

Connor Krukosky

There's a z890 in My Basement

Who am I?

- First computer at 18 months old.
- None of my toys stayed together for very long.
- Had to learn more about electronics.
- Aspiring EE.
- Started collecting vintage machines about 2-3 years ago.
- Started slow buying single computers.
- But it wasn't long before...

This...

- It was all downhill from here.



Then this happened...



From [REDACTED] ✨
Subject [midatlanticretro] OT: Rutgers is selling a IBM Z890 10/19/2015
To yahogroups ✨

Kind of off topic but I know people here like this stuff.
IBM z890 – Model: 2086-320, bidding so far \$100.00
<https://www.govdeals.com/index.cfm?fa=Main.Item&itemid=106&acctid=7529>

From Connor Krukosky connork@connorsdomain.com [midatlanticretro] ✨
Subject Re: [midatlanticretro] OT: Rutgers is selling a IBM Z890
To midatlanticretro@yahogroups.com ✨



Ohhh, thanks for posting this! I needed something to heat the basement this winter ;) I will definitely be going for this.
-Connor K

Warnings from the concerned.

From [REDACTED] 
Subject **Re: [midatlanticretro] OT: Rutgers is selling a IBM Z890**
To midatlanticretro@yahooogroups.com 

Whoa, Connor. The z890 weighs well over a ton and doesn't fit through most doorways. This is not one to chase.

-Dave

From [REDACTED] 
Subject **Re: [midatlanticretro] OT: Rutgers is selling a IBM Z890**
To midatlanticretro@yahooogroups.com 

Heat the house and hold down the floors, this machine is probably 2,200 lbs.

Jokes from the not so concerned.

From [REDACTED] ★
Subject **Re: [midatlanticretro] OT: Rutgers is selling a IBM Z890**
To [REDACTED] ★

Connor: 115lbs
z890: 2,300lbs

We could sell tickets. :-)

From [REDACTED] ★
Subject **Re: [midatlanticretro] OT: Rutgers is selling a IBM Z890**
To midatlanticretro@yahoogroups.com ★

On 10/19/2015 03:38 PM, [REDACTED] wrote:


Connor: 115lbs
z890: 2,300lbs

We could sell tickets. 😊


Priceless ?


This didn't stop me.

- Also I had already bid...
- Started planning.
- Realized I was screwed...
- Two trips had to happen.
- Before I realized it...

From [REDACTED] 

Subject **Re: [midatlanticretro] OT: Rutgers is selling a IBM Z890**

To midatlanticretro@yahooogroups.com 

On 10/19/2015 04:27 PM, [REDACTED] 
[midatlanticretro] wrote:

Connor: 115lbs
z890: 2,300lbs

We could sell tickets. 😊

Priceless ?

Guys, enough. This is not a joke. This thing weighs a couple THOUSAND pounds. Iron like this can kill someone in the briefest moment of distraction, and we're not exactly talking about the most focused person here. Then, when the liability lawyers get done with Rutgers, you can be most certain that no hardware like this will ever reach the public again.

-Dave


I had won the z890.

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Main Frame Computer IBM z890 – Model: 2086-320



[More media](#)

Make/Brand	Model	VIN/Serial	Condition	Category
IBM	2086-320	013E0B	See Description	Computers, Parts and Supplies

IBM z890 – Model: 2086-320:

- Serial Number: 013E0B • 20 MSU's • 133 MIPS

Auction Closed

High Bidder: c*****a
Sold Amount: \$211.01
Buyer's Premium (12.50%): \$26.38
Total Price: **\$237.39**

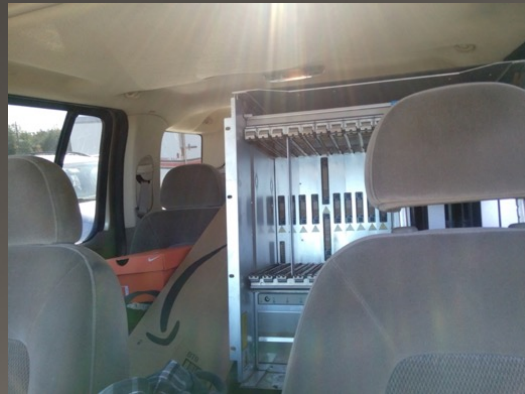
[View Bid History](#)
[Terms and Conditions](#)

250 visitors

And so it began.



The big move.



So far so good.

- I had to go and jinx it...
- First Roadblock: Wasn't going to fit under the deck!



A New Day

- My father excavated some land.
- Things were looking promising!



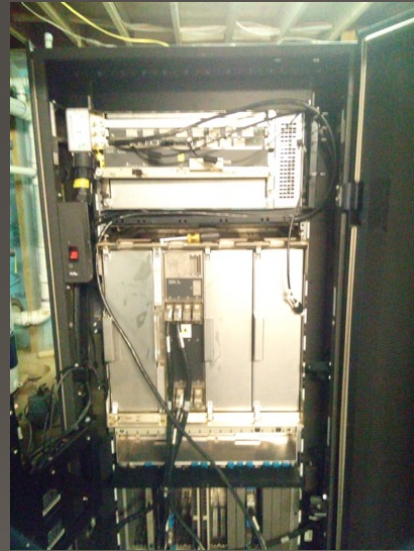
Very tight fit!



Finally!

