IBM i – Migration to Skytap using Commvault

06-September-2021

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Introduction

Today 60% of enterprises are running Power/iSeries for their mission critical application and database. It is renowned for its reliability and stability and is deemed irreplaceable my many. There are however some issues:

- The veteran admins for Power/iSeries have been retiring and this has been an ongoing concern for IT departments.
- Older generations of Power hardware are becoming EOL and losing support
- IBM withdrew support for Power6 and Power7 in 2019.
- IBM i backs-up locally to tape creating silos of data requiring on-site expertise

Customers are trying to get out of the datacenter business and move to cloud, and with Power hardware becoming EOL now it the perfect time to think about migrating these workloads to cloud.

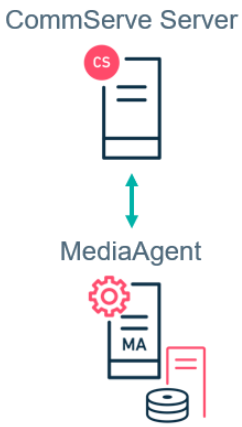
This is where Commvault and Skytap come in, Skytap is the front end for Microsoft's Power offering.

- Skytap claims to provide a 40% TCO savings for Power servers moving to the Azure cloud (compute, storage, labor)

Commvault is the perfect method to migrate these workloads, provide data protection, enable multi-site replication and disaster recovery, automation, and above all simplicity.

This guide will cover the full process of migrating on-prem IBM i to Skytap. It includes best practices and optional steps to make the process smoother. Many of the steps must be performed by an IBM iSeries expert so do not attempt this process without the correct resources available.

This guide will assume an on-prem CommServe Server and MediaAgent (with a deduplicated storage pool) are already configured with Commvault 11.24 or later per the diagram below.



Everything else will be deployed and configured using this guide.

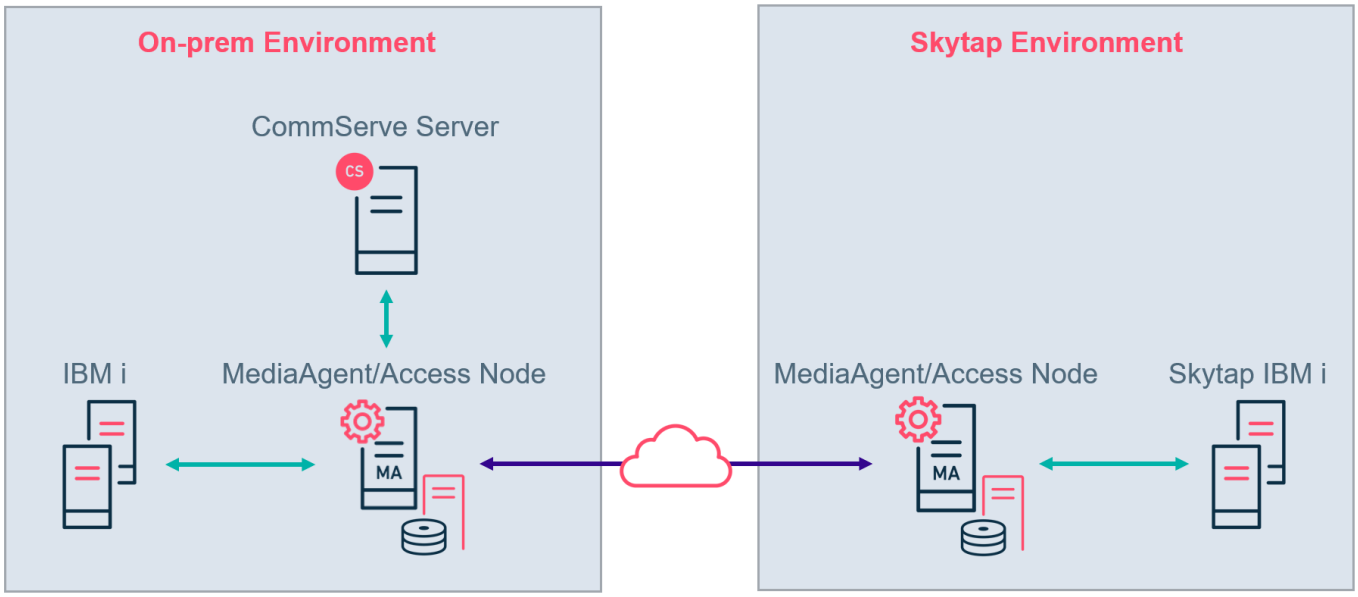
Disclaimer

This guide is accurate for the current release at the time of writing, FR11.24. It is to be used as a guideline, please ensure you fully understand the process and everything that is associated before usage. This process should not be attempted without an IBM i expert.

Solution Overview

Solution Architecture

This guide will use the architecture depicted below. This is just an example and Commvault can support any configuration provided an Access Node has direct communication with both source and destination IBM i Systems.



Systems

- CommServe Server
  - Orchestrates and monitors all jobs in this guide
  - Used to upload ISO image to Skytap
- On-prem MediaAgent/Access Node
  - Supported Linux Operating System (see documented system requirements on documentation.commvault.com)
  - Direct network (TCP/IP) communication with on-prem IBM i
  - Backup target for on-prem IBM i
  - DASH Copy Source
  - Network Gateway
  - Storage Accelerator (if Storage Pool is cloud based)
- On-prem IBM i
  - Migration Source
- Skytap MediaAgent/Access Node
  - Supported Linux Operating System (see documented system requirements on documentation.commvault.com)
  - Direct communication with Skytap IBM i
  - DASH Copy destination
  - Network Gateway
- Skytap IBM i
  - Migration Target

High Level Process

Pre-requisite: Install CommServe Server, MediaAgent, configure deduplicated Storage Pool following documentation best practices.

https://documentation.commvault.com/v11/essential/145241_migrating_on_premises_ibm_i_to_skytap.html

1. Install IBM i File System Agent on Media Agent
2. Optional: Create a plan for migration
3. Configure on-prem IBM i as an IBM i Client
4. Perform DR backup prerequisites on IBM i
5. Run IBM i Disk Space Report
6. Apply additional setting (SingleDVDImage)
7. Perform an IBM i backup of the DR Subclient.
8. Perform an IBM i backup of all non-DR subclients.
9. Create and deploy MediaAgent (with appropriate storage) on Skytap
10. Create a deduplicated storage pool on Skytap MediaAgent
11. Create a secondary copy for the non-DR Backup subclients pointing to the Skytap storage pool
12. DASH copy subclient backups to Skytap MediaAgent
13. Create IBM i virtual machine in Skytap
14. Configure Skytap IBM i as an IBM i Client
15. Start 1-Touch Restore process from CommServe Server
    a. Restore the DR Backup ISO to the Skytap MediaAgent
       1-Touch restore job is suspended at this point
    b. Upload the DR Backup ISO to Skytap (temporarily disabling the Skytap session timeout is required if the upload will take longer than 15min)
    c. Change the VM hardware configuration to boot in *D Mode side – Manual*
    d. Start the VM
    e. As soon as the media icon is available on the VM, mount the ISO image
    f. Restore the minimal operating system from the DVD image
    g. Recover System Data and Commvault Libraries from the DR Backup
    h. Power down the system
    i. Change the VM hardware configuration to boot in B Mode side – Normal.
    j. Power on the system and wait for it to boot.
    k. Resume the 1-Touch restore job.

Commvault IBM I Data Protection

Commvault Configuration

Once configured an IBM i client will by automatically have seven data subclients and one DR subclient:

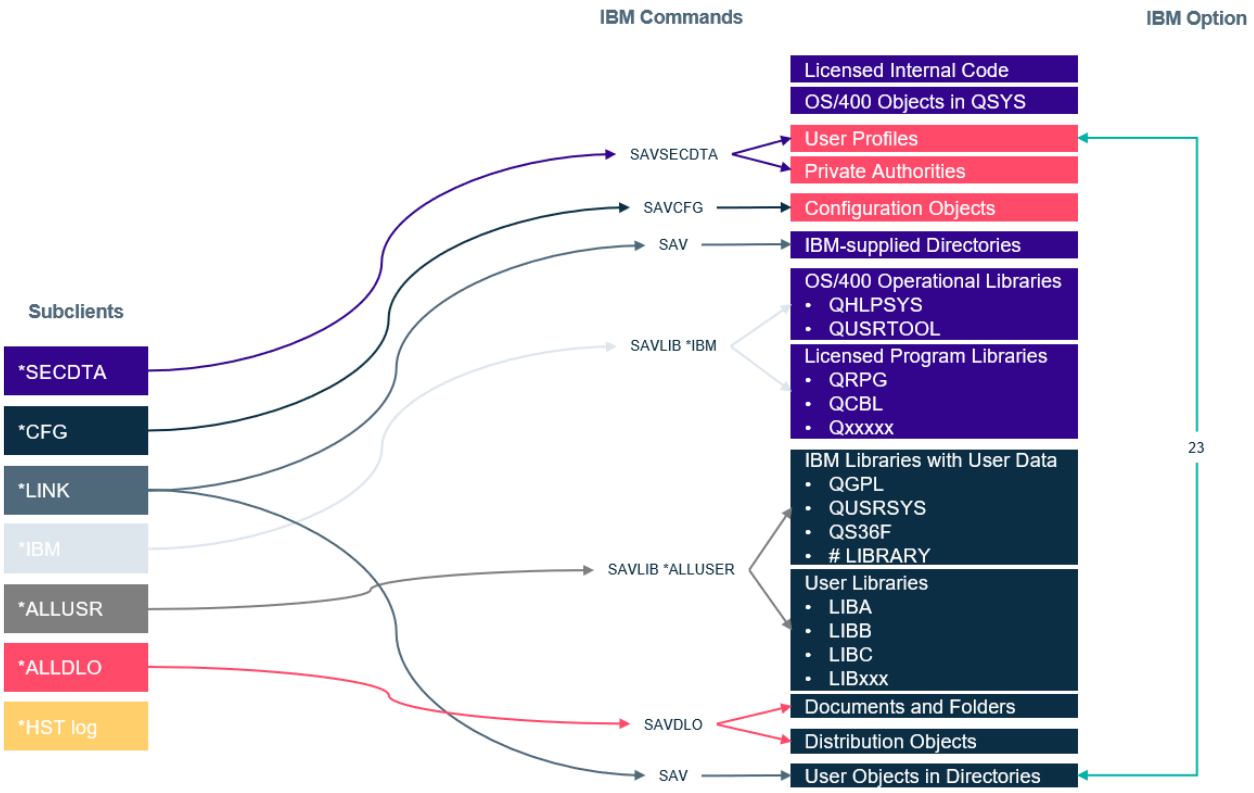
Subclient Name	Contents
*ALLDLO	All documents and folders
*ALLUSR	All user libraries
*CFG	The configuration objects
*HST log	The history logs
*IBM	All IBM supplied libraries
*LINK	The system directories, user directories, and the objects that the directories contain
*SECDTA	The security data
DR Subclient	Creates a bootable ISO with the contents mapped below

Anything not protected by these subclients will need to be added to a new custom subclient, so it can be migrated.

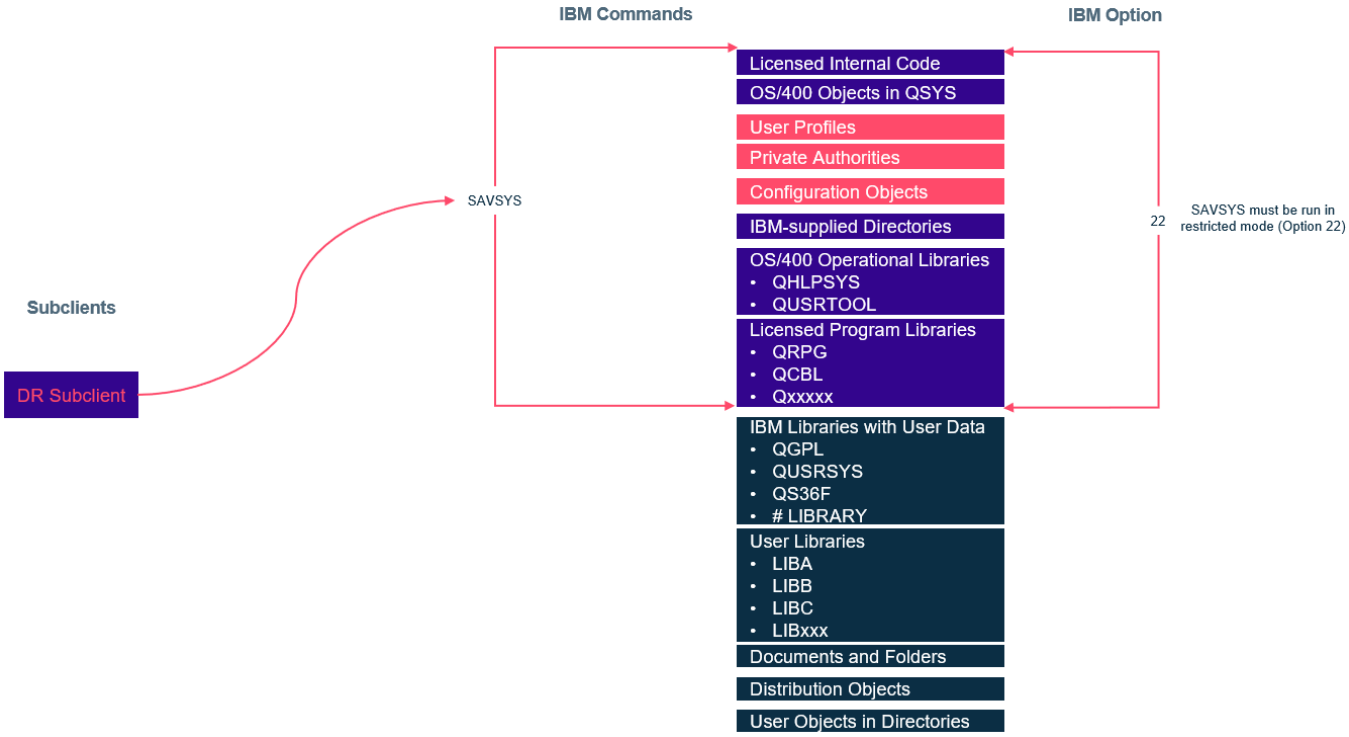
Subclient to IBM i Mapping

These diagrams show the data protected by each of the subclients, the IBM Command that is run to protect then, and the IBM option that is required. All subclients are pre-configured, these diagrams are just for awareness.

Data Subclients



DR Subclient

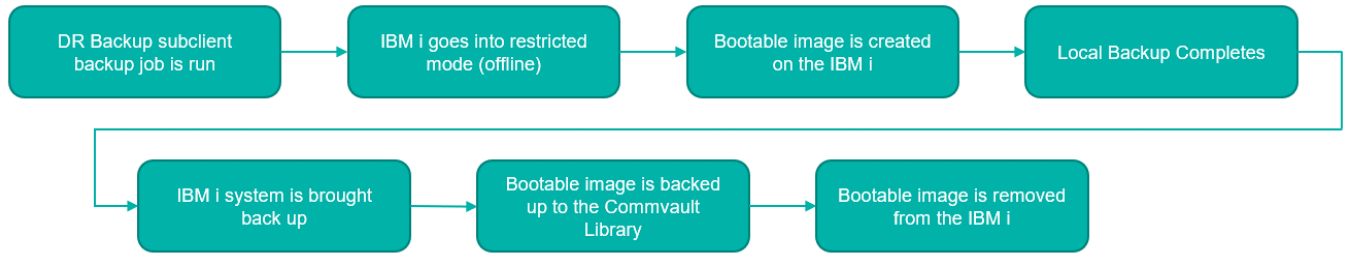


Job Steps

The following steps are automated

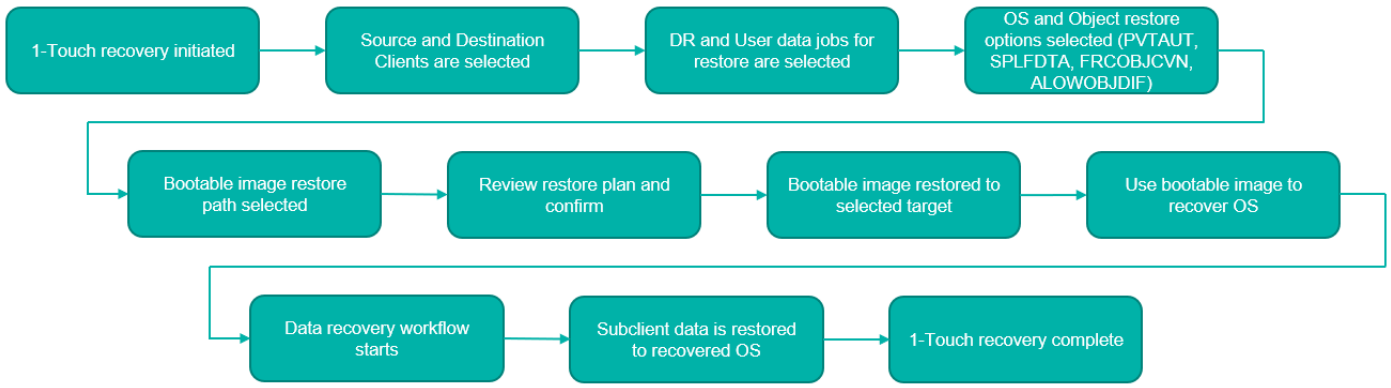
DR Backup

These steps happen in the background when the DR Subclient job runs



1-Touch Restore

Most of these steps are automated, anything requiring interactions is detailed in the guide.



Procedure

Machines

This guide will use the following machines (machine names are for illustration purpose only, actual machine/client name may be different)

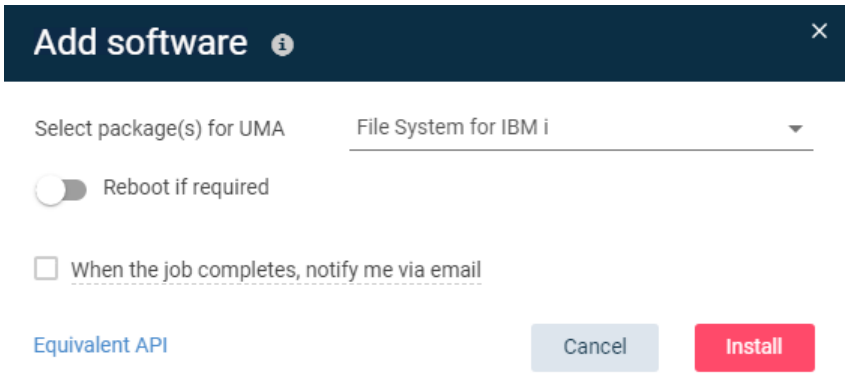
Function	Client Name	Client Hostname
CommServe Server	dpr-cs11	dpr-cs11.lab.local
On-prem MA/Access Node	dpr-uxma01	dpr-uxma01.lab.local
On-prem IBM i	lpar6	lpar6.lab.local
Skytap MA/Access Node	st-uxma01	generated by Skytap on boot
Skytap IBM i	st-lpar6	10.0.0.2
IBM i User	CVBKP	

Install CommServe Server, On-Prem MediaAgent, and configure deduplicated Storage Pool

- This guide assumes the CommServe Server, and Linux MediaAgent have been pre-installed. We also assume, that a deduplicated storage pool has been created on the MediaAgent.
- This guide requires the Commserve, MediaAgents, Access Nodes all to be running Commvault FR 11.24+.
- The deduplicated storage pool should have sufficient free space to backup the whole IBM i that is being migrated.

