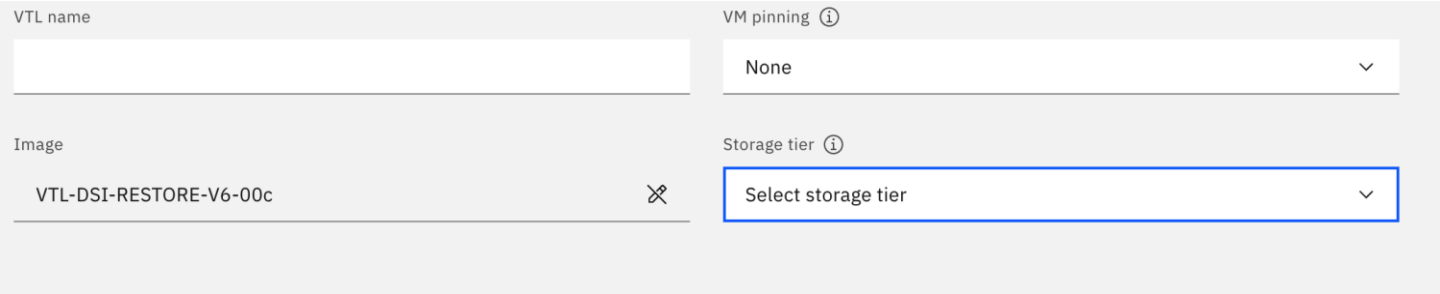
For the network connectivity 1-3 you will need to use Direct Link to bridge that traffic to the classic infrastructure side of IBM Cloud. For the iSCSI traffic that is used to save and restore the data, that traffic can stay local to the PowerVS side of IBM Cloud. When sending data from the VTL to COS, an appliance must be used to forward the traffic to COS. Typically, this is either a Vyatta or NGINX server running on the IBM Cloud Classic side.

The DSI Restore VTL appliance requires a Java based application to be run a Windows machine. This GUI is used by an admin to manage and monitor the VTL. Some of the actions include creating tape libraries, drives and tapes, managing the connectivity to hosts, managing the connectivity to COS. The management UI itself has no access to the data stored on the VTL.

Reference:

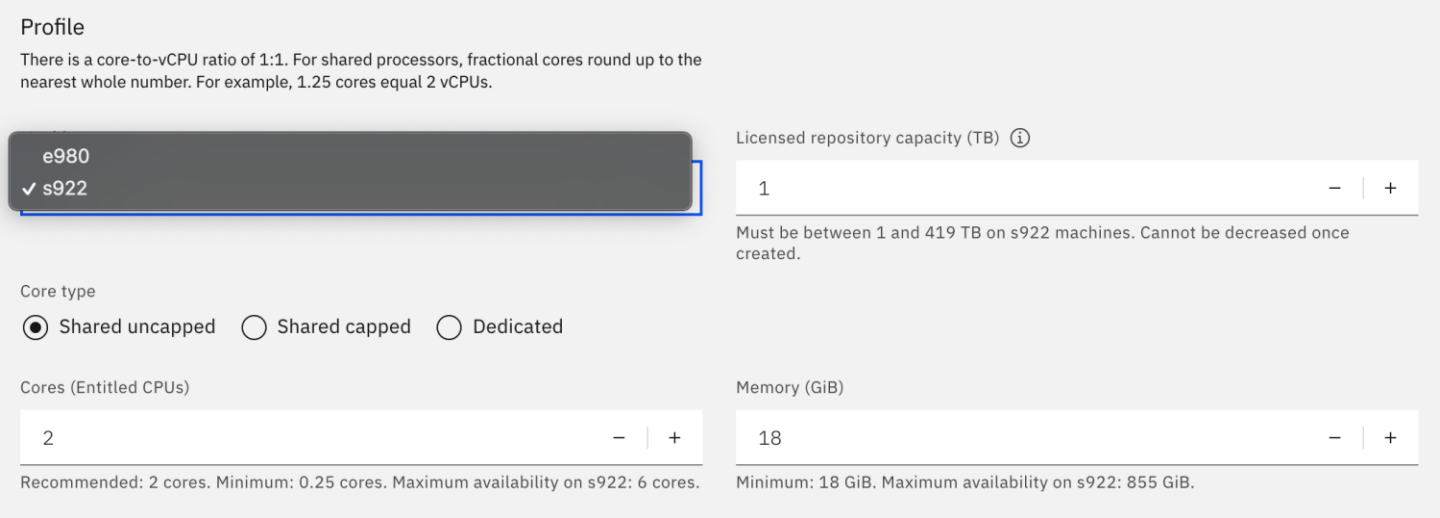
Full details on the management UI see DSI Virtual Tape Library User Guide.

VTL Deploy using the IBM Cloud UI



Start by giving the VTL a name. This is what the hostname of the VTL should be set to. If the hostname is set to the IP address, change the hostname using the VTL management UI. If you change the hostname to something different from the VTL management UI, that change will not be reflected in the PowerVS UI.