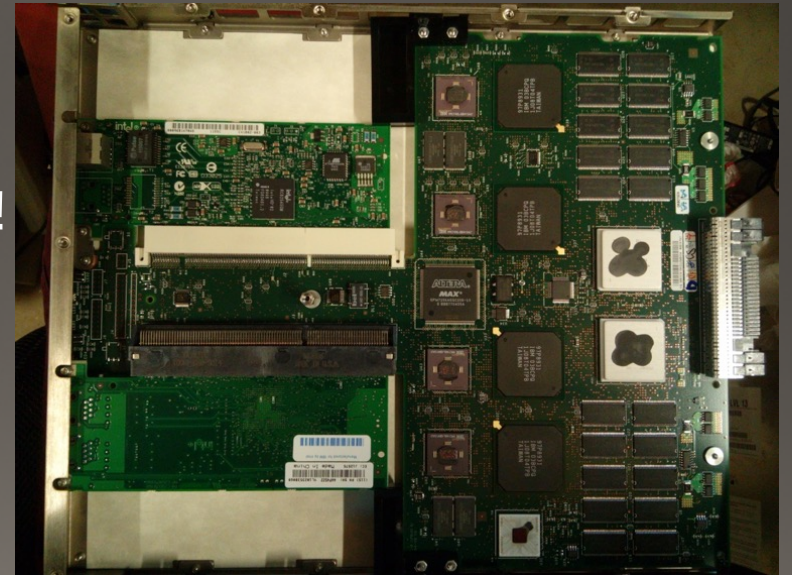


Reassembly.



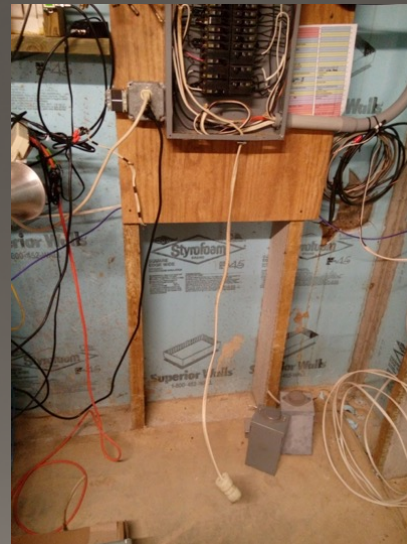
Second Roadblock: Bad Thermal Compound

- When removing I/O modules, heatsinks appeared.
- I knew this wasn't too good of a sign...
- Almost every module had this problem.
- Redoing these took a long time.
- Probably a good idea to check yours too!



Third Roadblock: Power

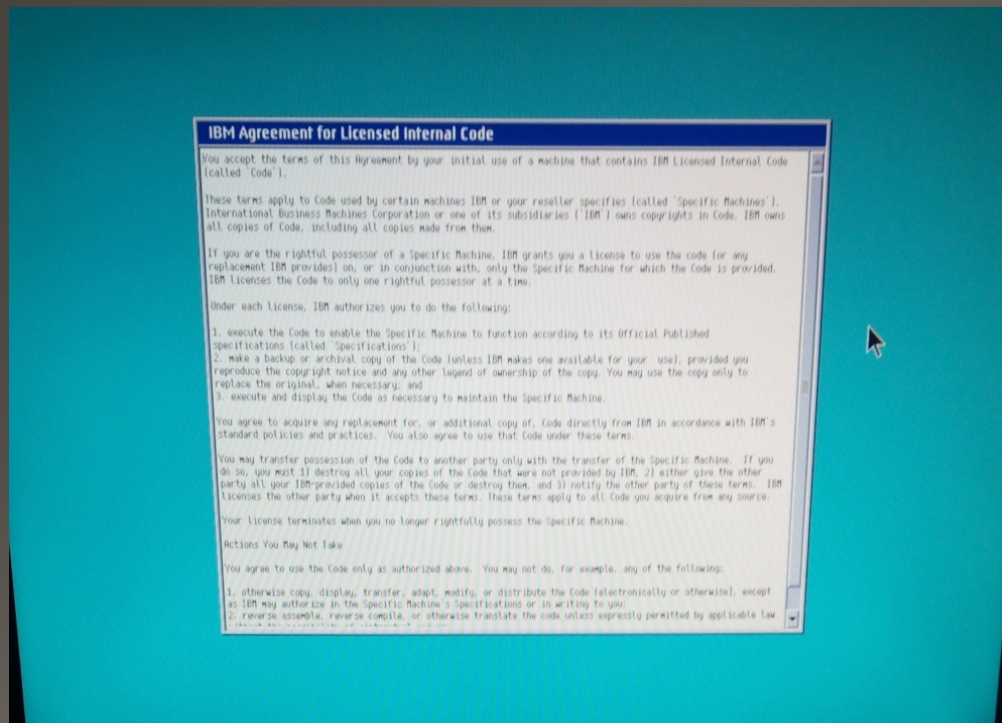
- Originally wired for 3-phase.
- Learned that you can rewire for single phase.
- Just ignore the 3rd phase! Easy enough!
- Requires 220v at 30A.
- Just had to get 220v out of the panel.
- Legal?
- Probably not, but it worked!



