LINUX Install Fest, July 2000

Preparing for Installing LINUX® for S/390® - July 25, 2000

LINUX Install Fest, July 2000

Preparing for Installing LINUX® for S/390® - July 25, 2000

Install Fest Edition (July 2000)

This edition applies to the LINUX for S/390 kernel 2.2 patch and to all subsequent releases and modifications until otherwise indicated in new editions.

Contents

About this document

This document is provided for use in the LINUX Install Fest, starting July 15 2000. Instructions in this document work only with the SuSE LINUX for S/390 distribution. Ensure that you have the correct version of this document corresponding to the distribution you are using.

This document contains primarily hardware and software requirements, and describes steps you need to take be fore the Install Fest. For the actual installation steps, see *Installing LINUX for S/390*, which can also be downloaded from the Install Fest website.

If you have questions about any of the material covered in this document, contact the LINUX for S/390 team at: **contact_linux390@de.ibm.com**

How to obtain the most recent version

As needed, this document will be updated with new and changed information. The latest document will be made available on the Install Fest website, **http://www.s390.ibm.com/linux/installfest/**. Check the website regularly to ensure that you have the newest documentation.

Who should read this document?

This document is provided as a help for customers participating in the Install Fest of LINUX for S/390, starting July 15, 2000. This document can be used by system programmers, security administrators, and others involved in setting up the hardware and software in preparation for LINUX.

Assumptions

The following general assumptions are made about your background knowledge:

- You have an understanding of LINUX and S/390 terminology.
- You have an understanding of basic computer architecture, operating systems, and programs.

Installation process overview

This section gives a quick overview of the installation methods you can use and the installation process. More details can be found in the *Installing LINUX for S/390*.

Installation methods

You can install in three different ways:

- Install in an LPAR
- Install natively
- Install as a guest under VM/ESA

Installation mediums

You can use one of the following installation media:

- Tape (created under OS/390, VM/ESA or VSE/ESA)
- VM reader (files are obtained through the network)
- CD-ROM (emulated tape on Multiprise 3000)

Differences between installation methods

IPL from tape is identical for all platforms. The only difference is the console:

- Under VM/ESA: 3270 screen
- All other methods: Hardware console (directly or via HMC)

Installation process

If installing from tape	**If installing from VM reader**
Prepare the IPL tape	Get the installation files into the VM reader
IPL from tape to load mini-system into RAM	IPL from VM reader to load mini-system into RAM
Start the SuSE installation program YaST	Start the SuSE installation program YaST
YaST will install LINUX on DASD	YaST will install LINUX on DASD
IPL from DASD	IPL from DASD

What to read in this document

If you are building the IPL tape on ...	Then read this
OS/390	“7 IPL tape production with OS/390” on page 21
VM/ESA	“8 IPL tape production with VM/ESA” on page 25
VSE/ESA	“9 IPL tape production with VSE/ESA” on page 31
If you are using the VM reader	“10 Using the VM reader” on page 37

If you are installing on...	Then read this
G5 or G6	
as a VM/ESA guest	• “VM guest checklist” on page 3 • “3 Installation worksheet for VM/ESA” on page 7 • “4 Hardware and software requirements” on page 9 • “12 Preparing a VM/ESA guest” on page 45 • “13 Before the Install Fest” on page 49
on an LPAR or natively	• “LPAR or native checklist” on page 3 • “2 Installation worksheet for LPAR or native” on page 5 • “4 Hardware and software requirements” on page 9 • “11 Preparing the LPAR or native install” on page 43 • “13 Before the Install Fest” on page 49
Multiprise 3000	
as a VM/ESA guest	• “VM guest checklist” on page 3 • “3 Installation worksheet for VM/ESA” on page 7 • “4 Hardware and software requirements” on page 9 • “12 Preparing a VM/ESA guest” on page 45 • “13 Before the Install Fest” on page 49
on an LPAR or natively	• “LPAR or native checklist” on page 3 • “2 Installation worksheet for LPAR or native” on page 5 • “4 Hardware and software requirements” on page 9 • “Preparing a Multiprise 3000 LPAR” on page 54 • “13 Before the Install Fest” on page 49
G3, G4, or Multiprise 2000	
as a VM/ESA guest	• “VM guest checklist” on page 3 • “3 Installation worksheet for VM/ESA” on page 7 • “4 Hardware and software requirements” on page 9 • “12 Preparing a VM/ESA guest” on page 45 • “13 Before the Install Fest” on page 49 • “Appendix C. Restrictions when installing on G3, G4, or Multiprise 2000” on page 63

If you are installing on...	Then read this
on an LPAR or natively	• "LPAR or native checklist" on page 3 • "2 Installation worksheet for LPAR or native" on page 5 • "4 Hardware and software requirements" on page 9 • "11 Preparing the LPAR or native install" on page 43 • "13 Before the Install Fest" on page 49 • "Appendix C. Restrictions when installing on G3, G4, or Multiprise 2000" on page 63

Part 1. System requirements

This part discusses what the hardware and software requirements are for LINUX for S/390. You should ensure that your target LINUX system fulfills these requirements.

1 Requirements checklist

When you install LINUX for S/390, the installation process will ask you for data about your system. As you set your system up, we recommend that you fill in the installation worksheets, either for VM/ESA® (see “3 Installation worksheet for VM/ESA” on page 7), or for LPAR or native installation (see “2 Installation worksheet for LPAR or native” on page 5).

As a quick check that your system fulfills the requirements, you might want to use the requirements checklists below.

VM guest checklist

Ensure that your system fulfills the requirements as given in “4 Hardware and software requirements” on page 9, and that you have:

__ 1. The user ID and password of the VM guest
__ 2. Access to a tape device, and you have its device number
__ 3. A network connection, its device number, and port number if applicable
__ 4. The disk volumes and their device numbers

Also ensure that:

__ 1. You have access to a (real or emulated) 3270 terminal to use as the virtual machine console of the LINUX for S/390guest
__ 2. You have an IP address for LINUX for S/390
__ 3. You know the disk with end-user programs like FTP
__ 4. If you use a router, the IP address of the router, gateway information and other network information.
__ 5. You have installed the required APARs and fixes as given in “Required APARs and fixes” on page 10.
__ 6. You have created an IPL tape, or, if installing from the VM reader, you have transferred files to the reader. (See “13 Before the Install Fest” on page 49

LPAR or native checklist

Ensure that your system fulfills the requirements as given in “4 Hardware and software requirements” on page 9, and that you have:

__ 1. The LPAR where you want to install LINUX for S/390
__ 2. Access to a tape device, and you have its device number. (Not needed on a Multiprise 3000)
__ 3. A network connection, its device number, and port number if applicable
__ 4. The disk volumes and their device numbers

Also ensure that:

__ 1. You have access to the console integrated with the service element (SE) or hardware management console (HMC)
__ 2. You have an IP address for LINUX for S/390
__ 3. If you use a gateway, ensure that you have the IP address of the gateway and other network information
__ 4. You have installed the required microcode fixes as given in “Required APARs and fixes” on page 10.
__ 5. You have created an IPL tape. (Not needed on a Multiprise 3000.)

2 Installation worksheet for LPAR or native

Use this worksheet as you go through the preparation steps and can note information about your system that you will need during LINUX for S/390 installation.

Devices	**Device address**
The following data can be found in your IOCDS:	
First DASD volume (root file system)	
Second DASD volume (swap space)	
Tape unit	
I/O device number for the network connection (including port number)	

Ask your network administrator for the network parameters of your LINUX for S/390 system:

Network data	**Value**
Host name	
IP address	
Net mask	
Broadcast address	
Gateway address	
IP address of the DNS	
DNS search domain	

You will need to know the following things about your NFS or FTP server:

NFS or FTP server data	**Value**
IP address or hostname	
Path to CD-ROM data	

LINUX data	**Value**
Root password	

3 Installation worksheet for VM/ESA

Use this worksheet as you go through the preparation steps for an installation in a VM/ESA environment. You can note information that you will need during LINUX for S/390 installation.

VM data	**Value**
VM guest user ID	
VM guest password	
Disk with FTP program	
Devices[1]	**Device address**
First DASD volume (root file system)	
Second DASD volume (swap space)	
Tape unit (not needed when installing from VM reader)	
Device for network connection (including port number)	

[1]The device data can be found in the VM guest user directory (see “Step 1. Setting up the user directory” on page 45).

Ask your network administrator for the network parameters of the VM/ESA guest where you will install LINUX for S/390:

Network data	**Value**
Host name	
IP address	
Net mask	
Broadcast address	
Gateway address	
IP address of the DNS	
DNS search domain	

You will need to know the following things about your NFS or FTP server:

NFS or FTP server data	**Value**
IP address or hostname	
Path to CD-ROM data	

LINUX data	Value
Root password	

4 Hardware and software requirements

S/390 hardware for LINUX for S/390

S/390 hardware platforms suitable for SuSE LINUX for S/390 include:

- S/390 Parallel Enterprise Server™ Generation 5 and higher
- S/390 Multiprise® 3000

The following platforms support running LINUX for S/390, but there are technical restrictions you need to be aware of:

- S/390 Parallel Enterprise Server Generation 3 and 4
- S/390 Multiprise 2000

For the restrictions, see “Appendix C. Restrictions when installing on G3, G4, or Multiprise 2000” on page 63.

You can install SuSE LINUX for S/390 natively, in a logical partition (LPAR), or as a VM guest.

Required hardware features

Feature	Comment
Memory	128 MB or more. The processor must be of the CMOS generation and be at least G3.
DASD volumes	Installing natively or in LPAR: Two dedicated 3390 model 3 or better. (To share disks between Linux and another LPAR running, for example, OS/390, is not recommended.) **Note: Real 3390 disks attached to real 3990 controllers are not supported.** Installing as a VM guest: • For the root file system: One 3390 model 3 • For the swap space: 200 cylinders or more. • If IPLing from the VM reader: A minidisk with 60 cylinders or more.
Console	Installing natively or in LPAR: Use the console that is integrated with the HMC or the SE. Installing as a VM guest: Use the virtual machine console of the LINUX for S/390 guest, that is the (real or emulated) 3270 terminal through which you log on to VM. The intended use of the console is solely to launch LINUX. When LINUX is running, you should use a Telnet connection directly to LINUX for S/390 to log in to LINUX and access the shell and other applications such as `vi` or the SuSE installation program YaST.
Tape unit	Installing natively or in LPAR: Temporary access to a tape unit. On a Multiprise 3000, you need access to the emulated tape. Installing as a VM guest: Not required if you want to install using the VM reader.
Network connection	See “Requirements for the network connections” on page 11

Required software

Software	Comment
S/390 operating system	Installing natively or in LPAR: You will need an S/390 operating system to create a tape. You can use one of: • OS/390® • VM/ESA • VSE/ESA™
Software utilities	A utility for copying the installation files onto a tape, for example, DITTO, or IEBGENER Installing from VM reader: You only need VM/ESA.
Network connections	See “Requirements for the network connections” on page 11.

