



Linux for S/390 Technical Discussion

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The logo for Sytek Services, Inc. is located in the bottom right corner. It consists of the word "sytek" in a white, lowercase, sans-serif font, with "SERVICES, INC." in a smaller, uppercase, sans-serif font directly below it. The logo is set against a dark blue background that is part of a larger triangular graphic element.

Agenda

- Options available for running Linux
- Linux installation tasks
- The install process
- Linux Networking
- Open Source Software
- IBM Software
- ISV Software



Options - Distributors

- Connectiva
- Marist – 2.2.16
- Redhat – 2.4.9
- SuSE
 - SuSE Linux Enterprise Server 7 for S/390 (2.4.7)
 - SuSE Linux Enterprise Server 7 for 64-bit IBM eServer zSeries (2.4.7)
- ThinkBlue – 32 and 64-bit
- Caiman
- Debian – 2.4.16



Options - Distributors

- Choice driven by
 - Religion
 (“my distribution is better than your distribution...”)
 - Code level requirements
 - Corporate Standards
 - Personal choice/intuition



Options – Installation

- Type
 - Native
 - LPAR
 - z/VM ☺
- Networking
 - Guest LAN, vCTC, IUCV
 - OSA (lcs, qeth)
 - 3172
 - ESCON CTC
 - Hipersockets
 - CLAW
- Initial System
 - Tape
 - CMS RDR



Linux Installation Tasks

- Install medium location (FTP, SMB, NFS)
 - A Linux-intel machine is ideal
 - A windows machine with an FTP server that supports the Rock Ridge extensions
 - Otherwise use smb install option
- Load location (tape, CMS RDR)
- Talk to networking folks
 - Start off with a few IP addresses and proxyarp
 - You will soon need your own subnet
- Prepare directory entry

Linux Directory Entry

```
USER LINUX1  YARIGHT  128M 128M G  
INCLUDE CMSUSER1  
ACCOUNT 2001 LINUX1  
LINK LINUX 191 191 RR  
MDISK 200 3390 0001 0400 VMWRK1 MR  
MDISK 201 3390 0401 1600 VMWRK1 MR
```

```
PROFILE CMSUSER1  
IPL CMS PARM AUTOCR  
MACH ESA  
SPOOL 000C 2540 READER *  
SPOOL 000D 2540 PUNCH A  
SPOOL 000E 1403 A  
CONSOLE 0009 3215 T  
LINK MAINT      0190 0190 RR  
LINK MAINT      019D 019D RR  
LINK MAINT      019E 019E RR  
LINK MAINT      0300 0300 RR  
LINK TCPMAINT 0592 0592 RR
```



Linux Initial Installation Tasks

- FTP install files from CD to VM
 - suse/images/vmrdr.ikr
 - suse/images/parmfile
 - suse/images/initrd
- As they appear in CMS...

```
LINUX  FILELIST A0  V 169  Trunc=169 Size=6 Line=1 Col=1 Alt=17
Cmd  Filename Filetype Fm Format Lrec1  Records  Blocks  Date  Time
LIN   EXEC    A1 V      28      9       1  1/30/02  0:32:38
SLES7 PARM     A1 V      36      2       1  1/30/02  0:31:59
SLES7 INITRD  A1 F      80    121559  2375  1/30/02  0:31:22
SLES7 IMAGE  A1 F      80    33709  579   1/30/02  0:21:03
LIPL  EXEC     A1 V      24      3       1  8/24/01  8:56:23
PROFILE EXEC     A1 F      80     10      1  8/24/01  8:37:11
```

```
1= Help      2= Refresh  3= Quit    4= Sort(type)  5= Sort(date)  6= Sort(size)
7= Backward  8= Forward  9= FL /n 10=          11= XEDIT/LIST 12= Cursor
```

```
====>
```

```
X E D I T 1 File
```


Linux Initial Installation Tasks

- Exec to punch files to the CMS RDR
- IPL RDR to boot Linux

```
/* REXX LOAD EXEC FOR SUSE LINUX S/390 VM GUESTS */  
/* LOADS SUSE LINUX S/390 FILES INTO READER      */  
SAY ''  
SAY 'LOADING FILES INTO READER...'  
'CP CLOSE RDR'  
'PURGE RDR ALL '  
'SPOOL PUNCH * RDR'  
'PUNCH SLES7 IMAGE A (NOH'  
'PUNCH SLES7 PARM A (NOH'  
'PUNCH SLES7 INITRD A (NOH'  
'CH RDR ALL KEEP NOHOLD'  
'IPL 00C CLEAR'
```



Linux Initial Installation

- **Boot messages...**

```
hwc low level driver: can write messages
hwc low level driver: can not read state change notifications
hwc low level driver: can read commands
hwc low level driver: can read priority commands
Linux version 2.4.7-SuSE-SMP (root@s390vm11) (gcc version 2.95.3 20010315 (SuSE)
) #1 SMP Tue Oct 30 23:24:09 GMT 2001
We are running under VM
This machine has an IEEE fpu
On node 0 totalpages: 32768
zone(0): 32768 pages.
zone(1): 0 pages.
zone(2): 0 pages.
Kernel command line: ramdisk_size=32768 root=/dev/ram0 ro
Highest subchannel number detected (hex) : 000D
Calibrating delay loop... 158.10 BogoMIPS
Memory: 115872k/131072k available (1924k kernel code, 0k reserved, 617k data, 48
k init)
Dentry-cache hash table entries: 16384 (order: 5, 131072 bytes)
Inode-cache hash table entries: 8192 (order: 4, 65536 bytes)
Mount-cache hash table entries: 2048 (order: 2, 16384 bytes)
Buffer-cache hash table entries: 8192 (order: 3, 32768 bytes)
Page-cache hash table entries: 32768 (order: 5, 131072 bytes)
debug: Initialization complete
POSIX conformance testing by UNIFIX
```

