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MARC
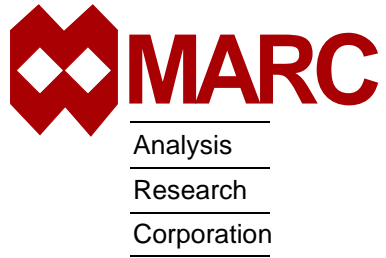
MARC® K7.3.2
Network Version for UNIX

Installation and User Notes

MARC® Installation and Usage on UNIX machines

This document describes the installation and usage of the MARC programs on UNIX platforms listed in Table 1. The instructions given here require a basic knowledge of the machine on which you are loading the MARC software, no attempt is made to teach the use of UNIX commands.

This document contains a quick installation section intended for experienced MARC users, a section containing details about the installation procedure, a section concerning the usage of the MARC programs and a section about making permanent changes to the MARC programs.

Appendices include a sample installation session and hints about troubleshooting.

If you encounter a problem during the installation, please contact the customer support staff at the nearest MARC office listed below.

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Table 1 Versions of MARC Running Under UNIX

Computer	Operating System Revision	CD-ROM mount command (assumes a directory /cdrom exists)
Digital Equipment Alpha	OSF 4.0 or later	mount -tcdfs /dev/rz**u****A** /cdrom **u** = CD-ROM unit number, **A** = a or c
HP 9000-700, 800	HP-UX 10.2 or later	mount -F cdfs /dev/dsk/c0t**n**d0 /cdrom **n** = SCSI controller number for CD-ROM
IBM RS6000	AIX 3.2.5 or later	mount -rv cdrfs /dev/cd0 /cdrom
Silicon Graphics MIPS 5000	IRIX 6.3 or later (32 bit version)	mount -rt iso9660 /dev/scsi/sc**n**d**u**l0 /cdrom **n** = SCSI controller number, **u** = CD-ROM unit #
Silicon Graphics MIPS 8000	IRIX 6.2 or later (64 bit version)	mount -rt iso9660 /dev/scsi/sc**n**d**u**l0 /cdrom **n** = SCSI controller number, **u** = CD-ROM unit # The CD-ROM will usually automount to /cdrom or /CDROM
SUN SparcStations	Solaris 2.4 or later	mount -F hsfs /dev/dsk/c0t**n**d**u**s0 /cdrom **n** = SCSI controller number, **u** = CD-ROM unit #
SUN SparcStation	Solaris 2.5 or later	Uses automounting to /cdrom

Table of Contents

Introduction

The current document is divided into four parts:

Part I   provides the general description about the hardware requirements, required UNIX comands, notes on compatibility of machines and types of installation.

Part II   provides a step-by-step approach to installation in a shared directory.

Part III   provides a flavor of the distributed run over networked workstations.

Part IV   provides miscellaneous information about execution with distributed I/O and use of user subroutines.

The list of supported capabilities in parallel can be found in Section VI of the Release Notes while additional notes on memory management and types of solvers for multi-processor jobs can be found in Section III, Items 4 and 5.

Part I General Information

The MARC K7.3.2 network version for UNIX uses MPICH Version 1.1.2 Argonne National Laboratory for MPI.

Hardware Requirements:

Although no specific hardware requirements exist for MARC to run in network mode, it is preferable to have fast network connections between the machines.

It is recommended that the network should have a speed of at least 100 MBit per second. If only two machines are to be used, a hub or a cross-over cable can be used to connect them. If more than two machines are to be used, a switch is preferable.

Only machines running nearly identical operating systems and communicating via TCP/IP is supported at this time. For heterogeneous networks, see Part IV.

Compatibility:

It is strongly advised that the machines on which MARC is to be executed are compatible or homogeneous. Examples of compatible machines are (but not limited to the ones below):

1. SGI, SUN, IBM, HP and DEC with exactly the same processor type and O/S

2. One SGI R8000/Irix 6.2 and one SGI R10000/Irix 6.5 machine

3. One SUN Ultra/Solaris 2.5 and one SUN Ultra/Solaris 2.6

4. One HP J Class/HPUX-10.20 and one HP C Class/HPUX-10.20

Installation:

For compatible machines, MARC should be installed in a local or remotely shared directory via NFS or similar mechanism (see Figure 1) on one machine only.

