

# A Locally Developed Utility For Managing CRI Tapes

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**ABSTRACT:** *CRL provides library management for all silo tapes. Users can read from and write to tapes stored in the silo. We provide user-written tape storage at no cost to the user. However, current procedures to archive and restore data is not user-friendly. As a result only users who cannot store their massive amounts of data using any other means use CRL to store their data. We have developed a utility **crlmain** that will enable users to read, write, and manage tapes easily.*

## Introduction

Cray REELibrarian (CRL) manages DMF, user, and system silo tapes. References to CRL in this paper refer to user created silo tapes to archive user data. CRL provides full screen and command line interfaces for users to archive and retrieve tapes from the silo. However, cryptic error messages and fear of data loss has discouraged users with moderate amounts of data from actively using CRL. Their alternate choice of storing data in the tmp drive has created storage and DMF problems for the Arctic Region Supercomputing Center (ARSC). User Services has developed an interactive tool called **crlmain** to archive and retrieve data from CRL. This is done in an effort to encourage researchers to write tapes, and control the amount of data stored in the tmp drive.

## Features

**crlmain** is a shell script in Korn. It consists of several functions also written in korn shell to archive and retrieve data to and from CRL tapes. In addition **crlmain** calls two independent shell scripts called **crlin** and **crlout** to move tapes between the tape library and the silo. The prompts and listings visible to the user are native to the function and script and relevant to the feature requested by the user. All tape resources are reserved and released by **crlmain** for the user. The script is designed to interactively solicit a user for information and error check the replies prior to executing the command. **crlmain** in conjunction with **crlin** and **crlout** attempts to implement an easy, self explaining and robust interface between the user and the CrayREELibrarian.

### **crlmain**

A user can archive and restore data to and from tapes by choosing a specific function in **crlmain**. These functions are to:

- create complete and/or selective backup of directories
- append files to an existing volume set, at the end of the tape
- restore directories or selective files from volume sets
- delete old volume sets
- edit access permissions for files and volume sets

In addition, **crlmain**:

- ensures that the site requirements for the device group, tape labels and number of files that can be listed in a volume set are met
- checks the user supplied information for validity and consistency

### **crlin**

**crlmain** invokes **crlin** to move user CRL tapes from an off-line tape storage location to the silo. Inactive user data tapes are moved to an off-line location based on their last access times. This ensures that all DMF data stays in the silo and that there are a sufficient number of scratch tapes in the DMF pool. An operator has to manually move the tape from the off-line location to the silo for the user to access the tapes. **crlin** marks the volume set or volume for return to the silo when a user invokes the **crlin** script. **crlin**

- sends email to the operator on duty, requesting a tape move, and
- changes the "sloc" bit, for the volume set reports, to "silo" from "library"

### **crlout**

**crlmain** invokes **crlout** to move user CRL tapes from the silo to an off-line tape storage location. Currently, there is no charge for CRL tape usage or silo space. However, as part of a long-term goal to balance tapes between DMF and CRL in the

silo, ARSC may ask users to specify tapes for long-term storage only. `crout` is designed to help users move their tapes to an off-line location from the silo if they perceive no need for it in the immediate future. `crout`

- sends email to the operator on duty requesting a tape move, and
- changes the “sloc” bit, for the volume set reports, to “library” from “silo”

## Benefits

### *Easy to use*

Most of our users work on well outlined projects but in rather restricted environments, and with `crlmain` they do not have to learn complex UNICOS commands to archive and restore their data.

### *Error Control*

`crlmain` rejects invalid file and volume set names at the time of input. It also processes all user replies for consistency and accuracy. `crlmain` translates the error conditions to the user so he/she may make the right choice.

For example, if a user enters an incorrect volset name such as **.tests** or **testsdirectory**

current error message in either case is:

TM086 - Tape daemon error code : 90301: error code

`crlmain` error message for a **.tests** entry is:

*The volume set name cannot start with a (.) character.*

`crlmain` error message for a **testsdirectory** entry is

*The volume set name has to be 12 characters or less.*

TM086 error also occurs when the user has another volume set with the same name, and/or the file being archived already exists in the volume set. In this case the error message generated by `crlmain` is *This volume set already exists*. For more details, please see Figure 3 in the appendix.

Additionally `crlmain` reserves the required tape resources with the site appropriate options for the users. This feature specifically avoids user errors that generate the *TM056 - device group not reserved* tape message. TM056 error message is generated when the user specifies a device group on the `tpmnt` command that does not match the group used on the `rsv` command. The same error message is also generated when the user does not issue a `rsv` command.

