Linux for S/390
Technical Discussion

October 24, 2002
Rich Smrcina
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

• Initial System
  – Tape
  – CMS RDR

• Networking
  – Guest LAN, vCTC, IUCV
  – OSA (lcs, qeth)
  – 3172
  – ESCON CTC
  – Hipersockets
  – CLAW
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 extentions
    • 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 AUTOCLR
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...

```
<table>
<thead>
<tr>
<th>Cmd</th>
<th>Filename</th>
<th>Filetype</th>
<th>Fm</th>
<th>Format</th>
<th>Fm</th>
<th>Lrecl</th>
<th>Records</th>
<th>Blocks</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIN</td>
<td>EXEC</td>
<td>A1 V</td>
<td>28</td>
<td></td>
<td>9</td>
<td></td>
<td>1</td>
<td>1/30/02</td>
<td>0:32:38</td>
<td></td>
</tr>
<tr>
<td>SLES7</td>
<td>PARM</td>
<td>A1 V</td>
<td>36</td>
<td></td>
<td>2</td>
<td></td>
<td>1</td>
<td>1/30/02</td>
<td>0:31:59</td>
<td></td>
</tr>
<tr>
<td>SLES7</td>
<td>INITRD</td>
<td>A1 F</td>
<td>80</td>
<td></td>
<td>121559</td>
<td>2375</td>
<td>1/30/02</td>
<td>0:31:22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SLES7</td>
<td>IMAGE</td>
<td>A1 F</td>
<td>80</td>
<td></td>
<td>33709</td>
<td>579</td>
<td>1/30/02</td>
<td>0:21:03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LIPL</td>
<td>EXEC</td>
<td>A1 V</td>
<td>24</td>
<td></td>
<td>3</td>
<td></td>
<td>1</td>
<td>8/24/01</td>
<td>8:56:23</td>
<td></td>
</tr>
<tr>
<td>PROFILE</td>
<td>EXEC</td>
<td>A1 F</td>
<td>80</td>
<td></td>
<td>10</td>
<td></td>
<td>1</td>
<td>8/24/01</td>
<td>8:37:11</td>
<td></td>
</tr>
</tbody>
</table>
```

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

```
====>

XEDIT 1 File
```
Linux Initial Installation Tasks

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

```bash
/* 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
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
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
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:
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 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]
Linux Initial Installation
Linux Initial Installation
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

'real' network

TCP/IP for VM
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
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)

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

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

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

**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
[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:
Finis

• Contact info:
  Rich Smrcina
  Sytek Services, Inc
  rsmrcina@sytek-services.com
  Office: 262-392-2026
  Cell: 414-491-6001