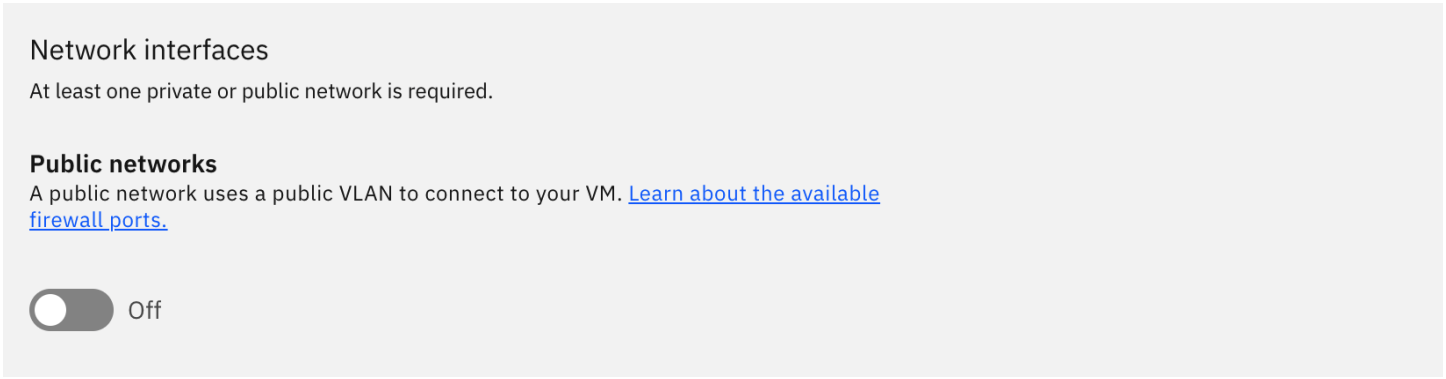
The storage tier is set here. The base storage tier is what will be used for all volumes that are attached to the VTL.



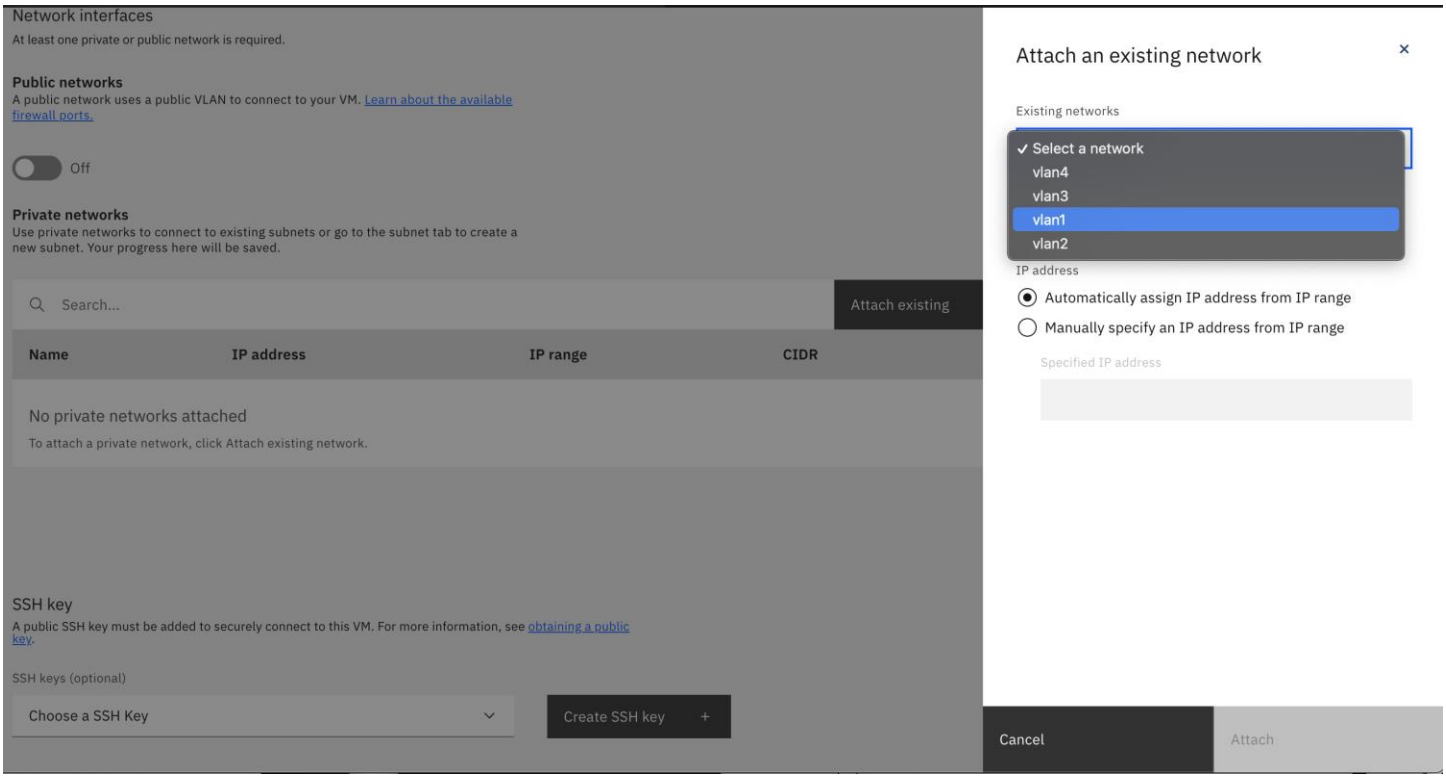
You can deploy the VTL on either an S922 or e980. For a VTL that needs over ~400TB of repository space, the e980 is the only box that can support the amount of memory required.

The Licensed repository capacity is a software licensing metric only. It will determine the license key required for the repository space. Once the VTL is created, the process is started to generate the license key. A license key will be emailed to the IBM Cloud account owner's email. Once the VTL is created the Licensed repository capacity can only be increased. The software license charge metric is based on per month usage and is not pro-rated less than a month.