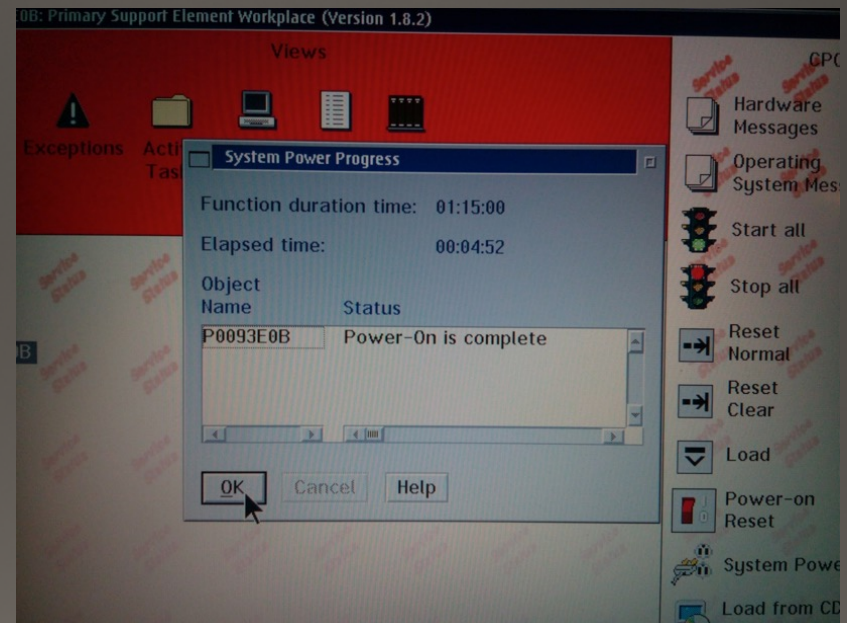
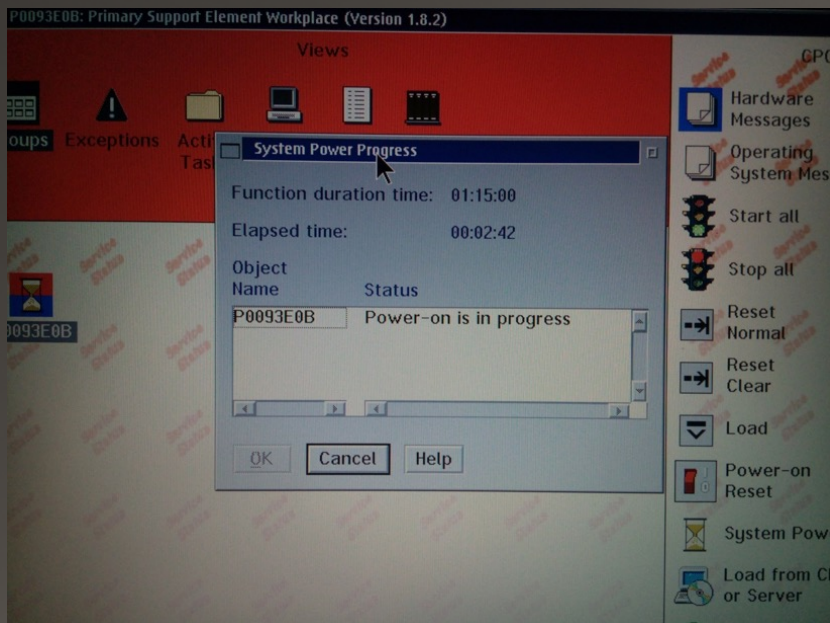
What's this?



Oh... Guess its time to wait.



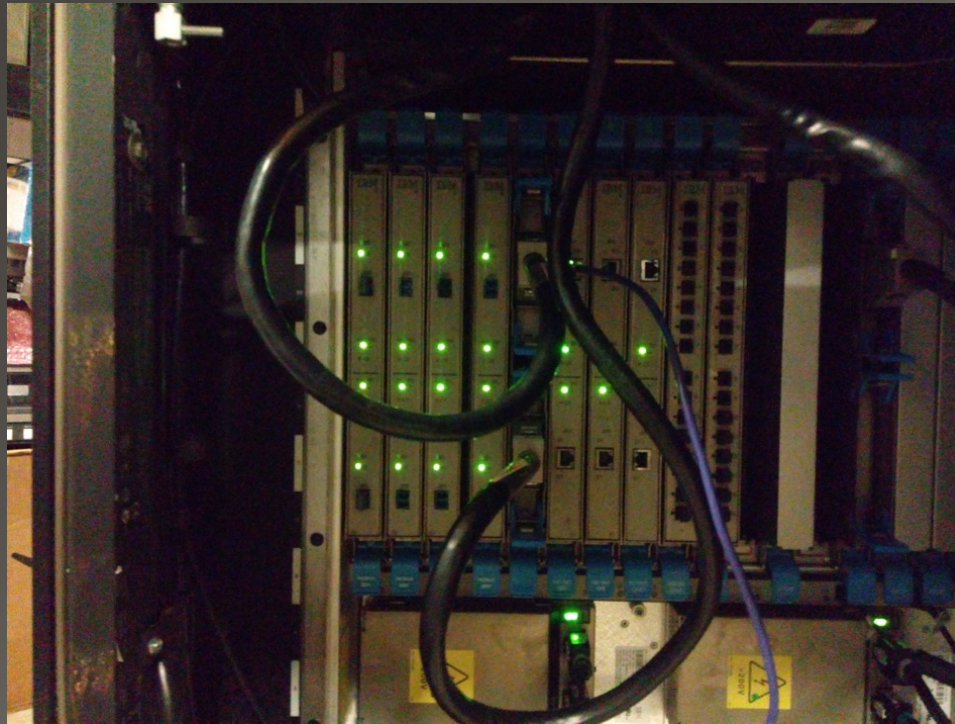
Power-on!



Fourth Roadblock: User Error

- When trying to POR (Power-on Reset) it was throwing an error and none of my I/O seemed to be working.
- Played around on the ThinkPad for hours.
- This solved nothing.
- I finally decided to check power connections.
- I forgot to fully install the power supplies in the I/O...
- DOH!