Required APARs and fixes

System	APAR or fix number
VM/ESA	• VM61762 is required if the version of VM is V2R3.0. • VM62337 is required when using IEEE FPU under VM. • VM62410 is required when using IEEE FPU under VM. • VM62520 is required to run LINUX guests with more than one virtual CPU. • VM62573 is required to avoid FRE001 abend when telnetting into VM in line mode. • PQ34318 is required when using TCP/IP under VM. VM62337 and VM62410 are required only to run on G5, G6, or Multiprise 3000 processors.
Multiprise 3000	Microcode fix EC F34643 MCL048.
All systems	OSA Express Fast Ethernet card LIC code level 324

Requirements for the network connections

Hardware	Comment
Console	Installing natively or in LPAR: Use the console that is integrated with the HMC or the SE. Installing as a VM guest: Use the virtual machine console of the LINUX for S/390 guest, that is the (real or emulated) 3270 terminal through which you log on to VM. The intended use of the console is solely to launch LINUX. When LINUX is running, you should use a Telnet connection directly to LINUX for S/390 to log in to LINUX and access the shell and other applications such as `vi` or the SuSE installation program YaST.
NFS or FTP server	Workstation with CD-ROM drive that serves as an NFS or FTP server. (See also Figure 1 on page 12.) An NFS server is recommended. See the section ″No NFS server available?″ in *Installing LINUX for S/390* for advice on obtaining one.
Network connection	A TCP/IP network connection is required in order to get files from the FTP or NFS server, and to telnet in to the LINUX system. (See Figure 1 on page 12). The connection can be one of the following: • OSA (OSA-2, OSA Express) • CTC (virtual or real) • ESCON® channels • Multiprise 3000: PCI adapter (see example in “Preparing the IOCDS” on page 53) CTC and ESCON need additional routing support to your local network. All network connections require the correct setup on both LINUX for S/390 and the remote system.
Workstation	You need a client for the telnet session. This can be any workstation in your network.

Software	Comment
FTP or NFS server	You will need to set up an FTP or NFS server on the workstation where you have the CD-ROMs. Note that an FTP or NFS server is not included in Windows NT® or Windows 95 or 98. (See also Figure 1 on page 12 and the section ″No NFS server available?″ in *Installing LINUX for S/390*.)
Telnet client	You need telnet in full screen mode (a line mode terminal such as 3270 does not work). For example, you can use PuTTY.exe, a freeware tool that can be found on the Internet, for example on: http://www.chiark.greenend.org.uk/~sgtatham/putty.html

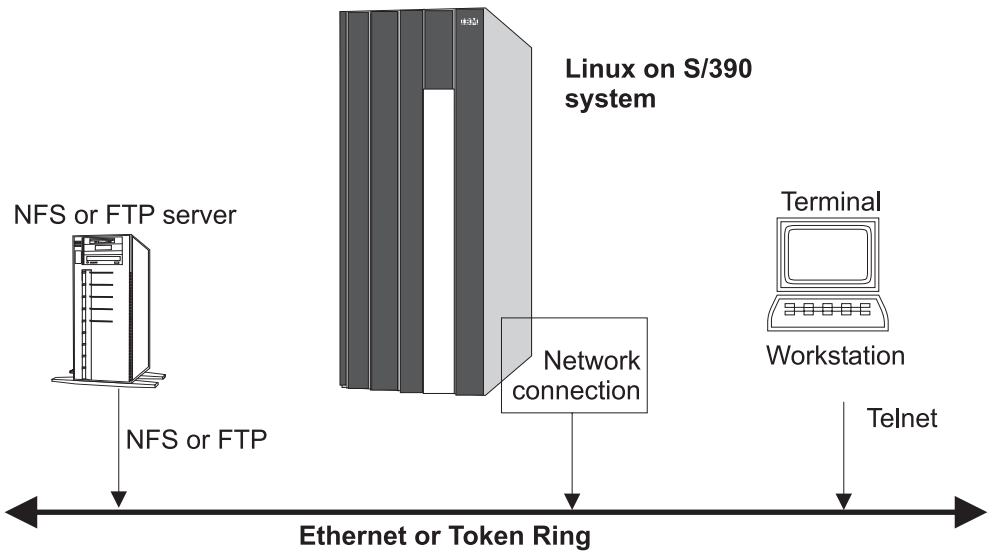

Figure 1. Network communication needed for installing LINUX for S/390

Required authorizations

What to authorize	Authorization
VM user ID	If installing from tape: • Write access to tape
On LPAR or native	• Write access to tape • Write access to IOCDS, or access to person that can change it for you • Right to issue LOAD command on SE or HMC
On LINUX system	Root privileges. You automatically receive root privileges when you install LINUX for S/390.
On NFS server	Right to export a file system read only.

Part 2. Preparing the IPL medium

Overview

You need to prepare the medium you want to IPL LINUX from. This part describes how to prepare a tape and how to use the VM reader as the IPL medium.

To create the tape you need to:

1. Set up an NFS or FTP server that contains the files on the SuSE CD-ROM.
2. Transfer the following files from the SuSE CDROM:
   - The kernel image
   - The default parameter line file
   - The image of the root file system (initial RAMdisk)
3. Build an IPL-able tape that contains these files.

You can create the tape using one of the following operating systems:

- OS/390
- VM/ESA
- VSE/ESA

This part describes how to build an IPL tape with each of the possible operating systems. Pick the one you want to use and follow the instructions.

Note: You need to build the tape before preparing the target LINUX system if you will build it using the system that will become the LINUX system. This can be the case, for example, when installing natively, or on VM/ESA.

To prepare the VM reader:

1. Prepare the minidisks
2. Transfer the files from the SuSE CD-ROM to the VM reader

5 Finding out about your configuration

You need to have some information about your network ready when you install LINUX for S/390.

Step 1. TCP/IP configuration

Make sure that you know the network parameters of your LINUX for S/390 system. These are:

- Host name
- IP-address
- Net mask
- Broadcast address
- Gateway address
- IP-address of the DNS server
- DNS search domain.

Ask your network administrator for this information and fill in the network part of the installation worksheet (see “3 Installation worksheet for VM/ESA” on page 7 and “2 Installation worksheet for LPAR or native” on page 5).

Step 2. Device addresses

Device addresses can be found in the IOCDS or the VM guest directory entry. Ask your system administrator to fill in the device addresses part of the installation worksheet.

6 Setting up the NFS or FTP server

Recommendation: Use a UNIX NFS server.

If none available see the section ″No NFS server available?″ in *Installing LINUX for S/390*.

You need access to the CD-ROM through FTP or NFS. Therefore you need to install and setup an FTP or NFS server on the workstation where the CD-ROM drive is located. You can use any FTP or NFS server program available.

You can also use SuSE LINUX for workstations to set up an FTP or NFS server. The following example describes the SuSE setup:

1. Use the SuSE LINUX CD containing the distribution for workstations.
2. Follow the instructions in the *SuSE LINUX 6.4 Quick Install Manual* to install SuSE LINUX on a workstation connected to the network.
3. To connect to the network, see *SuSE LINUX 6.4 Installation, Configuration, First Steps*, Chapter 3: System administration, and Chapter 5: Networking.

   An example FTP environment is delivered with SuSE 6.4 as package `ftpdir`. After installation, it resides in /usr/local/ftp.

   An NFS server is contained in package `nfsserv`.

Another possibility is to use software from the Internet. Here are examples of locations where you can find FTP servers for Windows, to use at your own risk:

- Freeware: http://download.cnet.com
- Freeware and shareware: http://www.tucows.com/perl/tucowsSearch
- Shareware and commercial: http://winfiles.cnet.com/

Verifying the NFS connection

Mount the exported directory to your local system and copy a file.

Verifying the FTP connection

To verify that the FTP server is running and is accessible to you, try downloading a file from the SuSE LINUX for S/390 CD to your system.

For example:

1. `FTP` *`ftpserver`*

   You will be prompted for your user ID and password.
2. If the SuSE CD is located under /suse/ and the files you need under /images/:

   ```
   cd /suse/images/
   ```
3. Get, for example, the parmline file:

   ```
   get parmline
   ```

That should get you a copy of the parmline file on your system.

Note: There are known problems with FTP servers. These are detailed under ″Known Problems″ in the LINUX for S/390 Installation Manual.

7 IPL tape production with OS/390

This chapter describes how to build an IPL-able tape using the OS/390 operating system. Once a tape has been built, it can be used to install LINUX for S/390 on the native hardware or LPAR. It can also be used for installation as a guest under VM.

Creating the tape - overview

You need to create the tape to IPL from. To create the tape you need to:

1. Transfer the following files from the SuSE CDROM
   - The kernel image
   - The default parameter line file
   - The image of the root file system (initial RAMdisk)
2. Build an IPL-able tape that contains these files.

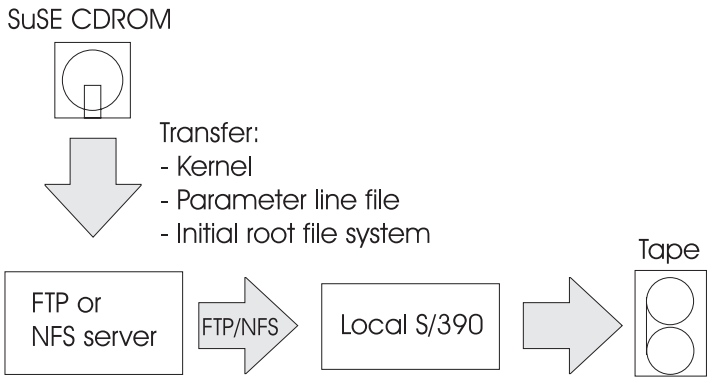

Figure 2. Creating the IPL tape

Before you begin

Before you begin creating a tape:

- You need to have set up a connection to the FTP or NFS server where the CDROM is connected.
- You should already have a user ID on OS/390. Make sure you have access to a tape unit that is compatible with the tape unit you will use to IPL from at a later stage. Make sure you know the device number of that tape unit.
- Make sure that you know the network parameters of your LINUX for S/390 system. This information should have been noted on the worksheets in “2 Installation worksheet for LPAR or native” on page 5. The required parameters are:
  - Network adaptor device number
  - Host name
  - IP-address
  - Net mask
  - Network-address
  - Broadcast-address
  - Default gateway address

– IP-address of the DNS server
– DNS search domain.

Step 1. Locating the LINUX for S/390 files

You need to locate the following files on the SuSE CDROM, and transfer them to a local workstation (UNIX or Windows NT):

- Kernel image file `/suse/images/tapeipl.ikr`
- Parameter line file `/suse/images/parmline`
- Initial root file system `/suse/images/initrd`

  Note that the initial RAMdisk file (`/suse/images/initrd`) is a compressed file that the kernel will uncompress during IPL.

Getting the image of the kernel

For building the tape, you should use the tape IPL kernel that is supplied on the SuSE CDROM. There are two kernel images:

- `/suse/images/tapeipl.ikr` used for tape IPL
- `/suse/images/vmrdr.ikr` used for VM reader IPL

You should rename the kernel image to **`linux390.image.txt`**

The supplied kernel might not be ideal for your environment, so later on you might have to build a kernel that is better suited to your specific needs. Note however, that only those kernels supplied on the CDROM or SuSE web site are supported by IBM and SuSE. Use a modified kernel at your own risk!