Linux Initial Installation

```
Detected 1 CPU's
Boot cpu address 0
cpu 0 phys_idx=0 vers=FF ident=011AAA machine=7060 unused=0000
init_mach : starting machine check handler
init_mach : machine check buffer : head = 0024E404
init_mach : machine check buffer : tail = 0024E408
init_mach : machine check buffer : free = 0024E40C
init_mach : CRW entry buffer anchor = 0024E410
init_mach : machine check handler ready
Linux NET4.0 for Linux 2.4
Based upon Swansea University Computer Society NET3.039
Initializing RT netlink socket
mach_handler : ready
mach_handler : waiting for wakeup
Starting kswapd v1.8
VFS: Diskquotas version dquot_6.4.0 initialized
pty: 256 Unix98 ptys configured
block: queued sectors max/low 76773kB/25591kB, 256 slots per queue
RAMDISK driver initialized: 16 RAM disks of 32768K size 1024 blocksize
loop: loaded (max 8 devices)
debug: cio_msg: new level 2
debug: cio_trace: new level 2
debug: cio_crw: new level 6
NET4: Linux TCP/IP 1.0 for NET4.0
IP Protocols: ICMP, UDP, TCP, IGMP
IP: routing cache hash table of 512 buckets, 8Kbytes
```

Linux Initial Installation

```
TCP: Hash tables configured (established 4096 bind 8192)
Linux IP multicast router 0.06 plus PIM-SM
NET4: Unix domain sockets 1.0/SMP for Linux NET4.0.
RAMDISK: Compressed image found at block 0
Freeing initrd memory: 9547k freed
EXT2-fs warning: checktime reached, running e2fsck is recommended
VFS: Mounted root (ext2 filesystem).
This is SuSE Instsys Version 2001.10.24 Rel. 4
Build date: Wed Oct 31 14:27:41 GMT 2001
mount: proc already mounted
Mounted /proc
Creating /var/log/boot.msg
Enabling system logging...
Sep 27 08:37:19 suse syslogd 1.3-3: restart.
/linuxrc: line 15:      18 Terminated          /sbin/syslogd -m 720
=
==--      Welcome to SuSE Linux Enterprise Server 7 for S/390 and zSeries      ==
=
```

Please select the type of your network device:

- 0) no network
- 1) OSA Token Ring
- 2) OSA Ethernet
- 3) OSA-Gigabit Ethernet or OSA-Express Fast Ethernet
- 4) Channel To Channel
- 5) Escon
- 6) IUCV
- 8) Hipersockets
- 9) Show subchannels and detected devices

Enter your choice (0-9): 6

Linux Initial Installation

The name of the peer guest, e.g. 'TCPIP' (TCPIP): TCPIP

Trying to start the netiucv module now...

```
insmod netiucv iucv='TCPIP' :
```

Using /lib/modules/2.4.7-SuSE-SMP/kernel/drivers/s390/net/netiucv.o

```
iucv0: 'TCPIP'
```

```
NETIUCV driver Version: 1.12  initialized
```

```
netiucv          17808    0 (unused)
```

```
netiucv module is loaded, checking interface iucv0.
```

```
iucv0      Link encap:Serial Line IP
```

```
           POINTOPOINT NOARP  MTU:9216  Metric:1
```

```
           RX packets:0 errors:0 dropped:0 overruns:0 frame:0
```

```
           TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
```

```
           collisions:0 txqueuelen:50
```

```
           RX bytes:0 (0.0 b)  TX bytes:0 (0.0 b)
```

iucv0 seems to exist, continuing with network setup.

Please enter your full host name, e.g. 'linux.example.com' (linux.example.com):

```
linux1
```

Please enter your IP address, e.g. '192.168.0.1' (192.168.0.1): 172.16.102.9

Please enter the IP address of your peer, e.g. '192.168.0.254' (192.168.0.254):

```
172.16.102.8
```

Please enter the IP address of the DNS server or 'none' for no DNS (none): none

Please enter the MTU (Maximum Transfer Unit),

leave blank for default: (1500):

Configuration for iucv0 will be:

```
Full host name    : linux1
```

```
IP address       : 172.16.102.9
```

```
Peer IP address  : 172.16.102.8
```

Linux Initial Installation

```
MTU size          : 1500
Is this correct (Yes/No) ? yes
```

For security reasons you have to set an temporary installation system password for the user "root". You'll be asked for it only when you telnet into this installation system to limit the access to it and it will be cleared as soon as you shut down or reset the installation system

```
Please enter the temporary installation password: yaright
Temporary installation password set.
ifconfig iucv0 172.16.102.9 pointopoint 172.16.102.8 mtu 1500
/sbin/ifconfig iucv0 :
```

```
Network Setup finished, running inetd...
```