For incompatible or heterogeneous machines, MARC must be installed in local directories on each machine. These directories must have the same path names. A symbolic link can be made if necessary (see Figure 2).

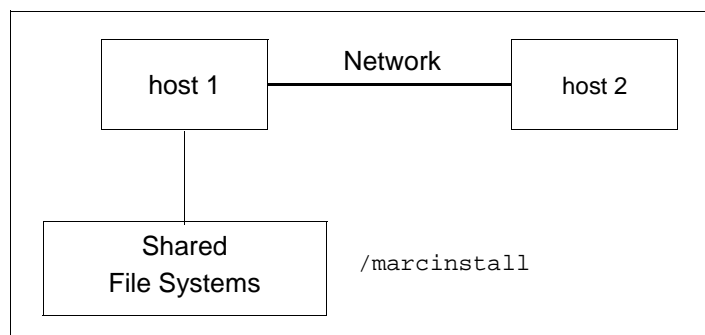The rest of the document focuses on the shared installation of MARC K7.3.2 on a network of compatible machines.
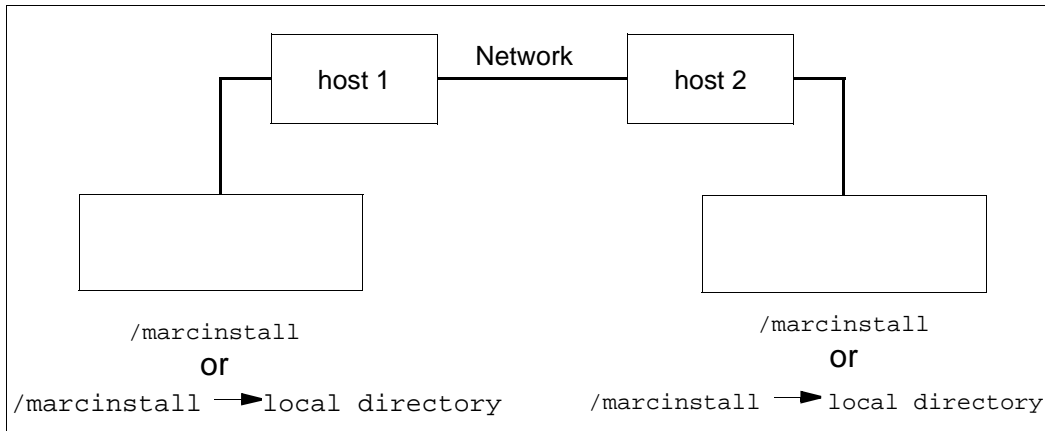

Figure 1   Shared Installation

Figure 2   Local Installation

New MARC Command Line Options for Parallel Runs

A. `-host  hostfile`

Specify the name of the host file (default is execution on one machine only). This option is necessary if a network execution is desired

B. `-dist  yes|no` *(Optional)*

(`yes` : when I/O is distributed. The script checks for this option if it is not explicitly specified)

C. `-comp  yes|no` *(Optional)*

(`yes` : machines are compatible. The script checks for this option if it is not explicitly specified)

Required UNIX Commands:

The following UNIX commands must exist on host1 (see Figure 1):

```
rsh (remsh on HP), rcp, hostname, uname -s, awk (nawk on Sun),
/bin/ksh, grep, /bin/sort, /bin/uniq
```