Much better!



Fifth Roadblock: IOCDS / Reset Profile

- Next I had to change my I/O Configuration Data Set (IOCDS)
- To do this I had to use the IOCP (I/O Configuration Program)
- Exported the IOCDS to floppy to edit on my desktop.
- Hours later, and probably about 5 PDFs later I was figuring it out.
- Then I had to configure a new Reset Profile and a new LPAR.
- And then I was theoretically off to the races!

Old IOCDs vs. New IOCDs

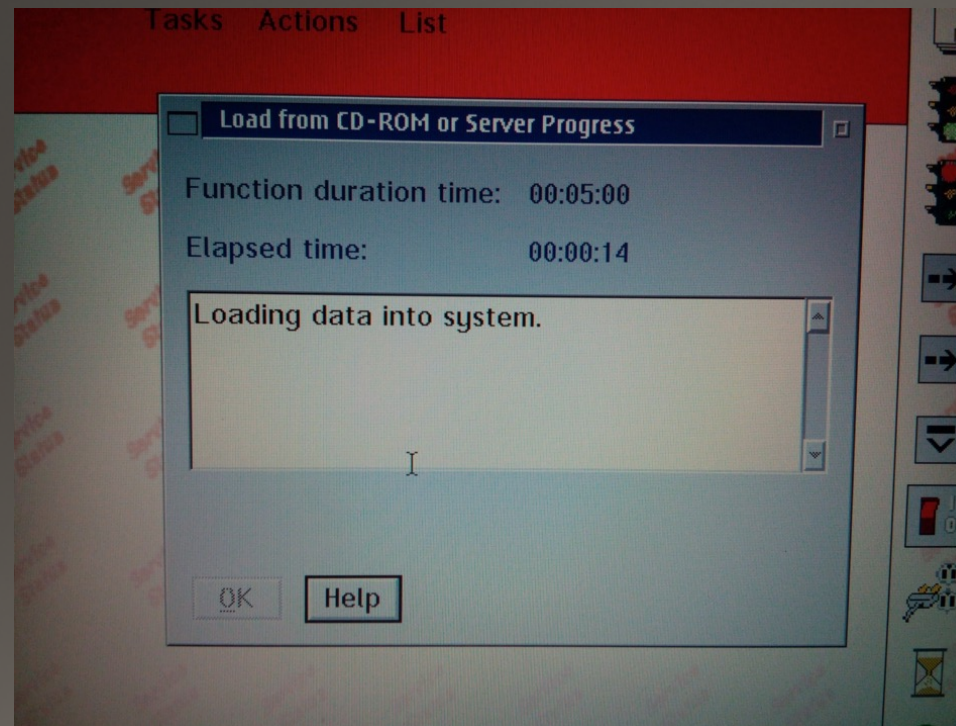
```
1  *SYSPRT *MAMR0001 *IOCD HAS WRITTEN WITH IOP 08/10/18 01:01:00
2  *MSG2 *SYS1.IODFA0 - 2015-04-29 16:29
3  *
4  *
5  *
6  *
7  *
8  *
9  *
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98 *
99 *
100 *
```

```
ID MSG1='SYS1.IODFA0
MSG2='SYS1.IODFA0 - 2015-04-29 16:29
SYSTEM=(2086,1),
TOK=( 'Z890
008000013E0B2086162909630115119F00000000,
00000000,'15-04-29','16:29:09',
'SYS1 ','IODFA0 ')
RESOURCE PARTITION=((CSS(0),(LINUX,1))),MAXDEV=((CSS(0),08192))
CHPID PCHID=100,PATH=(CSS(0),00),TYPE=FCP,SHARED,PARTITION=((LINUX))
CHPID PCHID=101,PATH=(CSS(0),01),TYPE=FCP,SHARED,PARTITION=((LINUX))
CHPID PCHID=110,PATH=(CSS(0),02),TYPE=FCP,SHARED,PARTITION=((LINUX))
CHPID PCHID=111,PATH=(CSS(0),03),TYPE=FCP,SHARED,PARTITION=((LINUX))
CHPID PCHID=120,PATH=(CSS(0),04),TYPE=FC,SHARED
CHPID PCHID=121,PATH=(CSS(0),05),TYPE=FC,SHARED
CHPID PCHID=130,PATH=(CSS(0),06),TYPE=FC,SHARED
CHPID PCHID=131,PATH=(CSS(0),07),TYPE=FC,SHARED
CHPID PCHID=140,PATH=(CSS(0),08),TYPE=OSC,SHARED
CHPID PCHID=141,PATH=(CSS(0),09),TYPE=OSD,SHARED
CHPID PCHID=150,PATH=(CSS(0),0A),TYPE=OSD,SHARED
CHPID PCHID=151,PATH=(CSS(0),0B),TYPE=OSD,SHARED
CHPID PCHID=160,PATH=(CSS(0),0C),TYPE=OSD,SHARED
CHPID PCHID=161,PATH=(CSS(0),0D),TYPE=OSD,SHARED
CNTLUNIT CUNUMBR=2000,PATH=(CSS(0),00),UNIT=FCP
CNTLUNIT CUNUMBR=2100,PATH=(CSS(0),01),UNIT=FCP
CNTLUNIT CUNUMBR=2200,PATH=(CSS(0),02),UNIT=FCP
CNTLUNIT CUNUMBR=2300,PATH=(CSS(0),03),UNIT=FCP
CNTLUNIT CUNUMBR=3100,PATH=(CSS(0),08),UNIT=OSC
CNTLUNIT CUNUMBR=3200,PATH=(CSS(0),09),UNIT=OSA
CNTLUNIT CUNUMBR=3300,PATH=(CSS(0),0A),UNIT=OSA
CNTLUNIT CUNUMBR=3400,PATH=(CSS(0),0B),UNIT=OSA
CNTLUNIT CUNUMBR=3500,PATH=(CSS(0),0C),UNIT=OSA
CNTLUNIT CUNUMBR=3600,PATH=(CSS(0),0D),UNIT=OSA
IODEVICE ADDRESS=(0100,064),CUNUMBR=(2000),UNIT=FCP
IODEVICE ADDRESS=(0200,064),CUNUMBR=(2100),UNIT=FCP
IODEVICE ADDRESS=(0300,064),CUNUMBR=(2200),UNIT=FCP
IODEVICE ADDRESS=(0400,064),CUNUMBR=(2300),UNIT=FCP
IODEVICE ADDRESS=(0500,8),CUNUMBR=(3100),UNIT=3270,MODEL=X
IODEVICE ADDRESS=(0510,3),CUNUMBR=(3200),UNIT=OSA
IODEVICE ADDRESS=(0520,3),CUNUMBR=(3300),UNIT=OSA
IODEVICE ADDRESS=(0530,3),CUNUMBR=(3400),UNIT=OSA
IODEVICE ADDRESS=(0540,3),CUNUMBR=(3500),UNIT=OSA
IODEVICE ADDRESS=(0550,3),CUNUMBR=(3600),UNIT=OSA
```