Install IBM i File System Agent on Media Agent

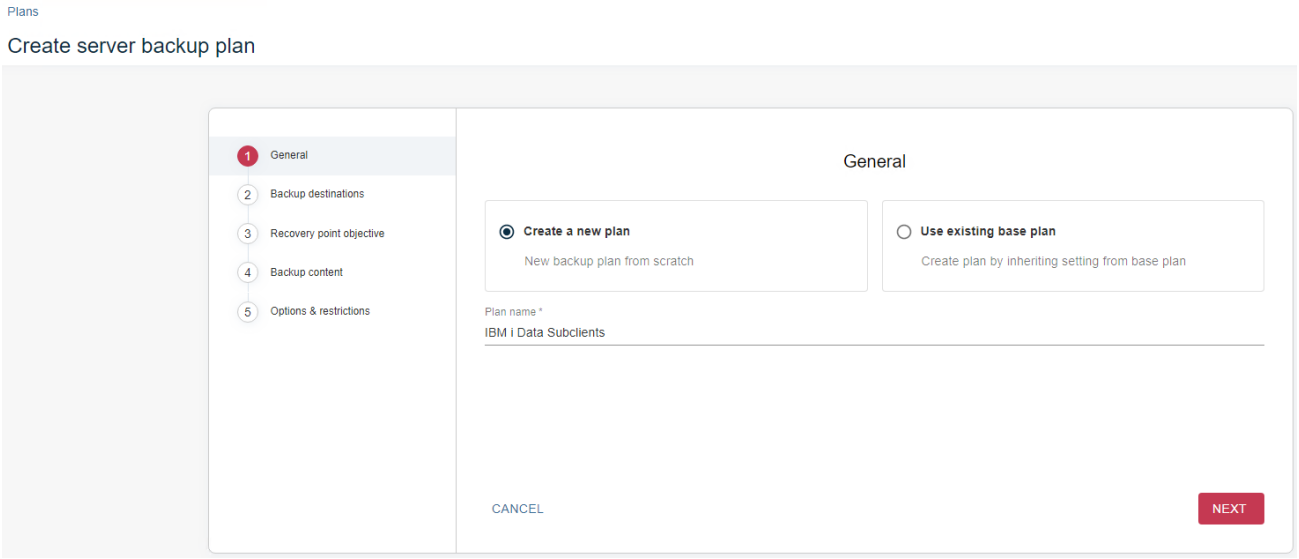
1. Manage > Servers > Click the Actions button next to the MediaAgent > Add Software
2. Select the File System for IBM i package



3. Complete the installation
    a. A download job will automatically be started if the software cache is missing the required packages

Create a plan for migration

1. Manage > Plans > Create plan > Server backup
2. Give it a name: *IBM i Data Subclients*

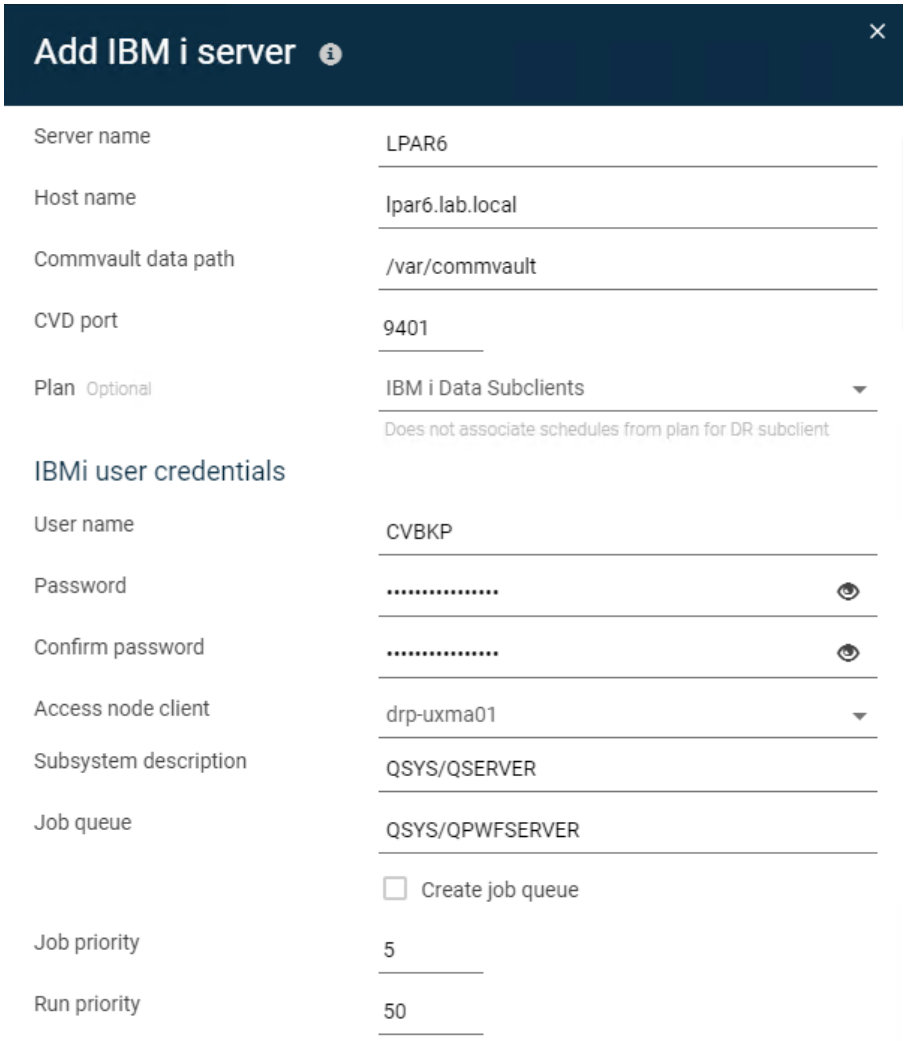


3. Add storage pool from the on-prem MediaAgent
4. Set other options as desired

Configure on-prem IBM i as an IBM i Client

Pre-requisite: SSH and SFTP is required between the access node and the IBM i client, if this is not possible please see documentation for manual steps to deploy the CVINSTPKG.savf package after the client has been configured.

1. Protect > File Servers > Add Server > IBM i
2. Enter details of the IBM i we are going to protect



3. Click Save

Perform DR backup prerequisites on IBM i

- These steps should be carried out by the IBM administrator
- The goal of the prerequisites is to make the created ISO as small as possible by removing items unnecessary for restore, details can be found here: https://documentation.commvault.com/v11/essential/108621_performing_ibm_i_file_system_dr_backups.html
- After the backup succeeds, the following data is backed up in the format of bootable optical volumes:
    - SAVSYS
        - LIC - License internal code.
        - OS/400 Objects in QSYS
        - SAVSECDTA
            - User profiles
            - Private authorities
        - SAVCFG (configuration objects)
    - *IBM Libraries (system libraries)
    - System libraries with user data: QSYS2, QGPL, QUSRSYS
    - Commvault Libraries: CVLIB, CVLIBOBJ
    - System files and Commvault files with logs
    - /QIBM/ProdData
    - /QOpenSys/QIBM/ProdData

1. Do not create, or include the following under QGPL, QSYS2, and QUSRSYS libraries, if they are present and can be removed safely, please remove them:
    a. Applied PTFs
    b. Compiled programs
    c. Image catalog
    d. Journal or Journal receivers
    e. OS related image catalog files
    f. SAVF files
    g. Spool output files
2. Do not create any library starting with the letter 'Q'.

Run IBM i Disk Space Report

If there is an available Disk Space Report on the IBM i system, that was run within the last 3 days, this will be used to predict the size of the 1-Touch recovery DVD.

The Disk Space Report should be run/scheduled by an IBM i administrator and can take some time to run.

The backup job will verify if there is sufficient free disk space to run the 1-Touch backup. The job will fail if the free space is less than double the estimated DVD size.

Apply additional setting

This additional setting will create a single ISO image, instead of spanning the image over multiple ISOs.

Note: This is default behavior in FR11.26, so the additional setting is only needed in FR1124 and FR11.25 environments.

Additional Setting	SingleDVDImage
Description	Use this additional setting to create a single DVD image during an IBM i DR backup.
Category Type Value	ProxyClients Boolean TRUE
Where to apply	Source Access Node
URL	SingleDVDImage

Run IBM i Client Backups

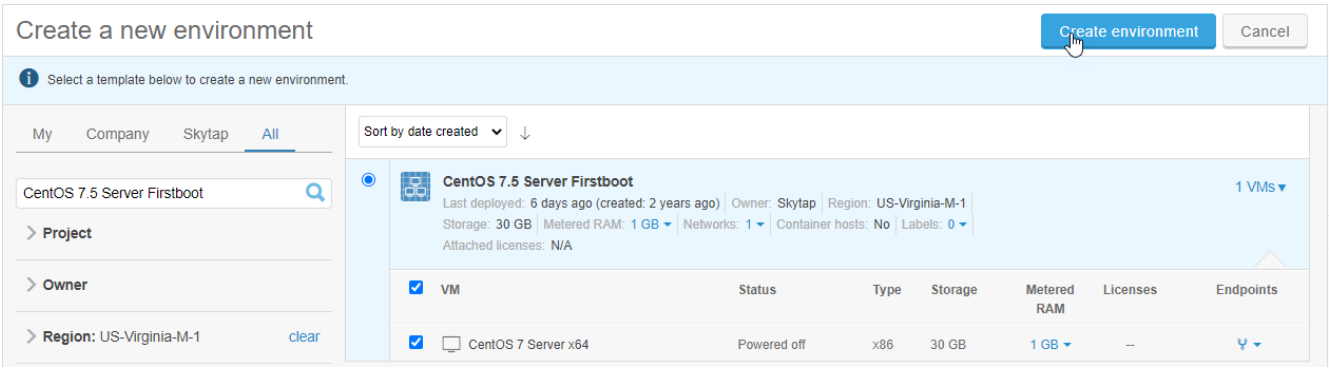
1. Click Protect > File servers > LPAR6
2. Click Actions next to DR Subclient > Back up
3. Select Resume (*STSSBS) > OK
4. Once the backup is complete run Full backups for all other subclients

Recommendations:

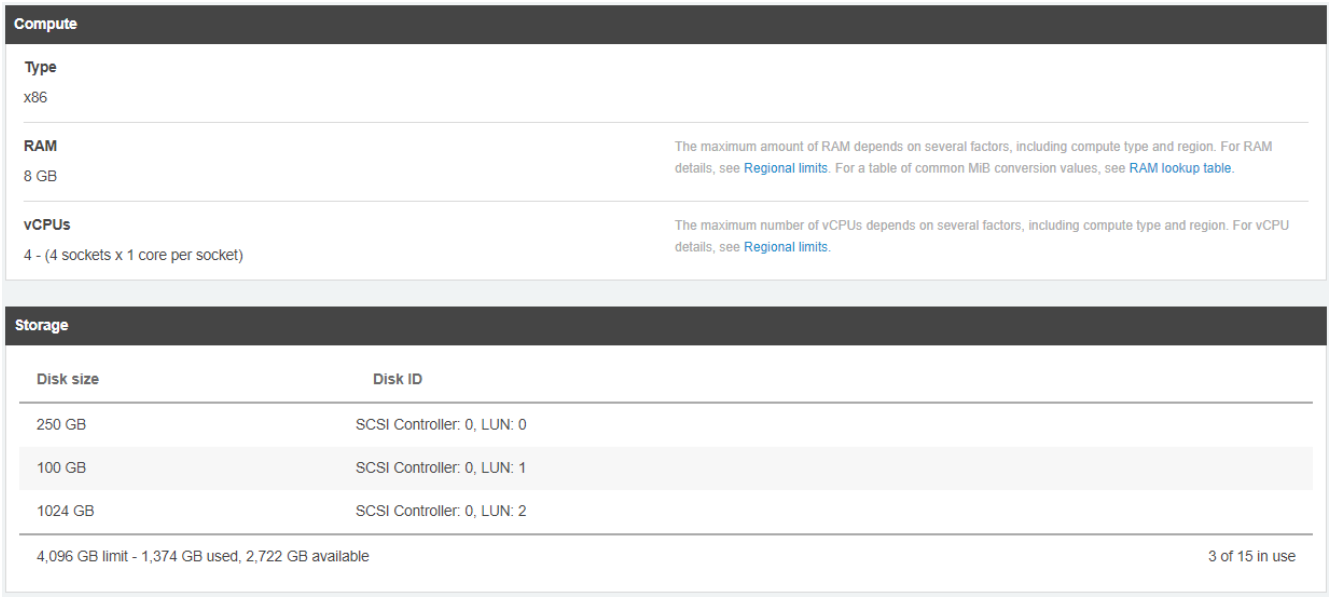
- You can run *ALLDLO, *CFG, *HST Log, and *SECDTA simultaneously
- *IBM and *LINK should be run individually
- If *ALLUSR has very large libraries separate them into smaller subclients

Create and deploy MediaAgent (with appropriate storage) on Skytap

1. Login to Skytap
2. Environments > New environment
3. Select a template, for this guide we will use *CentOS 7.5 Server Firstboot*
4. Create Environment

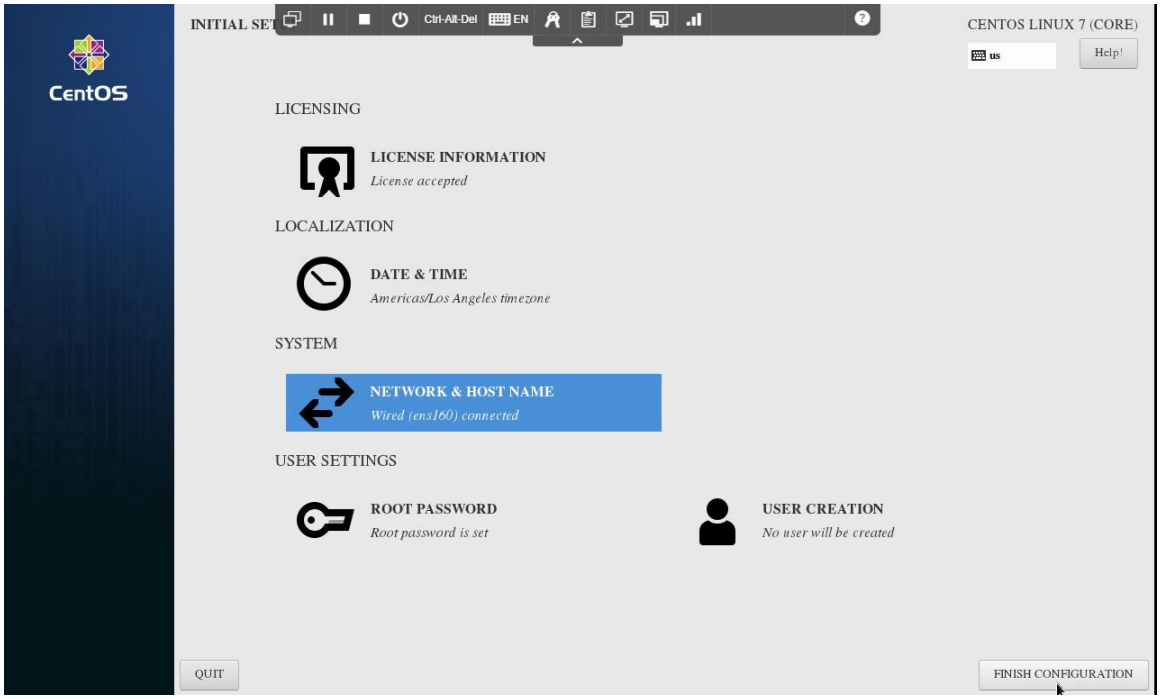


5. Optional: Name your environment, and MediaAgent
6. Select VM settings
   a. Network Adapters: Configure appropriate network interfaces
   b. Hardware: Configure appropriate CPU, RAM, Disks (be sure to have enough free space for the backups and the ISO to be restored)
      In this guide we are using local disk on the Skytap MA, you can also use cloud storage but be aware of additional costs that may be incurred.



7. Power on the MediaAgent
8. Accept the License
9. Set a root password
10. Optional: Set time zone, configure users, etc

11. Finish Configuration



12. Login and update the MediaAgent
    a. For CentOS: yum update -y
13. Configure storage

```
[root@st-uxma01 ~]# df -h
Filesystem                              Size  Used Avail Use% Mounted on
devtmpfs                                3.9G     0  3.9G   0% /dev
tmpfs                                   3.9G     0  3.9G   0% /dev/shm
tmpfs                                   3.9G   17M  3.9G   1% /run
tmpfs                                   3.9G     0  3.9G   0% /sys/fs/cgroup
/dev/mapper/centos_centos7sx64-root      27G  6.1G   21G  23% /
/dev/mapper/store_vg-store_lv           1.0T   33M  1.0T   1% /store
/dev/mapper/ddb_vg-ddb_lv                70G   33M   70G   1% /ddb
/dev/sda1                              1014M  241M  774M  24% /boot
//gw/shared                              10G  1.5G  8.6G  15% /media/shared_drive
tmpfs                                  783M     0  783M   0% /run/user/0
```

14. Create appropriate network topologies to allow communication between on-premise and Skytap components
15. Deploy the MediaAgent to the CommCell using best practices for your environment installing the *MediaAgent* and *File System for IBM i* packages at minimum.

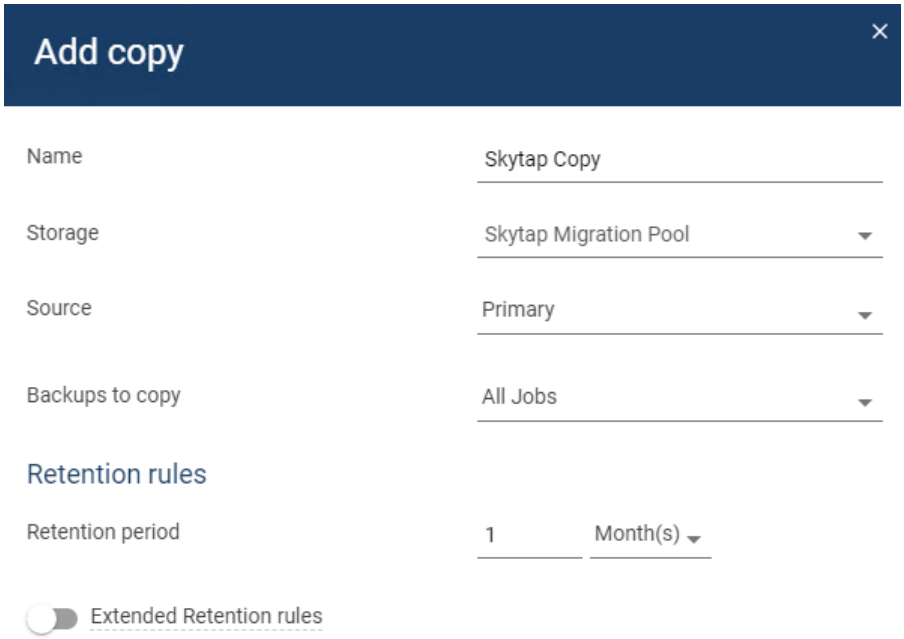
Create a deduplicated storage pool on Skytap MediaAgent

1. Storage > Disk > Add
2. Give the Storage Pool a Name: *Skytap Migration Pool*
3. Add the storage and deduplication DB based on the previously configured mountpoints.

4. Save

Create a secondary copy pointing to the Skytap storage pool

1. Manage > Plans > *IBM i Data Subclients*
2. Under Backup Destinations > Click Add > Copy
3. Enter copy details



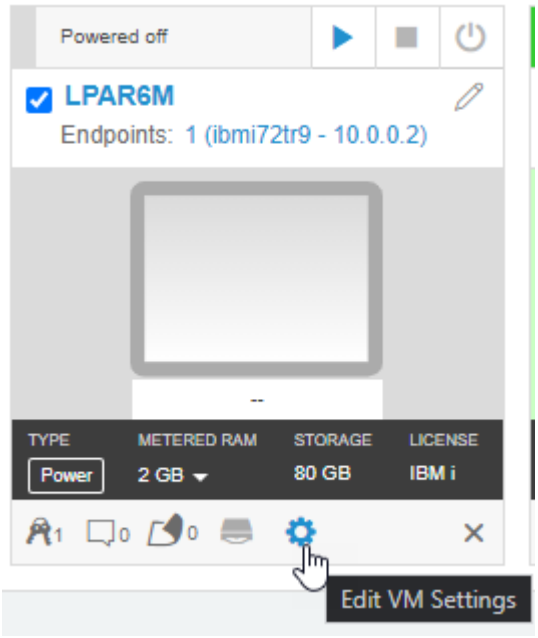
4. Save

Copy jobs to Skytap MediaAgent

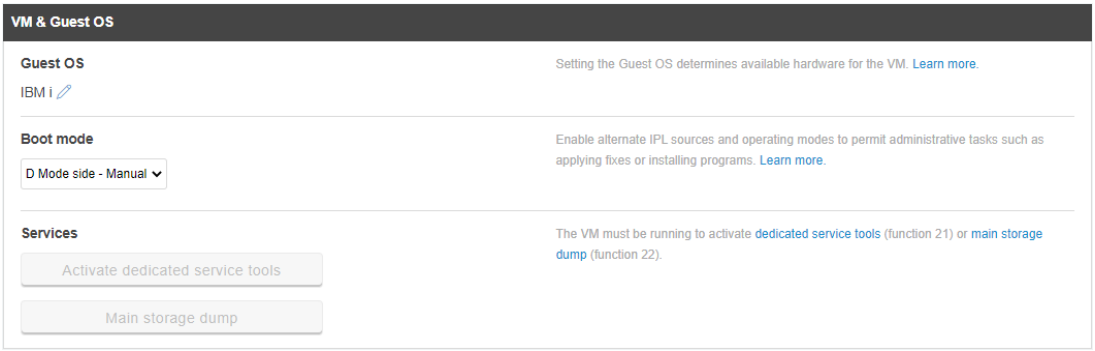
1. Plans will have an automatic schedule for Secondary copies
2. Click Jobs
3. After 5 min there should be an Auxiliary Copy running.
4. The Auxiliary copy can run while the next steps are being completed

Create IBM i virtual machine in Skytap

1. In the Skytap environment > Click Add VMs
2. Select an appropriate IBM i template
3. Add VM(s)
4. Once created give it a name: *LPAR6M*
5. Edit the VM Settings

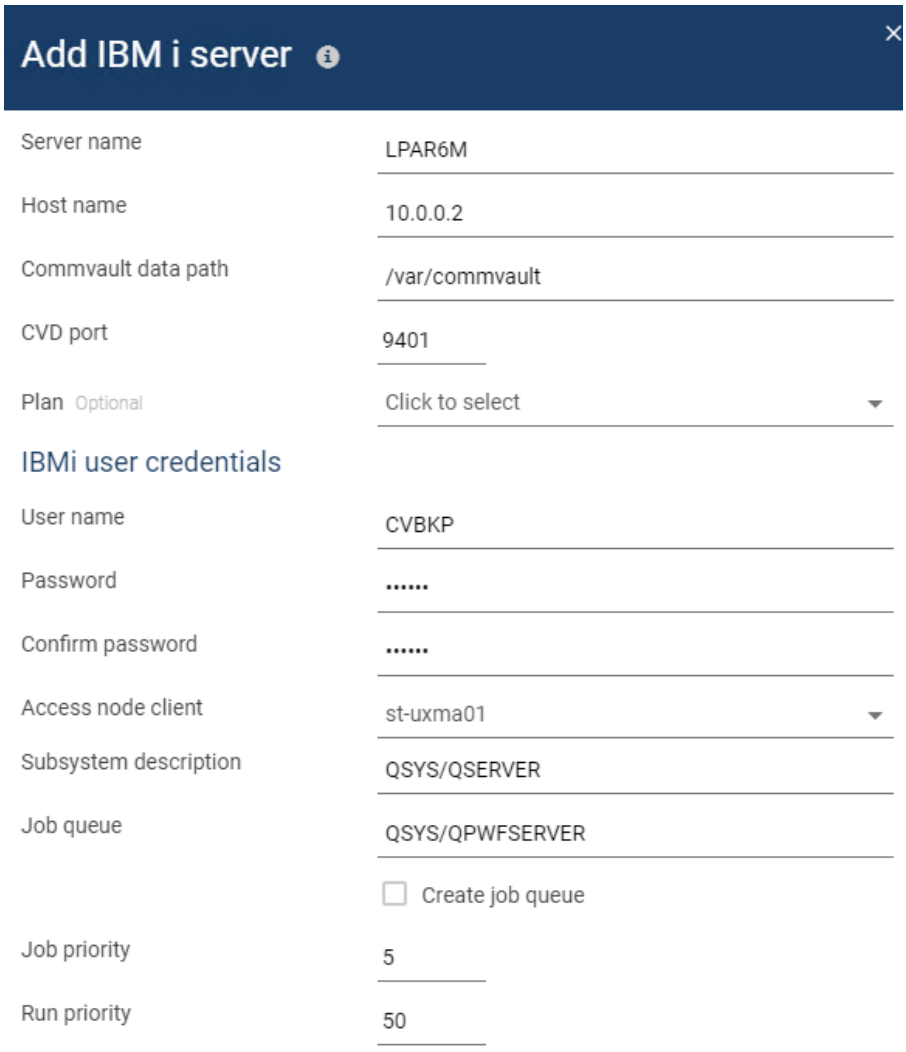


6. Hardware
7. Set the required RAM, CPU, Disks
8. Under VM & Guest OS
9. Set Boot mode to *D Mode side – Manual*
   This will allow us to boot from the DVD