You should be able to login via telnet now, for ssh wait a few seconds, temporary host keys (only for installation) are being generated now:

```
Generating /etc/ssh/ssh_host_key.
Generating public/private rsa1 key pair.
Your identification has been saved in /etc/ssh/ssh_host_key.
Your public key has been saved in /etc/ssh/ssh_host_key.pub.
The key fingerprint is:
97:84:bb:7e:f8:89:b3:a7:19:56:c5:01:3e:0a:c2:a9 root@linux1
```

Linux Initial Installation

```
Generating /etc/ssh/ssh_host_dsa_key.  
Generating public/private dsa key pair.  
Your identification has been saved in /etc/ssh/ssh_host_dsa_key.  
Your public key has been saved in /etc/ssh/ssh_host_dsa_key.pub.  
The key fingerprint is:  
11:13:15:5b:68:e8:09:28:9a:ba:c6:49:53:d6:4c:64 root@linux1  
Generating /etc/ssh/ssh_host_rsa_key.  
Generating public/private rsa key pair.  
Your identification has been saved in /etc/ssh/ssh_host_rsa_key.  
Your public key has been saved in /etc/ssh/ssh_host_rsa_key.pub.  
The key fingerprint is:  
5e:13:75:e1:1f:72:73:18:af:2b:f7:00:ab:97:d5:06 root@linux1  
Starting SSH daemon..done
```

Generation of temporary installation host keys finished.
After installation, new, different SSH keys will be generated.

```
Jun 17 00:19:59 suse sshd[112]: Server listening on 0.0.0.0 port 22.  
You should be able to login via telnet and ssh now.
```

Don't use Windows telnet, it does not work, putty is ok:
CD1:/dosutils/puttytel/puttytel.exe

To restart network setup, enter:
netsetup

```
SuSE Instsys linux1:/ #
```

Linux Initial Installation

- YAST (Yet Another Setup Tool)
 - Used for installation of Linux
 - Used for some maintenance activities
- After connecting via telnet
 - Use insmod command to add initial DASD devices
 - Start YAST to continue installation



Linux Initial Installation

```
>>> >>> >>> SuSE Linux Enterprise Server 7 for S/390 and zSeries <<< <<< <<<
```

```
Choose the device numbers you want to use for Linux
```

```
!!! BE CAREFUL WHEN SELECTING DASDs - !!!
```

```
!!! YOU MAY DESTROY DATA ON SHARED DEVICES !!!
```

1. Enter 'insmod dasd dasd=<list of devices>'

Remember to separate devices by commas (<dev_no>,<dev_no>),
syntax for ranges is <from_dev_no>-<to_dev_no>
like

```
'insmod dasd dasd=FD00-FD0F,FD40,FD42,FD80-FD86'
```

Note: When updating, you have to load the dasd driver with the
same DASD order as in the installed system - see documentation
for further information.

2. Start installation or update with 'YaST'.

In case your function keys don't work, you can emulate them with
Ctrl-F Number, e.g. for F1: Ctrl-F and then '1'.

Linux Initial Installation

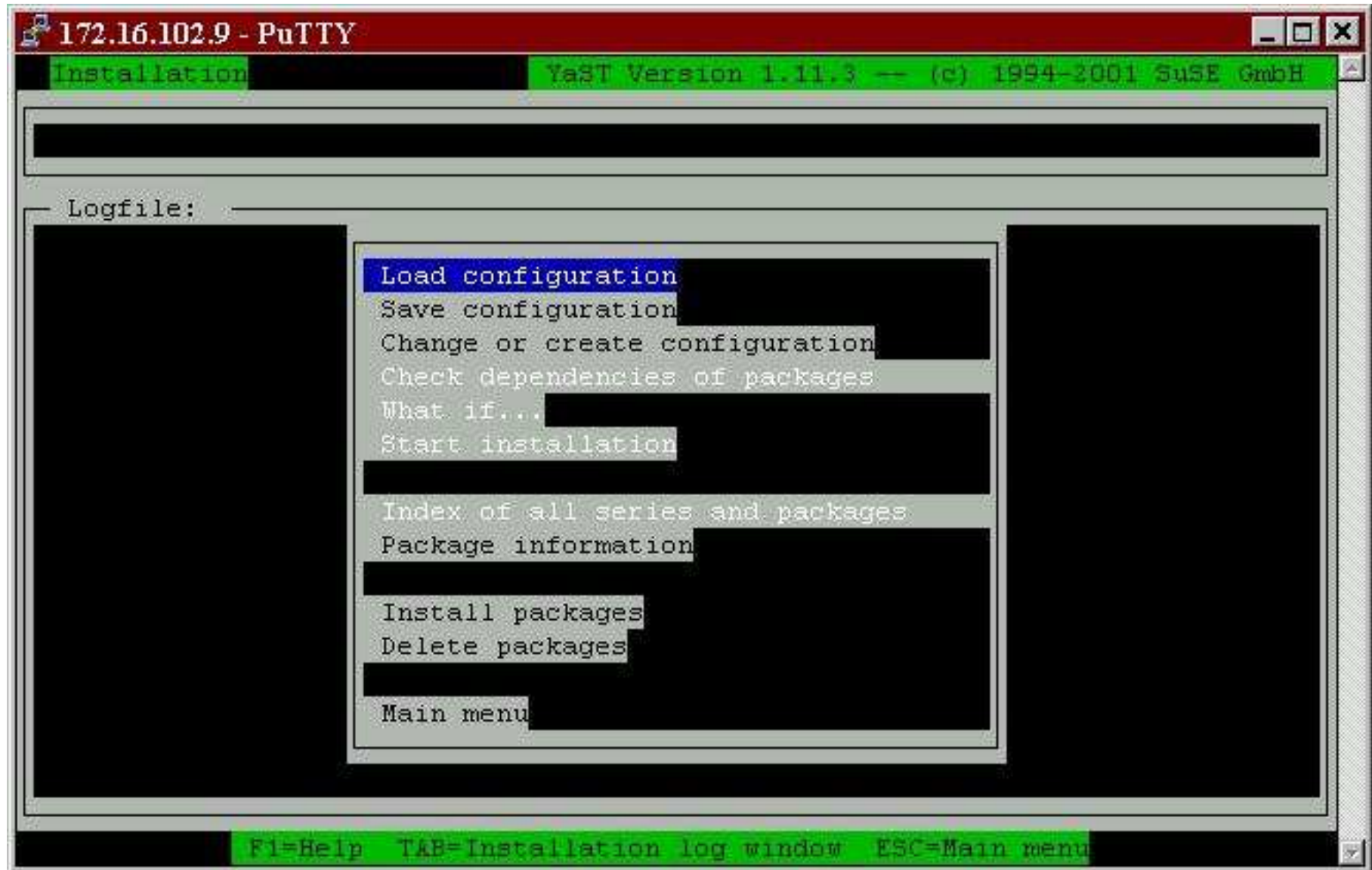
- In the case of this install:
 - `insmod dasd dasd=200-201`
- Start YAST
 - Select language
 - Select install medium
 - Install from scratch or update?
 - Select swap device
 - Partition drives?
 - Create filesystems
 - Set up FTP site (for an FTP install)