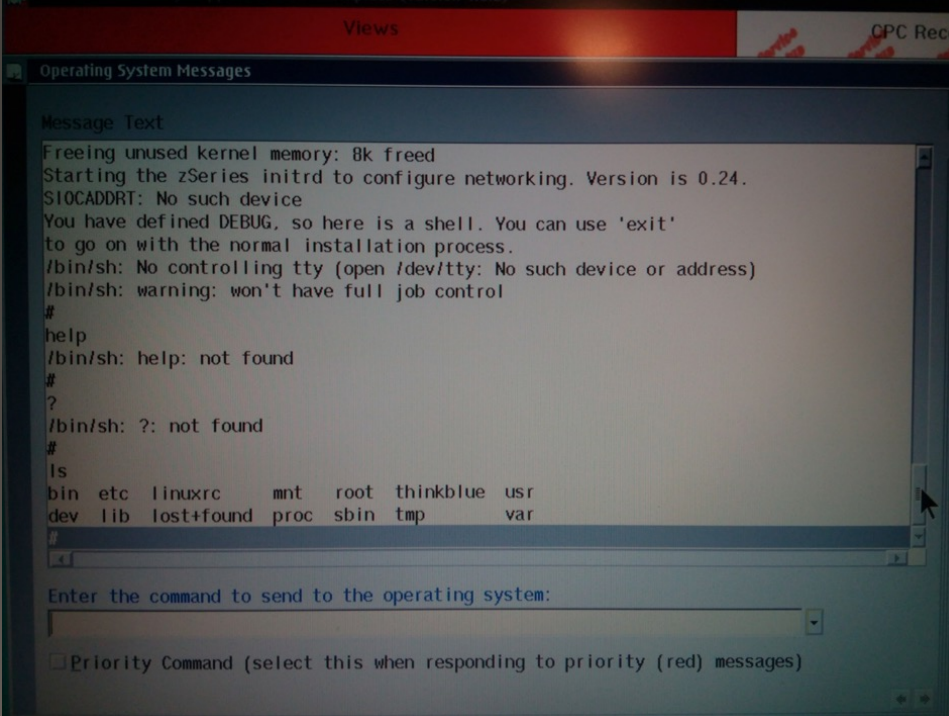

Time to Load over FTP

- Or so I thought.
- Where do you attach the LAN?!
- Another couple of PDFs later I figured it out.
- Oh and make sure your FTP password DOES NOT have any special characters!!!
- Yes I was trying to connect for hours before realizing...
- But finally...

Loading



Success!