Configure Skytap IBM i as an IBM i Client

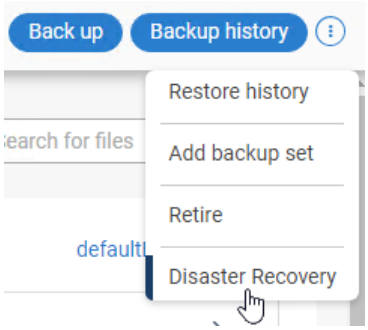
1. Protect > File Servers > Add Server > IBM i
2. Enter details of the IBM i we are going to restore to



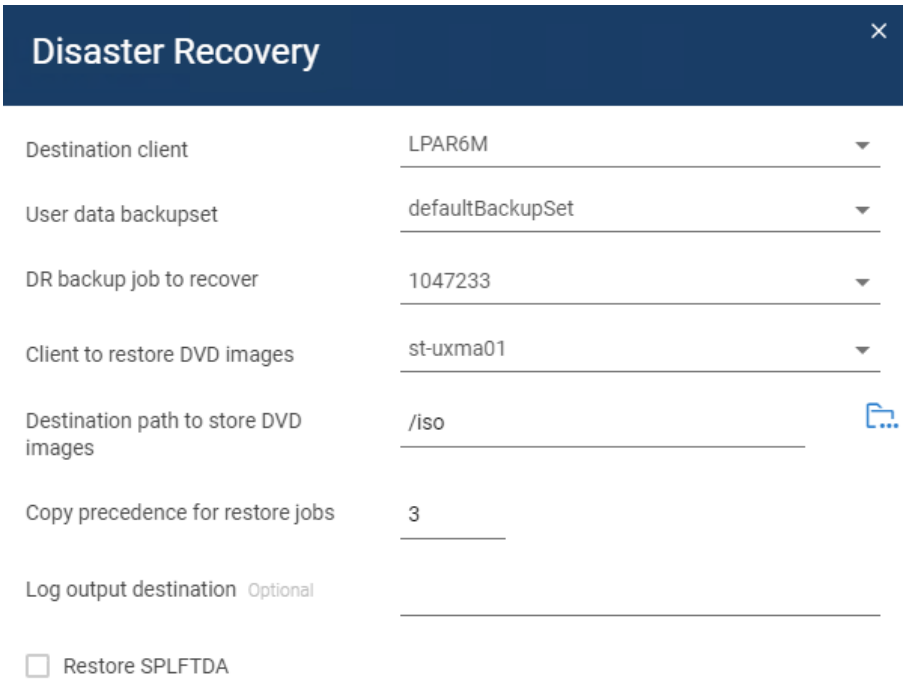
3. Click Save

Start 1-Touch Restore process

1. Protect > File Servers > LPAR6 > Actions > Disaster Recovery



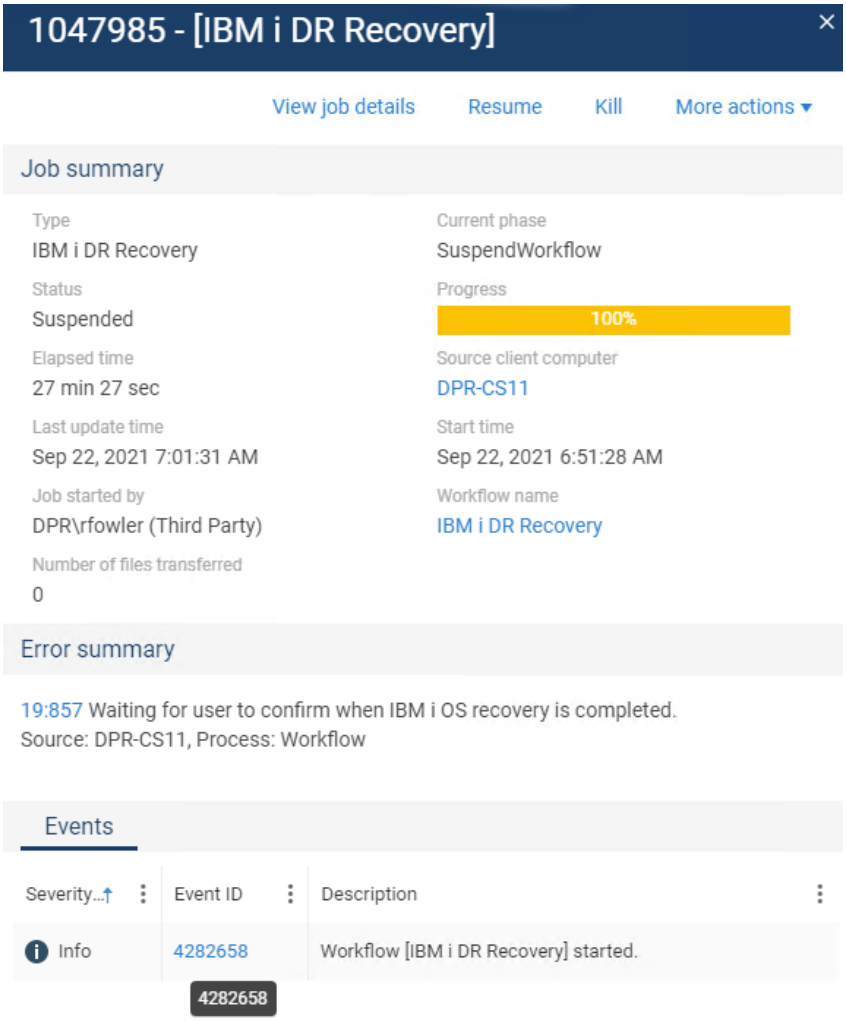
2. Fill in:
    a. Destination Client
    b. BackupSet to restore from
    c. DR backup job to recover
    d. Restore the DVD image to the Skytap MediaAgent
    e. Select the Copy Precedence to restore from, we want to restore this data from the Skytap MediaAgent:
        i. If using plans (as in this guide):
            1. Copy precedence 1 will be the default created snap copy on the local MediaAgent
            2. Copy precedence 2 will be on the local MediaAgent.
            3. Copy Precedence 3 will be on the Skytap MediaAgent



        ii. If using storage policies choose the appropriate copy precedence pointing to your Skytap copy.
3. Press Submit

1-Touch restore job is suspended at this point

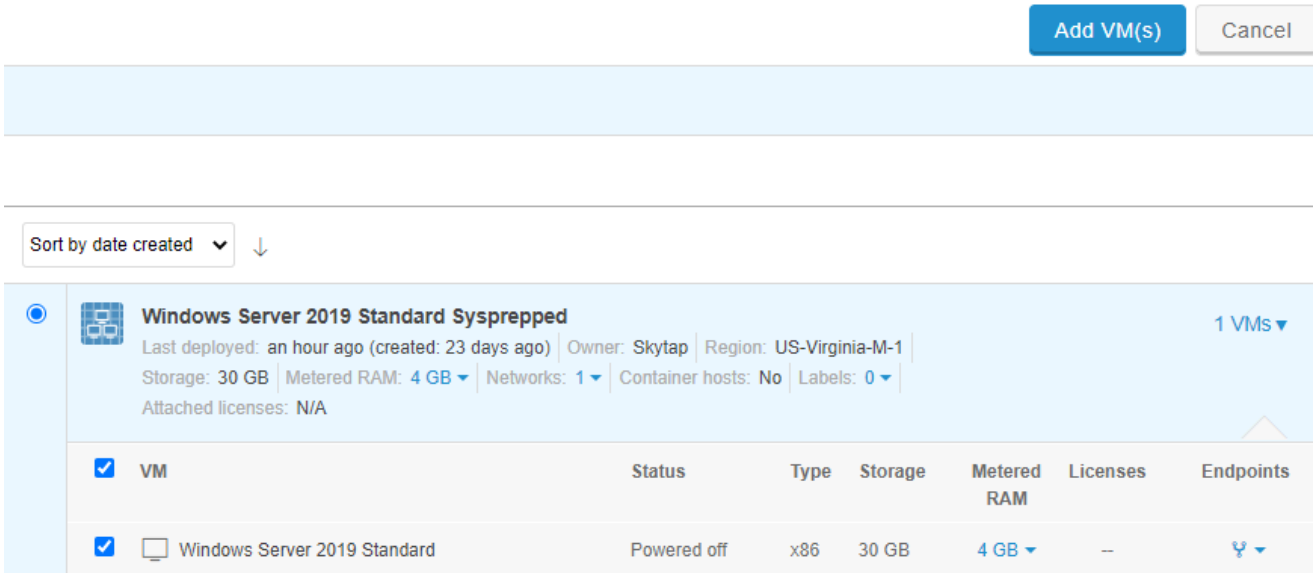
At this point the IBM i DR Recovery Job will be suspended waiting on the restore of the ISO on the Skytap IBM i



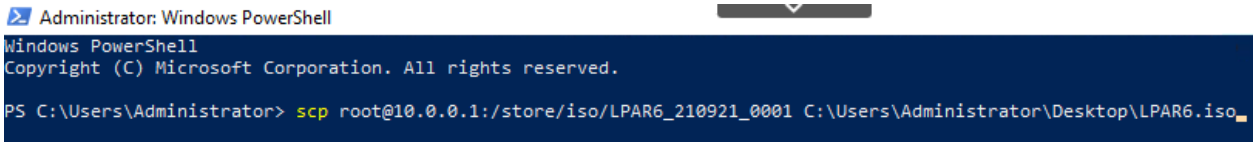
Upload DR Backup ISO to Skytap

To upload the ISO we need a GUI and a browser, as the ISO resides on the Skytap MediaAgent, there is two options. The first being to install a GUI on the MediaAgent and upload directly, the second is to configure another VM with a GUI. This time we are going to

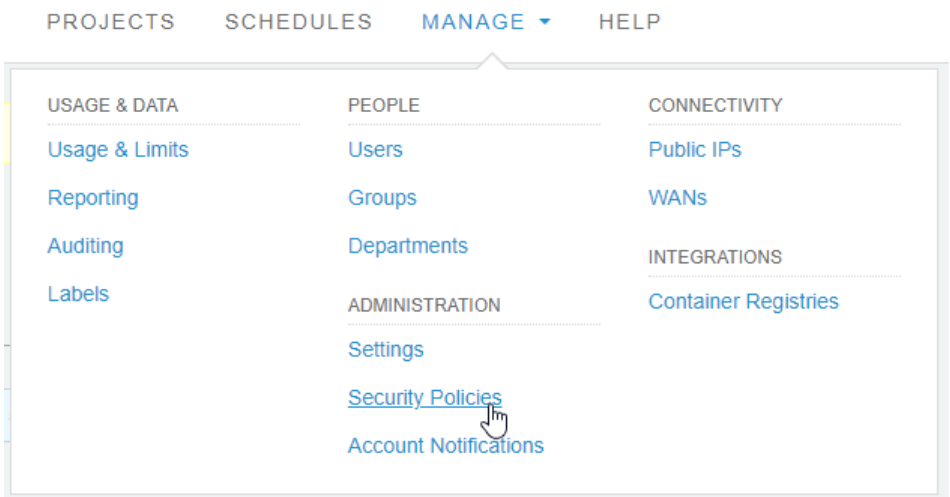
1. Create a new Windows server 2019 VM in the Skytap environment (any VM with a GUI/browser and SCP would work)



2. Configure it with a big enough disk to hold the ISO and complete the basic setup
3. Copy the ISO from the Skytap MediaAgent to the Windows server
    a. Open PowerShell and use the SCP command
    scp user@Skytap MediaAgent IP:/path/isofile x:\DesktinationPath\DestinationFile.iso



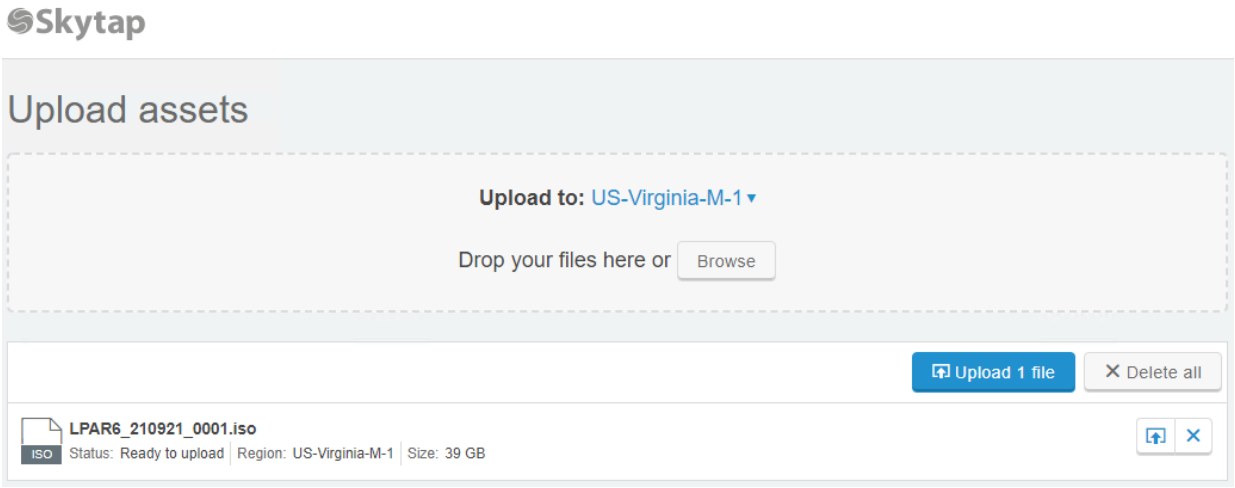
4. From the Skytap Windows VM > login to Skytap > Manage > Security Policies



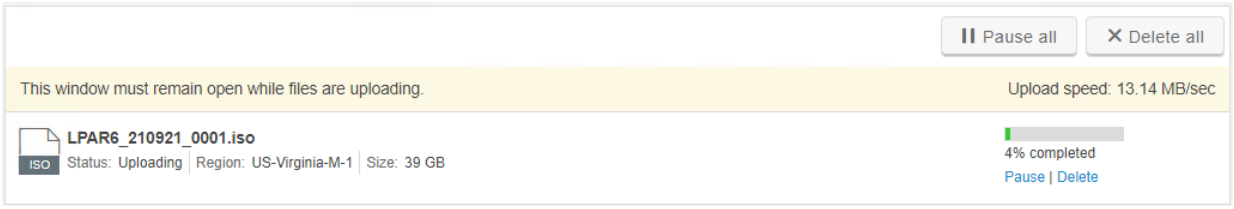
5. Set the Session Expiration Time to Never Expire

6. Press Save

7. Click Assets > Upload assets
8. Select the iso to upload



9. Press Upload 1 file and keep this window open until the upload is complete

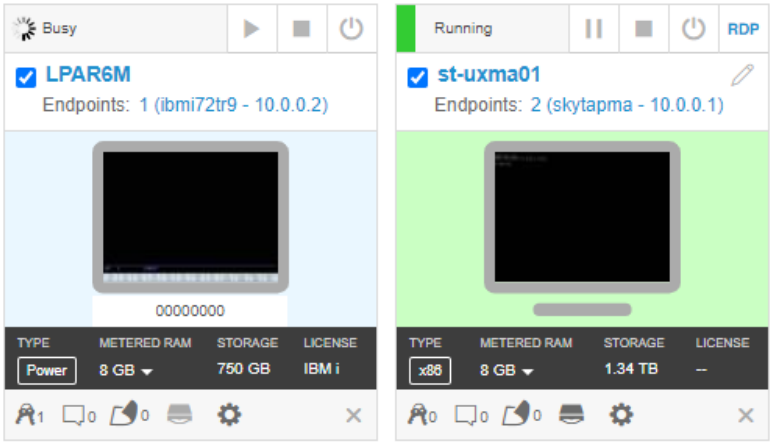


10. This VM is no longer required

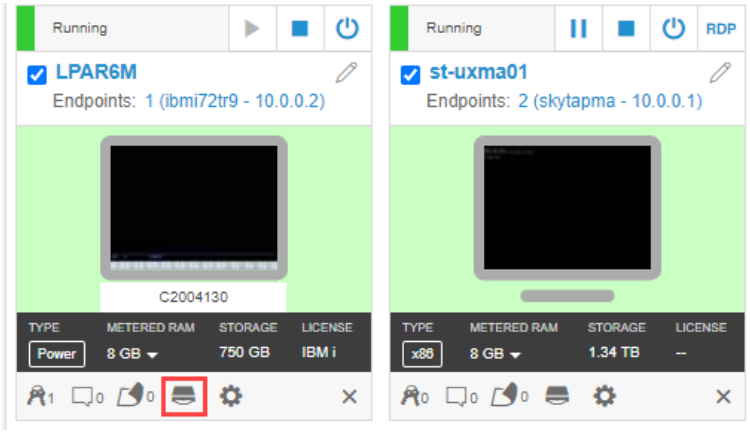
Restore the OS on the Skytap IBM i

Documentation used for these steps can be found here:
https://documentation.commvault.com/v11/expert/16271_restoring_minimal_operating_system_os_for_ibm_i_file_system_agent_client.html

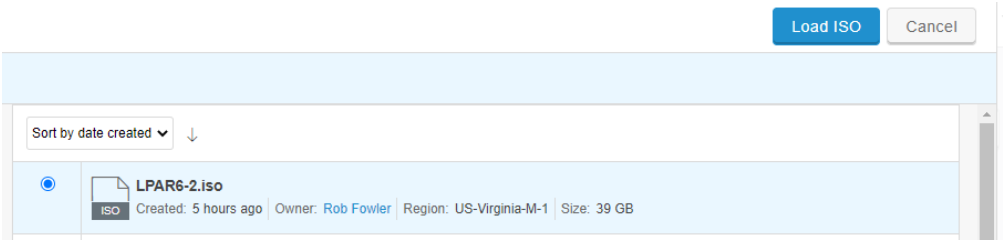
1. Power on the Skytap IBM i VM



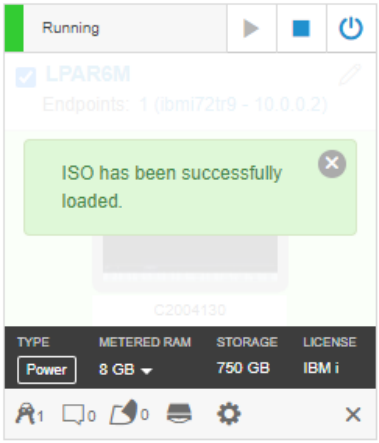
2. As soon as the Load ISO icon is available click on it.