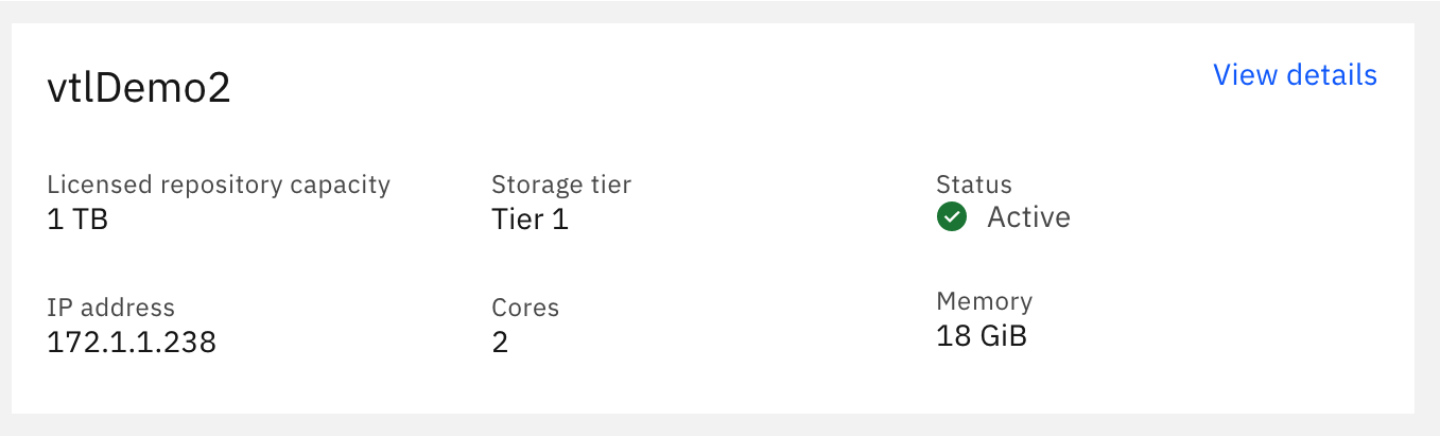
The core type can be any of the choices (Shared uncapped, Shared capped, or Dedicated). The most cost-effective choice is using Shared uncapped. If more performance is required Dedicated can be used.



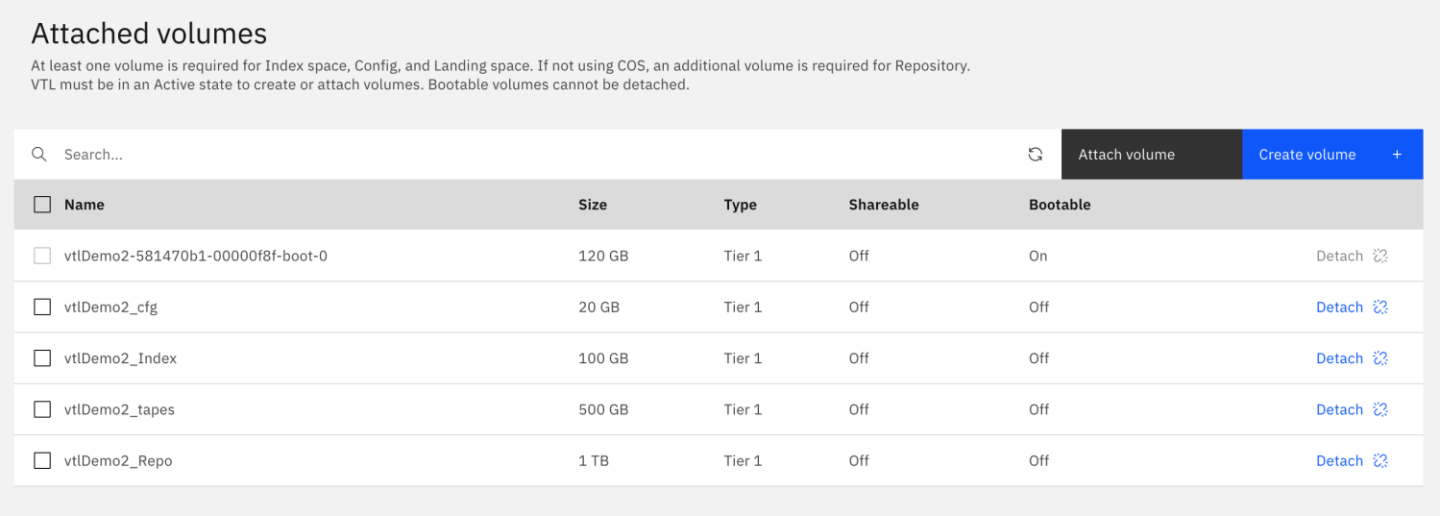
The public network is not required for the VTL. The VTL will use the public network if it is there for the software registration but there are alternative methods if there is no public network. If the public network is set, you will need to add routes in the VTL for the VTL to connect to IBM Cloud Object Storage.



The VTL uses the private networks for iSCSI traffic to the hosts and to communicate with IBM Classic services such as Cloud Object Storage. If you specify the networks at VTL create time, the IP addresses will be configured. If you add the networks after create time, you will have to go into the VTL console to configure the IP addresses. All networks should be configured before deduplication on the VTL is started.



After the deploy of the VTL, you must wait for the status to become 'Active'. At this point click on the View details to add the additional storage for the VTL.



Create volumes here for the config space, index, tapes, and optionally for the repository. See the sizing for exact volume sizes for the VTL.