Linux Initial Installation

```
FTP Settings                               YaST Version 1.11.3 -- (c) 1994-2001 SuSE GmbH
FTP Server [Name|IP] :10.1.1.131
Server directory    :/cd1/suse
[ ] Use Proxy?
Proxy [Name|IP]     :(no proxy)
[X] Default FTP Port?
Port [Number]       :21
[ ] Anonymous FTP?
Login               :mainframe
Password            :**
Timeout [Seconds]   :60
-----
Log:
Check settings...
Connecting to [10.1.1.131]
-----
F1=Help  F5=Check  F10=Ok  Esc=Cancel
```

Linux Initial Installation



Linux Initial Installation

```
172.16.102.9 - PuTTY
Series selection YaST Version 1.11.3 -- (c) 1994-2001 SuSE GmbH
Series
a Linux Base System (required) [158.8 M]
ap Applications which do not need X [ 98.5 M]
beo Extreme Linux (Beowulf) [ 0 B]
d Development (C, C++, Lisp, etc.) [126.1 M]
doc Documentation [ 4.4 M]
e Emacs [ 0 B]
fun Games and more [ 0 B]
gnm GNOME - GNU Network Object Model Environment [ 0 B]
gra All about graphics [ 16.7 M]
han Korean packages [ 0 B]
j Japanese packages [ 0 B]
k2de KDE2 - K Desktop Environment (Version 2) [ 0 B]

<F3>=Zoom
device name partition total used free free% mount point
/dev/dasda1 DASD 340.5 M 97.5 M 243.1 M 71% /
/dev/dasdb1 DASD 1.46 G 620.4 M 877.9 M 58% /usr

F1=Help F4=Resorting F5=Dependencies F10=Esc=Exit
```