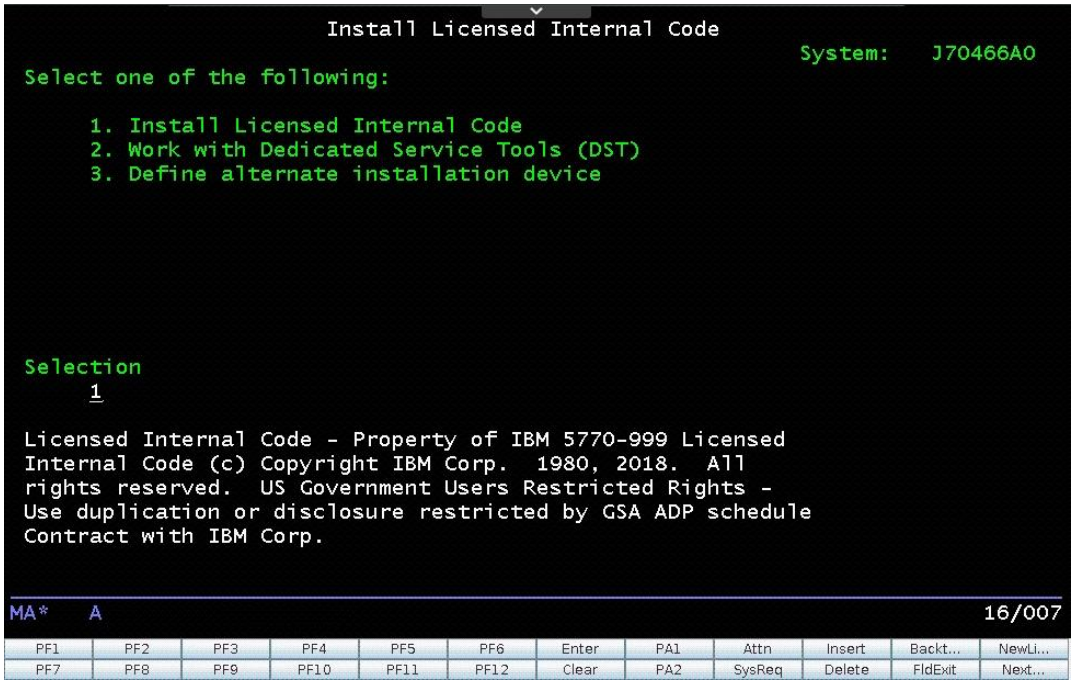
3. Select the uploaded ISO and press Load ISO



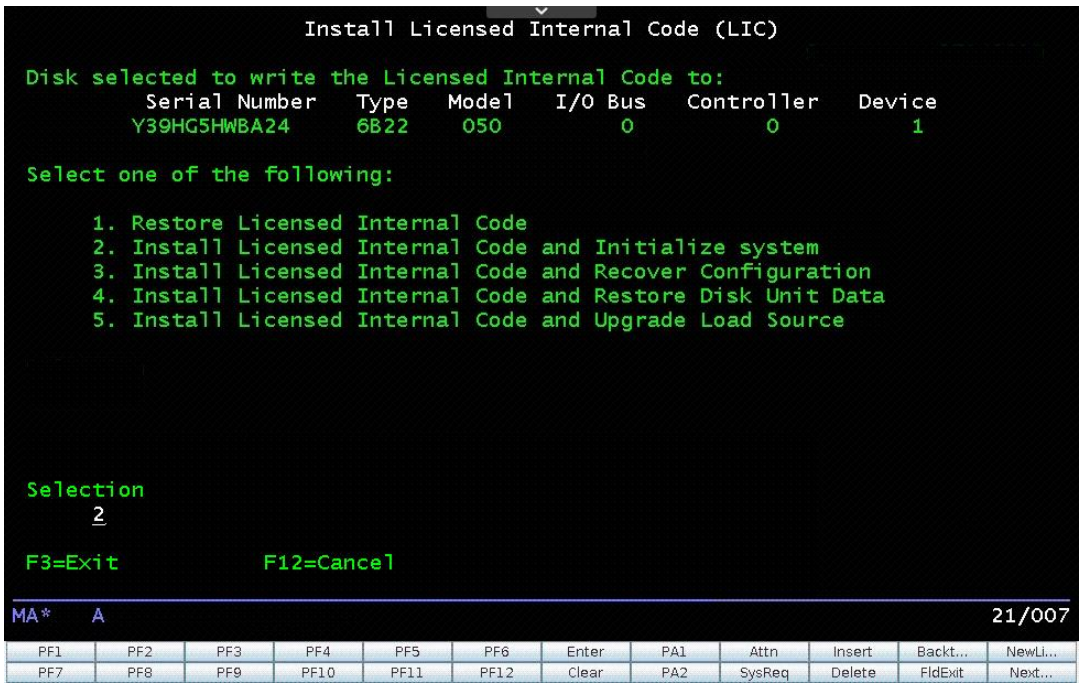
4. There will be a confirmation message on the VM



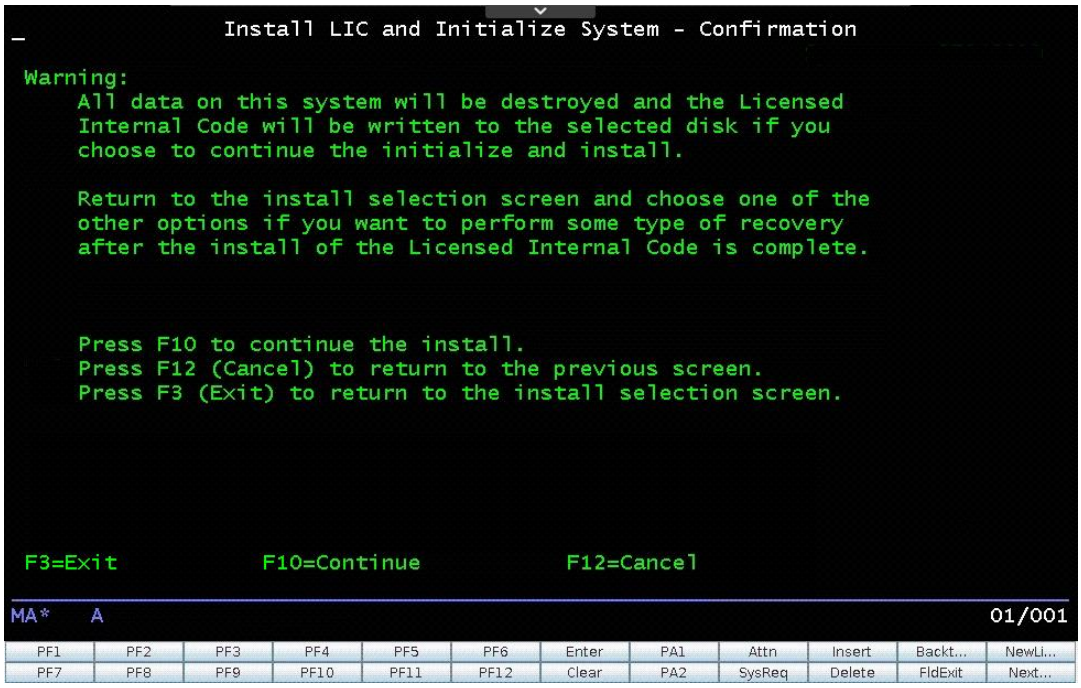
5. Install the Licensed Internal Code (LIC). On the Install Licensed Internal Code screen, select 1 to install the code and then press Enter.



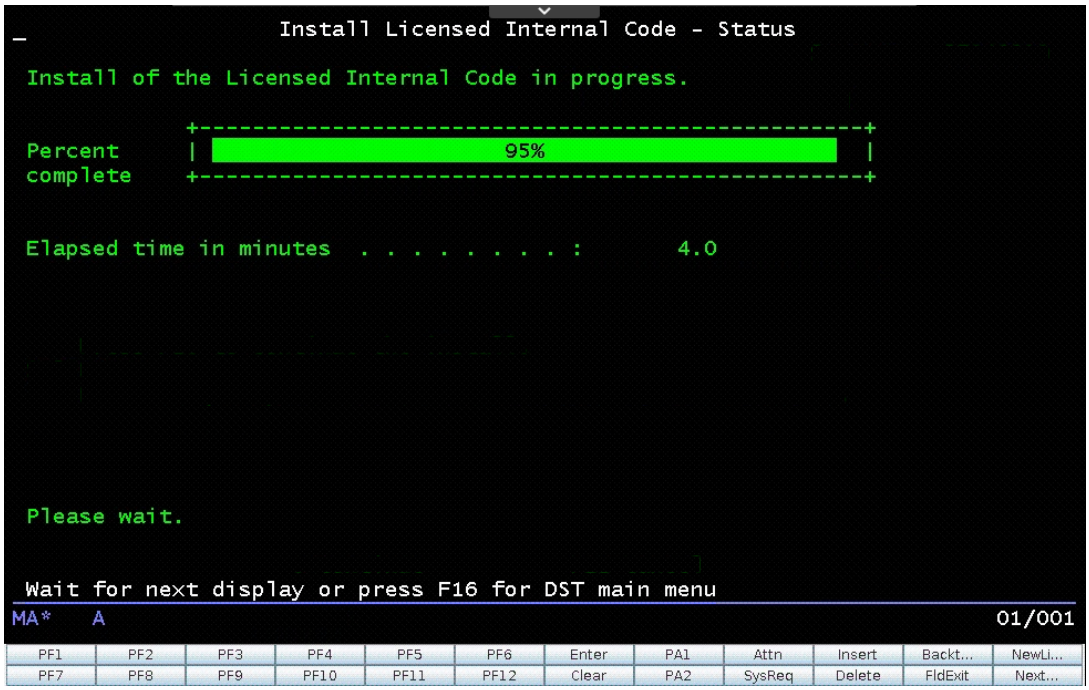
6. Install the Licensed Internal Code (LIC) and initialize the system. On the Install Licensed Internal Code screen, select 2 to install the code and initialize the system and then press Enter.



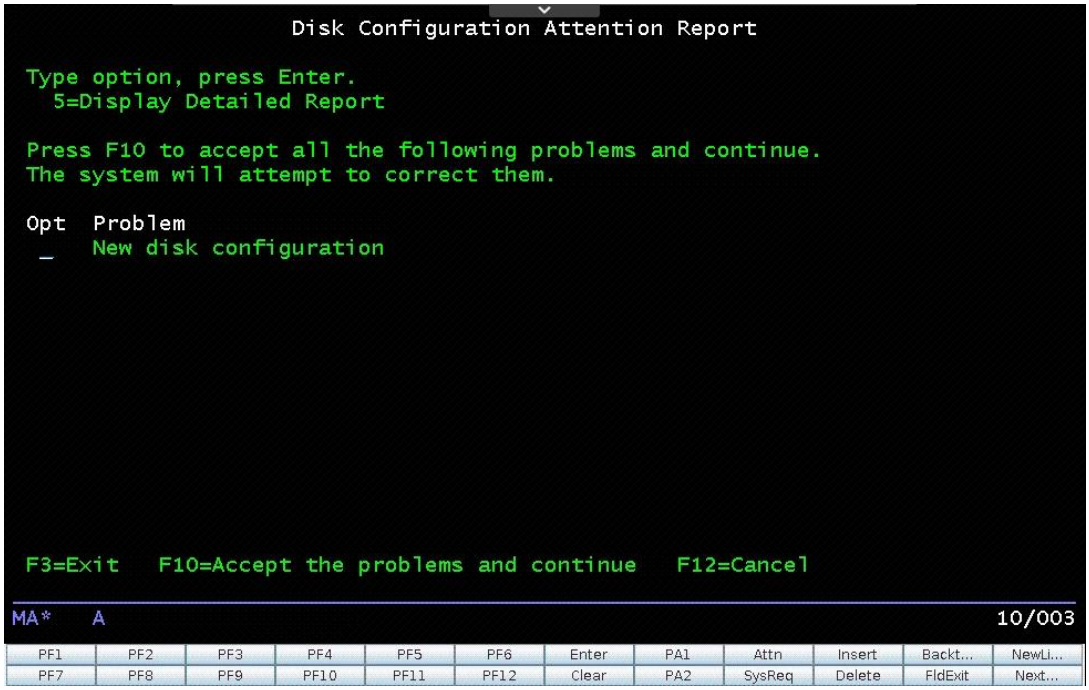
7. Confirm the install and initialization. On the Install LIC an Initialize System - Confirmation screen, press F10.



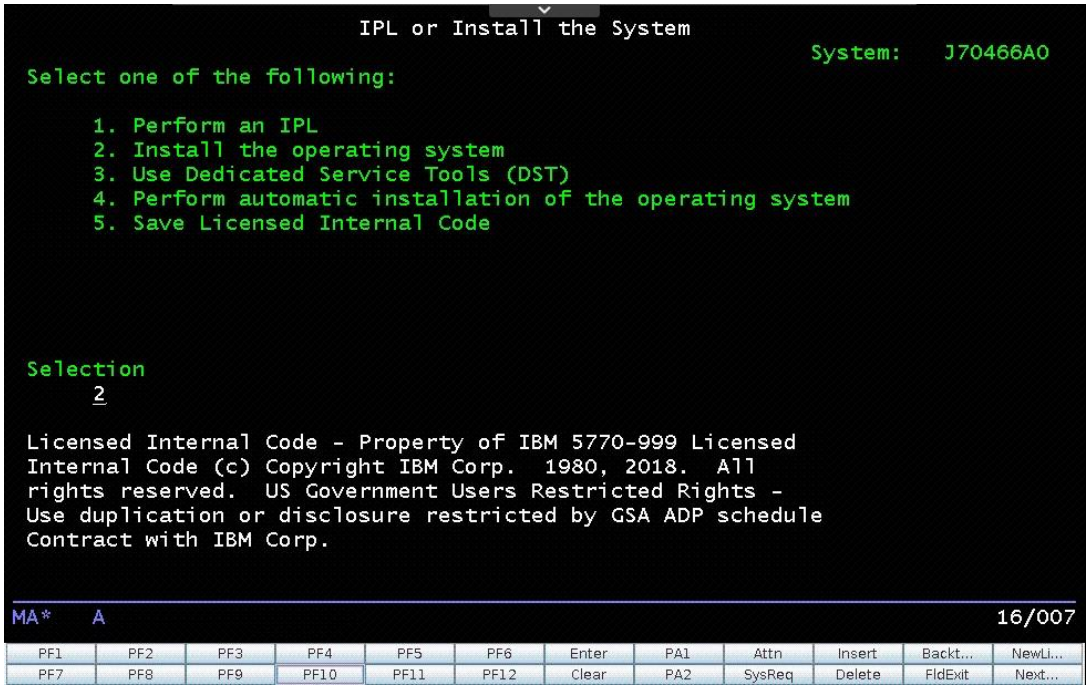
8. Wait for the status screens to complete. The Initialize the Disk - Status screen displays followed by the Install Licensed Internal Code - Status screen. You do not need to press anything on these screens.



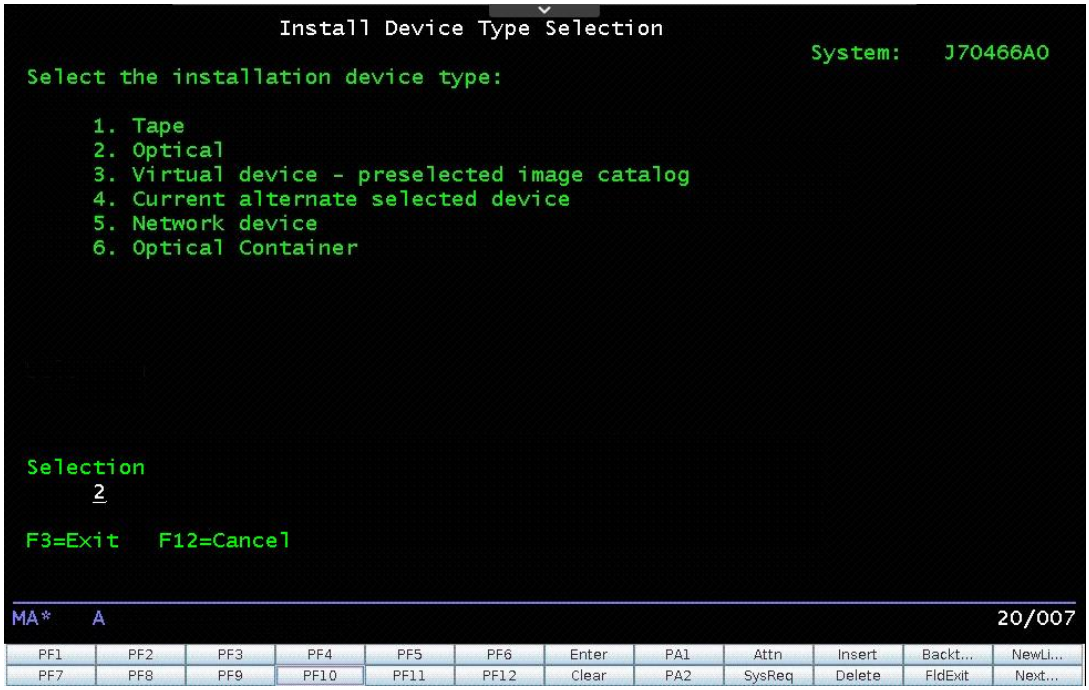
9. Accept the warnings on the report. Press F10 on the Disk Configuration Problem Report screen.



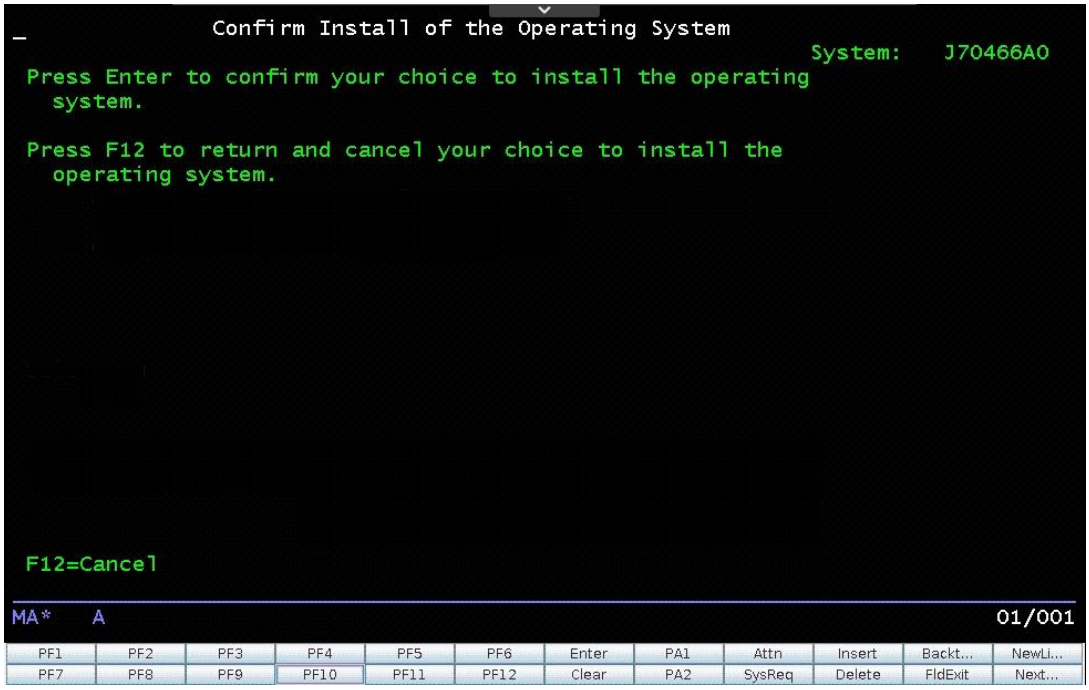
10. On the IPL or Install the System screen, select 2 to install the operating system and initialize the system and then press Enter.



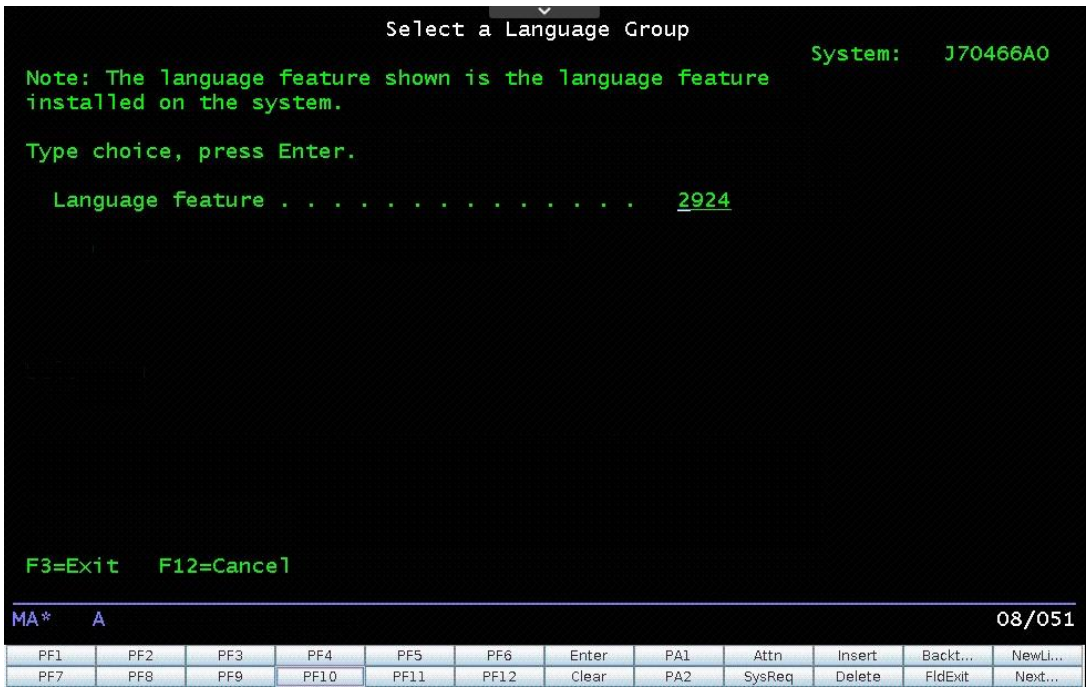
11. Select 2 to use the optical device for the installation



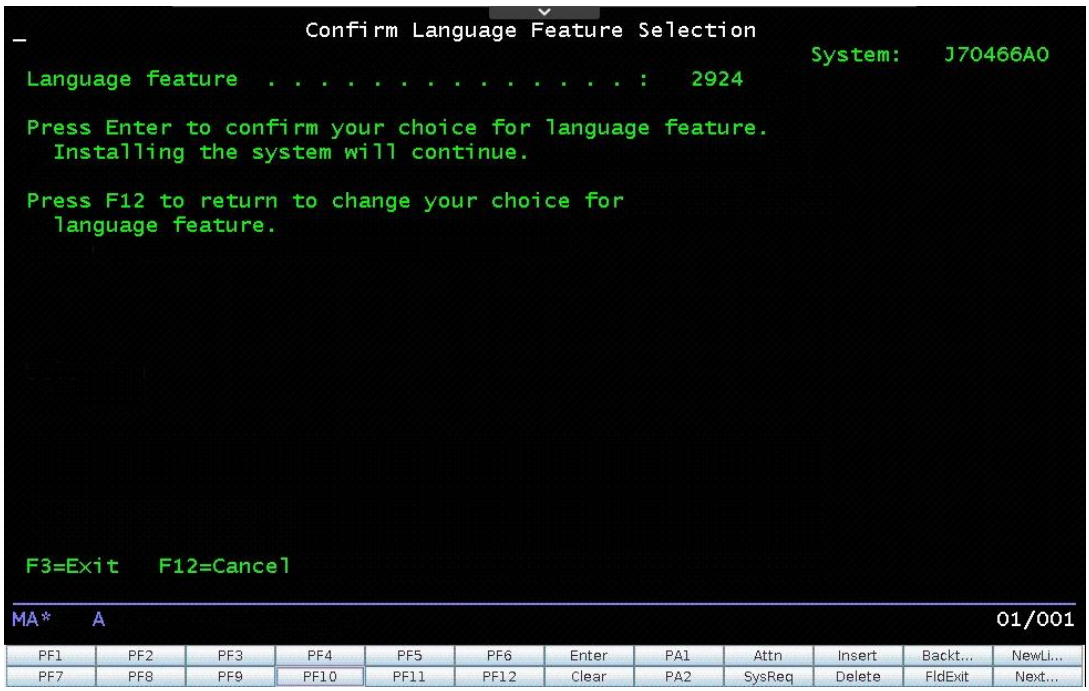
12. Confirm your selection of the operating system installation, press Enter.