VTL Deploy using the IBM Cloud CLI

See this link to install the [IBM Cloud CLI and power-iass plugin](#).

The following is a working example; change these commands to suit your implementation:

1. Make sure you have configured the vlan networks that you intend to use on the VTL.

   To list the existing networks use:

   ibmcloud pi nets

```
ID                                   Name   Address
8f475164-2ec8-4d67-9e81-cfeaa03d1f63 vlan1  /pcloud/v1/cloud-instances/f682a8fb74564409ae2e9195460855ca/networks/8f475164-2ec8-4d67-9e81-cfeaa03d1f63
```

2. Create the VTL

First find the id of the VTL image you want to use

ibmcloud pi imglc

Use that image ID and the network ID(s) to create the VTL

vtlc vtlName --image <image id from imglc> --capacity 1 --memory 34 --processors 2 --processor-type shared --sys-type s922 --network <network id from nets> --storage-type tier3

3. Monitor for the status of the VTL

ibmcloud pi vtl 20a87524-24e6-4645-bdbc-665cb258740b

```
ID                  20a87524-24e6-4645-bdbc-665cb258740b
Name                vtlTest
Capacity            1
CPU Cores           2
Memory              18
Processor Type      shared
Networks            8f475164-2ec8-4d67-9e81-cfeaa03d1f63
Disk Size           120
Volumes             47daadfc-8d47-42e7-befc-f6ae7ef826eb
Storage Type        tier1
Pin Policy          none
Image               b48a168b-7f2e-4a9c-a7dc-92d3068178a0
Created             2021-10-07T03:25:48.000Z
Last Updated        2021-10-07T03:25:48.000Z
Status              ACTIVE
Progress            0
Address             Internal Address: 172.1.1.113, Mac Address: fa:62:24:de:65:20
Last Health Update  2021-10-07T19:00:40.443208
Health Reason
Health Status       OK
```

Make sure the Status is 'ACTIVE' and the Health Status is 'OK' before attaching the volumes.

4. Create the disks that will make up the config, index, tapes/landing, and optionally the repository if you are putting the repository on PowerVS block storage. The volume must be the same tier as what you are going to deploy the base VTL on. Take note of the ID so it can be attached later to the VTL.

ibmcloud pi volc vtlTest_cfg --type tier1 --size 20 --affinity-policy affinity --affinity-volume <id of vtl boot vol>

ID 73d663d7-819e-42df-89d9-7c3de57f71a4

ibmcloud pi volc vtlTest_Index --type tier1 --size 100 --affinity-policy affinity --affinity-volume <id of vtl boot vol>

ID a5d5c0c3-517c-4e8c-a06b-ab7af1adb941

ibmcloud pi volc vtlTest_Tapes --type tier1 --size 500 --affinity-policy affinity --affinity-volume <id of vtl boot vol>

ID 4c8a58c8-1f3f-4698-b311-a7fc1147a4b4

The Repository is optional on either the PowerVS storage or on COS. If using COS skip this volume creation for the repository. The COS configuration is done within the VTL.

```
ibmcloud pi volc vtlTest_Repo --type tier1 --size 1000 --affinity-policy affinity --affinity-volume <id of vtl boot vol>

ID        f38b18ab-9639-48cd-8afa-e4537ee49897
```

5. Attach the volumes to the VTL

```
ibmcloud pi volat 73d663d7-819e-42df-89d9-7c3de57f71a4 --instance 20a87524-24e6-4645-bdbc-665cb258740b

ibmcloud pi volat a5d5c0c3-517c-4e8c-a06b-ab7af1adb941 --instance 20a87524-24e6-4645-bdbc-665cb258740b

ibmcloud pi volat 4c8a58c8-1f3f-4698-b311-a7fc1147a4b4 --instance 20a87524-24e6-4645-bdbc-665cb258740b

ibmcloud pi volat f38b18ab-9639-48cd-8afa-e4537ee49897 --instance 20a87524-24e6-4645-bdbc-665cb258740b
```

DSI Restore Setup

After you have the VTL deployed, storage allocated, optional COS connectivity, and a Windows instance for the console, proceed to the document 'Restore v6 Installation Guide for the IBM PowerVS Environment.pdf' .

IBM i Configuration to connect to the VTL

IBM i uses iSCSI to connect to VTL; for the latest PTF list and SQL Services to configure iSCSI:

IBM i iSCSI Configuration

You can use SQL to configure iSCSI. The following is a couple of commands to show an example. These can be run from ACS or using interactive SQL 'strsql'. For interactive SQL, remove the ';' in the examples.

Use this command to get the IBM i client IQN to input into the VTL configuration.