Getting the parameter line file

To perform the first IPL from RAM you need the parameter line file that is supplied on the SuSE CDROM:

- `/suse/images/parmline`

  This is a file used to supply parameter values during IPL. You should rename the file to **`linux390.parm.line`**.

Note: The parameter line file is in ascii format. This means that you cannot edit or view this file on OS/390.

In some special cases you might need to modify the values in the parameter line file to suit your environment. You can build a parameter line file on OS/390. Refer to *Installing LINUX for S/390*.

Getting the image of the root file system for first IPL

To create the initial root file system to be used for the first IPL from RAM you need the initial RAMdisk file that is supplied on the SuSE CDROM:

- `/suse/images/initrd`

  This is an image of the file system that you should rename to **`linux390.initrd.txt`** . It is a compressed file that the kernel will uncompress during IPL and is a maximum of 32 MB in size when it is uncompressed.The uncompressed file will be used as a RAMdisk by Linux/390.

Step 2. Building an IPL-able tape

Transfer the required files from the local workstation to the S/390 operating system. Use a record size of 1024.

Using FTP on native OS/390

You can use FTP to get the files from the FTP server as follows:

```
ftp ftpserver
USER
PASS
BIN
locsite lrecl=1024 recfm=f primary=300 quotesoverride
GET /suse/images/tapeipl.ikr 'userid.linux390.image.txt' (repl
GET /suse/images/parmline 'useridlinux390.parm.line' (repl
GET /suse/images/initrd 'useridlinux390.initrd.txt' (repl
QUIT
```

Where:

- *ftpserver* is the name of your FTP server.
- *userid* is the fully qualified user ID on OS/390.

Preparing the tape for IPL

Locate your tape drive and physically insert a blank, formatted, tape into the tape drive.

Operating under OS/390, verify that a tape unit is available and ready for use. Use the following command to display the status of the device:

```
D U,,,180,4
```

where `180,4` is the real device number (physical location of tape in the tape device) of the four devices `180`, `181`, `182`, and `183`.

The system response is, for example:

```
180 online
181 offline
182 offline
183 online
```

If the tape unit is not online, use the following command:

```
V 180,online
```

Transferring the files to tape using OS/390

Transfer the required files to a tape using, for example, IEBGENER. Copy the files in the following order:

1. kernel image
2. kernel parameter line
3. initial RAM disk.

Write the three files to the tape several times. This allows you to IPL several times without rewinding the tape.

Here is a sample job:

```
//LINUXIPL JOB   (),
//         CLASS=A,
//         MSGCLASS=D,
//         MSGLEVEL=(1,1),
//         NOTIFY=&SYSUID,
//         TIME=1440
//TOTAPE PROC LBL=NOSUCH,FILE=NOSUCH.FILE
//IEBGNR EXEC PGM=IEBGENER
//SYSPRINT DD SYSOUT=*
//SYSIN     DD DUMMY
//SYSUT1 DD DSN=&FILE,DISP=OLD,
//          DCB=(LRECL=1024,RECFM=F,BLKSIZE=1024)
//SYSUT2 DD LABEL=(&LBL,NL),DISP=OLD,
//          UNIT=YOUR_UNIT_ID,
//          VOL=(PRIVATE,RETAIN,SER=LINUX1)
//TOTAPE PEND
//*
//FILE1 EXEC TOTAPE,LBL=1,FILE=LINUX390.IMAGE.TXT
//FILE2 EXEC TOTAPE,LBL=2,FILE=LINUX390.PARM.LINE
//FILE3 EXEC TOTAPE,LBL=3,FILE=LINUX390.INITRD.TXT
//*
```

To continue...

When you have finished building the tape and preparing the initial file system, the next step is to prepare the target LINUX system. Go to “Part 3. Setting up the target LINUX system” on page 41 to continue.

8 IPL tape production with VM/ESA

This chapter describes how to build an IPL-able tape using the VM/ESA operating system. Once a tape has been built, it can be used to install LINUX for S/390 on the native hardware or LPAR. It can also be used for installation as a guest under VM.

Creating the tape - overview

You need to create the tape to IPL from. To create the tape you need to:

1. Transfer the following files from the SuSE CDROM
   - The kernel image
   - The default parameter line file
   - The image of the root file system (initial RAMdisk)
2. Build an IPL-able tape that contains these files.

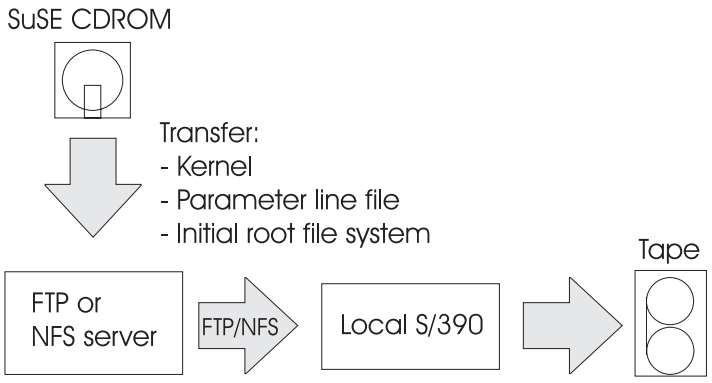

Figure 3. Creating the IPL tape

Before you begin

Before you begin creating a tape:

- You need to have set up a connection to the FTP or NFS server where the CDROM is connected.
- You should already have a user ID on VM/ESA with a tape support utility installed, such as DITTO/ESA. Make sure you have access to a tape unit that is compatible with the tape unit you will use to IPL from at a later stage. Make sure you know the device number of that tape unit.
- Make sure that you know the network parameters of your LINUX for S/390 system. This information should have been noted on the worksheets in “3 Installation worksheet for VM/ESA” on page 7. The required parameters are:
  - Network adapter device number
  - Host name
  - IP-address
  - Net mask
  - Network-address
  - Broadcast-address
  - Default gateway address

– IP-address of the DNS server
– DNS search domain.

Step 1. Locating the LINUX for S/390 files

You need to locate the following files on the SuSE CDROM, and transfer them to a local workstation (UNIX or Windows NT):

- Kernel image file `/suse/images/tapeipl.ikr`
- Parameter line file `/suse/images/parmline`
- Initial root file system `/suse/images/initrd`

  Note that the initial RAMdisk file (`/suse/images/initrd`) is a compressed file that the kernel will uncompress during IPL.

Getting the image of the kernel

For building the tape, you should use the tape IPL kernel that is supplied on the SuSE CDROM. There are two kernel images:

- `/suse/images/tapeipl.ikr` used for tape IPL
- `/suse/images/vmrdr.ikr` used for VM reader IPL

You should rename the kernel image to **`image txt A`**

The supplied kernel might not be ideal for your environment, so later on you might have to build a kernel that is better suited to your specific needs. Note however, that only those kernels supplied on the CDROM or SuSE web site are supported by IBM and SuSE. Use a modified kernel at your own risk!

Getting the parameter line file

To perform the first IPL from RAM you need the parameter line file that is supplied on the SuSE CDROM:

- `/suse/images/parmline`

  This is a file used to supply parameter values during IPL. You should rename the file to **`parm line A`**.

Note: The parameter line file is in ascii format. This means that you cannot edit or view this file on VM/ESA.

In some special cases you might need to modify the values in the parameter line file to suit your environment. You can build a parameter line file on VM/ESA. Refer to *Installing LINUX for S/390*.

Getting the image of the root file system for first IPL

To create the initial root file system to be used for the first IPL from RAM you need the initial RAMdisk file that is supplied on the SuSE CDROM:

- `/suse/images/initrd`

  This is an image of the file system that you should rename to **`initrd txt A`**. It is a compressed file that the kernel will uncompress during IPL and is a maximum of 32 MB in size when it is uncompressed.The uncompressed file will be used as a RAMdisk by Linux/390.

Step 2. Building an IPL-able tape

Transfer the required files from the local workstation to the S/390 operating system. Use a record size of 1024.

Using FTP on VM/ESA

For example using FTP under VM/ESA you would issue the following commands:

```
ftp ftpserver
USER ftp
PASS yourname@youraddress
BIN
LOCSITE FIX 1024
GET /suse/images/tapeipl.ikr image.txt
GET /suse/images/parmline parm.line
GET /suse/images/initrd initrd.txt
QUIT
```

Preparing the tape for IPL

Locate your tape drive and physically insert a blank, formatted, tape into the tape drive.

Operating under VM in your CMS-session, use the `attach` command, or ask your operator to attach the tape to your VM guest.

The format of the attach command is:

```
attach rdev to userid as vdev
```

where `rdev` is the real device number (physical location of tape in the tape device), `userid` is the VM guest user ID, and `vdev` is the virtual device number (conventionally a 'standard' location is used for tape devices).

For example:

```
attach 0649 to your_VM_guest_ID as 0181
```

The system response is:

```
TAPE 0649 ATTACHED TO your_VM_guest_ID 0181
```

At the tape unit, rewind the tape to make sure it is at the beginning. Use the command:

```
rew 181
```

Transferring the files to tape

Transfer the required files to a tape using, for example, the file copy function of DITTO/ESA, do not use BACKUP/RESTORE.

Note that there are two different versions of DITTO available. If the version shown in the following example is different to the version you have on your system, refer to "Appendix D. Alternative version of DITTO" on page 65 for the alternative version.

Write the three files to the tape several times. This allows you to IPL several times without rewinding the tape.

To use DITTO/ESA, in a VM/ESA session:

1. Enter **DITTO**
2. Enter function code **7** for copying data.
3. Enter function code **4** for copying from a CMS file.
4. Enter function code **1** for copying to tape.
5. Press **Enter**.

This is illustrated in Figure 4.