Linux Initial Installation

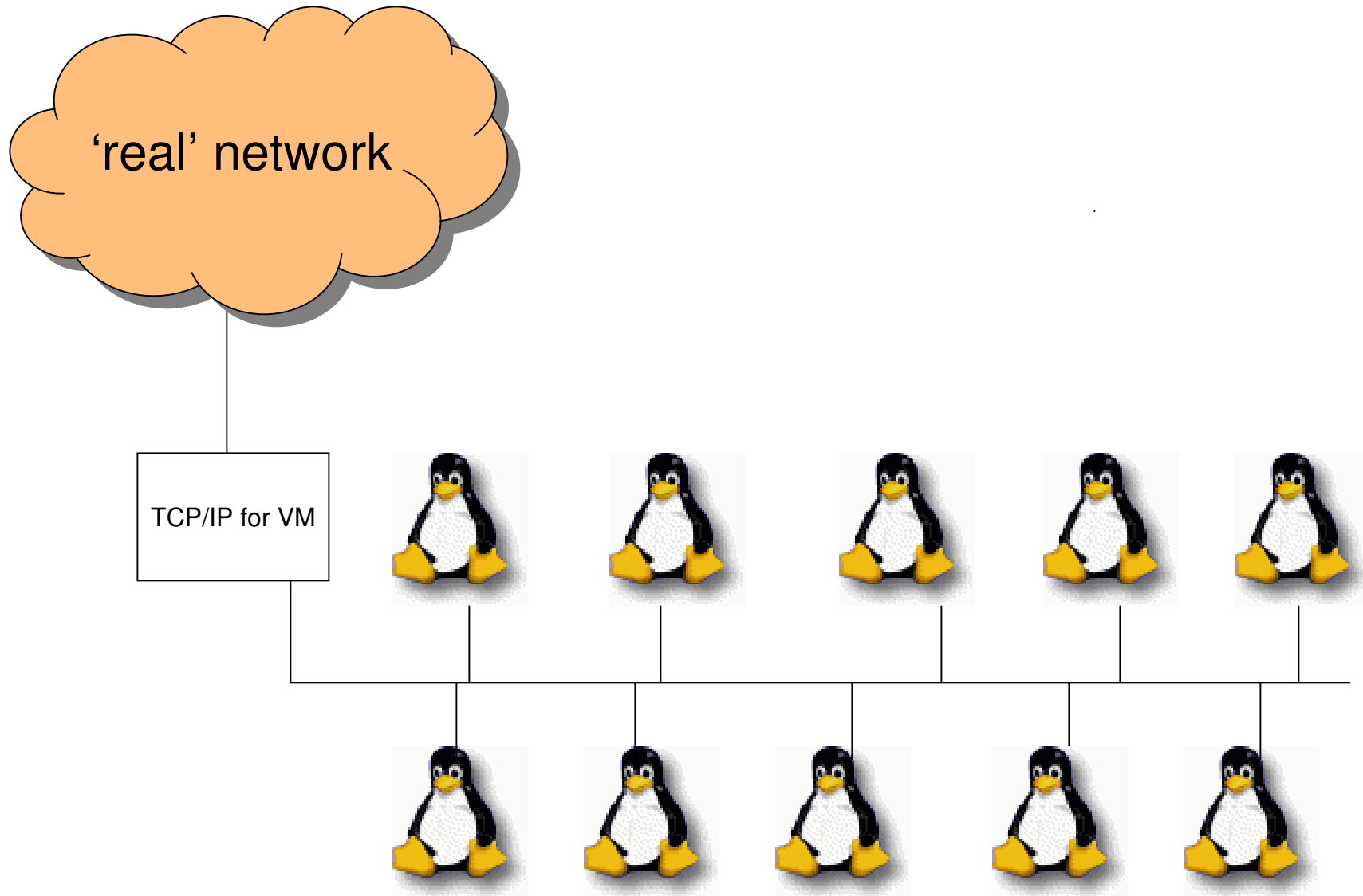
- Select packages desired
 - Or use canned configurations
- Package dependencies will come up
 - Some packages require others
- When done hit F10 from 'Series Selection'
 - RPM will be invoked continually to install

Networking with Linux



- Options galore...
 - vCTC, IUCV, Guest LAN
 - Token Ring, Ethernet, FENET, Hipersockets
- Newer installs will (should!) gravitate toward Guest LAN
- Point to point links may still be relevant

Networking with Linux



Networking with



- Guest LAN Setup
 - Service for z/VM 4.2
 - UM30225 (CP), UQ61461 (TCPIP)
 - and prereqs!
 - LAN Name?
 - Network/Netmask?
 - QDIO device numbers?
 - Use SET VMLAN (command or SYSTEM CONFIG)
 - Set system wide Guest LAN values
 - Accounting and number of LANs allowed
 - Other options
 - Persistence, accounting & access

Networking with Linux



- Guest LAN Setup – Define the LAN

- SYSTEM CONFIG statement

```
/*  
/*          Guest LAN setup          */  
/*  
Define LAN GLAN1 Ownerid System Type QDIO Maxconn Inf
```

- CP Command

```
DEFINE LAN GLAN1 MAXCONN INF OWNERID SYSTEM TYPE QDIO
```

- MFS (maximum frame size) 16K (24, 40, 64)

- Hipersocket LANs only

- If RESTRICTED

- Use SET LAN to define access list

```
SET LAN name (GRANT | REVOKE) user
```

Networking with



- Guest LAN Setup – Define virtual NIC

- CP command:

```
DEFINE NIC 0600 QDIO DEV 3  
COUPLE 0600 TO SYSTEM GLAN1
```

- in directory:

```
SPECIAL 0600 QDIO 3 SYSTEM GLAN1
```

Networking with Linux

- Other commands

- QUERY [VMLAN | LAN | NIC]

```
q vmlan
```

```
VMLAN maintenance level:
```

```
Latest Service: VM62938
```

```
VMLAN default accounting status:
```

```
SYSTEM Accounting: OFF          USER Accounting: OFF
```

```
VMLAN general activity:
```

```
PERSISTENT Limit: INFINITE      Current: 0
```

```
TRANSIENT  Limit: INFINITE      Current: 0
```

```
q lan
```

```
LAN SYSTEM GLAN1          Type: QDIO          Active: 0          MAXCONN: INFINITE
```

```
PERSISTENT UNRESTRICTED MFS: 8192          ACCOUNTING: OFF
```

```
q nic
```

```
Adapter 0600  Type: QDIO          Name: GL1          Devices: 3
```

```
Port 0 MAC: 00-04-AC-00-00-00  LAN: SYSTEM GLAN1          MFS: 8192
```