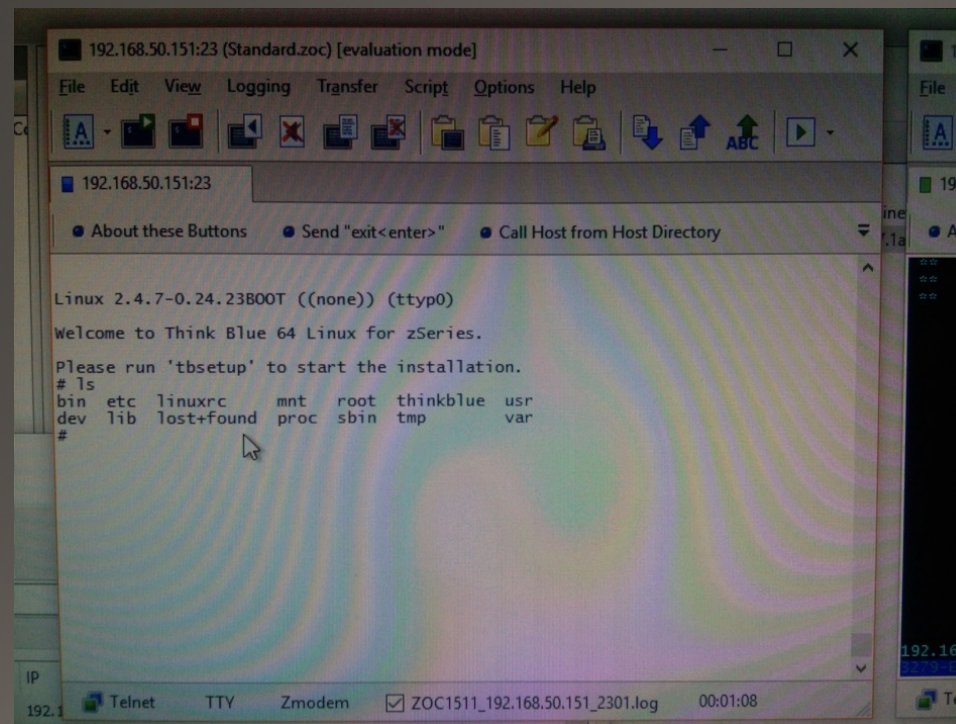


The screenshot shows a terminal window titled "Operating System Messages" with a red header bar. The terminal output includes the following text:

```
Message Text
Freeing unused kernel memory: 8k freed
Starting the zSeries initrd to configure networking. Version is 0.24.
SIOCADDRT: No such device
You have defined DEBUG, so here is a shell. You can use 'exit'
to go on with the normal installation process.
/bin/sh: No controlling tty (open /dev/tty: No such device or address)
/bin/sh: warning: won't have full job control
#
help
/bin/sh: help: not found
#
?
/bin/sh: ?: not found
#
ls
bin etc linuxrc mnt root thinkblue usr
dev lib lost+found proc sbin tmp var
#
```

Below the terminal output, there is a text input field with the label "Enter the command to send to the operating system:" and a checkbox labeled "Priority Command (select this when responding to priority (red) messages)".

Lets try SSH!



The screenshot shows a ZOC terminal window titled "192.168.50.151:23 (Standard.zoc) [evaluation mode]". The window has a menu bar with "File", "Edit", "View", "Logging", "Transfer", "Script", "Options", and "Help". Below the menu bar is a toolbar with various icons. The main terminal area shows a shell prompt "#" and the following text:

```
Linux 2.4.7-0.24.23B00T ((none)) (tty0)
Welcome to Think Blue 64 Linux for zSeries.
Please run 'tbsetup' to start the installation.
# ls
bin  etc  linuxrc  mnt  root  thinkblue  usr
dev  lib  lost+found  proc  sbin  tmp      var
#
```

At the bottom of the window, there is a status bar with "IP" and "192.168.50.151:23" on the left, and "Telnet", "TTY", "Zmodem", " ZOC1511_192.168.50.151_2301.log", and "00:01:08" on the right.

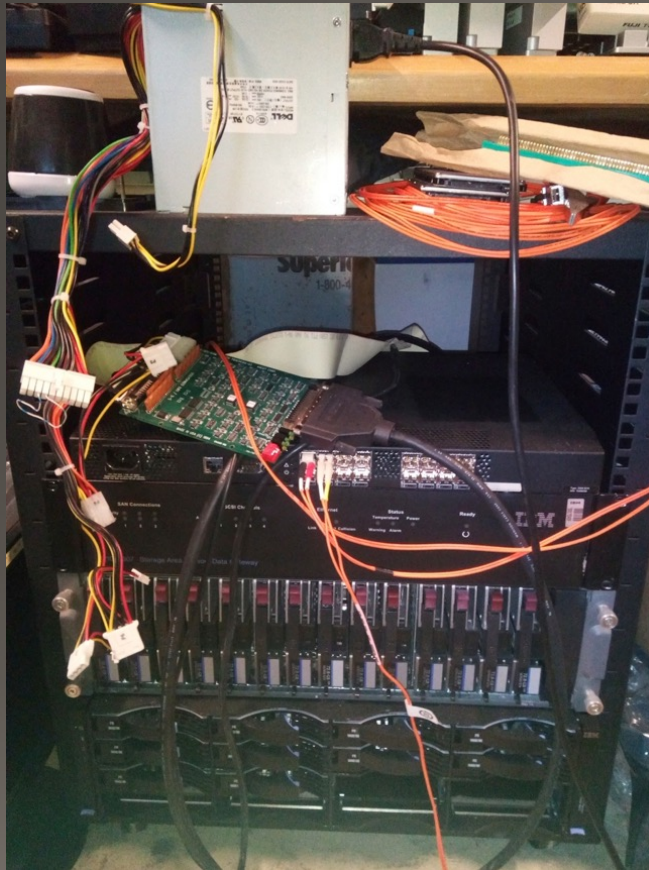
Sixth Roadblock: Storage

- I saw this coming from a mile away.
- All the proper FICON/ESCON based storage is too expensive.
- All BUS&TAG based storage is too hard to get.
- Only other option is a SAN attached to a FICON port via FCP.
- Started to gather stuff for specifically that.

Storage

- IBM 2108-G07 SAN Data Gateway
- IBM 2005-B16 TotalStorage SAN 16 Port Switch
- Ancot PBSED616A-03 Differential SCSI Converter
- 2x 3m LC-LC Duplex Fiber Optic Cable
- 2x 5m LC-SC Duplex Fiber Optic Cable
- HP StorageWorks MSA30 with 10x 300GB 10Krpm Drives
- Hitachi IBM 4Gb 1300nm GBIC SFP Transceiver HTR6g16R20-E
- Remember that last item...

Storage Cont.



Seventh Roadblock: Storage, again.