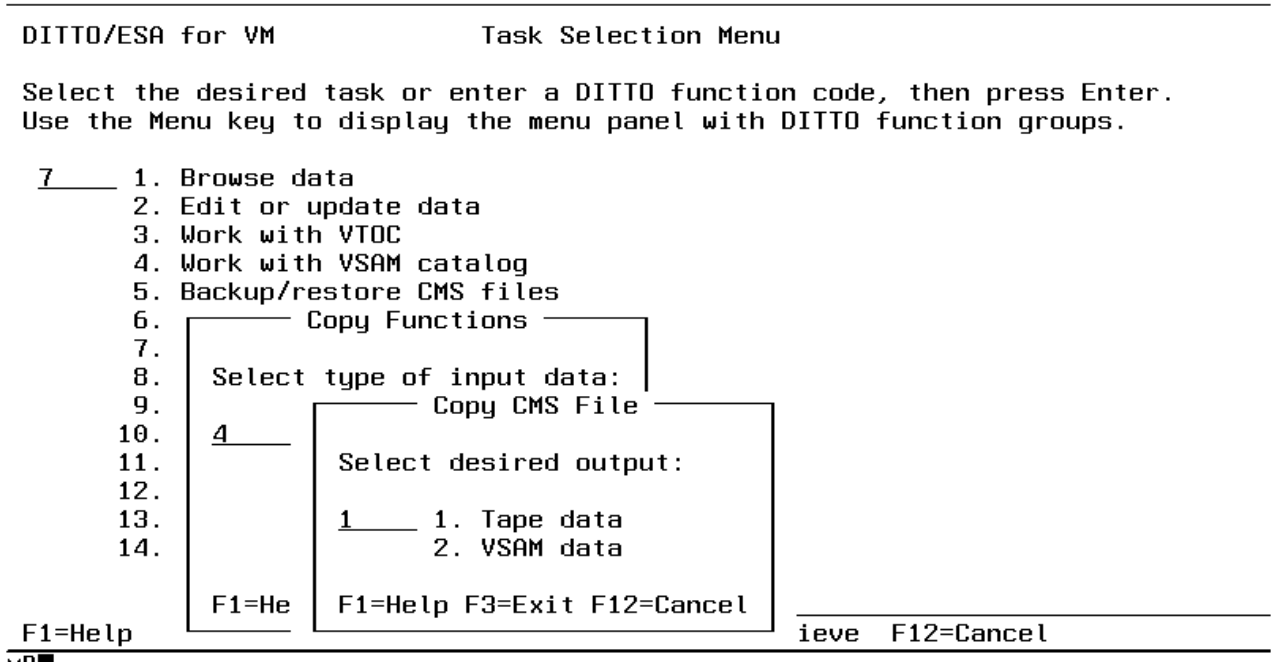

Figure 4. Using DITTO/ESA on VM/ESA

Use the DITTO/ESA data entry window (shown in Figure 5 on page 29) to copy the three files one at a time in the following order:

1. Kernel image
2. Parameter line file
3. Initial root file system (RAM disk) file

```
DITTO/ESA for VM            FT - CMS File to Tape

Tapes:  No tapes attached

Input:  CMS file ID. . . image txt a

        Skip count . . . ________     number of records to be skipped
        Copy count . . . ALL_____     number of records to be copied

Output: Unit address . . 181          device number of tape
        Tape mode. . . . __           optional recording mode or density code
        File ID. . . . . ___________________

        Record format  . F__          F,FB, V,VB,VS,VBS, D,DB,DS,DBS, or U
        Block size . . . 1024___      required for blocked output

F1=Help  F3=Exit  F10=Actions  F11=CRetrieve  F12=Cancel
```

Figure 5. Using DITTO/ESA to copy files to tape.

If you are certain that you do not want to supply a parameter line, you must write a tape mark to the tape instead.

Note that you do not have to uncompress the initial RAM disk file (`initrd` that you renamed `initrd.txt`) because the kernel will detect the compressed file and uncompress it during IPL.

To continue...

When you have finished building the tape and preparing the initial file system, the next step is to prepare the target LINUX system. Go to “Part 3. Setting up the target LINUX system” on page 41 to continue.

9 IPL tape production with VSE/ESA

This chapter describes how to build an IPL-able tape using the VSE/ESA operating system. Once a tape has been built, it can be used to install LINUX for S/390 on the native hardware or LPAR. It can also be used for installation as a guest under VM.

Creating the tape - overview

You need to create the tape to IPL from. For example, create the following VSAM files in VSE USERCAT (VSESPUC) using the following jobs:

- VSAMCR - creates LINUX.IMAGE.FILE (IMAGE), LINUX.PARM.FILE (PARMLIN), and LINUX.INITRD.TXT (INITRD)
- FTPJOB - transmits Data from LINUX server and writes them to IMAGE, PARMLIN and INITRD files
- DITTOTAV - creates IPL tape

In some special cases you might need to modify the values in the parameter line file to suit your environment. You can build a parameter line file on VSE/ESA. Refer to *Installing LINUX for S/390*.

Before you begin

Before you begin creating a tape:

- You need to have set up a connection to the FTP or NFS server where the CDROM is connected.
- You should already have a user ID on VSE/ESA. Make sure you have access to a tape unit that is compatible with the tape unit you will use to IPL from at a later stage. Make sure you know the device number of that tape unit.
- Make sure that you know the network parameters of your LINUX for S/390 system. This information should have been noted on the worksheets in “2 Installation worksheet for LPAR or native” on page 5. The required parameters are:
  - Network adaptor device number
  - Host name
  - IP-address
  - Net mask
  - Network-address
  - Broadcast-address
  - Default gateway address
  - IP-address of the DNS server
  - DNS search domain.

Step 1. Creating the image, parameter line and initrd files on VSE/ESA (VSAMCR)

You can pre-allocate datasets on VSE/ESA and FTP to them. For example, use the following job to create the kernel, LINUX.IMAGE.FILE (IMAGE) and initial RAMdisk, LINUX.INITRD.TXT (INITRD):

```
* $$ JOB JNM=LINUX,CLASS=0,DISP=D,NTFY=YES
// JOB  LINUX DEFINE FILES
// EXEC IDCAMS,SIZE=AUTO
 DEFINE CLUSTER ( -
        NAME (LINUX.IMAGE.FILE                          ) -
        CYLINDERS(3        3          ) -
        SHAREOPTIONS (1) -
        RECORDSIZE (1024   1024  ) -
        VOLUMES (DOSRES SYSWK1 ) -
        NOREUSE -
        NONINDEXED -
        FREESPACE (15 7) -
        COMPRESSED -
        TO (99366  )) -
        DATA (NAME (LINUX.IMAGE.FILE.@D@                    ) -
        CONTROLINTERVALSIZE (8192  )) -
        CATALOG (VSESP.USER.CATALOG                         )
 DEFINE CLUSTER ( -
        NAME (LINUX.PARM.FILE                            ) -
        CYLINDERS(2        2          ) -
        SHAREOPTIONS (3) -
        RECORDSIZE (1024   1024  ) -
        VOLUMES (DOSRES ) -
        REUSE -
        NONINDEXED -
        FREESPACE (15 7) -
        NOCOMPRESSED -
        TO (99366  )) -
        DATA (NAME (LINUX.PARM.FILE.@D@                         ) -
        CONTROLINTERVALSIZE (4096  )) -
        CATALOG (VSESP.USER.CATALOG                         )
 DEFINE CLUSTER ( -
        NAME (LINUX.INITRD.TXT                          ) -
        CYLINDERS(6        6          ) -
        SHAREOPTIONS (1) -
        RECORDSIZE (1024   1024  ) -
        VOLUMES (DOSRES SYSWK1 ) -
        NOREUSE -
        NONINDEXED -
        FREESPACE (15 7) -
        COMPRESSED -
        TO (99366  )) -
        DATA (NAME (LINUX.INITRD.TXT.@D@                    ) -
        CONTROLINTERVALSIZE (8092  )) -
        CATALOG (VSESP.USER.CATALOG                         )
  IF LASTCC NE 0 THEN CANCEL JOB
/*
// OPTION STDLABEL=ADD
// DLBL IMAGE,'LINUX.IMAGE.FILE',,VSAM,                             X
               CAT=VSESPUC
// DLBL PARMLIN,'LINUX.PARM.FILE',,VSAM,                            X
               CAT=VSESPUC
// DLBL INITRD,'LINUX.INITRD.TXT',,VSAM,                            X
               CAT=VSESPUC
/*
// EXEC IESVCLUP,SIZE=AUTO
A LINUX.IMAGE.FILE                          IMAGE   VSESPUC
A LINUX.INITRD.TXT                          INITRD  VSESPUC
/*
/&
* $$ EOJ
```

Step 2. Locating the LINUX for S/390 files

You need to locate the following files:

- Kernel image file `/suse/images/tapeipl.ikr`
- Parameter line file `/suse/images/parmline`
- Initial root file system `/suse/images/initrd`

  Note that the initial RAMdisk file (`/suse/images/initrd`) is a compressed file that the kernel will uncompress during IPL.

Getting the image of the kernel

For building the tape, you should use the tape IPL kernel that is supplied on the SuSE CDROM. There are two kernel images:

- `/suse/images/tapeipl.ikr` used for tape IPL
- `/suse/images/vmrdr.ikr` used for VM reader IPL

The supplied kernel might not be ideal for your environment, so later on you might have to build a kernel that is better suited to your specific needs. Note however, that only those kernels supplied on the CDROM or SuSE web site are supported by IBM and SuSE. Use a modified kernel at your own risk!

Getting the parameter line file

To perform the first IPL from RAM you need the parameter line file that is supplied on the SuSE CDROM:

- `/suse/images/parmline`

  This is a file used to supply parameter values during IPL.

Note: The parameter line file is in ascii format. This means that you cannot edit or view this file on VSE/ESA.

In some special cases you might need to modify the values in the parameter line file to suit your environment. You can build a parameter line file on VSE/ESA. Refer to *Installing LINUX for S/390*.

Getting the image of the root file system for first IPL

To create the initial root file system to be used for the first IPL from RAM you need the initial RAMdisk file that is supplied on the SuSE CDROM:

- `/suse/images/initrd`

  This is an image of the file system that you should use to create an initial RAM disk. It is a compressed file that the kernel will uncompress during IPL and is a maximum of 32 MB in size when it is uncompressed.The uncompressed file will be used as a RAMdisk by Linux/390.

Step 3. Preparing the tape for IPL

Locate your tape drive and physically insert a blank, formatted, tape into the tape drive.

Operating under VSE/ESA, use the `att` command, or ask your operator to attach the tape.

The format of the attach command is:

```
att rdev to userid
```

where rdev is the real device number (physical location of tape in the tape device), userid is the VSE/ESA is the machine channel to which the tape should be attached.

For example:

```
att 480 to use29
```

Rewind the tape to make sure it is at the beginning. In cp mode at the tape unit, use the command:

```
rew 480
```

Step 4. Using FTP to get the kernel and initial RAMdisk files (FTPJOB)

Copy the kernel image and the RAMdisk files to the IMAGE, PARMLIN and INITRD files you created earlier. For example, use the following job to FTP the files:

```
* $$ JOB JNM=FTPJOB,CLASS=0,DISP=D,NTFY=YES
// JOB  getfiles ftp FILES
// DLBL IMAGE,'LINUX.IMAGE.FILE',,VSAM,                                X
               CAT=VSESPUC
// DLBL PARMLIN,'LINUX.LINUX.PARM.FILE',,VSAM,                         X
               CAT=VSESPUC
// DLBL INITRD,'LINUX.INITRD.TXT',,VSAM,                               X
               CAT=VSESPUC
// EXEC FTP,PARM='IP=<ip_address_of_download_site>,PORT=21,ID=00'
<your_user_id>
<your_password>e
<iccf_user_id>
<iccf_password>   BINARY
cd <to_the_download_site>
GET /suse/images/tapeipl.ikr FILE
GET /suse/images/parmline TXT
GET /suse/images/initrd TXT
QUIT
/*
/&
* $$ EOJ
```

Step 5. Building an IPL-able tape (DITTOTAV)

Transfer the required files to a tape using, for example, the file copy function of DITTO/ESA, do not use BACKUP/RESTORE. Copy the files in the following order:

1. kernel image
2. kernel parameter line
3. initial RAM disk.

Write the three files to the tape several times. This allows you to IPL several times without rewinding the tape.