- UNCOUPLE (detaches cable from virtual NIC)

- DETACH NIC (remove NIC from virtual machine)

- DETACH LAN

- Destroys Guest LAN

```
detach lan glan1 ownerid system
```

```
LAN SYSTEM GLAN1 is destroyed
```



Networking with



- Connecting z/VM to the Guest LAN

```
DEVICE OSD1 OSD 0600 PORTNAME GLAN1 AUTORESTART  
LINK OSD1 QDIOETHERNET OSD1
```

HOME

```
172.16.102.8 OSD1
```

GATEWAY

```
;           First           Subnet           Subnet  
; Address   Hop     Link   MTU   Mask   Value  
  172.16    =     OSD1  8192  0.0.255.0  0.0.102.0
```

START OSD1

Networking with Linux



- Connecting Linux for S/390 to the Guest LAN
 - SLES 7.2 distribution QDIO drivers work fine

A screenshot of a PuTTY terminal window titled "172.16.102.9 - PuTTY". The terminal displays a menu titled "SELECTION OF NETWORK" with instructions and a table of network device options. The table has columns for "Number", "Active", "Type of network", "Device name", "IP address", "PCMCIA", and "PtP address". The first row is highlighted in blue. Below the table is a prompt "<Create an additional network>". At the bottom, there are function key assignments: F3=Auto IP, F4=Deactivate, F5=Device, F6=IP address, F7=Hardware, F8=ISDN, F9=PCMCIA, and F10=Save.

```
172.16.102.9 - PuTTY
-----SELECTION OF NETWORK-----
The base configuration of your network devices is set here. Press F6 to
assign an IP address to a network device. Use F7 to configure your hardware;
this is only necessary with ISDN and PLIP networks. The ISDN parameters may
be configured by pressing F8.

Number Active Type of network Device name IP address PCMCIA PtP address
-----
[0] [X] IUCV iucv0 172.16.102.9 [ ] 172.16.100.8
[1] [X] Hipersocket hsi0 172.16.102.10 [ ]
[2] [ ] Unknown [ ]
[3] [ ] Unknown [ ]

<Create an additional network>

F3=Auto IP F4=Deactivate F5=Device F6=IP address
F7=Hardware F8=ISDN F9=PCMCIA
F10=Save
```

Networking with Linux



- Additional Linux changes

- In `/etc/chandev.conf`:

```
add_parms,0x10,0x600,0x602,portname:GLAN1
qeth0,0x600,0x601,0x602
```

- In `/etc/modules.conf`:

```
alias eth0 qeth
alias eth1 qeth
alias hsi0 qeth
alias hsi1 qeth
```

Networking with Linux



- Use `ifconfig` to check the interface(s)

```
linux1:~ # ifconfig eth0
eth0      Link encap:Ethernet  HWaddr 00:00:00:00:00:00
          inet addr:172.16.102.10  Mask:255.255.255.0
          UP RUNNING NOARP MULTICAST  MTU:1492  Metric:1
          RX packets:1018 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:100
          RX bytes:42096 (41.1 Kb)  TX bytes:0 (0.0 b)
          Interrupt:8
```

- Notice the 1492 MTU, fix with YaST

Open Source Software

- Apache
- Samba
- CP Interface
- Distributions provide lots of other packages
- New releases or packages not included may run, if source is available
- The build process is not very difficult

Apache HTTP Server

- One of a number of projects of the Apache Software Foundation
- Consistently ranked as serving over 60% of the web sites in the world¹
- A variation used by IBM to front-end WebSphere Application Server
- Can be installed automatically

¹www.netcraft.com/survey



The **Apache Software Foundation**

<http://www.apache.org/>

Apache HTTP Server

- Should come right up after install at boot time
- Configuration information in `/etc/httpd.conf`
- Numerous parameters
 - Listening port(s)
 - Virtual web servers
 - Modules support
 - Directory level security
- Documentation can also be installed



The **Apache Software Foundation**

<http://www.apache.org/>

Apache HTTP Server



This is only a test page for the webserver!
SuSE is not responsible for the contents of this domain!

system information

Operating system: [SuSE SLES-7 (s390)]
Host: [linuxs1.rks0.com, Kernel: 2.4.7-SuSE-SMP (s390)]

webserver
and modules

Webserver version:
[Apache/1.3.19 (Unix) (SuSE/Linux) mod_ssl/2.8.3 OpenSSL/0.9.6a]

documentation

Installed modules:
[PHP module is not installed]
[Apache perl module (mod_perl) is not installed]
[Apache DAV module (mod_dav) is not installed]
[Apache Python module (mod_python) is not installed]
[SuSE help system]
[/usr/share/doc/ directory]
[The PHP manual is not installed]
[Apache manual is not installed]

[The SuSE website]