Part II Installation Notes for Shared Installation

MARC K7.3.2 UNIX Network Version

MPI Version: MPICH Version 1.1.2 Argonne National Laboratory
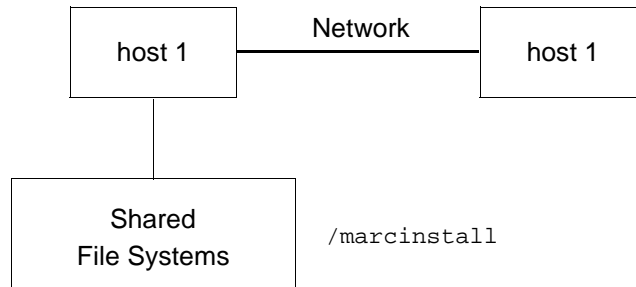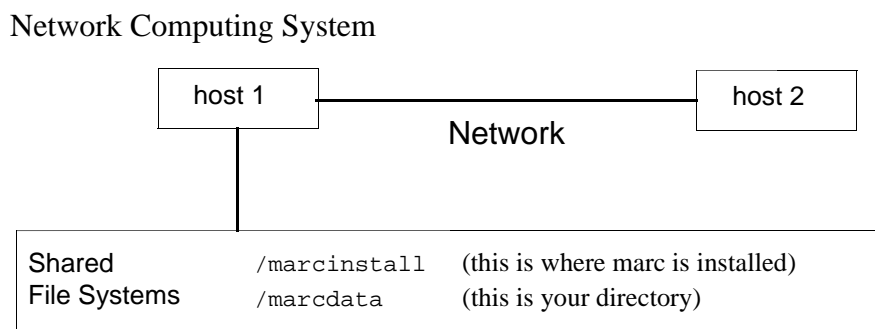

Figure 3   Shared Installation

Step 1   Assume that host1 and host2 are the host names of two machines on which MARC K7.3.2 is to be run in network, parallel mode. Check that the second machine exists (and responds) by typing:

```
ping host2
```

Interrupt the command and look for "0% packet loss". If this fails (>0% packet loss), contact your system administrator.

Step 2   Create or locate on host1 a directory which is shared between host1 and host2 via NFS or via a similar mechanism. Assume that this directory is named `/marcinstall`(see Figure 3). To test that `/marcinstall` can be written to from both host1 and host2, type from host1:

```
touch /marcinstall/test1 ; ls -l /marcinstall/test1
rsh host2 touch /marcinstall/test2 ; ls -l /marcinstall/test2
```

If successful, the above two steps should create two empty files called `test1` and `test2` in `/marcinstall`. If these two files do not exist, contact your system administrator, since either `/marcinstall` is not accessible from host1 and host2, or current permissions do not allow you to write from host2 to `/marcinstall`, or current permissions do not allow you to connect with host2.

Step 3   Install MARC from the CD into `/marcinstall` following the steps as prompted. When complete, check that the machines can exchange messages by typing from host1:

```
cd /marcinstall/mpich/examples
```

Edit the file called `hostfile`, and replace `thishost` with the host name of the current host, `host1`, `otherhost` with the host name of the other machine, `host2`, and `/marcinstall` with the actual path.

Now type:

```
./testmpi
```

This will start a program which should run on host1 and host2 in parallel to calculate and print the value of pi.

Step 4   Test the MARC installation for single processor execution by typing from host1:

```
cd /marcinstall/test_ddm/exmpl2/exmpl2_1
marck73 -j cyl2 -b no -v no
```

and MARC should exit in about three minutes if it is a successful run.

Step 5   Test the MARC installation for multi-processor execution by typing from host1:

```
cd /marcinstall/test_ddm/exmpl2/exmpl2_2
```

and edit the file `hostfile` in this directory by replacing `thishost` with `host1` and `otherhost` with `host2`. Finally, type:

```
marck73 -j cyl2 -b no -v no -nprocd 2 -host hostfile
```

and MARC should exit in about two minutes if it is a successful, parallel run on host1 and host2 using one processor on each.

Part III User Notes for Shared I/O

MARC K7.3.2 UNIX Network Version

MPI Version: MPICH Version 1.1.2 Argonne National Laboratory

Network Computing System

Figure 4   Shared Installation, Shared I/O

Step 1 Assume that host1 and host2 are the `hostnames` of two machines on which MARC K7.3.2 is to be run in network, parallel mode. Check that the host2 is seen by typing from host1:

```
ping host2
```

Interrupt the command and look for "0% packet loss". If this fails (>0% packet loss), contact your system administrator.