13. To use English as the language, on the Select a Language Group screen, enter 2924 and then press Enter. In case your IBM i system uses a different language feature, please choose the correct language number.



14. Confirm your language selection, press Enter.



15. Select the DASD option.
    a. If you have completed the DASD configuration, select the Keep the current disk configuration option (1).
    b. If you need to configure DASD, select one of the following:
        i. Add all disk units to the system auxiliary pool
        Select this option to add all non-configured disk units to the system auxiliary pool (ASP 1). Use this option when the system ASP has a few units and you have many non-configured units. All data stored on the units that are added will be deleted before adding units to the

system.

Note: This option will not balance data in the system ASP.

A series of screens display the status and any problems. If you see a problem screen, press F10. The process is complete when the "IPL step.....: Start the operating system" message appears.

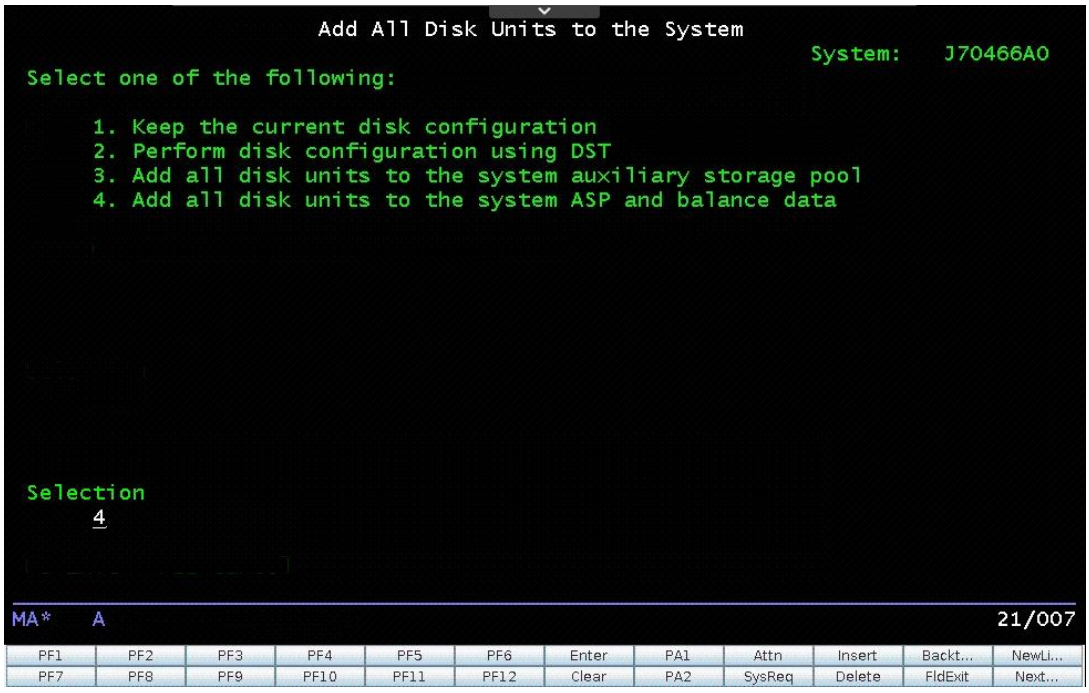
ii. Add all disks to the system ASP and balance data

This option adds all the non-configured disk units to the system ASP and then balances the data in the system ASP. Use this option when there are a few non-configured disk units, or when the system ASP contains many disk units. All data stored on the added units are deleted before they are added to the system ASP.

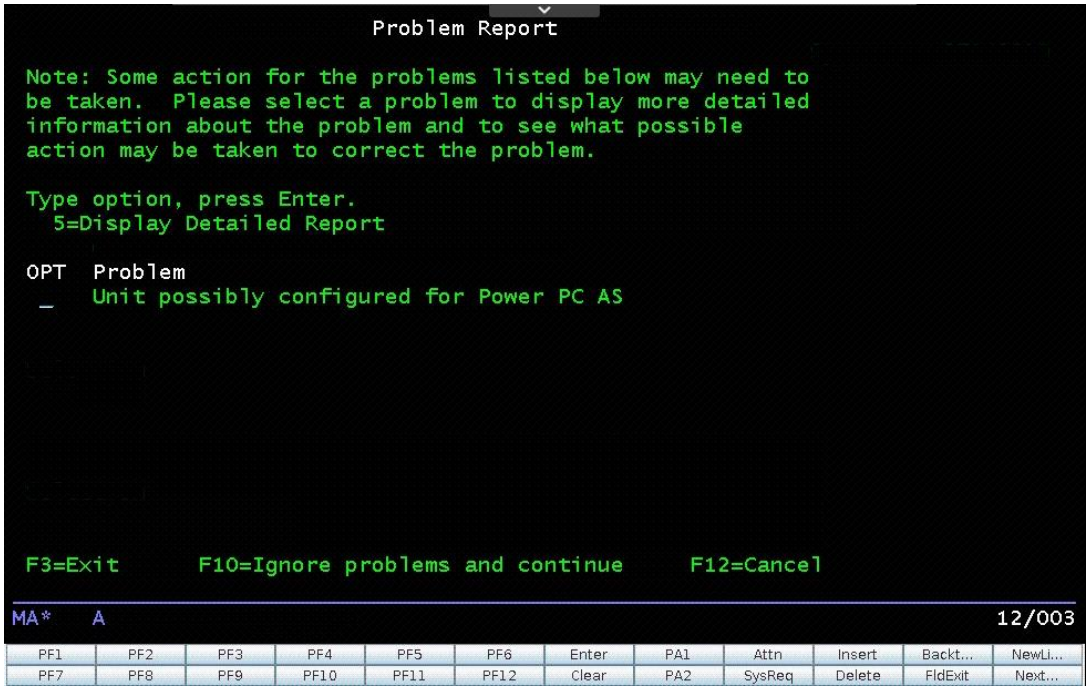
Note: You may have to wait for a few minutes with this option.

A series of screens display the status and any problems. If you see a problem screen, press F10. The process is complete when the "IPL step.....: Start the operating system" message appears.

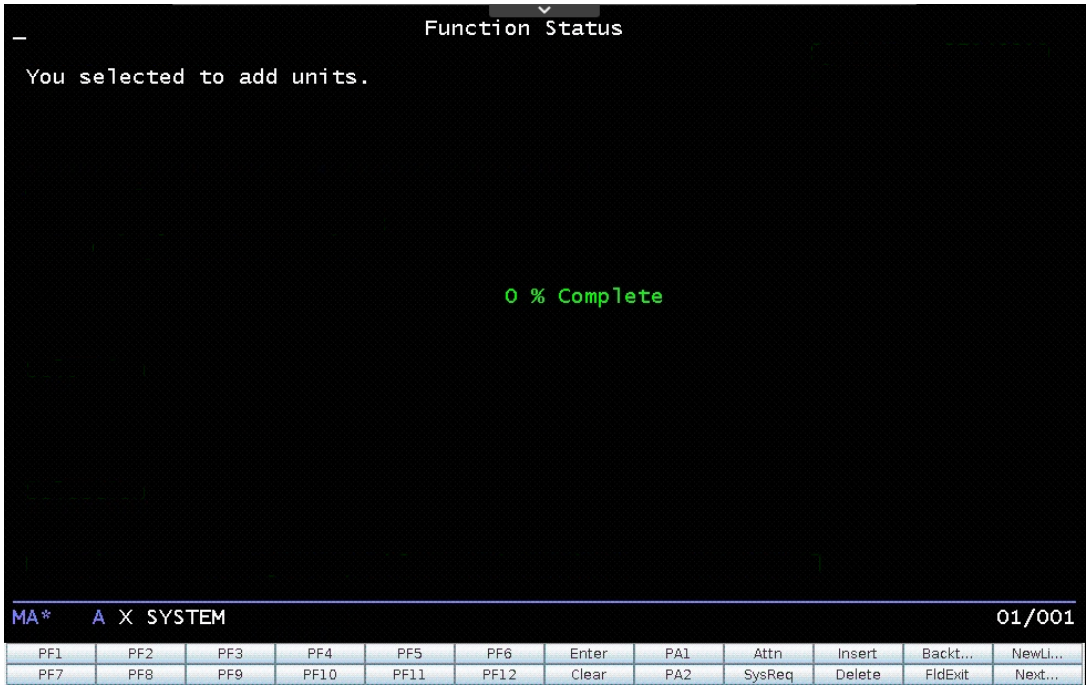
This guide will add all disks to the system ASP and balance data (option 4)



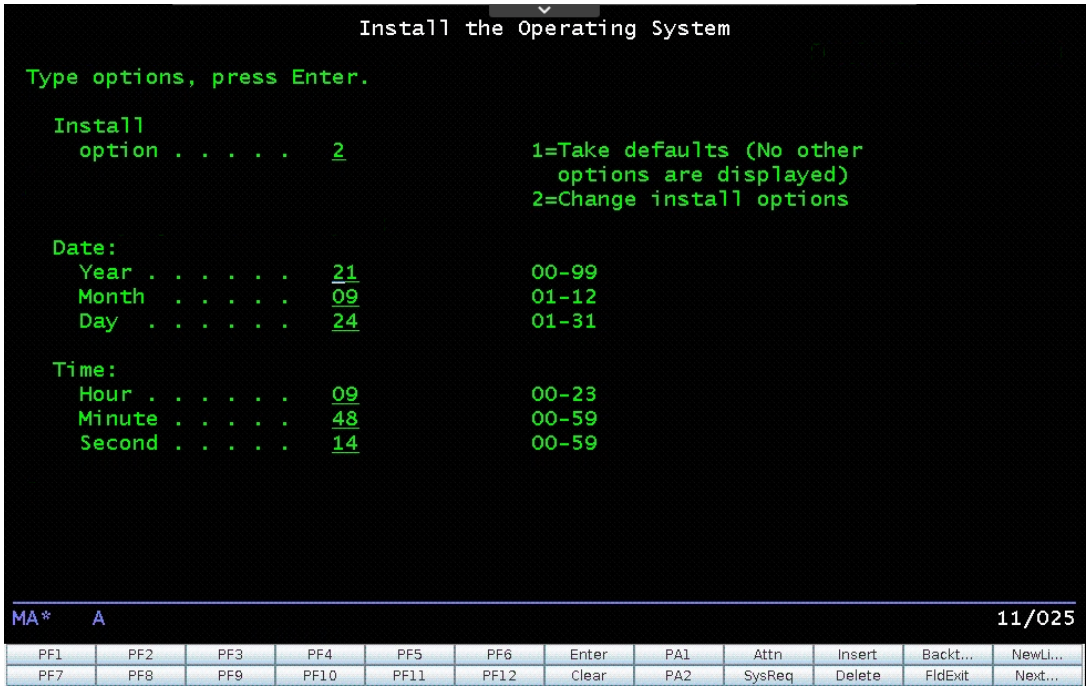
16. Press F10 to continue



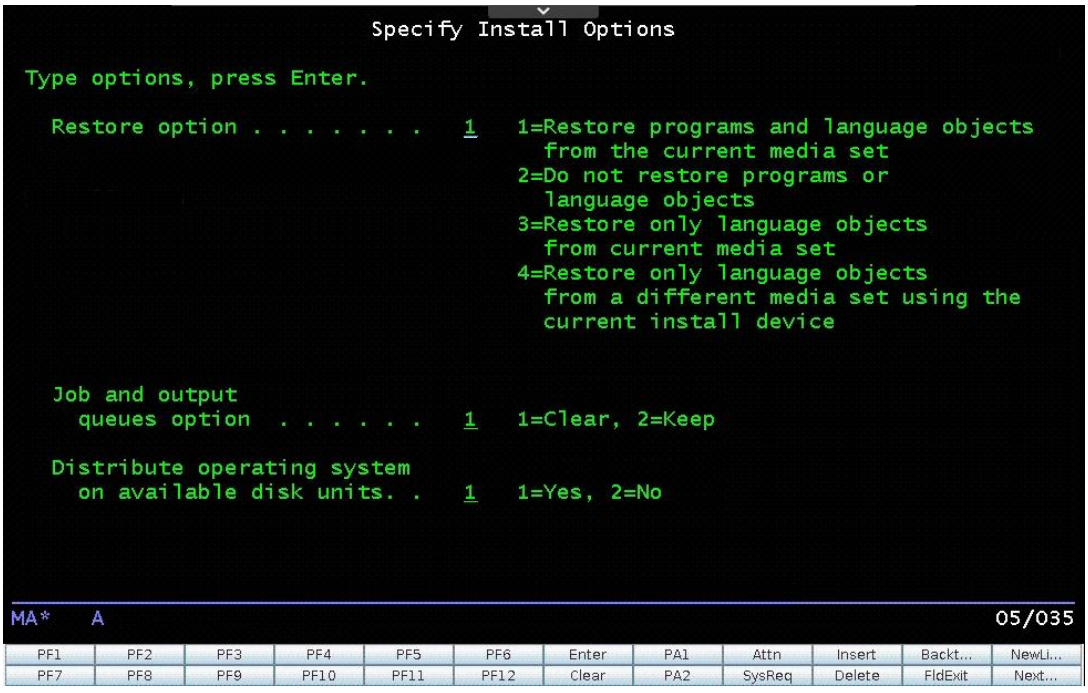
17. Disks will be added/configured



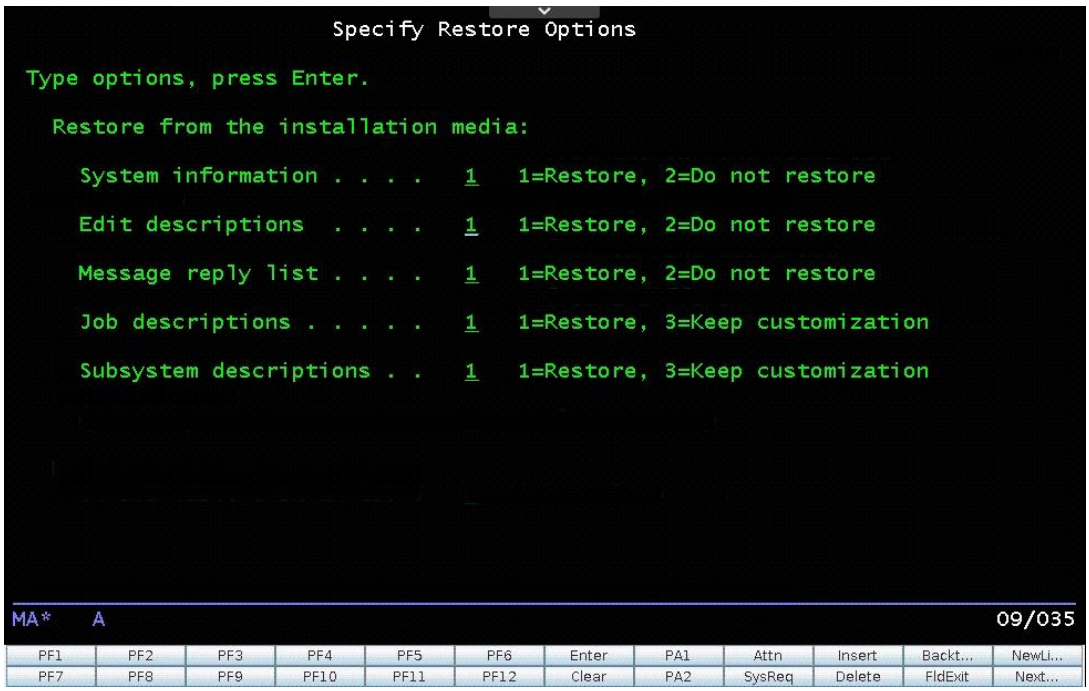
18. Change the install options. On the Install the Operating System screen select 2 to make updates.



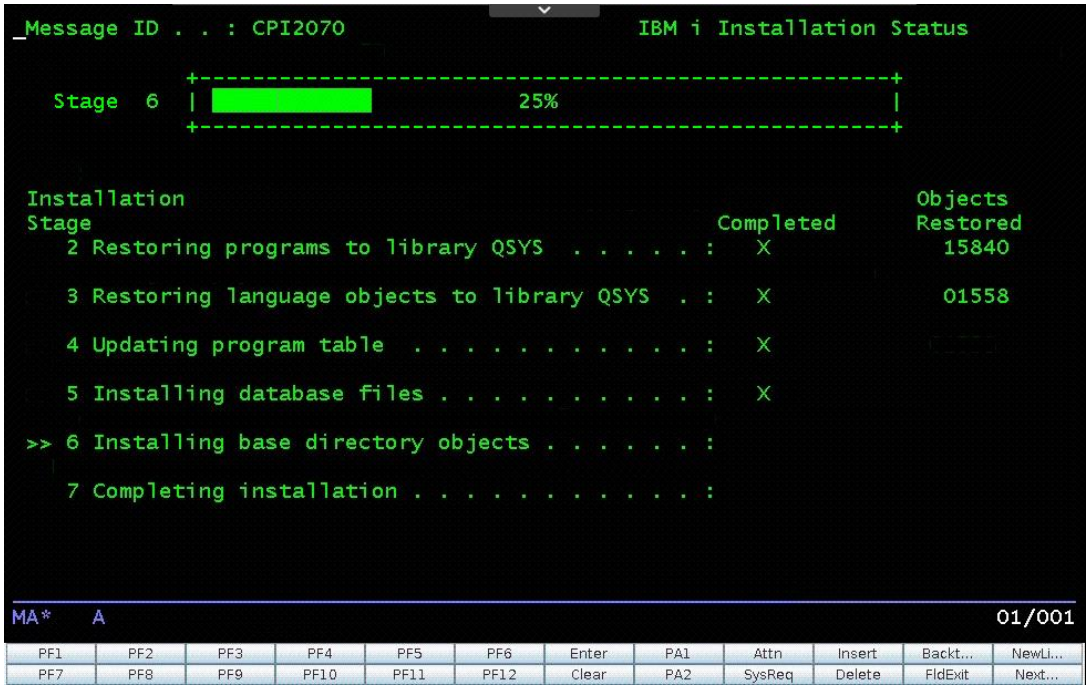
19. Press Enter. A status screen displays. There is no action required.
20. Choose the restore options. On the Specify Install Options screen:
    a. To restore the program and language options from the backup, select 1 for the Restore option.
    b. To clear the job queue, select 1 for the Job and output queues option.
    c. To distribute the operating system, select 1 for the Distribute Operating System On available disk units option.
    d. Verify that all options are 1 and then press Enter.



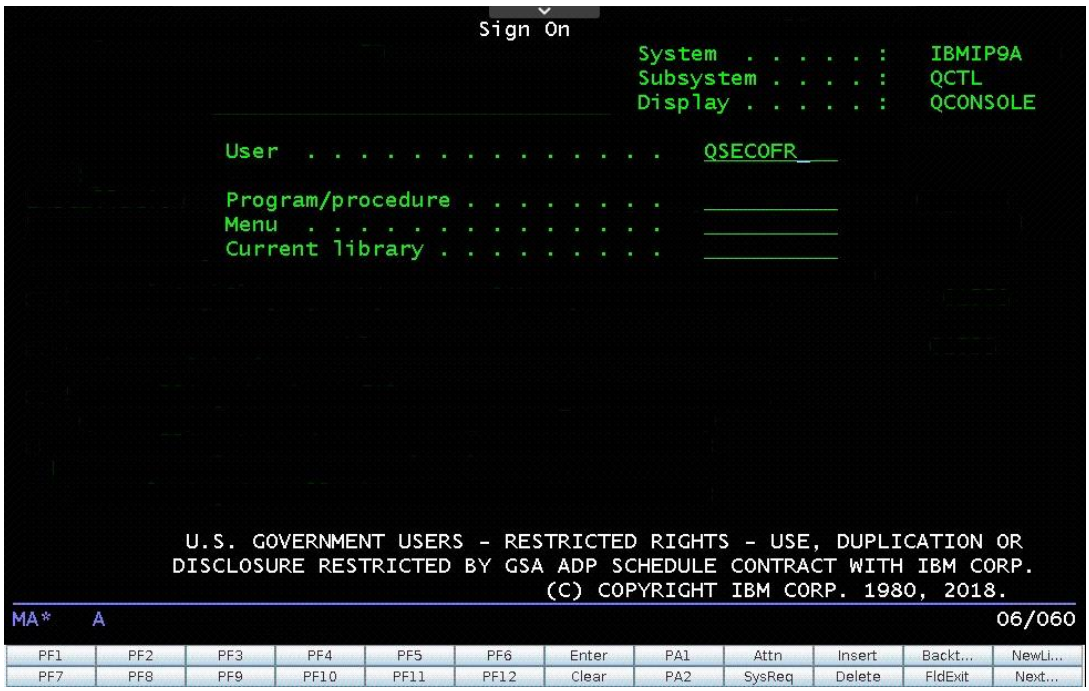
21. Verify the restore options. On the Specify Restore Options screen, verify all entries are set to 1 and then press Enter.