### *Free data storage*

A user can archive data to tapes in CRL at no cost while he/she is charged for DMF file storage and data in his/her home

and `/tmp` directories. There is no restriction on a file size for CRL and the user can archive large amounts of data for an indefinite period of time.

### *Group access of data*

`crlmain` helps users to set volume set and file permissions on their data tapes. With the help of the `crlmain` program, Principal Investigators and collaborating researchers can easily share data sets. A user can have different permissions set for selected volume sets and files.

### *Oversubscription to /tmp*

An attractive feature offered by ARSC is a 21-day storage period for data on `/tmp`. Unfortunately, `/tmp` is often used for extended data storage. Some users also circumvent our 21-day policy by ‘touching’ files on `/tmp` to change the last access times. The ease of using `crlmain` to store and retrieve data from tapes should ease oversubscription to the `/tmp` drive by users.

### *Toolkit Interface*

X-terminals with graphical interfaces offer a lot of comfort, but many users access `denali` from personal computers and vt100 terminals, and are unable to use tools designed for X-terminals. `crlmain` is a command line interface program and does not require any special toolkit interface. This feature is particularly useful as `denali` is accessible from heterogeneous operating systems.

## Conclusion

CRL provides a reliable storage capability, however it needs to be more user-friendly. `crlmain` provides the friendly interface between the user and CRL. Hopefully it should ease some of the storage problems we experience at ARSC.

## Acknowledgments

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## References

- [1] *CRAY/REELibrarian (CRL) User's Guide.(SG-2126 2.0)*, Cray Research Incorporated, Minnesota, 1994
- [2] *CRAY/REELibrarian (CRL) Administrator's Guide (SG2127 2.0)*, Cray Research Incorporated, Minnesota, 1994.

## Appendix

```
denali$/crlmain
***   CRL archive/restore program   ***

Please select the appropriate utility number from the
following list:

1) complete backup of a directory
2) backup of SELECTED files/subdirectories
3) restore all files from a volume set on CRL
4) restore SELECTED files/subdirectories from a
   volume set on CRL
5) move your tapes from the silo to the tape library
6) delete a volume set on CRL
7) edit file/volume permissions
8) quit the utility

decision ==>
```

Figure 1: crlmain choices

You own the following volsets and files

```
You own the following volsets and files
File List Report: Sun Mar  3 13:44:26 1996 (RL3.10)

User Name= harikuma
Application=
Vname      File Name      SEQ SEC FSTAT  Expires
-----
C++forCUG  C++.TAR        1  1  4      S
C++forCUG  EOT            3  1  1
C++forCUG  SCRIPT.TAR     2  1  4      S
billing    EOT            2  1  1
billing    SCRIPT.TAR     1  1  4      S
scripts    EOT            3  1  1
scripts    NEWA.TAR       2  1  4      S
scripts    SCRIPT.TAR     1  1  4      S
timeset    EOT            2  1  1
timeset    TIMEME         1  1  4      S

Please specify the volume set name you wish to delete =
Are you sure (y/n) y=>

Volume set timeset has been scratched
```

Figure 2: Example of a delete (decision=6)

```
You are in
/u1/uaf/harikuma/CUG

Please specify the full path of the directory that has to be a
/u1/uaf/harikuma/TIME

Do you wish to append the files to an existing volset (y/n) =
you have the foll volsets and files
File List Report: Sun Mar  3 13:07:30 1996 (RL3.10)

User Name= harikuma
Application=

Vname      File Name      SEQ SEC FSTAT Expires
-----
C++forCUG  C++.TAR        1  1  4  S
C++forCUG  EOT            3  1  1
C++forCUG  SCRIPT.TAR     2  1  4  S
billing    EOT            2  1  1
billing    SCRIPT.TAR     1  1  4  S

Please specify a new volume set name of your choice ==>
The volume set name cannot start with a (.) character

Please specify a new volume set name of your choice ==>
timedirectory
The volume set name has to be 12 characters or less

Please specify a new volume set name of your choice ==>
C++forCUG
this volset already exists

Please specify a new volume set name of your choice ==>
timeset
Please specify a File Name (Fid) of your choice
==> time

You own the following volume sets and files/directories
File List Report: Sun Mar  3 13:10:31 1996 (RL3.10)

User Name= harikuma
Application=

Vname      File Name      SEQ SEC FSTAT Expires
-----
C++forCUG  C++.TAR        1  1  4      S
C++forCUG  EOT            3  1  1
C++forCUG  SCRIPT.TAR     2  1  4      S
billing    EOT            2  1  1
billing    SCRIPT.TAR     1  1  4      S
timeset    EOT            2  1  1
timeset    TIMEME         1  1  4      S
```