- I had to figure out how to actually configure the storage.
- Mainly the SAN Data Gateway.
- Then I had to learn how the Linux FCP Mapping system worked...
- Headaches ensued.

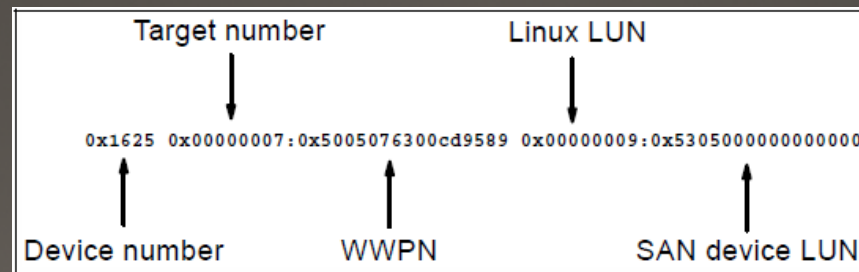


Figure 2-1 The format of an FCP map entry

The five elements in a map entry are:

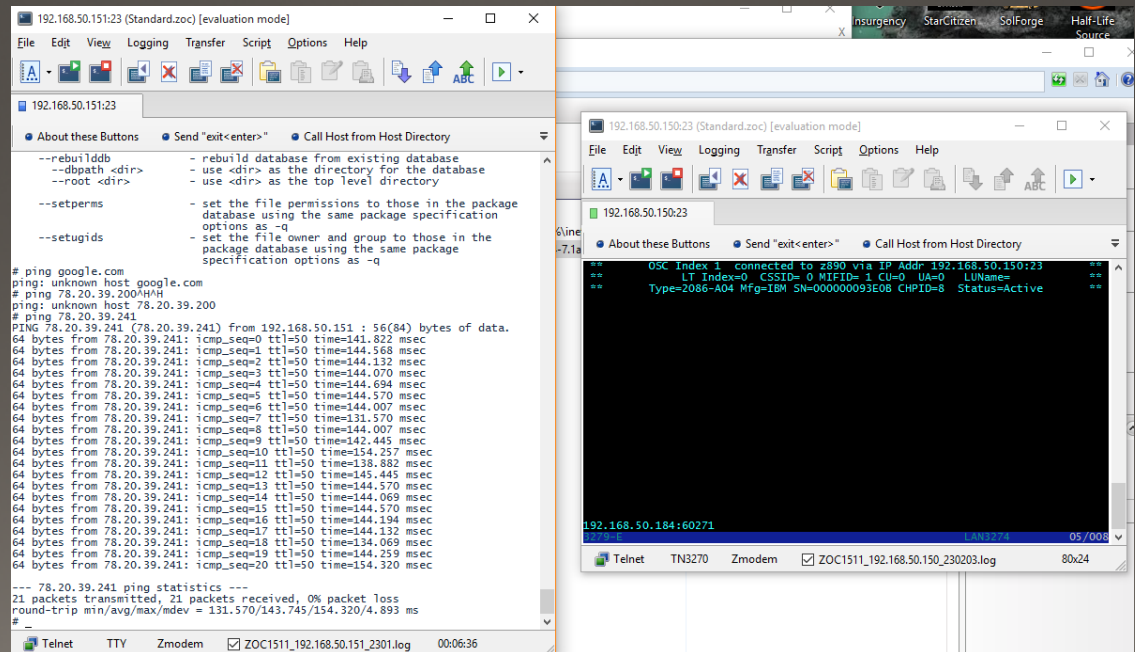
- ▶ Device number (explained in the next section)
- ▶ "Target number" on page 17
- ▶ "WWPN" on page 17
- ▶ "Linux LUN" on page 17
- ▶ "SAN device LUN" on page 17

Did you Remember?

- After 2 days of not being able to get it working...
- I learned the z890 has a LW (Long Wave, 1300nm) FICON port.
- Where as the FCP Switch and the SAN Gateway have SW (Short Wave, 850nm) ports.
- That's where the new SFP Module comes in.
- User Error, as always.

Time to Install!

- Loaded the CentOS Installer via FTP.
- Did an initial Ping test to Google.
- So far so good!