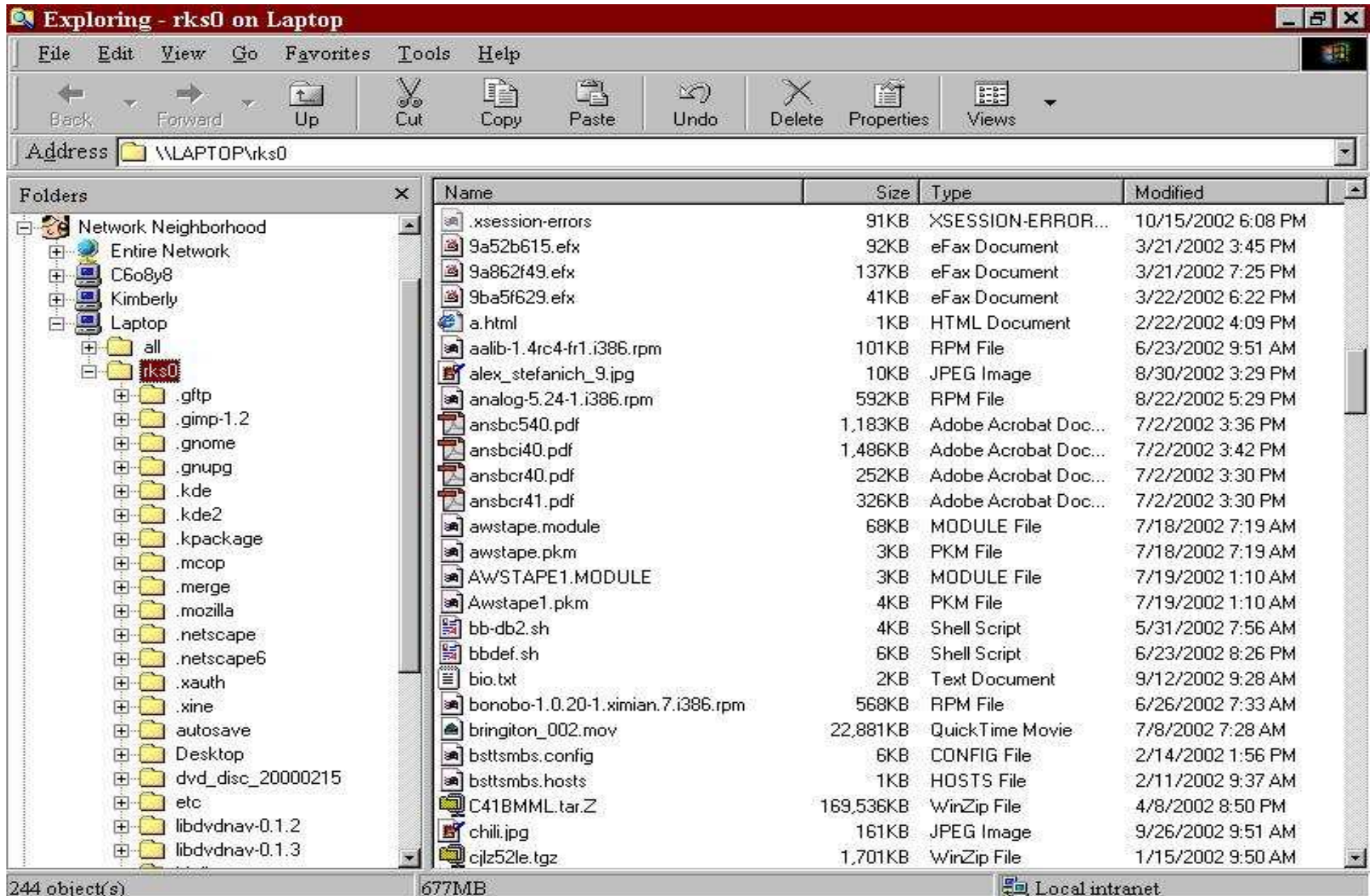
Samba

- Provides seamless file and print services to SMB/CIFS clients
- Makes a Unix/Linux system look and act like a Windows NT/2K server
- Samba ports
 - Available for many variants of Unix
 - Available for VMS, AmigaOS, Netware, VM/ESA-z/VM (OE) and VSE/ESA
 - A variation is available for OS/390-z/OS



Samba

The emulation is convincing enough for Windows Explorer



Samba – smb.conf

- /etc/smb.conf (/etc/samba/smb.conf)

```
[global]
# workgroup = NT-Domain-Name or Workgroup-Name
    workgroup = kims-domain

# server string is the equivalent of the NT Description field
    server string = Laptop Samba server
    netbiosname = laptop

# This option is important for security. It allows you to restrict
# connections to machines which are on your local network. The
# following example restricts access to two C class networks and
# the "loopback" interface. For more examples of the syntax see
# the smb.conf man page
    hosts allow = 192.168. 127.

# this tells Samba to use a separate log file for
# each machine that connects
    log file = /var/log/samba/%m.log

# Put a capping on the size of the log files (in Kb).
    max log size = 50

# Security mode. Most people will want user level
# security. See security_level.txt for details.
    security = share

[homes]
    comment = Home Directories
    browseable = no
    writable = yes
    valid users = %S
    create mode = 0664
    directory mode = 0775

[all]
    comment = Entire filesystem
    path = /
    read only = no
    public = yes
    valid users = rks0
    writable = yes
```

Samba - configuration

- Can be configured as standalone server or part of a domain
- Can be a primary domain controller
 - Perform domain logons for WinNT/2K clients
 - User level security for Win9x clients
 - Provide user/group lists to clients
 - Supply roaming user profiles
 - Allow WinNT system policies
- Can participate in active directory
- Great examples in
 - Linux on IBM eServer and S/390: ISP/ASP Solutions
 - Linux on IBM eServer and S/390: Distributions