For example, use the following job to build the tape:

```
* $$ JOB JNM=DITTO,CLASS=A,DISP=D
// JOB DITTO TO CREATE IPL-ABLE LINUX TAPE
// ASSGN SYS006,640                                (CUU = TAPE UNIT ID)
// DLBL IMAGE,'LINUX.IMAGE.FILE',,VSAM,CAT=VSESPUC,DISP=(OLD,KEEP)
// DLBL INITRD,'LINUX.INITRD.TXT',,VSAM,CAT=VSESPUC,DISP=(OLD,KEEP)
// DLBL PARMLIN,'LINUX.PARM.FILE',,VSAM,CAT=VSESPUC,DISP=(OLD,KEEP)
// LIBDEF *,SEARCH=PRD1.BASE
// UPSI 1
// EXEC DITTO
$$DITTO REW OUTPUT=SYS006
$$DITTO WTM OUTPUT=SYS006,NTMKS=5
```

```
$$DITTO REW OUTPUT=SYS006
$$DITTO VTP FILEIN=IMAGE,OUTPUT=SYS006
$$DITTO VTP FILEIN=PARMLIN,OUTPUT=SYS006
$$DITTO VTP FILEIN=INITRD,OUTPUT=SYS006
$$DITTO EOJ
/*
/&
* $$ EOJ
```

To continue...

When you have finished building the tape and preparing the initial file system, the next step is to prepare the target LINUX system. Go to “Part 3. Setting up the target LINUX system” on page 41 to continue.

10 Using the VM reader

This chapter describes how to use the VM reader as the installation medium. The files are punched to the reader on the S/390.

Minidisk requirements

You need to allocate space for the LINUX for S/390 files (kernel, parameters, etc.) on a CMS-formatted disk. This can be a new disk or you can use some free space on a normal CMS disk where you already have read/write-access. This disk is used to store the files before they are placed in the VM reader. You also need a separate VM-minidisk (or a dedicated DASD) for the LINUX for S/390 root file system. This lets you IPL with your root file system on the minidisk. You also need a separate minidisk for the swap space. Note that there is a limit of 2 GB on the size of each swap space.

Assuming that the disk drives are IBM 3390s, the minidisk sizes you require for the default SuSE system are:

- 60 cylinders for the LINUX for S/390 files
- at least 1000 cylinders for the LINUX for S/390 file system
- 200 cylinders for the swap space

The following description assumes that you are installing the default SuSE system, that have a new LINUX for S/390 user ID, that the minidisk used for the LINUX for S/390 files is device 191, the one for the file system is device 193, and the one for the swap space is 192. Ask your VM system administrator to assign these devices to your VM guest user ID. The minidisks in the examples are assigned as minidisk A, minidisk B, and minidisk C.

Refer to “8 IPL tape production with VM/ESA” on page 25 for a description of building a tape under VM for IPL and DASD for the file system storage.

Step 1. Preparing minidisks B and C

Prepare the second minidisk as a LINUX root file system and the third minidisk as swap space by using the following CMS commands:

```
format 193 b (blksize 4096
format 192 c (blksize 4096
```

You must specify a block size of 4KB for both disks.

For each command, the system responds with a confirmation request (enter `1` to proceed or `0` to reject the disk format). You are then asked to enter a disk label (for example, enter **`linux`**).

Step 2. Transferring the LINUX boot files to minidisk A

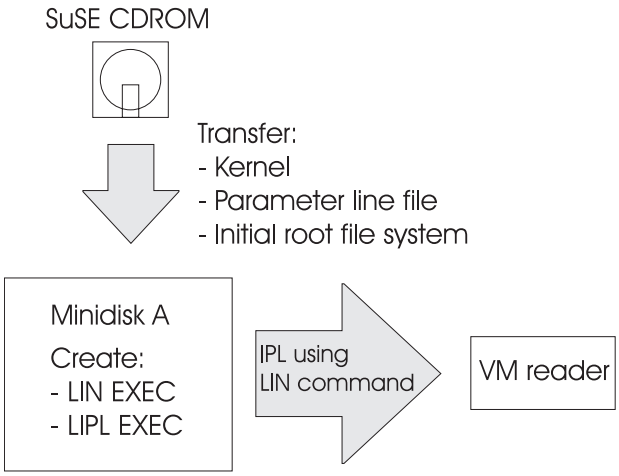

Figure 6. Using the VM Reader

You must locate the LINUX for S/390 boot files and transfer them to minidisk A. The following commands show how to do this:

```
ftp 12.12.12.12
user=user ID
password=password
cd download directory
bin
locsite fix 80
get /suse/images/initrd initrd.txt
get /suse/images/parmline linux.parm
get /suse/images/vmrdr.ikr vmlinux.txt
quit
```

An explanation of the process:

1. Use FTP to connect to the server where the kernel and RAMdisk files are located.
2. Log-on with your user ID.
3. Enter your password.
4. Change directory to get to the *download directory*.
5. Set binary file transfer.
6. Fix the record length of the transferred files to 80 bytes.
7. Copy (and rename) the `/suse/images/initrd` file to `initrd.txt` in your current location.

   Note that the initial RAMdisk file (`initrd`) is a compressed file that the kernel will uncompress during IPL.
8. Copy (and rename) the parameter line file, `/suse/images/parmline` to `parm.line` in your current location.

   Note that you might need to modify the values in the parameter line file to suit your environment. You can build a parameter line file in VM/ESA. Refer to*Installing LINUX for S/390*.
9. Copy (and rename) the kernel, `/suse/images/vmrdr.ikr` to `vmlinux.txt` in your current location.
10. Then exit FTP.

Creating the lin.exec and lipl.exec files

Create the `lin.exec`, and `lipl.exec` files on minidisk A. Refer to “Files stored on minidisk A” for the content of these files.

Files stored on minidisk A

The following files should be stored on your A disk:

- `VMLINUX TXT`
- `LIN EXEC`
- `LIPL EXEC`
- `INITRD TXT`
- `LINUX PARM`

VMLINUX TXT
This is the LINUX boot file.

LIN EXEC
This REXX executable loads the kernel into the VM reader and also boots the kernel from the reader. Check that the file has the following content:

```
/* */
'close rdr'
'purge rdr all'
'spool punch * rdr'
'PUNCH VMLINUX TXT A (NOH'
'PUNCH LINUX PARM  A (NOH'
'PUNCH INITRD TXT  A (NOH'
'ch rdr all keep nohold'
'i 00c'
```

An explanation of the commands:

/* */ Informs the system that the file is a REXX executable.

'close rdr'
Closes all open files in the reader so that they can be purged.

'purge rdr all'
Empties the VM reader. Note that this command empties the reader. You should ensure that any important files have been moved to another location before issuing this command!

'spool punch * rdr'
Moves the contents of the punch to the reader.

'PUNCH VMLINUX TXT A (NOH'
Moves the LINUX boot file to the reader.

'PUNCH LINUX PARM A (NOH'
Moves the LINUX parameters file to the reader.

'PUNCH INITRD TXT A (NOH'
Moves the initial RAMdisk file (initial root file system) to the reader.

'ch rdr all keep nohold'
Makes sure the content of the reader is not changed or deleted after the process is finished.

'i 00c'
Sends the reader an Initial Program Load (IPL) command — this boots LINUX for S/390.

LIPL EXEC

The REXX executable is used to re-boot the kernel. It contains the following commands:

```
/* */
'ch rdr all keep nohold'
'i 00c'
```

An explanation of the commands:

/* */ Informs the system that the file is a REXX executable.

'ch rdr all keep nohold'
Makes sure the content of the reader is not changed or deleted after the process is finished.

'i 00c'
Sends the reader an IPL command — this re-boots LINUX for S/390.

INITRD TXT

This is an initial RAMdisk file and is used as a root file system on initial boot. Note that the initial RAMdisk file (`initrd` that you renamed `initrd.txt`) is a compressed file that the kernel will uncompress during IPL.

LINUX PARM

This is the parameter line file.

To continue...

When you have finished building the tape and preparing the initial file system, the next step is to prepare the target LINUX system. Go to “Part 3. Setting up the target LINUX system” on page 41 to continue.

Part 3. Setting up the target LINUX system

This part describes preparation work that needs to be done regardless of whether you are using a G3 or higher system. The VM/ESA guest preparation also applies to a Multiprise 3000 system. The OSA description does not apply to a Multiprise 3000 system.

11 Preparing the LPAR or native install

This chapter explains what is needed to install LINUX for S/390 on an LPAR, or natively. The preparations include:

- Preparing the IOCDS
- Setting up a network connection

Preparing the IOCDS

The I/O configuration data set (IOCDS) needs to contain lines that define the devices used for LINUX for S/390:

- The DASDs
- The tape unit

The information here is given in example format; for more details about how to build an IOCDS, see the *OS/390 HCD User's Guide*.

Step 1. Preparing for the DASDs

You need two dedicated DASDs, one for the file system and one for the swap space. The following example shows two DASDs specified in IOCDS:

```
CHPID PATH=(7D),TYPE=CNC,PARTITION=(LIN01,REC)
CHPID PATH=(E9),TYPE=CNC,PARTITION=(LIN01,REC)
...
...
CNTLUNIT CUNUMBR=7D00,PATH=(7D,E9),UNITADD=((00,32)),   X
UNIT=3990,CUADD=1
...
...
IODEVICE ADDRESS=(21C,02),CUNUMBR=(7D00),               X
UNITADD=1C,STADET=Y,UNIT=3390
```

Step 2. Preparing for the network connection

LINUX for S/390 supports network connections through:

- OSA-2 and OSA Express cards using the LAN Channel Station protocol (LCS).

  Note that there are some configuration parameters for the LCS driver. See the *LINUX for S/390: LCS Device Driver* document.
- Channels - either parallel channels or ESCON channels.

  If you use ESCON channels, take care to set up the remote system correctly as a router.

Restrictions: IP Multicasting is not supported.

Recommendation: Use a dedicated OSA card for the LINUX system.

Example: Using OSA in an LPAR

The following example shows the IOCDS for an OSA-2 connection defined in a partition called LIN01:

```
CHPID PATH=(54),TYPE=OSA,PARTITION=(LIN01,REC)
...
...
CNTLUNIT CUNUMBR=0008,PATH=(54),UNIT=OSA
...
...
IODEVICE ADDRESS=(5400,002),UNITADD=00,CUNUMBR=(0008),  X
UNIT=OSA
```

For more information on OSA cards, see “OSA connections” on page 61.

Preparing your OSA card with OSA-SF

For information on how to set up OSA-SF, see the appropriate *OSA-SF User's Guide* for your system as listed in the table.

Table 1. OSA-SF books

Book name	Number
OS/390 OSA/SF User's Guide	SC28-1855
VM/ESA OSA/SF User's Guide	SC28-1992
VSE/390 OSA/SF User's Guide	SC28-1946

Also see the *IOCP User's Guide and ESCON Channel-to-Channel Reference*, GC38-0401.

Step 3. Tape unit

The following example shows the IOCDS entry for a tape unit.

```
CHPID PATH=(5A),SWITCH=06,TYPE=CNC,PARTITION=(BOELING5, X
REC)
...
...
CNTLUNIT CUNUMBR=5A00,PATH=(5A),UNITADD=((00,16)),      X
LINK=(CE),UNIT=3490
...
...
IODEVICE ADDRESS=(0A10,02),UNITADD=00,CUNUMBR=(5A00),   X
STADET=Y,UNIT=3490
```

12 Preparing a VM/ESA guest

For this release of LINUX for S/390 the VM/ESA guest is set up as a CMS user machine for installation of LINUX and also for recovery from catastrophic errors when running LINUX.