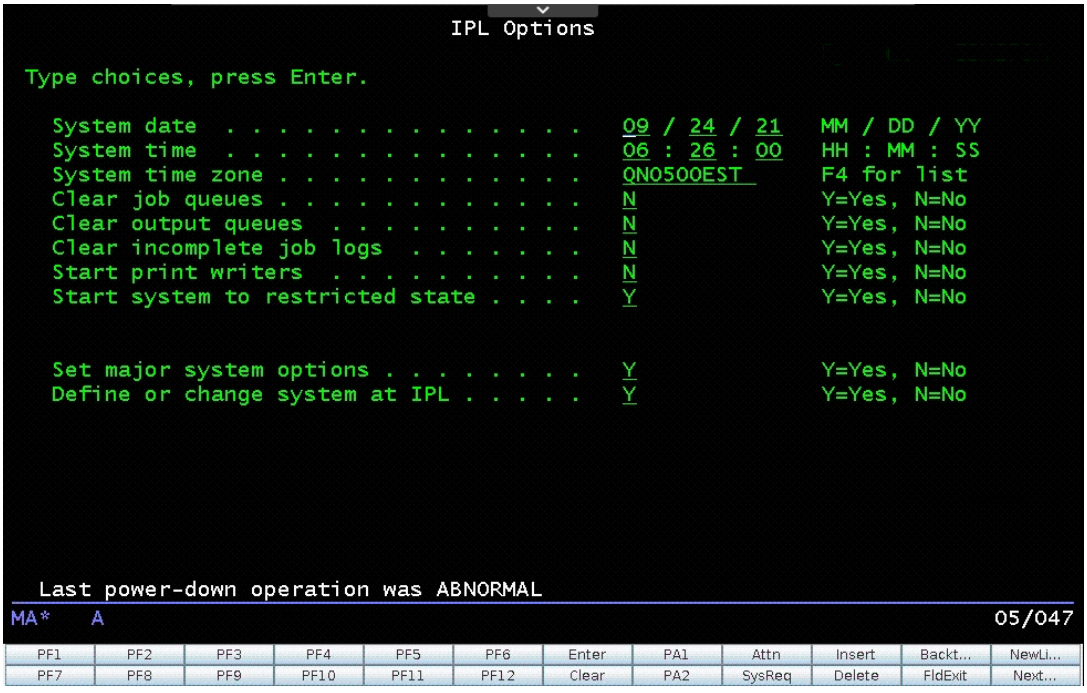
22. The install will proceed



23. Sign into the system. On the SIGN ON screen, enter QSECOFR and then press Enter. You do not need to enter a password.

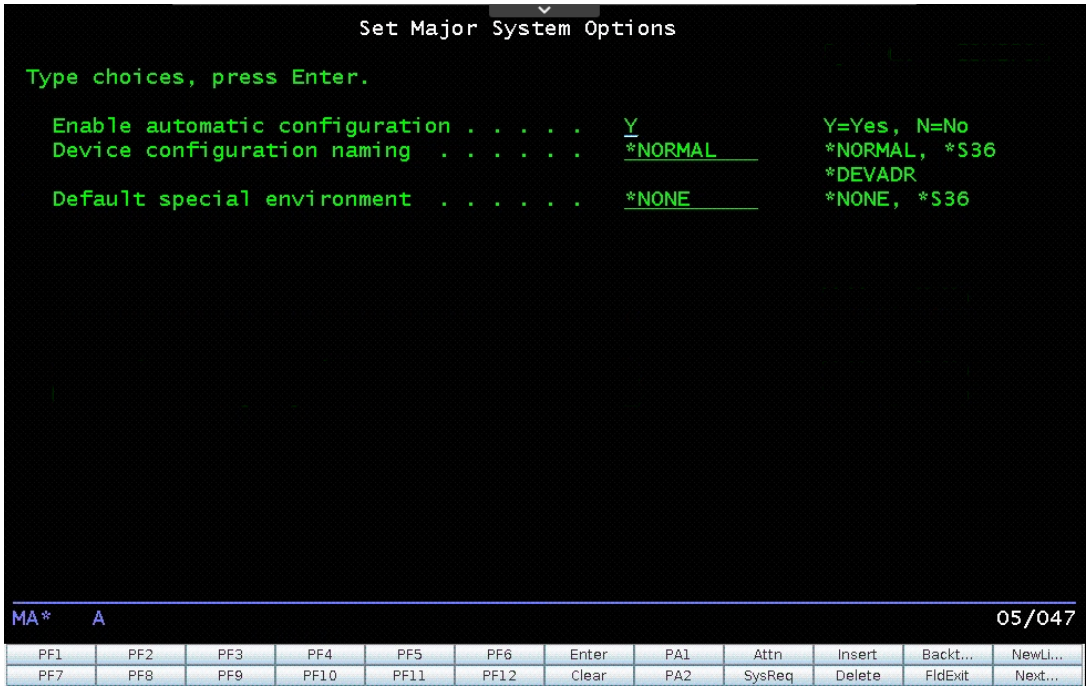


24. Set the system options. On the IPL Options screen, set the following options:
    a. Set the date and time.
    b. Set the Start system to restricted state option to Y.
    c. Set the Set Major System Options option to Y.
    d. Set the Define or Change System at IPL option to Y.

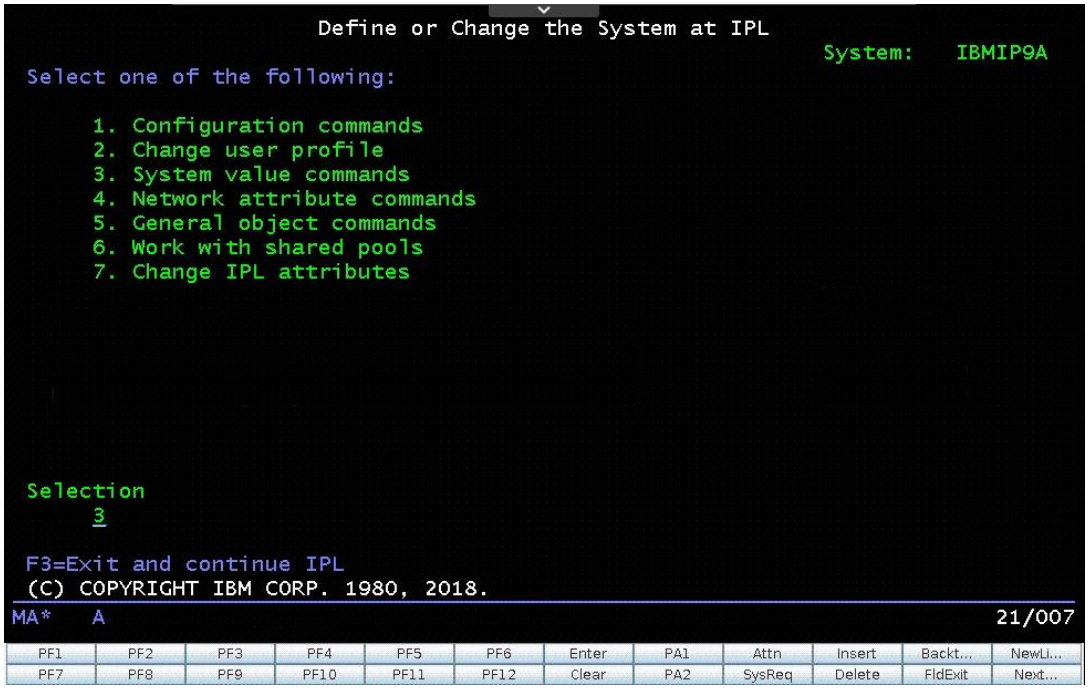


25. Press Enter.

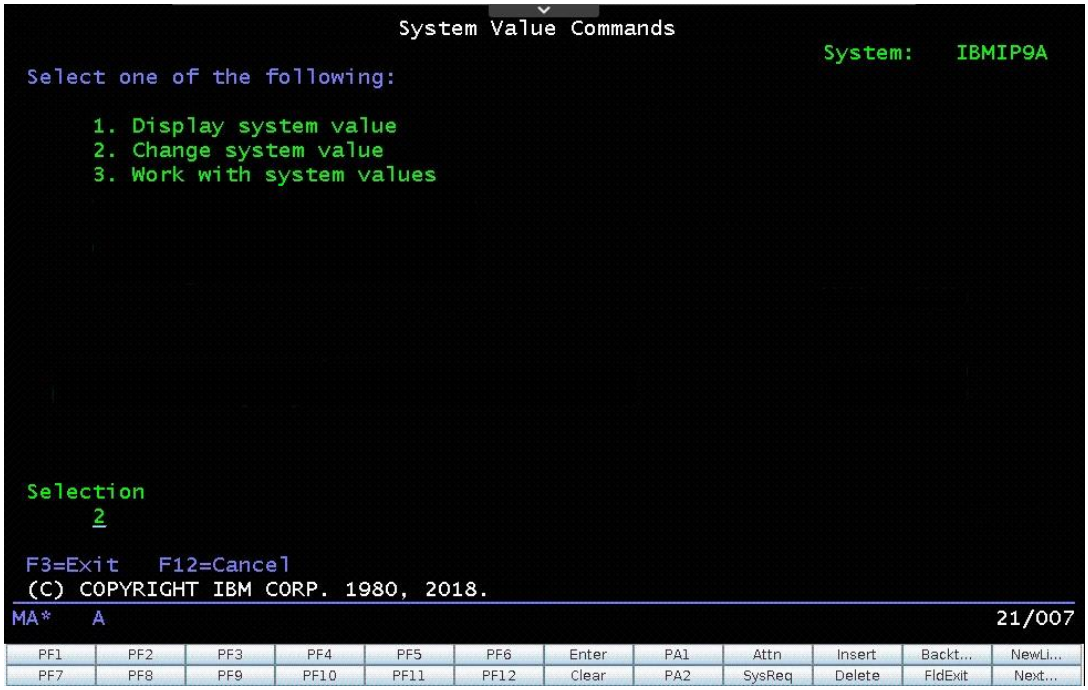
26. Set the automatic configuration. On the Set Major System Options screen:
    a. Set Enable automatic configuration to Y
    b. Set Device configuration naming to *NORMAL



27. Set the system values. On the Define or Change the System at IPL screen, select 3 and then press Enter.



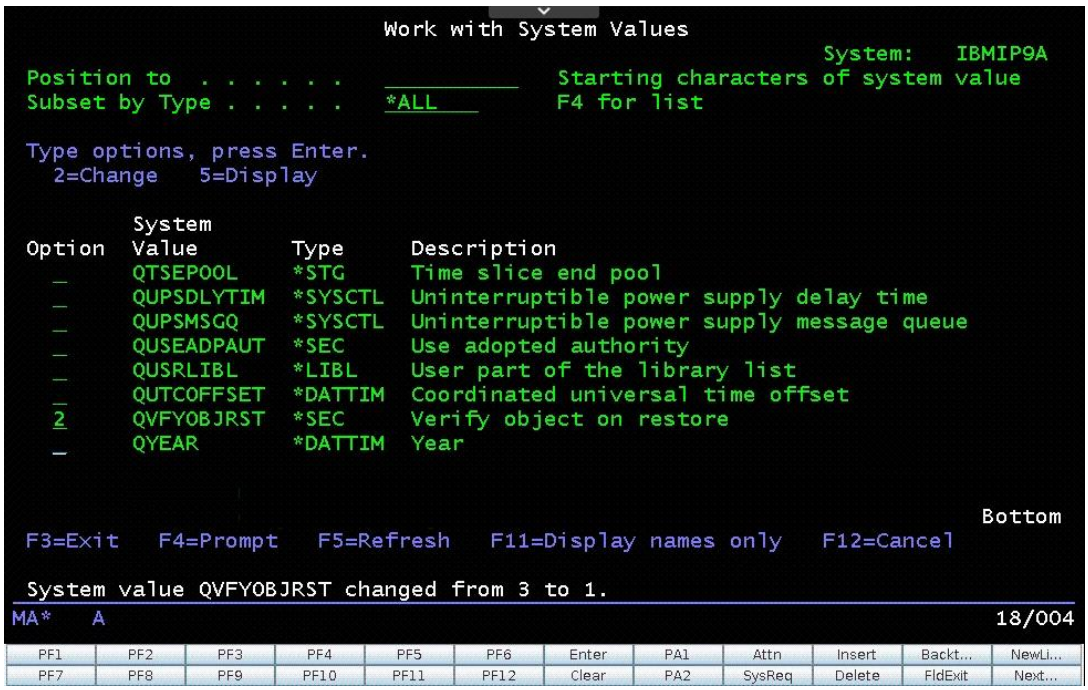
28. Select option 3 to work with the system values

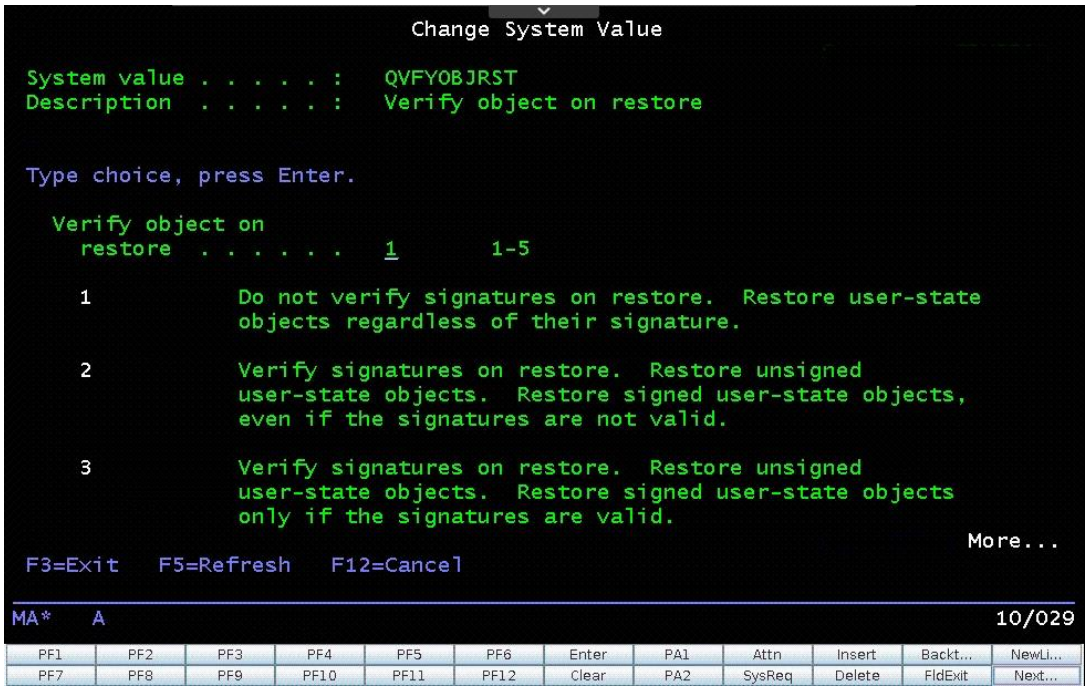


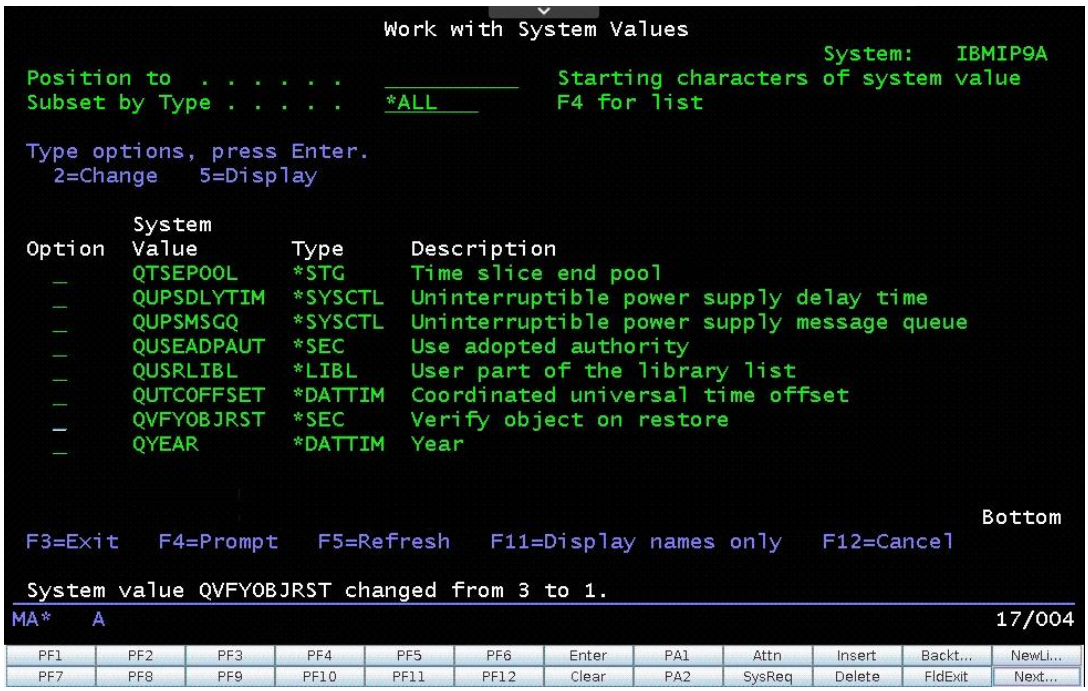
29. Set the values per the table:
    Screeshots below the table show how to set the value of 1 for the system value QVFYOBJRST
    Press tab until you find the desired value and set the option to 2 > press enter to change
    Enter a new value > press enter to set

System Value	New Setting
QALWOBJRST	*ALL
QFRCCVNRST	0
QINACTITV	*NONE
QIPLTYPE	2
QJOBMSGQFL	*PRTWRAP
QJOBMSGQMX	30 (minimum, 64 recommended)
QLMTDEVSSN	0
QLMTSECOFR	0
QMAXSIGN	*NOMAX
QPFRADJ	2
QPWDEXPITV	*NOMAX
QSCANFSCTL	*NOPOSTRST
QVFYOBJRST	1

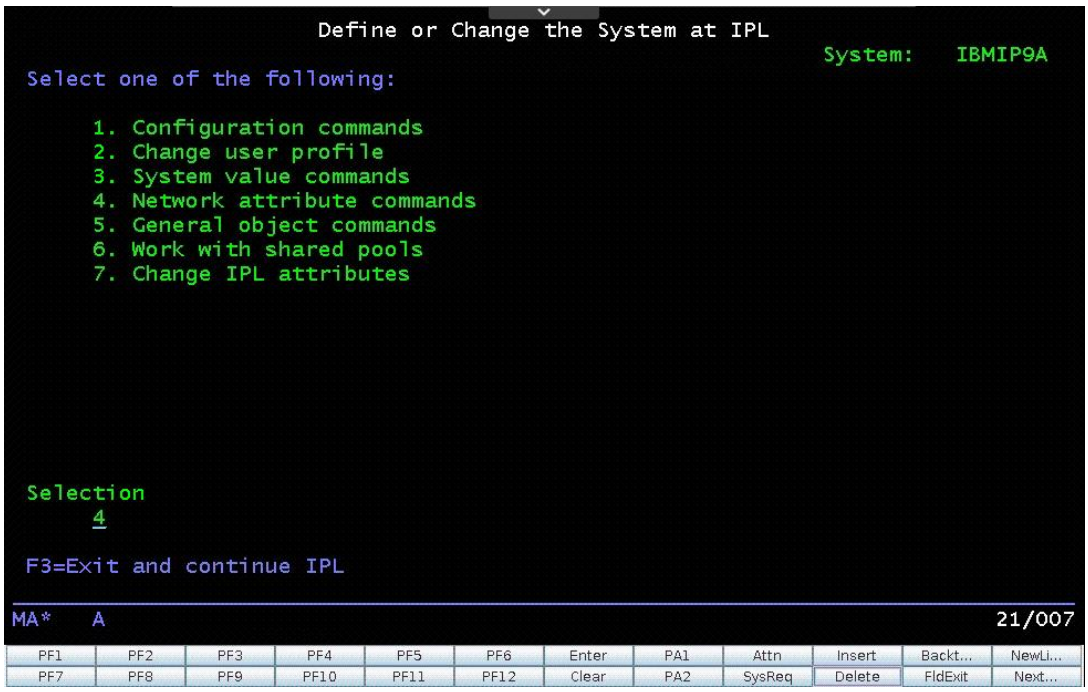
    e.g.