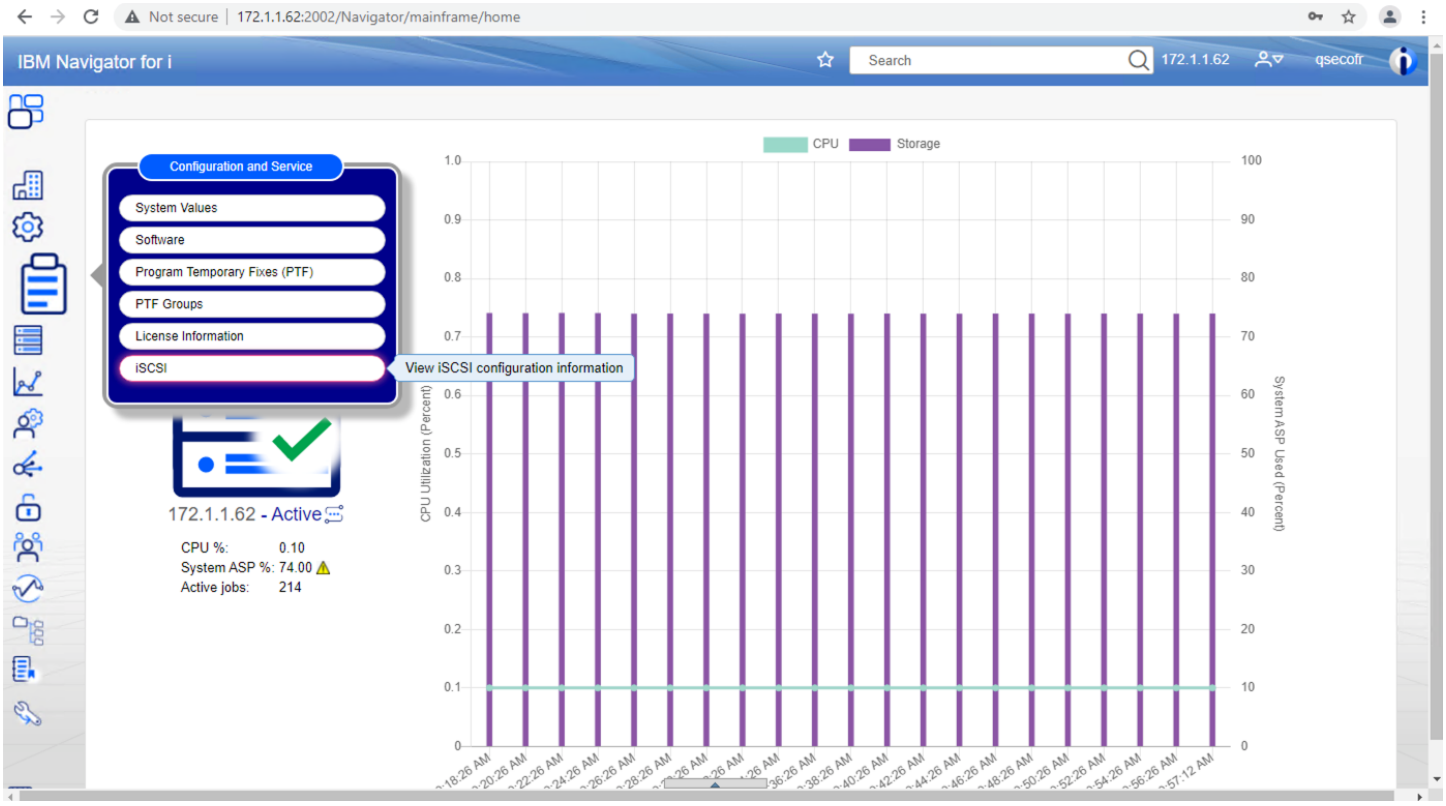
```
select * from table(qsys2.iscsi_info() );
```

Use this command to set the target of the VTL.

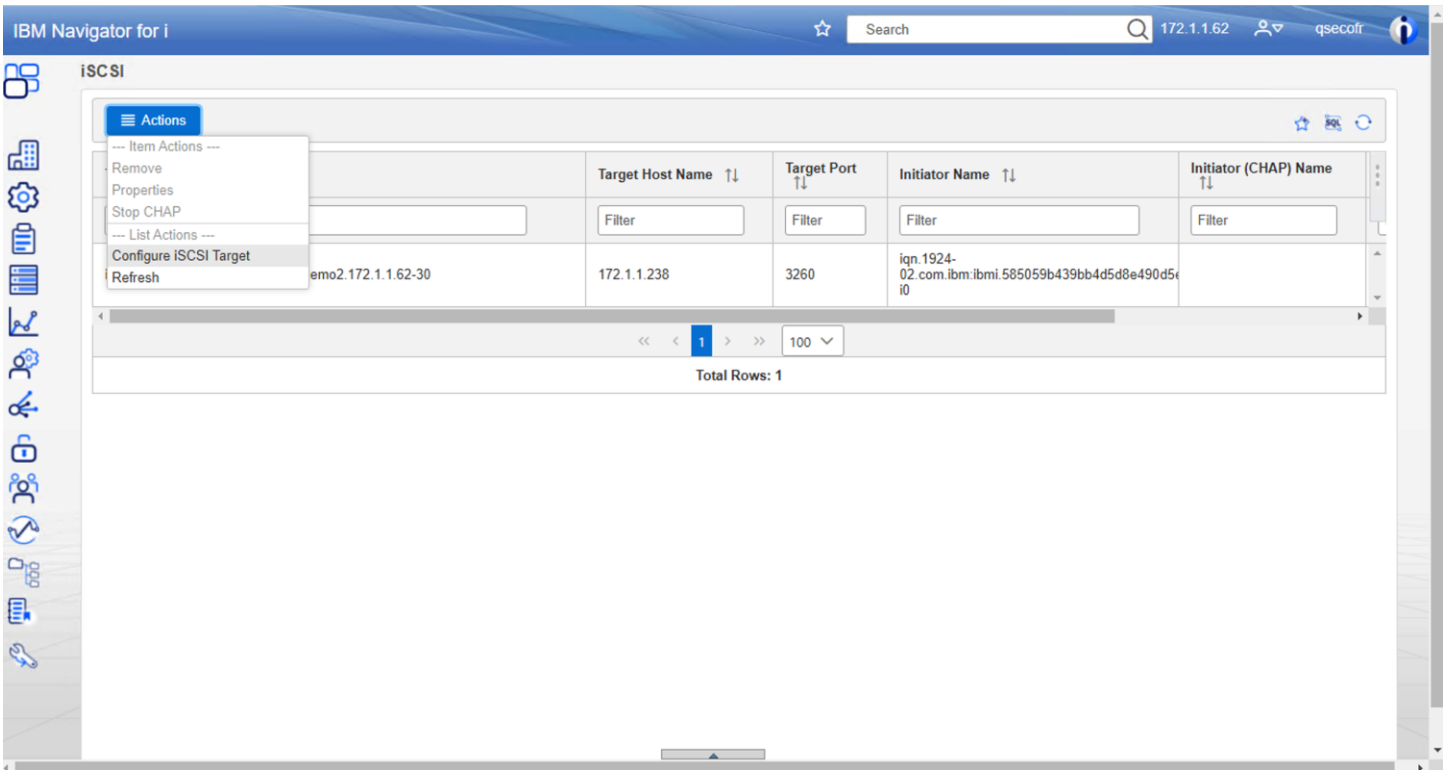
```
call qsys2.add_iscsi_target(target_name=>'target IQN', target_host_name=>'hostname or ip');
```