The VM system must be in ESA mode when you perform the steps below.

Required APARs

These APARs must be installed in order for the LINUX for S/390 installation to succeed:

- VM61762 - Required if the version of VM is V2R3.0
- VM62337 - Required when using IEEE FPU under VM
- VM62410 - Required when using IEEE FPU under VM
- VM62520 - Required to run LINUX guests with more than one virtual CPU.
- VM62573 - Required to avoid FRE001 abend when telnetting into VM in line mode.
- PQ34318 is required when using TCP/IP under VM

(VM62337 and VM62410 are required only when running on G5, G6, or Multiprise 3000 processors.)

Step 1. Setting up the user directory

Ask your VM/ESA system administrator to set up a VM/CMS directory entry for the VM guest.

"Step 1. Setting up the user directory" shows an example of a user directory.

```
USER MYLINUX password 128M 256M G  1
*------------------------------------------------------------------------*
IPL CMS   2
MACH ESA  3
CONSOLE 0009 3215 T   4
SPOOL 000C 2540 READER A  5
SPOOL 000D 2540 PUNCH A
SPOOL 000E 1403 A
LINK MAINT 0190 0190 RR   6
LINK MAINT 019D 019D RR
LINK MAINT 019E 019E RR
LINK TCPIP 0198 0198 RR     7
CPU 0 CPUID 100003 NODEDICATE  8
DEDICATE 7800 7800  9
DEDICATE 7801 7801
MDISK 0191 3390 1501   60 LNXU01 MR Rpassword Wpassword  Mpassword  10
MDISK 0192 3390 1561  200 LNXU01 MR Rpassword Wpassword  Mpassword  11
MDISK 0193 3390    1 3338 LNXU02 MR Rpassword Wpassword  Mpassword  12
OPTION QUICKDSP  13
```

Figure 7. Example user directory for VM guest

- 1 The user ID that identifies this virtual machine is `MYLINUX`. The virtual machine has a default storage of 128 MB.
- 2 CMS will boot automatically at logon (for installation).

- **3** Sets VM to run in ESA mode.
- **4** Defines the operating console for the virtual machine (the CP/CMS screen and the LINUX system console).
- **5** The SPOOL statements define the locations of the VM reader, punch, and printer. (The punch and reader may be used to IPL LINUX instead of a tape.)
- **6** These are read-only links to CMS minidisks that are owned by other virtual machines. They are required to IPL CMS.
- **7** Links to the TCP/IP disk.
- **8** Only needed if you are running with SMP. Defines the processors that LINUX can use.
- **9** The device addresses of the network connection.
- **10** 191: Minidisk definition for the CMS machine A disk. At least 60 cylinders are recommended. This disk will be used by CMS for installation and error recovery, but will not be accessible to LINUX.
- **11** 192: Minidisk definition for the LINUX swap disk.
- **12** 193+: Minidisk definition for read/write minidisks for LINUX file systems. These are full volume minidisks.
- The corresponding DASD definitions for these minidisks would be similar to this:

```
DASD 0191 3390 1501   60 LNXU01 MR Rpassword Wpassword Mpassword
DASD 0192 3390 1561  200 LNXU01 MR Rpassword Wpassword Mpassword
DASD 0193 3390    1 3338 LNXU02 MR Rpassword Wpassword Mpassword
```

  The above example defines three 3390 DASDs, one with 60 cylinders, one with 200 cylinders, and one with 3338 cylinders.
- **13** This prevents the console from hanging in certain situations

Step 2. Preparing the VM guest user profile

Launch a Personal Communications (PCOM) session through TCP/IP or use any 3270 terminal emulator to connect to your VM system.

Figure 8 shows the statements in the profile exec relevant to setting up the LINUX guest that corresponds to the user directory and the CMSUSER profile examples. You will use this profile to IPL the VM guest before installing LINUX. Particularly check that you have:

- The TCP/IP disk accessed
- Set relpage off

The CP commands in this file will still be effective after the IPL of LINUX; the other commands only affect the CMS session.

```
/* PROFILE EXEC for MYLINUX */
"CP SET RUN ON"       /* Insure guest runs after DISC */
"CP TERM CHARDEL OFF" /* Avoid problems with use of @ */
acc 198 F             /* Access the disk to be used for tcpip*/
set relpage off       /* Avoids a Linux problem */
Exit                  /* - */
```

Figure 8. Example PROFILE EXEC

Step 3. Assigning a TCP/IP address to the VM guest user ID

After you have completed the setup tasks, you need to obtain an IP address for your Linux system from your network administrator.

Step 4. Setting up a network connection

Restrictions: SuSE LINUX for S/390 does not support IUCV yet.

To run LINUX for S/390 with a network connection, you need to define a network device. This can be either:

- One port of an OSA-2 or OSA E card (Token Ring or Ethernet).
- A port of a CTC/ESCON card
- A virtual CTC device.

Recommendation: For the Install Fest, use a port of an OSA-2 or OSA E card.

If you are using CTC you have to set up your system connections to correctly handle the TCP/IP-traffic.

Your network device has two addresses (send and receive). Ask your VM system administrator to dedicate these addresses to your VM guest user ID. See “Step 1. Setting up the user directory” on page 45 for an example of dedicated addresses.

Setting up virtual CTC channels

Here is an example of how you could define virtual CTC channels:

1. Define two virtual channels to your user ID. This can be done with the following commands:

   ```
   define ctc c04
   define ctc c05
   ```

2. Connect the virtual channels with the channels from the VM TCP/IP user ID. You have to couple the read channel to the VM TCP/IP write channel and the write channel to the VM TCP/IP read channel. The coupling can be done with the following commands:

   ```
   couple c04 tcpip c05
   couple c05 tcpip c04
   ```

   The VM TCP/IP channel numbers depend on the customization on the remote side. In this example, the CTC read channel `c04` is connected to the VM TCP/IP write channel `c05`. Similarly, CTC write (`c05`) is connected to VM TCP/IP read (`c04`).

   You can write the `def` and `couple` commands into the profile data set.

3. Setup the TCP/IP on the remote side, as described in the reference manuals. This can vary depending on the operating system that is used on the remote side.

Instead of connecting to the VM TCP/IP user ID, you can also connect to another VM user ID, where a LINUX for S/390, OS/390 or VSE is running.

Note: In this case the remote side also needs to be a VM guest.

For info on using the LINUX for S/390 CTC/ESCON driver, see “CTC connections” on page 59.

13 Before the Install Fest

Before the Install Fest, you need to have completed the setup steps described in this document.

The final preparation steps are outlined in Table 2.

Table 2. Must do tasks before the Install Fest call

Task	Instructions can be found in...
Create jobs for making the tape Create an IPL tape	• "7 IPL tape production with OS/390" on page 21 • "8 IPL tape production with VM/ESA" on page 25 • "9 IPL tape production with VSE/ESA" on page 31
On VM using tape: • Try FTPing files to a CMS disk • CMS format the disks you want to use for LINUX. This will take a while.	• "Using FTP on VM/ESA" on page 27 • "Step 1. Preparing minidisks B and C" on page 37
On VM using the reader: • Create the LIN EXEC to FTP files to VM • CMS format the disks you want to use for LINUX. This will take a while.	• "Creating the lin.exec and lipl.exec files" on page 39 • "Step 1. Preparing minidisks B and C" on page 37
Prepare documentation	Ensure that you have the newest documentation from the website the day before the call.
Prepare the IOCDS	See "Preparing the IOCDS" on page 43. Installing on Multiprise 3000: See "Preparing the IOCDS" on page 53
Fill in the worksheets	See "2 Installation worksheet for LPAR or native" on page 5 and "3 Installation worksheet for VM/ESA" on page 7
Verify network parameters	Verify your network parameters with your network administrator. For example make sure that the routers/switches in your network know your IP address.

Next, look at the *Installing LINUX for S/390* document, also available on the InstallFest website: **http://www.s390.ibm.com/linux/installfest/**

Part 4. Appendixes

Appendix A. Multiprise 3000 considerations

There are some important differences in the area of network connections and I/O device driver setup, and these differences are described in example format in this chapter.

Before installing LINUX for S/390 on a Multiprise 3000, you should be familiar with the technical architecture of the machine. Two ITSO Redbooks are available:

- *Multiprise 3000 Technical Introduction: SG24-5633*
- *Multiprise 3000 Basic Emulated I/O Definitions: SG24-5669*

Required fix

The microcode fix EC Stream F34643 MCL048 is required on the system. It solves certain types of problem that occur during IPL. For example, the LCS device can fail to start up after you have successfully performed an IPL from tape on a LPAR, stopped LINUX, and then re-IPLed the system.

Preparing the IOCDS

The following examples assume that two Token Ring adapters are being used, where the MPTS Logical Adapter number `0` is used for OS/2® exclusively and MPTS Logical Adapter number `1` is used by LINUX for S/390.

PCI adapter for OS/2

The following shows the definition within MPTS in OS/2 which will be used in the Support Element TCP/IP settings:

```
IBM PCI Token Ring Family Adapter (IBMTRP.OS2)
0 - IEEE802.2
0 - IBM OS/2 NETBIOS
0 - TCP/IP
```

Now you have to define the TCP/IP settings in the Support Element:

1. Log-on to the Support Element as
   - user `ACDADMIN`
   - default password is `PASSWORD`
2. Select the **View** window and click **Console Actions**
3. Open **Support Element Settings** and select the **Enable LAN Connection** check box.
4. You will be asked to provide the Adapter Number.
   - Enter `0` for the Logical Adapter number specified within MPTS in OS/2
   - Click **Apply**.

Also see the redbook *Multiprise 3000 Basic Emulated I/O Definitions SG24–5669* Chapter 4.

Note: You cannot use the same LAN adapter with OS/2 TCP/IP and LINUX for S/390 TCP/IP.

PCI adapter for LINUX for S/390

You will need at least one second adapter to be used by LINUX for S/390. This adapter should be defined within MPTS in OS/2 as follows:

```
IBM PCI Token Ring Family Adapter (IBMTRP.OS2)
1 - IBM IEEE802.2
```

Note: The Token Ring adapter which is used by LINUX for S/390 must be defined **without** the TCP/IP protocol driver.

You will need the logical adapter number later in order to configure the LINUX for S/390 TCP/IP definitions. You have to configure the appropriate IOCDS definitions for read and write channels:

```
...
...
CHPID PATH=FC,TYPE=EIO,SHARED
...
...
CNTLUNIT CUNUMBR=FC20,PATH=(FC),UNIT=3088,UNITADD=((20,1))
CNTLUNIT CUNUMBR=FC21,PATH=(FC),UNIT=3088,UNITADD=((21,1))
...
...
IODEVICE ADDRESS=(FC20),CUNUMBR=(FC20),UNIT=3088,PARTITION=Z1
IODEVICE ADDRESS=(FC21),CUNUMBR=(FC21),UNIT=3088,PARTITION=Z1
...
...
```

You have to enter the definitions in the emulated I/O DEVMAP where the addresses refer to your settings in the IOCDS. In this example, Device Driver Manager 9 is LCS3172, but it can be another number depending on your configuration.

```
Adr   Device   Label   Atype   Size   Mgr   FN/P
22    3088                            9
23    3088                            9
```

This means that the LCS device driver uses device number `0xe22` for the read channel and the write channel device number is implicitly `0xe23` (read channel device number + 1).