Step 2 Create or locate on host1 a directory which is to be used for the MARC user data and which is shared between host1 and host2 via NFS or via a similar mechanism. Assume that this directory is named `/marcdata` (see Figure 4). To test that `/marcdata` can be written to from both host1 and host2, type from host1:

```
touch /marcdata/test1 ; ls -l /marcdata/test1
rsh (or remsh) host2 'touch /marcdata/test2' ; ls -l /marcdata/test2
```

If successful, the above two steps should create two empty files called `test1` and `test2` in `/marcdata`. If these two files do not exist, contact your system administrator, since either `/marcdata` is not accessible from host1 and host2, or current permissions do not allow you to write from host2 to `/marcdata`, or current permissions do not allow you to connect with host2.

Step 3 Create a host file specifying the machines to use and the number of processors to use on each. A typical host file should look as follows:

```
host1 2
host2 2
#this is a comment
hostn m
```

where `hostn` is a typical host name on which m processors are to be used. MARC will create parallel processes such that processes 1 and 2 will run on host1, processes 3 and 4 on host2, etc. The name of the host from which the job is started must occur first; each host name must occur only once; the host name should have the same format as was used in the ping command of step 1; all lines starting with a # sign or with a control character are ignored; finally, all blank lines are ignored.

Step 4   Use Mentat to build your test model. As an example, use the Mentat procedure file, `example.proc`, in the `marck73/notes` subdirectory. Enter Mentat and execute the procedure file to build your model as shown in the next step. Select and confirm your three domains as shown below on the following page.