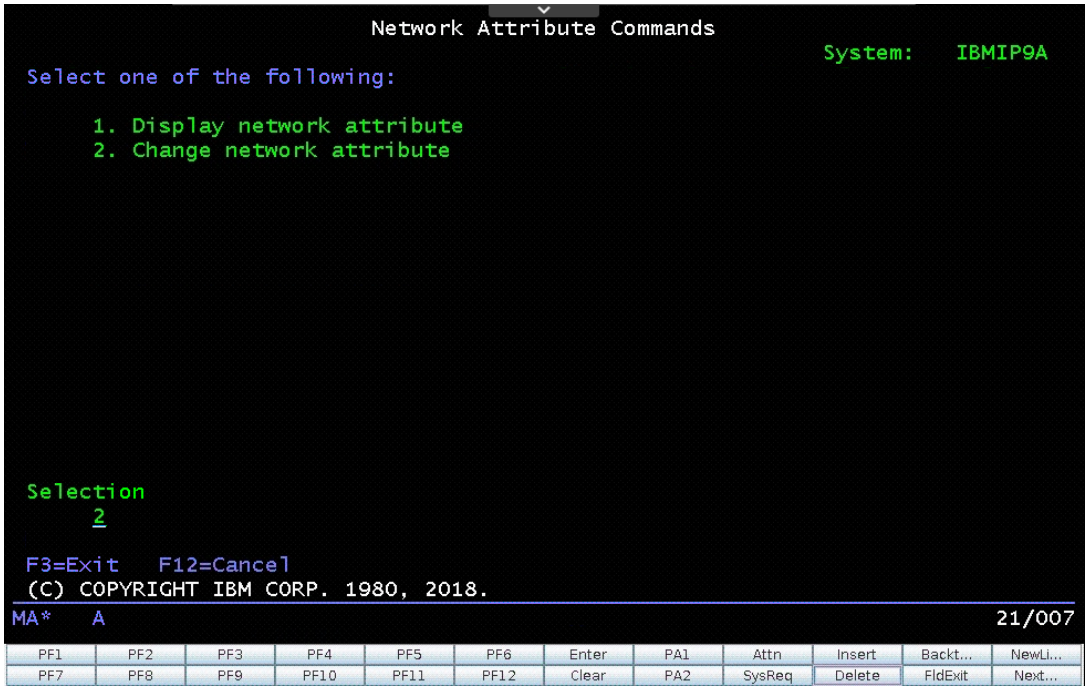




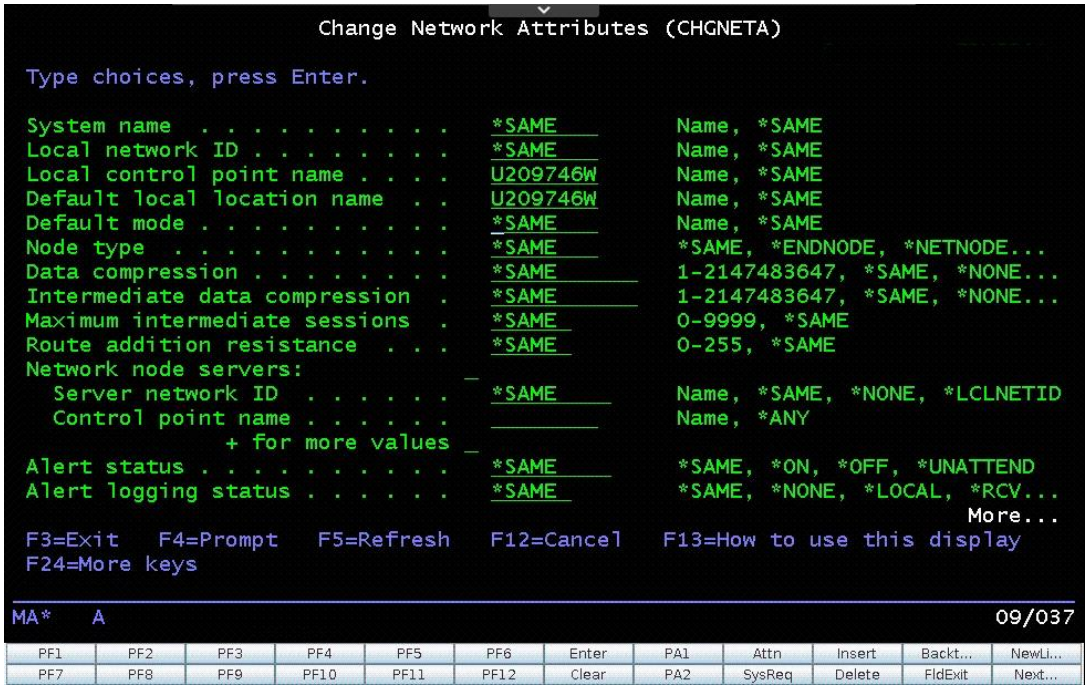
30. Press F3 twice to return to the Define or Change the System at IPL screen
31. Select 4 for Network attributes commands



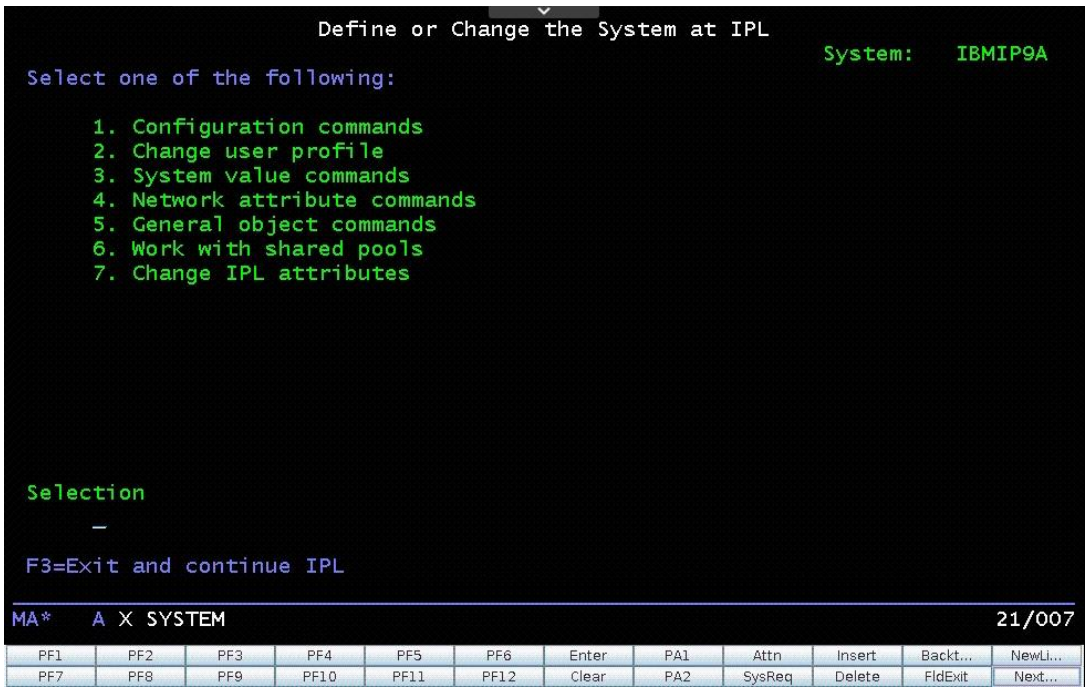
32. Select 2 to Change network attributes



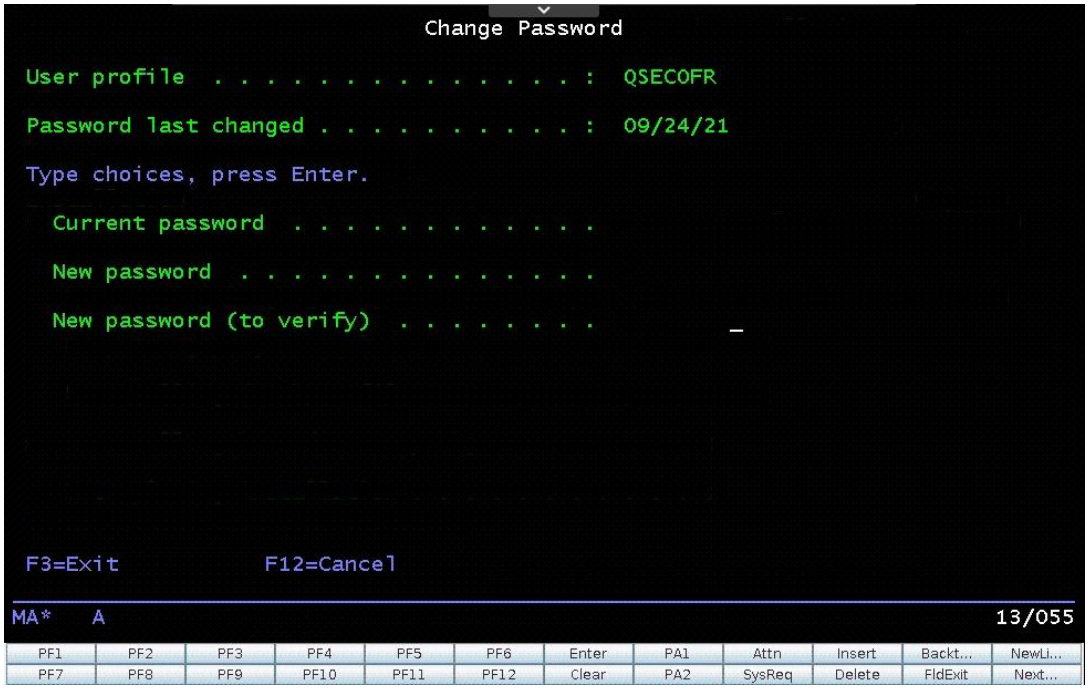
33. Set the Local control point name and Default local location to match your configuration



34. A message appears indicating the network attributes have changes. Press F12 and then F3. To continue the IPL



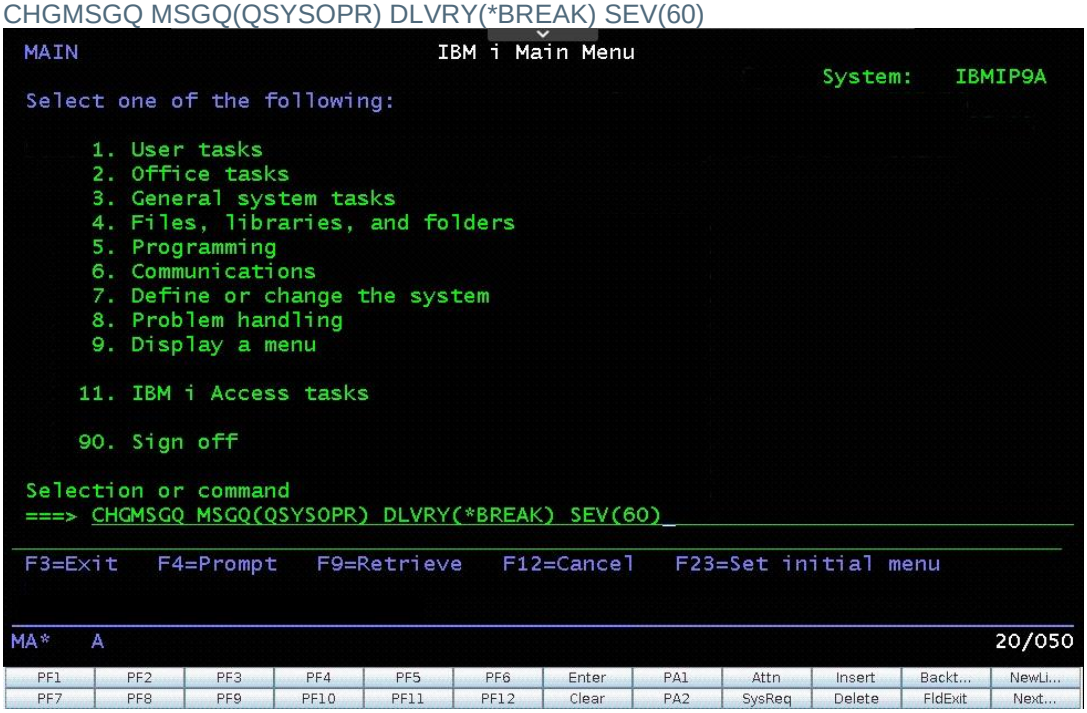
35. Wait for the Sign On information screen to appear.
36. Change the password for QSECOFR and press enter



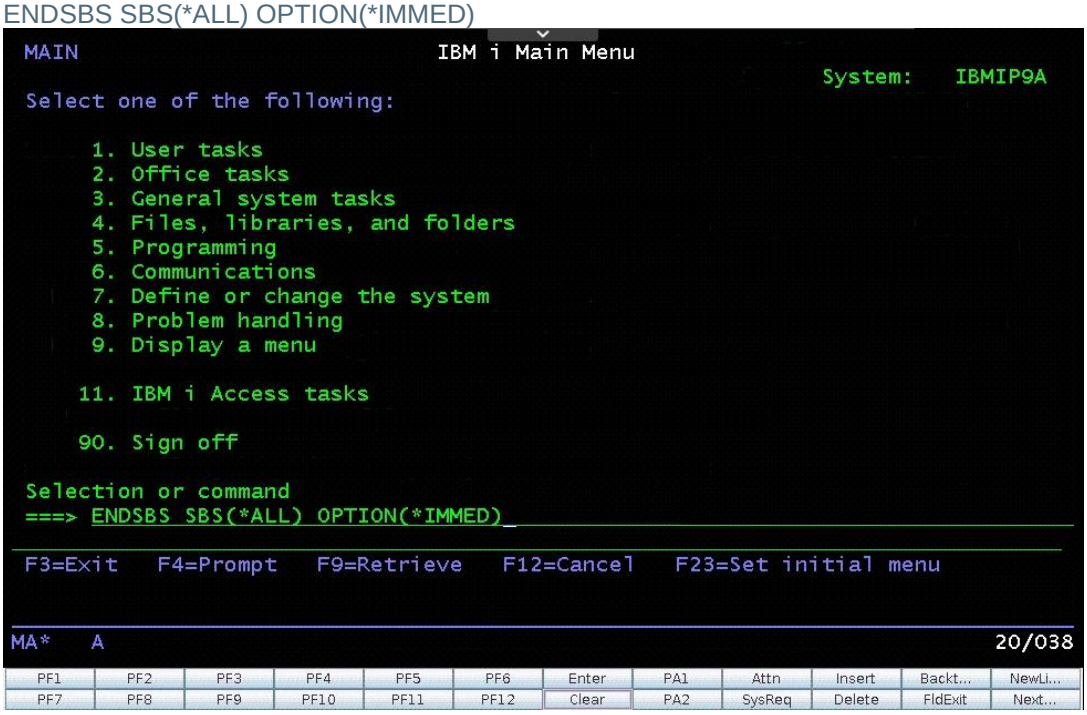
37. The basic OS is restored

Recover System Data and Commvault Libraries from the DR Backup

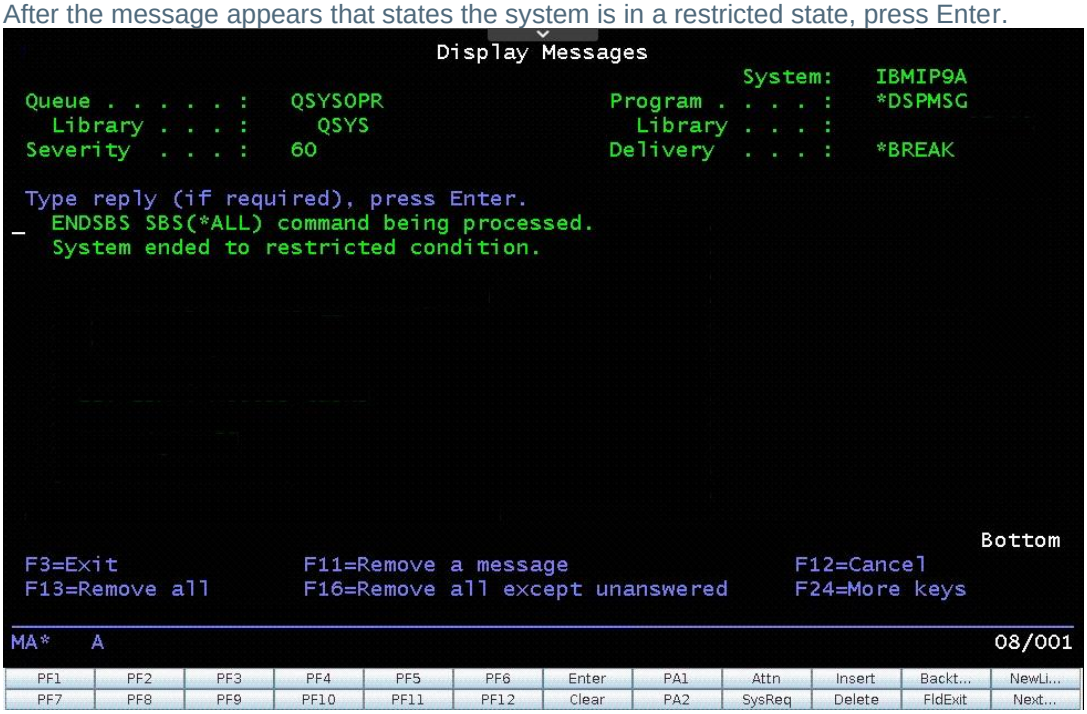
1. Clear the system messages.
   a. On the command line, type the following command, and then press Enter.
   CHGMSGQ MSGQ(QSYSOPR) DLVRY(*BREAK) SEV(60)



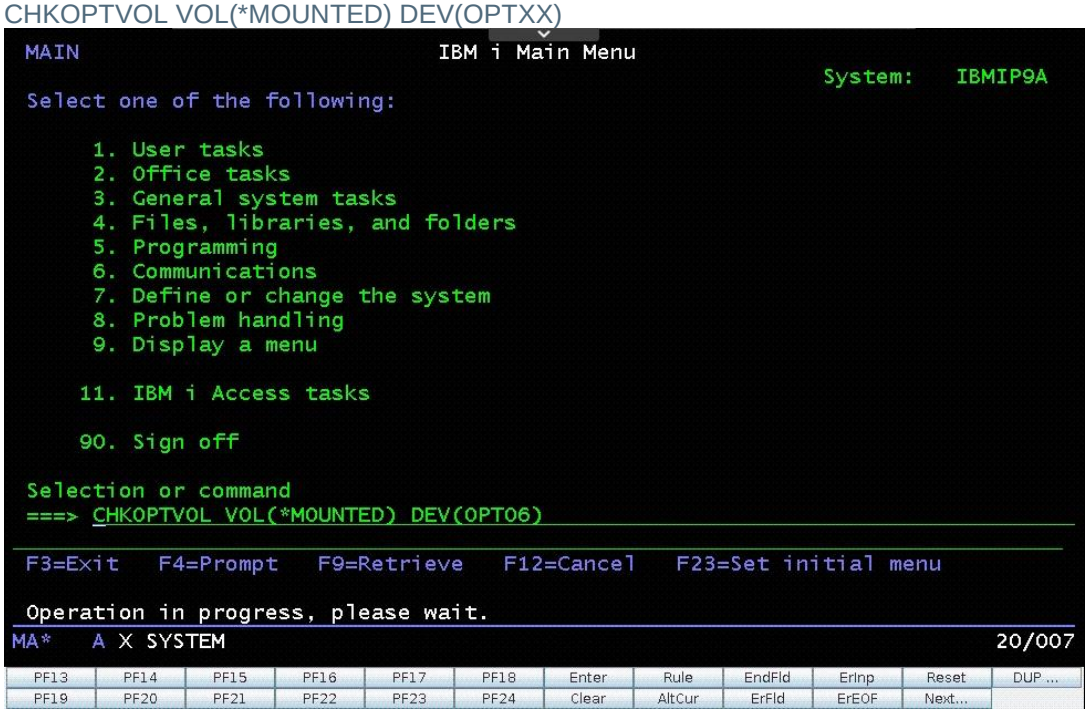
   b. On the command line, type the following command, and then press Enter.
   ENDSBS SBS(*ALL) OPTION(*IMMED)



c. After the message appears that states the system is in a restricted state, press Enter.



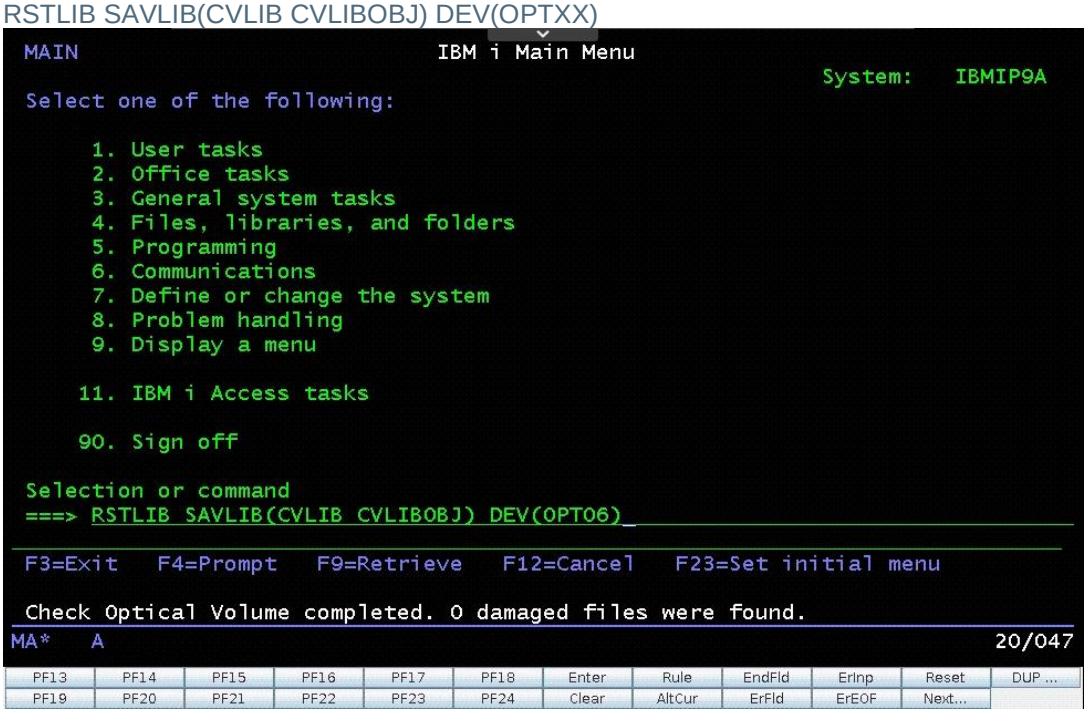
2. Verify that the DVD image is loaded in the optical drive. On the command line, type the following command, substituting OPTXX with the optical device name.
CHKOPTVOL VOL(*MOUNTED) DEV(OPTXX)



Operation in progress message will display, followed by a progress percentage, then a completion message

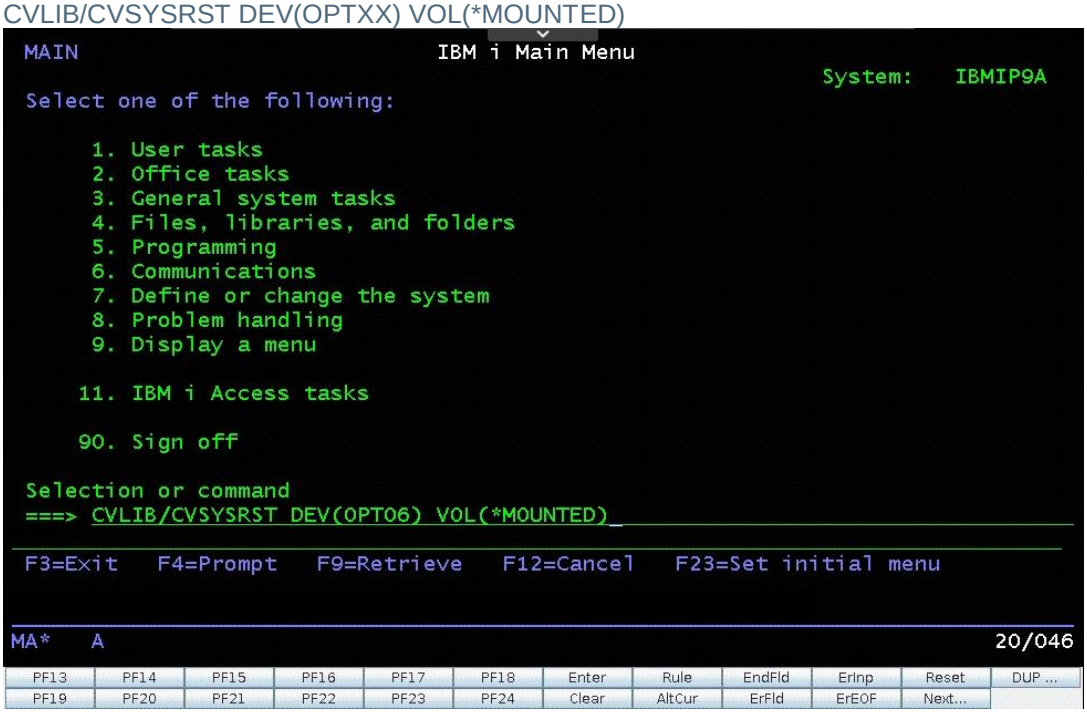
3. Restore the CVLIB. On the command line, type the following command, substituting OPTXX with the optical device name.