The Logical Adapter number `1` is defined within MPTS for OS/2.

Preparing a Multiprise 3000 LPAR

The following procedure describes how to set up a Multiprise 3000 to perform an IPL from a SuSE LINUX CD-ROM using emulated I/O into one or more LPARs.

Preparing the S/390 Service Element

You need to be logged on as user ACDADMIN, which allows you to:

1. Shut down all running LPARs (if any) by using the **OS messages** icon on the selected LPAR.
2. To prevent you from loading a formerly installed system accidentally when performing a power-on-reset (POR), switch off automatic load for each existing LPAR. To do this:
   a. Double click **Groups** in the upper left window and mark **CPC** in the window underneath

b. Select **CPC Operational Customization** in the right window and double click **Customize / Delete Activation Profiles**.

c. Select the **Default** profile and click on **Customize**

d. For each LPAR select the corresponding register card and go to the sheet named **Load**, where you deselect the **Load during activation** item.

e. Close all windows.

3. Enable automatic activation of LPARs. After each POR the system, and therefore all LPARs currently set up, are in an undefined state. To prepare the LPARs for an IPL, they must be activated. To activate LPARs automatically after a POR:

   a. In CPC Operational Customization double click **Automatic Activation**.

   b. Mark the displayed entry and go to **Options** where you select **Enable automatic activation**

   c. Close all windows.

4. Choose an LPAR profile and create an IOCDS prepared for Emulated I/O. To install SuSE LINUX into an LPAR, you must tell the system to start in LPAR mode with a defined number of LPARs each connected to devices of choice.

   a. If the S/390 is actually running in ESA mode, double click **Groups** in the upper left window and mark **CPC** in the window underneath.

      If the S/390 is actually running in LPAR mode, double click **Groups** in the upper left window and mark **Images** in the window underneath.

   b. Select **CPC Configuration** in the right window and double click **Input/Output (I/O) Configuration**; you will see entries for four user IOCDS and one IOCDS for diagnostics.

   c. Select a free, non-active (column Data Set Status) LPAR (for example, A3) and click **Option**s, then **Disable write protection**.

   d. Select the active LPAR (for example A1) and click **Options—>Copy configuration**.

   e. In the Target field select the chosen LPAR and click **OK**.

   f. Now mark the chosen LPAR and go to Options, then Open source file.

   g. The second line of the IOCDS file opened in the editor should contain the number and names of LPARS you want to set up. An example IOCDS is shown on page Figure 9 on page 56.

      In the first (resource) section, make sure there is at least a line

      ```
      CHPID PATH=FC,TYPE=EIO,SHARED
      ```

      The FC path is responsible for emulated I/O.

      Furthermore, we need a connection to DASDs in the next line with path FD. The second (DASD) section defines the access to the two DASDs (a root and a swap). Here the DASDs have the addresses FD00 and FD01.

```
ID    MSG1='SUSELP01',SYSTEM=(7060,1)
            RESOURCE PARTITION=((Z1,1))
          ************************************************************************
                 CHPID PATH=FC,TYPE=EIO,SHARED
                 CHPID PATH=FD,TYPE=DSD,SHARED
          ************************************************************************
          **  DASD                                                              **
          ************************************************************************
                CNTLUNIT CUNUMBR=FD00,PATH=FD,UNITADD=((00,256)),UNIT=3990-2
                IODEVICE ADDRESS=(FD00,2),CUNUMBR=FD00,UNIT=3390,PART=Z1
          ************************************************************************
          **  EMULATED DEVICES                                                  **
          ************************************************************************
          ** CDROM (will point to H:\SUSE\IMAGES\AWSOMA1.TDF)
                CNTLUNIT CUNUMBR=FC80,PATH=FC,UNIT=3422,UNITADD=((80,1))
                IODEVICE ADDRESS=FC80,CUNUMBR=FC80,UNIT=3422,PART=Z1
          ** LCS (Networkadapters, emulated)
                CNTLUNIT CUNUMBR=FC20,PATH=FC,UNIT=3088,UNITADD=((20,1))
                CNTLUNIT CUNUMBR=FC21,PATH=FC,UNIT=3088,UNITADD=((21,1))
                IODEVICE ADDRESS=(FC20,1),CUNUMBR=FC20,UNIT=3088,PART=Z1
                IODEVICE ADDRESS=(FC21,1),CUNUMBR=FC21,UNIT=3088,PART=Z1
```

Figure 9. Example of an IODCS

The third (Emulated devices) section contains information about two important emulated I/O devices: the CD-ROM and the network device. The CD-ROM is emulated as an 3422 tape bound to LPAR Z1 at FC80, the network device is a 3088 for LPAR Z1 at FC20 and FC21.

h. After inserting the lines above, save and exit the editor with **[F2]—>[F3]**.

i. To build the IOCD from the new IOCDS, go to **Options**, **Build data set ...** and then **Build Configuration** where the checkbox **Build the IOCDS for logically partitioned mode** must be activated.

   The IOCDS build might fail with the following error:

   ```
   *IZP  IZP101I OPERATION FIELD NOT FOUND
   ```

   If this happens, edit the IOCDS again and remove any trailing blanks in the changed lines, and any blank lines.

j. After a successful IOCDS build, click on **Options**, then **Enable write protection** and exit.

5. Configure Emulated I/O profile for the FC path. Until now the system knows of one or more devices as tape emulated devices, but where to get the data when these devices are accessed has not been declared yet. The corresponding table for this is the DEVMAP, which we will configure as follows:

   a. In CPC Configuration double click **Emulated I/O Configuration**; a textmode window titled ″Configurator DEVMAPS″ will pop up.

   b. **Important:**Move the cursor to a device map number that corresponds to the IOCDS number you have chosen in step 4 (for example, AWSMAPA3 for IOCDS A3) and press **[ENTER]**, then **[F2]**. If you need help, press **[F1]**.

   c. Insert a line for the emulated network device (1st line in the following example) and a line with the address, device, type of emulation and path of the TDF (Tape Descriptor File) to be read when this device is accessed. In our example, this is FC80 as the device address, (3422) for the tape device, the driver (H=AWSOMA) and the path to a TDF on CD:

```
U P D A T E   S Y S T E M   D E V I C E S          Mode = ESA

        /- Active Devices:16  -------- Available disk space in Gbytes: 4.186958 -------\
        |  Addr Device  Label  Atype  Size     Mgr  FN/P   PATH:>G:\                  <|
        |-------------------------------------------------------------------------------|
        |   >   >      >       >     >         >  >                                    |
        |    20  3088                           9                                      |
        |    21  3088                           9                                      |
        |    "    "                             "                                      |
        |    "    "                             "                                      |
        |    "    "                             "                                      |
        |    80  3422                           H  H:\SUSE\IMAGES\AWSOMA1.TDF          |
        |    "    "                             "                                      |
        |    "    "                             "                                      |
        |    "    "                             "                                      |
        \-------------------------------------------------------------------------------/
         Mgr Codes: 1=AWSFBA   2=AWSCKD   3=AWS3274  4=LAN3274  5=AWS3215  6=AWS2821
         7=AWS2540  8=LAN3172  9=LCS3172  A=MGR3172  B=WAN3172  C=AWSICA   D=AWSTAPE
         E=AWS34X0  F=AWS34X1  G=AWS34X2  H=AWSOMA   I=AWSPCSRV
        ---------------------------------------------------------------------------
          F1 Help  ALT+F1 Key Definitions  F10 Main Menu  ESC Cancel Input   | cnsysdev
```

To delete an entry, press **[F9]**, to insert an entry, simply type the values in the row with the ″>″ chars. To get help for an item, move the cursor to the item in question, and press **[F1]** (for example, to get information on AWSOMA, move the cursor under H=AWSOMA and press **[F1]**).

d. When done, press **[F10]** to exit the editor, **[F6]** to save configuration data and then **[F10]** twice to leave Emulated I/O Configuration.

6. Perform a POR as follows:
   a. Double click **Groups** in the upper left window and mark **CPC** in the window underneath
   b. Select **CPC Recovery** in the right window and click on **Power-on Reset**.

Preparing a VM/ESA guest on the Multiprise 3000

The steps used in preparing a VM guest on the Multiprise 3000 are similar to the preparation steps used on other systems. See “12 Preparing a VM/ESA guest” on page 45 for details on how to do this.

Hints and Tips for the Multiprise 3000

Unlocking the OS/2 desktop on the Multiprise 3000 SE

To unlock the desktop:

1. Log onto the SE as user ACSADMIN. The default password is PASSWORD.
2. Click **Console Actions**
3. Click **User Profiles**
4. Disable the Secure Desktop function

You should now be able to use the OS/2 icons.

Appendix B. Network connections

CTC connections

Virtual CTC devices are used to provide high speed internal connections between any two operating systems running under VM. ESCON devices are used to provide these connections under VM or in an LPAR. For example, you can connect two LINUX for S/390 systems together or a LINUX for S/390 and a OS/390 system. Refer to “CTC/ESCON” for more details.

It is essential to define the correct MTU size for the channel device, otherwise it will not work properly. The same MTU size (default 1500) must be used for the LINUX for S/390 side of the channel as is used on the remote side. For high performance, the MTU size must be as large as possible, for example 32K for communications between LINUX for S/390 and OS/390.

CTC/ESCON

CTC or ESCON connections are the typical high speed connections between mainframes. The difference between them is the media type which is used to transfer the data. The data packages and the protocol on both media are the same.

- The CTC channel uses a copper cable to connect from one mainframe to the other. The signals are transferred on parallel cables, like the PLIP device driver does. A virtual CTC is a connection inside a VM system. A virtual CTC can be used to connect two LINUX for S/390 systems running under VM or a LINUX for S/390 system with the TCP/IP running under VM.
- An ESCON channel uses a fibre optic connection and the signals are passed in sequence over the connection. These connections are used to connect two mainframes where each system runs in its own box or in an LPAR.

The LINUX for S/390 CTC/ESCON device driver is a network device driver that uses TCP/IP to connect different operating systems together (OS/390, VM, VSE or a LINUX on S/390). One `ctcn` or `esconn` network device needs two dedicated channels of the same type. One channel is used for read the other for write. Both physical channels are mapped to one logical network device. The following picture shows the connection of two systems via CTC:

Figure 10. Connection of two systems through CTC

The current implementation of the CTC network device driver can handle up to 8 CTC connections and/or 8 ESCON connections. In autosense mode the driver always picks 16 parallel/ESCON channels with the lowest device number, which are the first 64 CTC/ESCON sub-channel IDs. When a CTC definition is in the kernel parameter file, the channels must also be in the first 64 CTC/ESCON sub-channel ID’s. The number of sub-channel IDs (`MAX_CHANNEL_DEVICES`) can be changed in the `ctc.c` file.