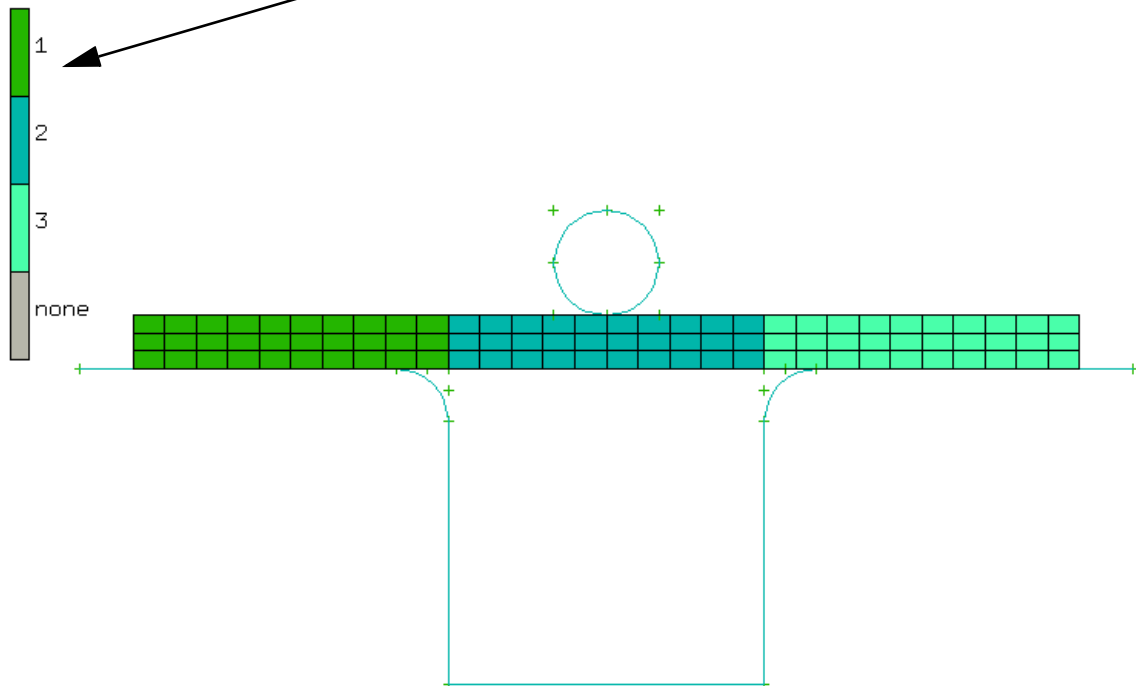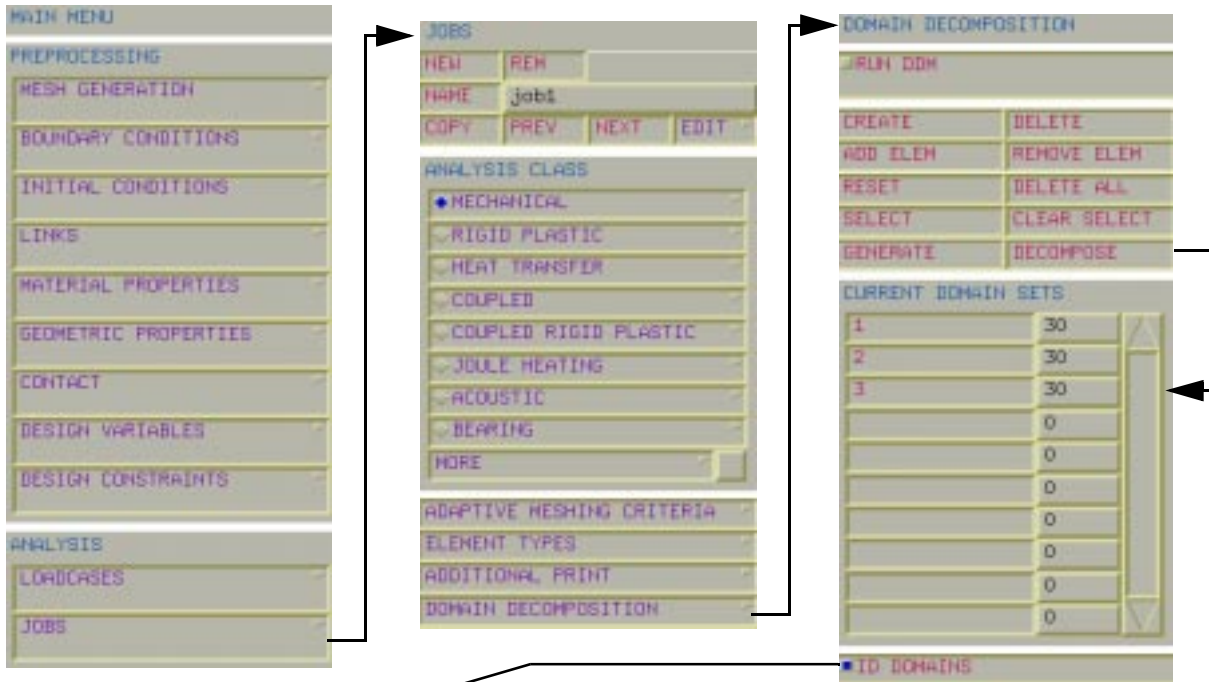
Step 5   Write The MARC Input

Select RUN DDM

Step 6   Adjust `hostfile` and run MARC. The `hostfile` places two domains on host1 and one domain on host2 with the contents:

```
host1 2
host2 1
```

Run MARC from host1 with the command:

```
/marcinstall/tools/run_marc -j model1_job1 -nprocd 3 -host hostfile -v n -b n
```

Sample output from MARC

```
MARC K7.3.2 sgi_r8000 version
-----------------------------
Program name         : marck73
Job ID               : model1_job1
User subroutine name :
Restart file job ID  :
Substructure file ID :
Post file job ID     :
Defaults file ID     :
View Factor ID       :
Save generated module: no
Number of tasks      : 3
Number of threads    : 3
Host file name       : hostfile
Message passing type : 0
Run job in queue     : foreground

checking if local or shared directories for host
 host2
 shared

checking if machines are compatible for host
 host2
yes


Wed Apr 17 10:44:03 PST 1999
 marc job /mounts/host2/marcdata/1model1_job1 begins execution
     (c) COPYRIGHT 1999 MARC ANALYSIS RESEARCH CORPORATION,
     all rights reserved

 memory in main program initially set to =   5000000

 number of processors set to   =    3

 VERSION April 12, 1999
                        marc execution begins

                        e n d   o f   i n c r e m e n t        0

                           Lines Omitted

                        e n d   o f   i n c r e m e n t       50

                        marc exit number      3004
```