RSTLIB SAVLIB(CVLIB CVLIBOBJ) DEV(OPTXX)

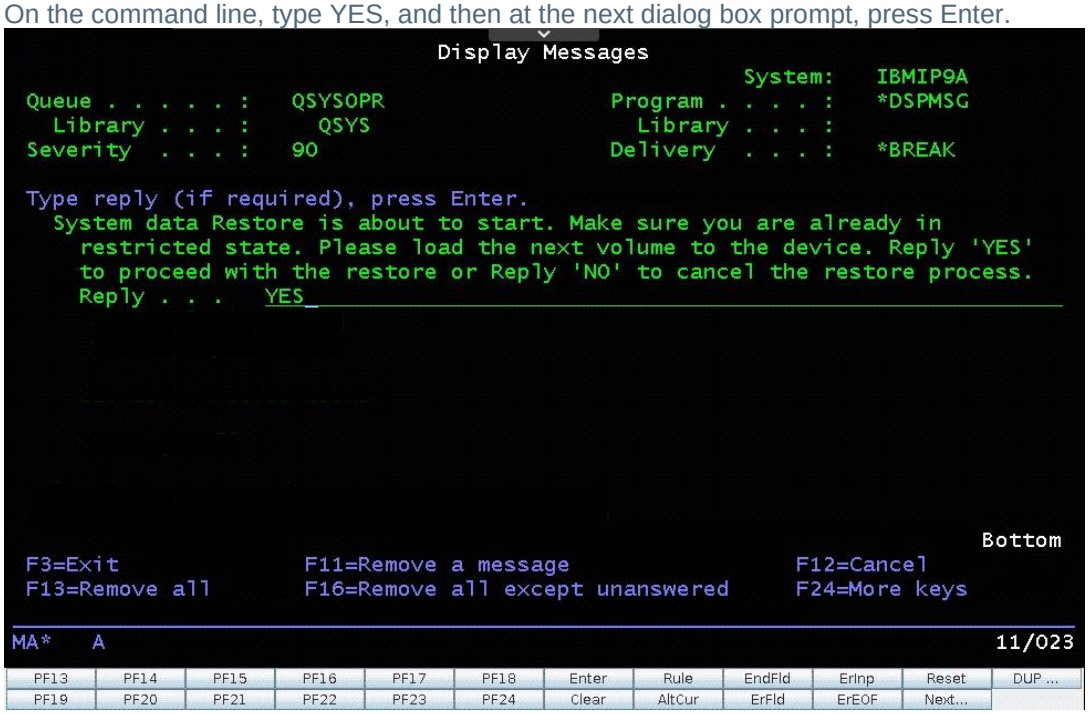


There will be some file not found warnings press page down until at the end of the output to confirm the completion of the restore.

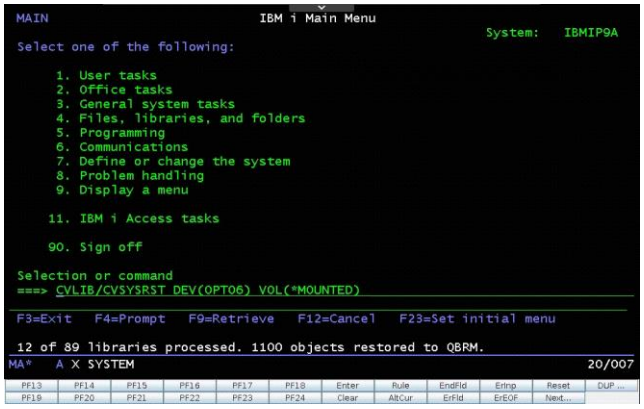
4. Restore the system backup data. On the command line, type the following command, substituting OPTXX with the optical device name.
CVLIB/CVSYSRST DEV(OPTXX) VOL(*MOUNTED)

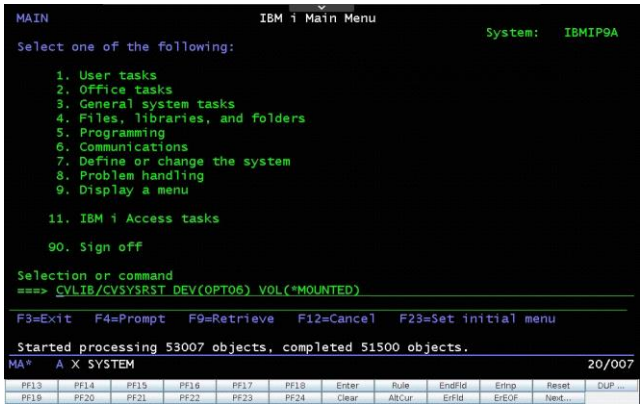


5. On the command line, type YES, and then at the next dialog box prompt, press Enter.

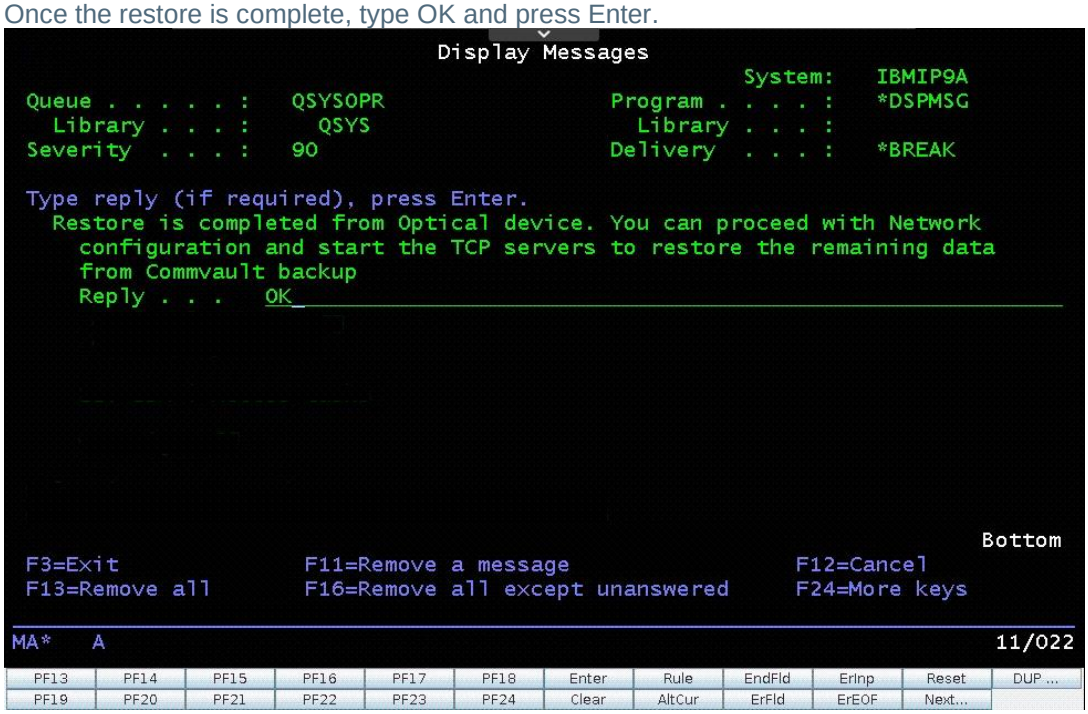


This will return to the main menu, recheck the DVD, then perform the restore, progress messages show in the status bar



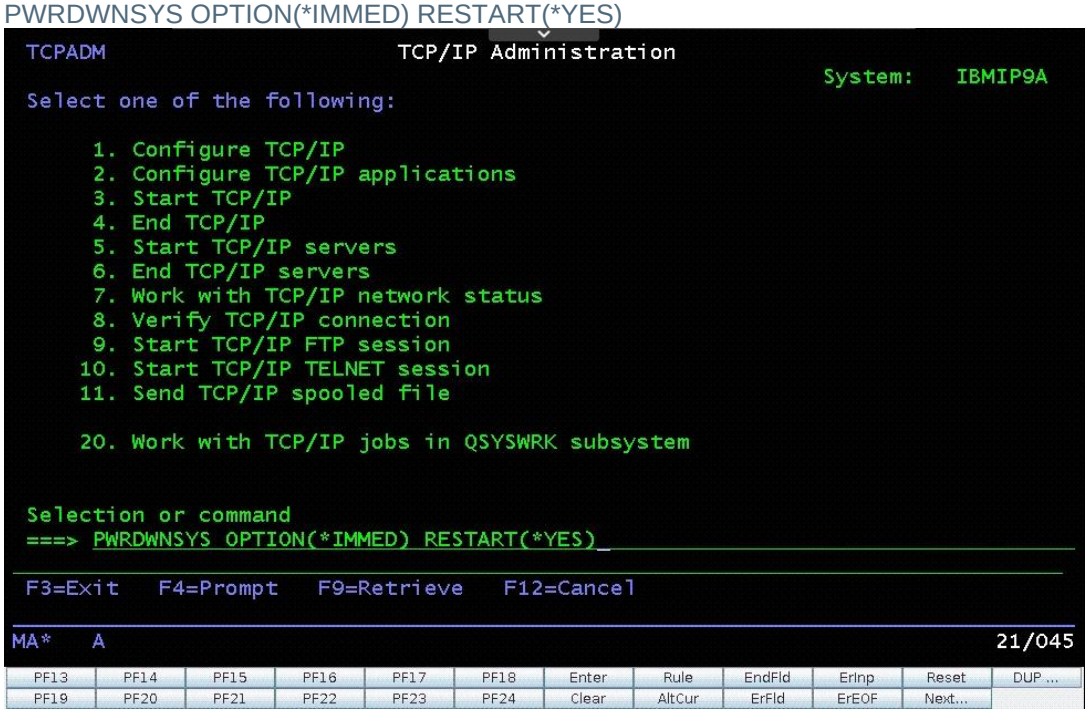


6. Once the restore is complete, type OK and press Enter.

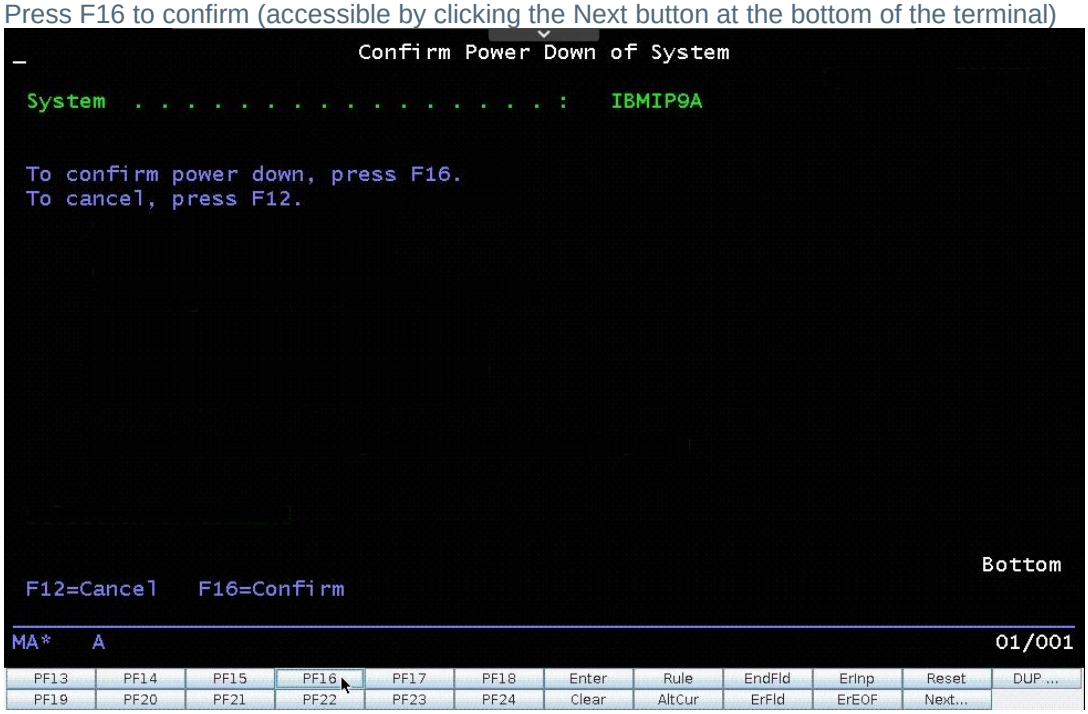


7. Have an IBM i admin configure the TCP/IP configuration from the command line.

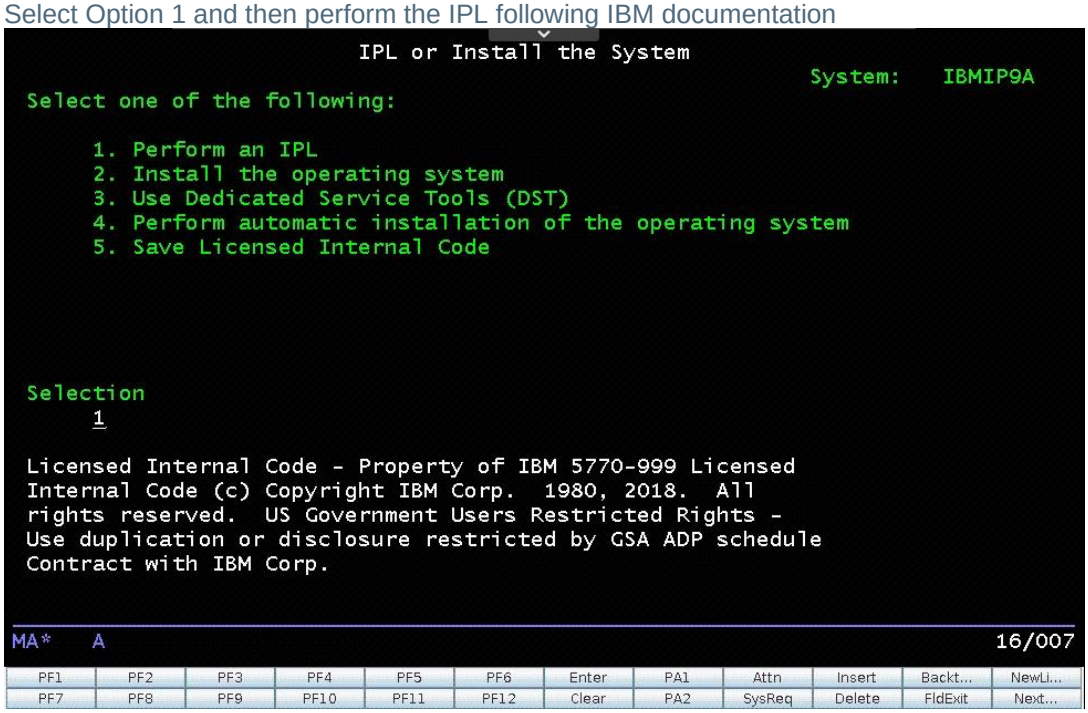
8. Perform the initial program load (IPL). On the command line, type the following command: PWRDWNSYS OPTION(*IMMED) RESTART(*YES)



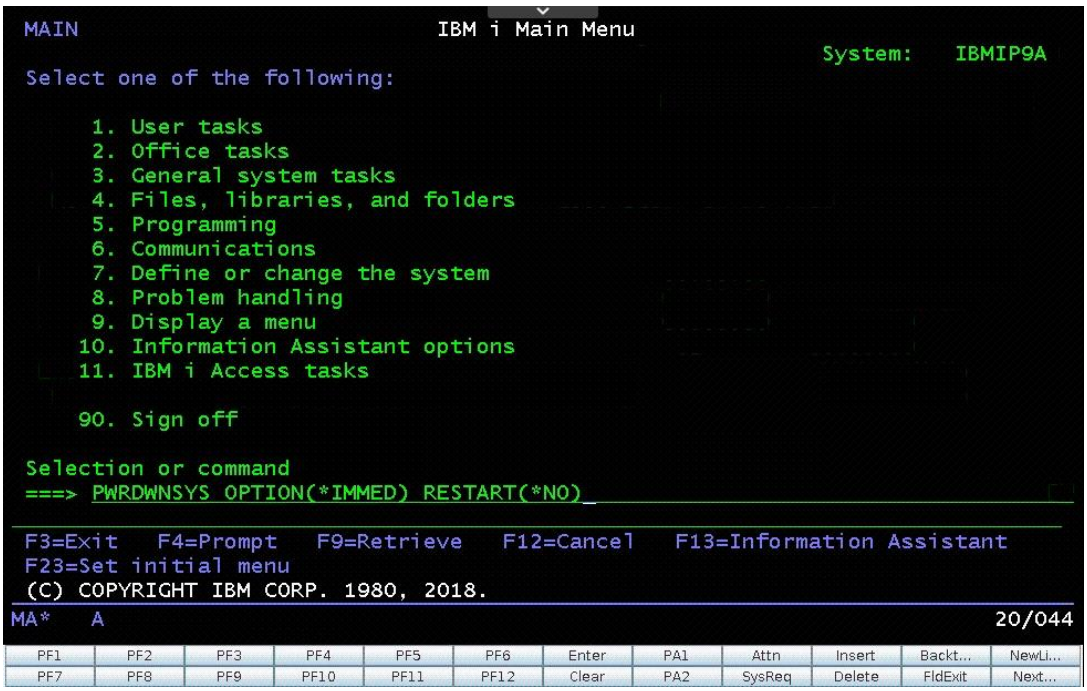
9. Press F16 to confirm (accessible by clicking the Next button at the bottom of the terminal)



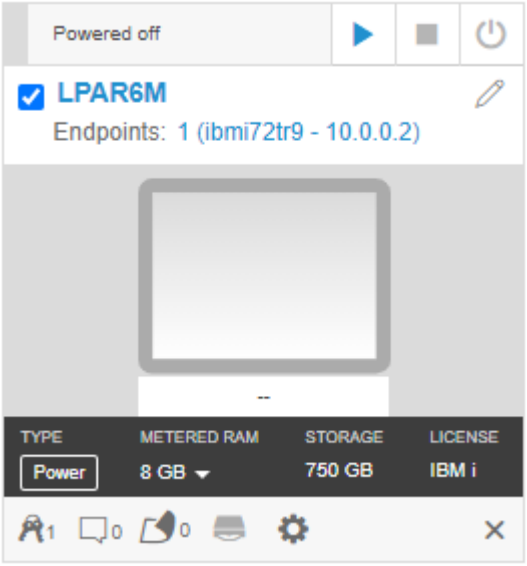
10. Select Option 1 and then perform the IPL following IBM documentation



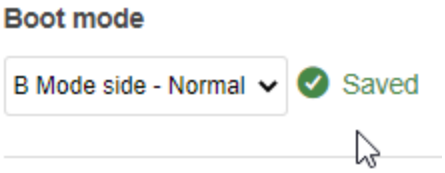
11. After the IPL is complete power down the system
PWRDWNSYS OPTION(*IMMED) RESTART(*NO)



12. Once the VM shows as powered off select the settings cog



13. Change the Boot mode to B Mode side - Normal



14. Power on the VM
15. Wait for the VM to boot and become operational.

Resume the 1-Touch Restore job

1. Click Jobs > press Actions on the IBM i DR Recovery job > Resume

2. This will trigger the restore jobs for the other subclients in order
3. Once the workflow has restored all the subclients, have an IBM admin IPL the system, and the migration is then complete.

Result

The migration process is now complete, you should have a replica of the on-prem IBM i running in Skytap.