Figure 3: Example of an archive (decision=1)

```

you own the following volume sets

File List Report: Sun Mar 3 13:44:59 1996 (RL3.10)

User Name= harikuma
Application=

Vname      File Name  SEQ    SEC    FSTAT  Expires
-----
C++forCUG  C++.TAR   1      1      4      S
C++forCUG  EOT       3      1      1
C++forCUG  SCRIPT.TAR 2      1      4      S
billing    EOT       2      1      1
billing    SCRIPT.TAR 1      1      4      S
tests     EOT       2      1      1
tests     TESTS.TAR 1      1      4      S
scripts   EOT       3      1      1
scripts   NEWA.TAR  2      1      4      S
scripts   SCRIPT.TAR 1      1      4      S

Use octal notation please specify the permissions.
754 gives you read/write/exec access, the group read/exec access
only read access

Do you want to change volume set permissions (y/n) ==>

Please specify the volset name tests
volume set permission 700

Volume Information Report: Sun Mar 3 13:45:57 1996 (RL3.10)

vname: harikuma/tests:G0000:V00:N001

vid: 107104      type: CART          uname: harikuma
vsn: 107104      ctype:              gname: uaf
rack: 107104     length: 2000        vmode: 700
vsid: 107104     format: ANSI        passwd:
vno: 1           ftrack: yes         pool: root/available
valloc: yes      rformat: u:10240:10240 expire: l
cloc: silo       conv: data          vacc: ' ' (040)
sloc: silo       scratch: no         offset: 0
floc: expire     maint:              ucnt: 13
dispose:         status: LIB         ccnt: 13
init: yes        ftemp:             app:
ctime: Thu Feb 29 19:50:03 1996
mtime: Thu Feb 29 20:47:27 1996
atime: Thu Feb 29 20:47:10 1996
fingerprint: 'X   Uninspected'
vcom:
Do you want to change File permissions (y/n) ==>

```

Figure 4: Example of a file/volume permission change (decision=7)

```

You own the following volsets and files

File List Report: Sun Mar 3 13:11:04 1996 (RL3.10)

User Name= harikuma
Application=

Vname      File Name  SEQ    SEC    FSTAT  Expires
-----
C++forCUG  C++.TAR   1      1      4      S
C++forCUG  EOT       3      1      1
C++forCUG  SCRIPT.TAR 2      1      4      S
billing    EOT       2      1      1
billing    SCRIPT.TAR 1      1      4      S
scripts   EOT       3      1      1
scripts   NEWA.TAR  2      1      4      S
scripts   SCRIPT.TAR 1      1      4      S
timeset   EOT       2      1      1
timeset   TIME ME   1      1      4      S

Please specify the volume set name. If the volset does not
to you, please use the userid/volset name

volsetname == tests scripts
you are in /u1/uaf/harikuma

Do you wish to restore your files in this directory (y/n) ==>

For the volume set specified the associated File Names (Fid)

Volume Set File List: Sun Mar 3 13:42:09 1996 (RL3.10)

Fid          SC Blocks Fexpire  Expires  SQ FSTAT Fcor
---
SCRIPT.TAR  1 6      S          -99999 D 1 4
NEWA.TAR    1 1      S          -99999 D 2 4
End of Tape

Please specify one File Name (Fid) from the above NEWA ==>
Bad File Name: File Name specified does not match

Please specify one File Name (Fid) from the above NEWA SCRIPT

```

Figure 5: Example of a Selective restore (decision=4) (over)

WARNING: If you have passwords set on volumes, please make  
passwords of all volumes in the volset are the same. If you have  
password for the volset, please contact User Services

\*\*\*\*\* Passwords set \*\*\*\*\*

- 1) You have a volume set password
- 2) You have a volume & file passwd, but no volset passwd
- 3) You only have a volume passwd set, but no volset passwd
- 4) You only have a file passwd set, but no volset passwd
- 5) You have no passwds set
- 6) You want to quit

Please enter your answer **5**=>

scripts volume set contains the following files

Please wait for the file names, it may take a few moments

```
rw-----  903  108    217 Dec 18 15:53 1995 NEWA/res.sc
rw-----  903  108    223 Feb 20 13:04 1996 NEWA/res.sc
```

Please specify files you would like to retrieve from the list  
Use spaces to separate the file names

Files ==>**NEWA/res.script**

x NEWACCTS/res.script, 217 bytes, 1 tape blocks

**Figure 6: Example of Selective restore (decision=4) (contd)**