Step 7   Check your results

Open Default

Skip to Inc 50

Def Only

Contour Bands

Select "Total Equivalent Plastic Strain"
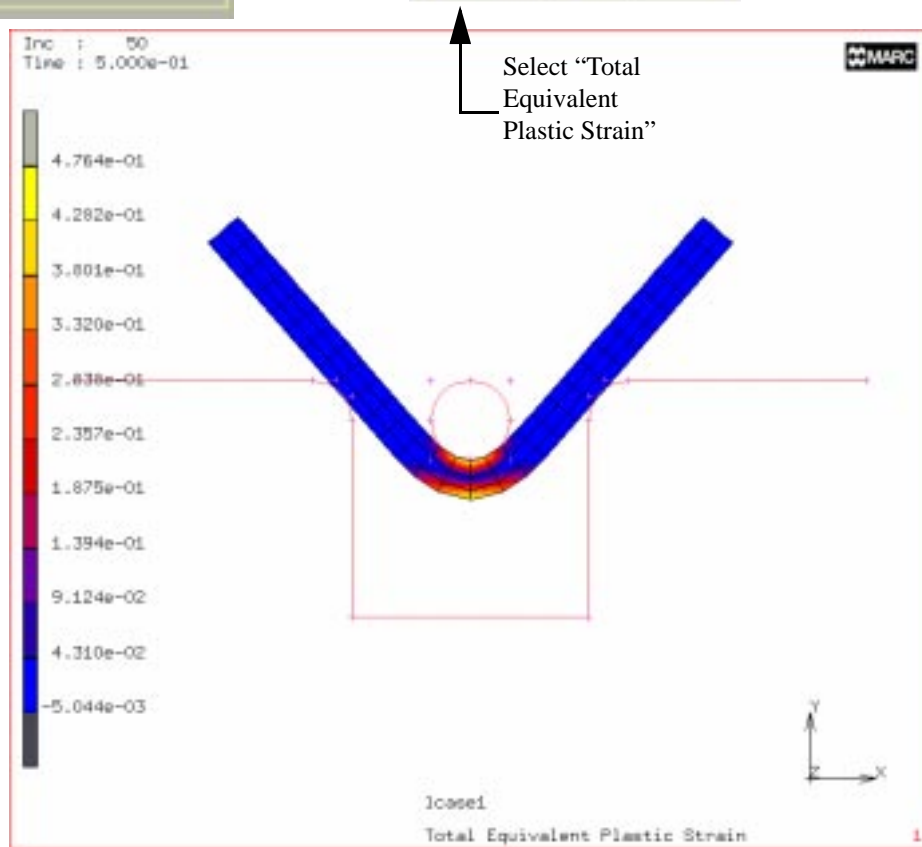
MARC created a post file associated with each domain as well as a root post file associated with the job id. For the previous model, `1model1_job1.t19`, `2model1_job1.t19`, and `3model1_job1.t19` are the processor files, while `model1_job1.t19` is the root file.

If the model is very large, it can be convenient to view only a portion of the model by selecting any one of the processor post files, such as `3model1_job1.t19`. This file contains only data associated with domain 3 as selected in the domain decomposition menu under step 4. As described in step 3, this file was created by host2.