With the PTF group IBM HTTP Server for i (SF99662) level 14 or newer you can use IBM i Navigator to do most of the configuration for iSCSI.

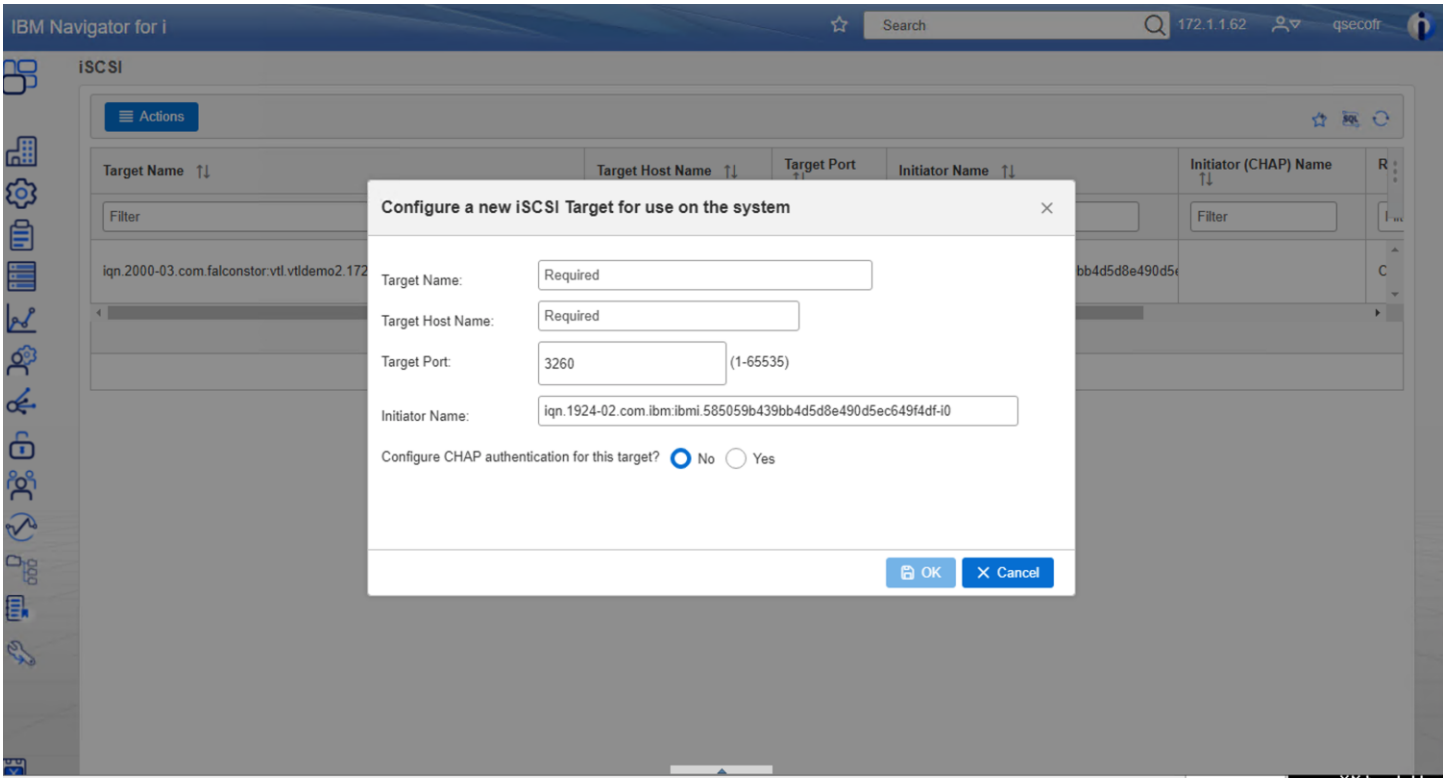
The direct URL is http://<IP ADDR>:2002/Navigator/. To access the iSCSI configuration, navigate to it from the Configuration and Service icon.



Click on Actions and Configure iSCSI Target



Input the Target Name and Target Host Name (or IP Address).