CP Interface

- An interface to z/VMs Control Program
- Written by Neale Ferguson of Software AG
- Can be installed from SuSE CDs
- In `/etc/boot.local` add:

```
/sbin/cpint_load  
/sbin/cpint-post-insmod
```

- Use `hcp` command to interface with CP

```
linux1:/ # hcp q cplevel  
z/VM Version 4 Release 3.0, service level 0201 (32-bit)  
Generated at 10/18/02 12:47:44 EDT  
IPL at 10/19/02 00:38:33 EDT  
Ready;
```

Other Open Source Software

- BIND
 - Provides DNS services
- Sendmail
 - SMTP Server for Linux
- Big Brother
 - Network Monitor with notification capability
- All software is open source, but licensing differs



IBM Software

- Java (JDK 1.3.1)
- Tivoli Storage Manager (TSM) client
- DB2 (UDB and Connect)
- WebSphere Application Server

IBM Java



- Download from:
`http://www.ibm.com/java`
- Install with RPM:
`rpm -Uvh IBMJava2-SDK-1.3.1-2.0.s390.rpm`
- Fix standard path in `/etc/profile`
- Test with `java -version`
`java version "1.3.1"`
Java™ 2 Runtime Environment, Standard Edition (build 1.3.1)
Classic VM (build 1.3.1, J2RE 1.3.1 IBM build cx390131-
20020622 (JIT enabled: jitc))

TSM Client

- **Untar download package**

```
tar -xf TSM420_LINUX390.tar
```

- **Install with RPM**

```
cd linux390
```

```
rpm -i TIVsm-BA.s390.rpm
```



TSM Client

- In `/opt/tivoli/tsm/client/ba/bin/dsm.sys`

```
SErvername  adsm
  COMMmethod      TCPip
  TCPPort         1500
  TCPServeraddress 172.16.1.242
  Nodename        L3WEBST
  schedlogretention 14
  password        linux390
  txnbytelimit    25600
  largecommbuffers yes
```

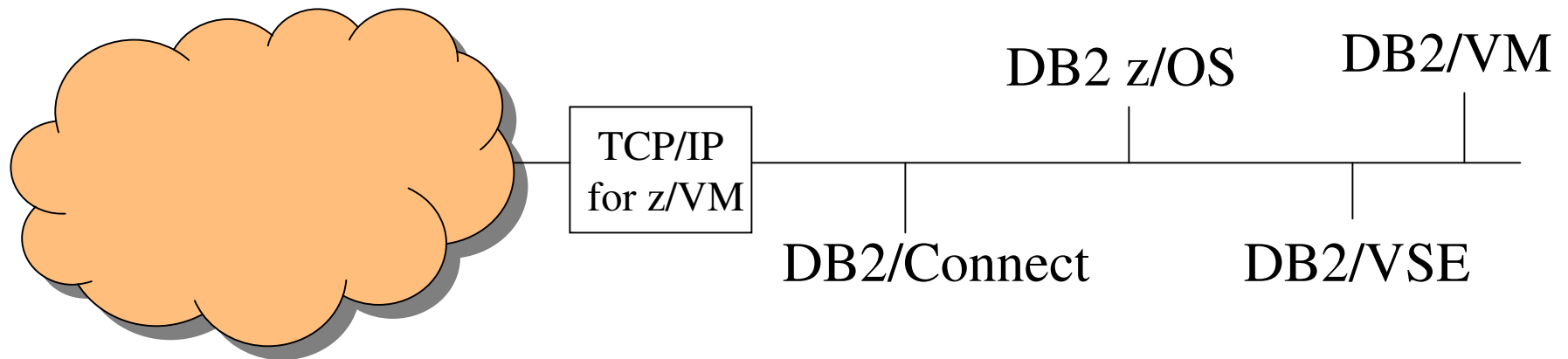
```
exclude /usr
include /usr/local
include /usr/IBMdb2
exclude core
```

- **Start the scheduler**

```
dsmc sched >/dev/null 2>&1 &
```

DB2 UDB/Connect

- One of the first major products available for Linux for S/390 from IBM
- Provides native relational database and DB2 gateway support



DB2/UDB Connect

- Installation via full screen text mode script
- Based on selections, will install many RPMs
- Database server and instances fully configured and started at boot time
- You need to set up connections and database definitions



```
db2 catalog tcpip node vseprod remote vseprod server 446
db2 catalog dcs db proddb as db2prod
db2 catalog db db2prod at node vseprod authentication dcs
```


WebSphere Application Server

- One of many products under the WebSphere umbrella
- Provides a framework and an environment for the development and execution of web based applications
- Applications can access relational databases for backend storage
- Connectors available for non-relational data access (CICS, VSAM, IMS/DL1)



WebSphere Application Server

- Installation is via a graphical application
- A Linux machine or a Windows xServer must be used
- On X Server
`xhost + (name | number)`
- On X Client
`set DISPLAY=number:0`
- Start install script
`./install.sh`

ISV Software

- Many, many vendors have caught on to the Linux wave
- Dozens and dozens of products available now and more coming
- See:

<http://www.ibm.com/servers/eserver/zseries/solutions/s390da/linuxproduct.html>

Finis



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