Part IV User Notes for Distributed I/O and User Subroutines

MARC K7.3.2 UNIX Network Version

MPI Version: MPICH Version 1.1.2 Argonne National Laboratory
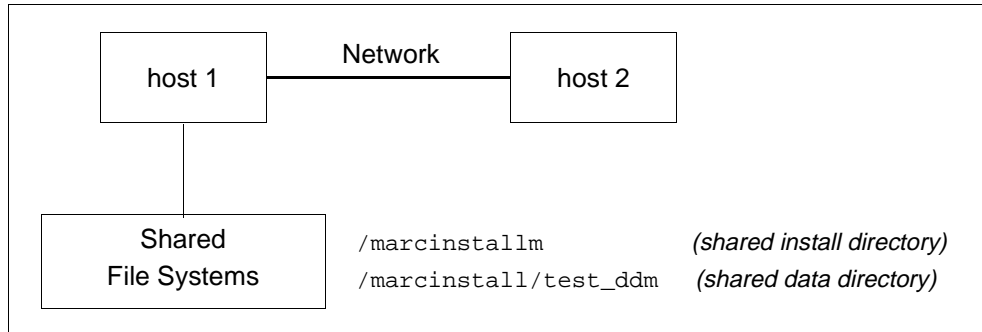

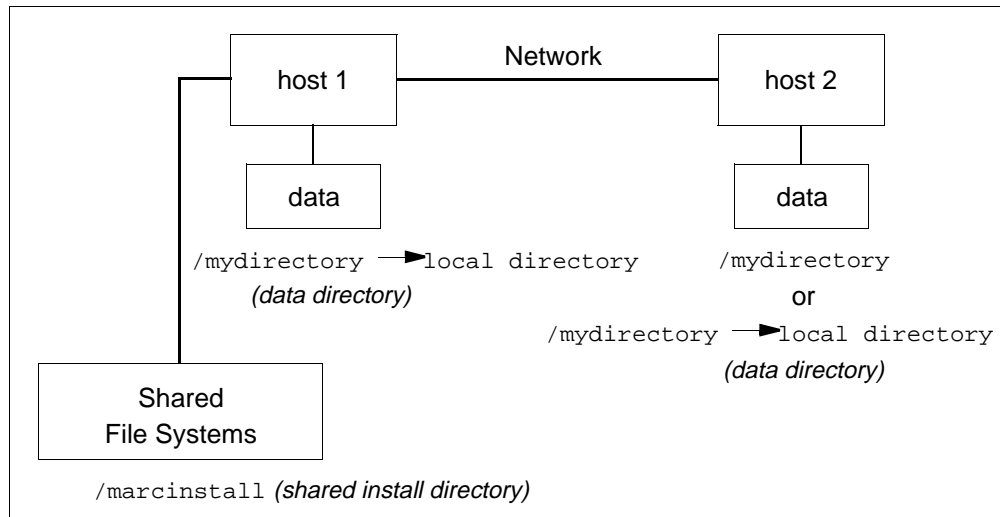Figure 5   Shared Installation, Shared I/O

Figure 6   Shared Installation, Network I/O

Information for Jobs with User Subroutine on compatible machines

A. Shared Data directory (see Figure 5):

Preferred case. The user subroutine is compiled on the host machine (where the job is started) only.

B. Local Data directories (see Figure 6):

The user subroutine is compiled on the host machine and the new executable is copied (using rcp) to the local disks of the other machines.

Heterogeneous machines:

MARC K7.3.2 version only supports connection of homogeneous networks; i.e., machines of the same type. The communication software we use, MPICH, allows heterogeneous networks to be used. You could connect for instance two HPs and three IBMs to run a job. While this option has been tested, you are urged to exercise caution when using this feature since it is beyond the original intent of this release. Obviously, the install directory must be local to different machines in this case. For the network execution, network I/O on heterogeneous machines, type:

```
marck73  -v no -b no -j test -host hostfile -nprocd 2
          -dist yes -comp no
```

Restrictions:

1. Hardware vendor provided solver must NOT be used when using different machines on the network.

2. Please note that DEC machines currently cannot be connected to the other UNIX machines at this time.

Information for Jobs with User Subroutine on Heterogeneous machines:

A. Shared Data directory (see Figure 5):

The user subroutine is compiled on each machine in the host file and each executable is given a unique name.

B. Local Data directories (see Figure 6):

The user subroutine file is first copied over to the local disks from the host. It is then compiled on each machine in the host file. Thus, the new executables are on the local disks.