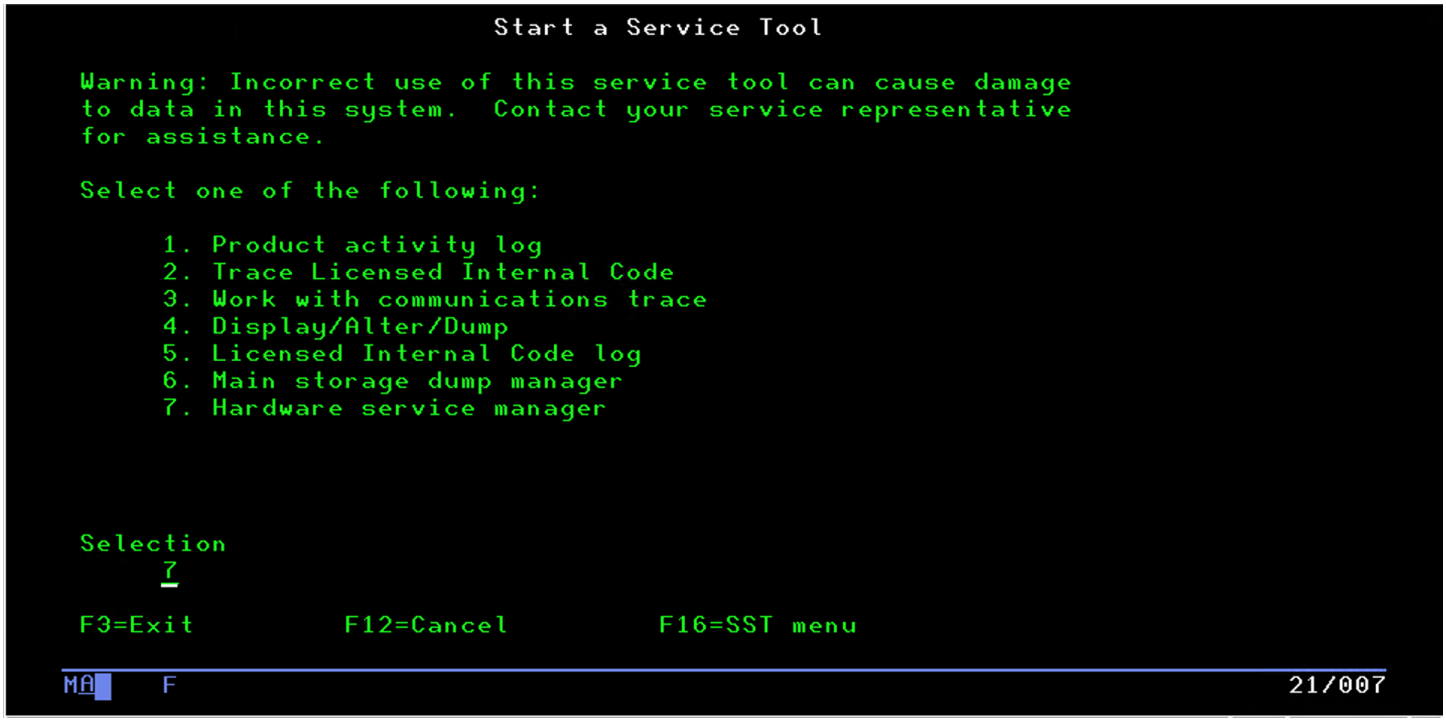


After the iSCSI configuration is done on the IBM i LPAR and there is a tape library and tapes assigned to the target port on the VTL side, re-IPL the virtual IOP associated with the iSCSI connection. An example of the SQL to re-IPL the IOP is below.

CALL QSYS2.CHANGE_IOP(IOP=>'ISCSI', OPTION=>'IPL')

You can also re-IPL the IOP from SST.

Choose option 1 to ‘Start a service tool’



Option 7 ‘Hardware service manager’

Option 2 ‘Logical hardware resources’

```
                          Logical Hardware Resources

Select one of the following:

     1. System bus resources
     2. Processor resources
     3. Main storage resources
     4. High-speed link resources




Selection
     1

F3=Exit      F6=Print configuration      F12=Cancel

MA  F                                                          21/007
```

Option 1 ‘System bus resources’

```
                  Logical Hardware Resources on System Bus

System bus(es) to work with . . . . . .   *ALL  *ALL, *SPD, *PCI, 1-9999
Subset by . . . . . . . . . . . . . . .   *ALL  *ALL, *STG, *WS, *CMN, *CRP

Type options, press Enter.
  2=Change detail    4=Remove    5=Display detail    6=I/O debug
  7=Display system information
  8=Associated packaging resource(s)     9=Resources associated with IOP

                                                          Resource
Opt Description                    Type-Model  Status     Name
 _    Virtual IOP                   6B25-001    Operational  CMB11
 _  Virtual Bus Exp Adapter             -      Operational  BCC03
 _   Virtual System Bus                 -      Operational  LB02
 6    Virtual IOP                   298A-001    Operational  CMB02



                                                                Bottom
F3=Exit    F5=Refresh    F6=Print    F8=Include non-reporting resources
F9=Failed resources      F10=Non-reporting resources
F11=Display serial/part numbers      F12=Cancel

MA  F                                                          03/044
```