Features
Can be configured from a kernel parameter line.

Limitations
This CTC option cannot be specified in the kernel parameter file which is used as input for SILO on native systems. If it is specified, LINUX for S/390 cannot be booted. A solution for this problem is to define the CTC Adapters as two adjacent 3088s in the IOCS. The following example defines the CTC IODEVICE for the two systems:

- System A:

```
IODEVICE ADDRESS=(500,2),CUNUMBR=001,      x
UNIT=CTC,UNITADD=0
```

- System B:

```
IODEVICE ADDRESS=(600,1),CUNUMBR=001,      x
    UNIT=CTC,UNITADD=1
IODEVICE ADDRESS=(601,1),CUNUMBR=001,      x
    UNIT=CTC,UNITADD=0
```

Activation of the CTC connection
1. Connection

   Prior to the activation, there is a channel connection required. This can be a real or virtual connection:

   - Real Channels

     Connect the systems with a pair of channels to the remote system. Verify that each read channel is connected to the corresponding write channel.

   - VM Channels

     Define two virtual channels to your user ID. For example, this can be done with the following commands:

     ```
     define ctc c04
     define ctc c05
     ```

     Connect the virtual channels with the channels from the VM TCP/IP user ID. You have to couple the read channel to the VM TCP/IP write channel and the write channel to the VM TCP/IP read channel. For example, the coupling can be done with the following commands:

     ```
     couple c04 tcpip c05
     couple c05 tcpip c04
     ```

     The VM TCP/IP channel numbers depend on the customization at the Remote Side. In this example, the CTC read channel `c04` is connected to the VM TCP/IP write channel `c05`. Similarly, CTC write (`c05`) is connected to VM TCP/IP read (`c04`).

     You can include the `CP DEFINE` and `COUPLE` commands in the PROFILE EXEC.

     Instead of connecting to the VM TCP/IP user ID, you can also connect to another VM user ID, where a LINUX for S/390, OS/390 or VSE is running.

     Note: In this case, the Remote Side also needs to be a VM Guest.

2. Definitions on the remote side.

   Setup the TCP/IP on the remote side, as described in the reference manuals. This depends on the operating system which is used on the remote side.

3. Activation on the Remote Side

Activate the channels on the remote side.

4. Activation on the LINUX for S/390 Side

   The network devices can be activated with the `ifconfig` command. It is necessary to define the right MTU size for the channel device, otherwise it will not work properly. Use the same MTU size (default 1500) that is defined on the remote side:

   ```
   ifconfig ctc0 10.0.51.3 pointopoint 10.0.50.1 netmask 255.0.0.0 mtu 32760
   ```

   Where:

   10.0.51.3
   : is the IP address of the local network device. (`ctc0` to `ctc7` or `escon0` to `escon7`)

   10.0.50.1
   : is the IP address of the remote side.

   Remember that the keyword in the `ifconfig` command changes from `ctc` to `escon` when a native installation is performed. For example:

   ```
   ifconfig escon0 10.0.0.1 pointopoint 10.0.50.1 netmask 255.0.0.0 mtu 32760
   ```

OSA connections

For outgoing network traffic, one of three types of OSA card is used:

- OSA-2 ENTR
- OSA-2 FENET
- OSA Express Fast Ethernet

The MTU size is fixed for Ethernet, so (apart from normal networking good-practice) the only way to tune the network performance is to choose the card most suitable for your requirements:

- The Ethernet and Token Ring (OSA-2 ENTR) card is limited to a data transfer speed of 10 Mbit/s (Ethernet) or 16 Mbit/s (Token Ring) and is suitable for a lightly loaded web server or a moderate number of Telnet sessions.
- The Fast Ethernet (OSA-2 FENET) card has been mainly superseded by the OSA Express Fast Ethernet (OSA Express Fast Ethernet) card. This card operates at 100 Mbit/s and is recommended for web serving and other high bandwidth use. This card requires a microcode fix (OSA Express Fast Ethernet LIC 324 or above) to be applied before it can be used with LINUX for S/390.

For information about setting-up Token Ring networks and improving Ethernet performance by workload planning, see the *Linux Network Administrators' Guide* available on the World Wide Web from the ″Linux Documentation Project″ (http://www.linuxdoc.org/).

Appendix C. Restrictions when installing on G3, G4, or Multiprise 2000

The following processors support running LINUX for S/390, but there are technical restrictions you need to be aware of:

- S/390 Parallel Enterprise Server Generation 3 and 4
- S/390 Multiprise 2000

The restrictions are:

- The older generations of the S/390 Enterprise servers do not support IEEE floating point in the hardware. Because of this, you might see performance degradation when running LINUX for S/390 and LINUX applications on such a machine, as IEEE floating point will be emulated by software.
- Some of the IBM middleware (such as DB2® UDB, DB2 Connect) for LINUX for S/390 - available as beta code in 3Q 2000 - does require hardware IEEE floating point. You can install LINUX for S/390 middleware after the initial install. There is no guarantee, however, that it runs without problems.
- Older models of the 9672 do not support booting of LINUX for S/390 from a CD-ROM. Instead, you need access to an S/390 tape unit (for example, 3480, 3590) during the initial install to boot the LINUX for S/390 code from there.
- The Service and Support offerings available from IBM Global Services do not support the older 9672 machine models. If you plan to move production workload onto your LINUX for S/390 environment, it is strongly recommended that you upgrade to a 9672 Model xx6 or Model xx7 or a Multiprise 3000.
- The IEEE exception handling is not emulated. Therefore you will see warning messages whenever a program tries to use it.

Appendix D. Alternative version of DITTO

The following description uses the alternative version of DITTO that might be available on your system.

To use DITTO, in a VM/ESA session:

1. Enter **DITTO**
2. Enter function code **6** to access CMS/CP file functions.
3. Press **Enter**.

The DITTO primary function menu is shown in the following figure.

```
                    VM/DITTO PRIMARY FUNCTION MENU
FUNCTION ===>

Select the desired function group.  Type the highlighted character or a DITTO
function to the right of the arrow, and press ENTER.

   0  CONTROL        -  DITTO control functions
   1  CARD           -  Card functions
   2  TAPE CONTROL   -  Tape control functions
   3  TAPE           -  Basic tape functions
   4  DISK           -  Basic disk functions
   5  DISKETTE       -  Basic diskette functions
   6  CMS/CP         -  CMS and CP file functions
   7  VSAM           -  VSAM functions
   8  DISKETTE FILE  -  Diskette file functions
   9  CMS/SAM        -  SAM file functions under CMS
   L  XXX LISTING    -  Print information about DITTO functions
   N  NEWS           -  Display release news
   X  EOJ            -  Terminate DITTO program
```

1. Enter function code **6** for copying a CMS file to tape.
2. Press **Enter**.

The DITTO CMS/CP functions menu is shown in the following figure.

```
                         VM/DITTO CMS/CP FUNCTIONS
FUNCTION ===>

Select the desired function or enter the function code directly above.

   1  FB   - CMS file browse
   2  SPB  - CP spool file browse

   3  FPR  - CMS file print - character format
   4  FD   -  CMS dump - hexadecimal dump format
   5  FDD  -  CMS dump deblocked - hexadecimal dump format

   6  FTP  - CMS file to tape
   7  TF   - Tape to CMS file
   8  FVS  - CMS file to VSAM
   9  VF   - VSAM to CMS file

  10  DUMP - DUMP CMS file(s) to tape
  11  LOAD - LOAD CMS file(s) from tape (DUMP or DDR format)



PF  1=HELP      2=TOP       3=END       4=RETURN    5=BOTTOM    6=LOCATE
PF  7=UP        8=DOWN      9=PRINT    10=LEFT     11=RIGHT    12=RETRIEVE
```

Use the DITTO CMS File to Tape window (shown below) to copy the three files one at a time in the following order:

1. Kernel image
2. Parameter line file
3. Initial root file system (RAM disk) file

```
                          VM/DITTO CMS FILE TO TAPE
===>


INPUT:  CMS file ID   ===> vmlinux txt a        <=

        Skip count    ===>          position to start at
        Copy count    ===> ALL      number of records to be copied
        Record format ===> f        enter F, V or U
        Record length ===>          if deblocking desired (format F only)
        Block factor  ===>          if blocking desired

OUTPUT: Unit address  ===> 181      specify channel/unit address of tape
        Tape mode     ===>          optional recording mode or density code
        File ID       ===>                   <= leave blank for unlabeled tape



PF  1=HELP      2=TOP       3=END       4=RETURN    5=BOTTOM    6=LOCATE
PF  7=UP        8=DOWN      9=PRINT    10=LEFT     11=RIGHT    12=RETRIEVE
```

If you are certain that you do not want to supply a parameter line, you must write a tape mark to the tape instead.

Note that you do not have to uncompress the initial RAM disk file (`initrd` that you renamed `initrd.txt`) because the kernel will detect the compressed file and uncompress it during IPL.

Where to find more information

This section lists books that can be of assistance to you.

Table 3. LINUX for S/390 books

Book name	Number
LINUX for S/390 Installation, Configuration and Use	N/A (This document can be downloaded from http://linux390.marist.edu/)
LINUX for S/390 LCS Device Driver	N/A (This document can be downloaded from http://linux390.marist.edu/)
Linux for S/390	SG24-4987 (at the time of writing, this was available as a redpiece on the redbooks website)

IBM Systems Center publications (redbooks) are available in softcopy at this website: **http://www.redbooks.ibm.com/**.

Table 4. Multiprise books (redbooks)

Book name	Number
Multiprise 3000 Technical Introduction	SG24-5633
Multiprise 3000 Basic Emulated I/O Definitions	SG24-5669

Table 5. IOCDS related books

Book name	Number
IOCP User's Guide and ESCON Channel-to-Channel Reference	GC38-0401
HCD User's Guide	SC28-1848

Table 6. Network connection books

Book name	Number
OSA Planning	GC23-3870
OS/390 OSA/SF User's Guide	SC28-1855
VM/ESA OSA/SF User's Guide	SC28-1992
VSE/390 OSA/SF User's Guide	SC28-1946
OSA Express Customer Guide and Reference	SA22-7403

Other useful homepages include:

- http://www-4.ibm.com/software/is/mp/linux/- The IBM LINUX home page.
- http://tune.linux.com - General tuning information for LINUX

Notices

This information was developed for products and services offered in the U.S.A. IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing
IBM Corporation
North Castle Drive
Armonk, NY 10504-1785
U.S.A.

The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law:
INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Trademarks

The following terms are trademarks of the IBM Corporation in the United States or other countries or both:

DB2	OS/390	VM/ESA
ESCON	OS/2	VSE/ESA
IBM	S/390	
Multiprise	S/390 Parallel Enterprise Server	

Microsoft, Windows, Windows NT and the Windows logo are registered trademarks of Microsoft Corporation.

LINUX is a registered trademark of Linus Torvalds.

SuSE is a registered trademark of SuSE GmbH.

Other company, product, and service names may be trademarks or service marks of others.

The Tux logo is used courtesy of L. Ewing, who created it using the General Image Manipulation Program (GIMP) drawing program.

Index

N

O

P

R

S

T

U

V