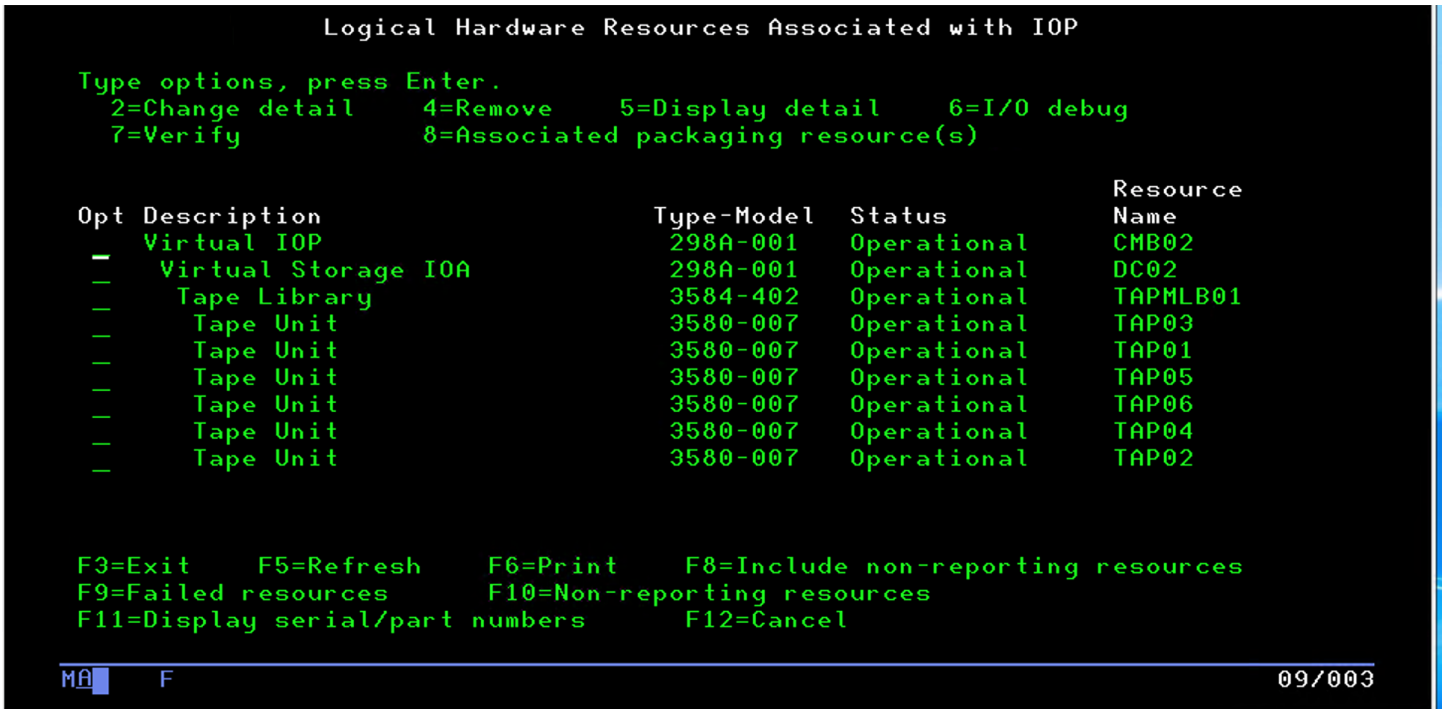
Find the Virtual IOP with a Type-Model of 298A-001 and take option 6

```
                          Select IOP Debug Function

  Resource name . . . . . :  CMB02
  Dump type . . . . . . . :  Normal

  Select one of the following:

       1. Read/Write I/O processor data
       2. Dump I/O processor data
       3. Reset I/O processor
       4. IPL I/O processor
       5. Enable I/O processor trace
       6. Disable I/O processor trace




  Selection
       4

  F3=Exit      F12=Cancel
  F8=Disable I/O processor reset      F9=Disable I/O processor IPL

MA    F                                                        20/007
```

Take Option 4 to 'IPL I/O processor'. After this is complete you should see tape library and drive resources. Take F12 to back out.

```
                    Logical Hardware Resources on System Bus

  System bus(es) to work with . . . . . .   *ALL  *ALL, *SPD, *PCI, 1-9999
  Subset by . . . . . . . . . . . . . . .   *ALL  *ALL, *STG, *WS, *CMN, *CRP

  Type options, press Enter.
    2=Change detail    4=Remove    5=Display detail    6=I/O debug
    7=Display system information
    8=Associated packaging resource(s)     9=Resources associated with IOP

                                                                  Resource
  Opt Description                    Type-Model  Status           Name
   _     Virtual IOP                  6B25-001    Operational      CMB11
   _  Virtual Bus Exp Adapter             -      Operational      BCC03
   _    Virtual System Bus                -      Operational      LB02
   9    Virtual IOP                  298A-001    Operational      CMB02



                                                                      Bottom
  F3=Exit    F5=Refresh    F6=Print    F8=Include non-reporting resources
  F9=Failed resources      F10=Non-reporting resources
  F11=Display serial/part numbers      F12=Cancel

MA    F                                                        03/044
```

Take option 9 to display the resources associated with IOP on the 298A-001 IOP


Logical Hardware Resources Associated with IOP
Type options, press Enter.
2=Change detail 4=Remove 5=Display detail 6=I/O debug
7=Verify 8=Associated packaging resource(s)
Opt Description Type-Model Status Resource Name
Virtual IOP 298A-001 Operational CMB02
Virtual Storage IOA 298A-001 Operational DC02
Tape Library 3584-402 Operational TAPMLB01
Tape Unit 3580-007 Operational TAP03
Tape Unit 3580-007 Operational TAP01
Tape Unit 3580-007 Operational TAP05
Tape Unit 3580-007 Operational TAP06
Tape Unit 3580-007 Operational TAP04
Tape Unit 3580-007 Operational TAP02
F3=Exit F5=Refresh F6=Print F8=Include non-reporting resources
F9=Failed resources F10=Non-reporting resources
F11=Display serial/part numbers F12=Cancel
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09/003