The image shows two overlapping screenshots of a ZOC terminal window. The left screenshot shows a terminal session on IP 192.168.50.151:23. It displays the output of several ping commands: a failed ping to google.com, a successful ping to 78.20.39.200, and a successful ping to 78.20.39.241. The ping to 78.20.39.241 shows 21 successful packets with 0% loss and a round-trip time of approximately 131-154 ms. The right screenshot shows a terminal session on IP 192.168.50.150:23. It displays the output of an 'osc' command, which shows that 'OSC Index 1' is connected to IP 192.168.50.150:23. The status is 'Active'.

```
192.168.50.151:23 (Standard.zoc) [evaluation mode]
File Edit View Logging Transfer Script Options Help

192.168.50.151:23
About these Buttons Send "exit<enter>" Call Host from Host Directory
--rebuilddb --rebuild database from existing database
--dbpath <dir> --use <dir> as the directory for the database
--root <dir> --use <dir> as the top level directory
--setperms --set the file permissions to those in the package
--setuids --set the file owner and group to those in the
package database using the same package
specification options as -q

# ping google.com
ping: unknown host google.com
# ping 78.20.39.200
ping: unknown host 78.20.39.200
# ping 78.20.39.241
PING 78.20.39.241 (78.20.39.241) from 192.168.50.151 : 56(84) bytes of data.
64 bytes from 78.20.39.241: icmp_seq=0 ttl=50 time=141.822 msec
64 bytes from 78.20.39.241: icmp_seq=1 ttl=50 time=144.568 msec
64 bytes from 78.20.39.241: icmp_seq=2 ttl=50 time=144.132 msec
64 bytes from 78.20.39.241: icmp_seq=3 ttl=50 time=144.070 msec
64 bytes from 78.20.39.241: icmp_seq=4 ttl=50 time=144.694 msec
64 bytes from 78.20.39.241: icmp_seq=5 ttl=50 time=144.570 msec
64 bytes from 78.20.39.241: icmp_seq=6 ttl=50 time=144.007 msec
64 bytes from 78.20.39.241: icmp_seq=7 ttl=50 time=131.570 msec
64 bytes from 78.20.39.241: icmp_seq=8 ttl=50 time=144.007 msec
64 bytes from 78.20.39.241: icmp_seq=9 ttl=50 time=142.445 msec
64 bytes from 78.20.39.241: icmp_seq=10 ttl=50 time=154.257 msec
64 bytes from 78.20.39.241: icmp_seq=11 ttl=50 time=138.882 msec
64 bytes from 78.20.39.241: icmp_seq=12 ttl=50 time=145.445 msec
64 bytes from 78.20.39.241: icmp_seq=13 ttl=50 time=144.570 msec
64 bytes from 78.20.39.241: icmp_seq=14 ttl=50 time=144.069 msec
64 bytes from 78.20.39.241: icmp_seq=15 ttl=50 time=144.570 msec
64 bytes from 78.20.39.241: icmp_seq=16 ttl=50 time=144.194 msec
64 bytes from 78.20.39.241: icmp_seq=17 ttl=50 time=144.132 msec
64 bytes from 78.20.39.241: icmp_seq=18 ttl=50 time=134.069 msec
64 bytes from 78.20.39.241: icmp_seq=19 ttl=50 time=144.259 msec
64 bytes from 78.20.39.241: icmp_seq=20 ttl=50 time=154.320 msec

--- 78.20.39.241 ping statistics ---
21 packets transmitted, 21 packets received, 0% packet loss
round-trip min/avg/max/mdev = 131.570/143.745/154.320/4.893 ms
#

192.168.50.150:23 (Standard.zoc) [evaluation mode]
File Edit View Logging Transfer Script Options Help

192.168.50.150:23
About these Buttons Send "exit<enter>" Call Host from Host Directory
** OSC Index 1 connected to 2890 via IP Addr: 192.168.50.150:23 **
** LT Index=0 CSSID= 0 MIFID= 1 CU=0 UA=0 LUName= **
** Type=2086-A04 Mfg=IBM SN=000000093E08 CHPID=8 Status=Active **

192.168.50.184:60271 LAN9274 05/008
Telnet TN3270 Zmodem [X] ZOC1511_192.168.50.150_230203.log 80x24
```

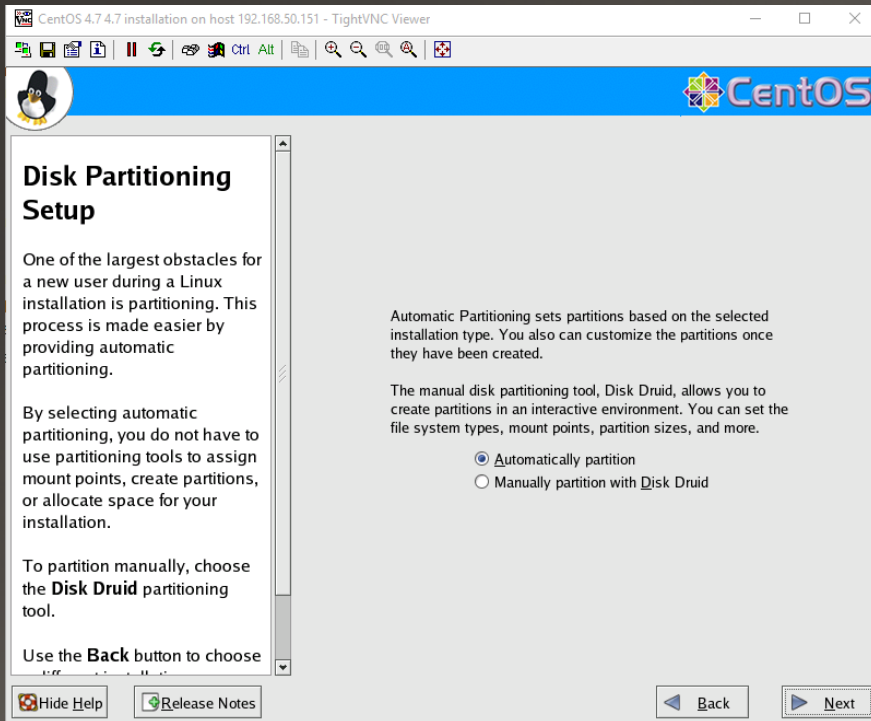
Starting the Installer

- The installer starts in the SSH terminal as a text based graphical system.
- Eventually asks if you want to continue with text based or VNC...
- Wait, VNC?
- Uhhh sure?

Were not in Kansas anymore...



Storage Partitioning



CentOS 4.7.4.7 installation on host 192.168.50.151 - TightVNC Viewer

Disk Partitioning Setup

One of the largest obstacles for a new user during a Linux installation is partitioning. This process is made easier by providing automatic partitioning.

By selecting automatic partitioning, you do not have to use partitioning tools to assign mount points, create partitions, or allocate space for your installation.

To partition manually, choose the **Disk Druid** partitioning tool.

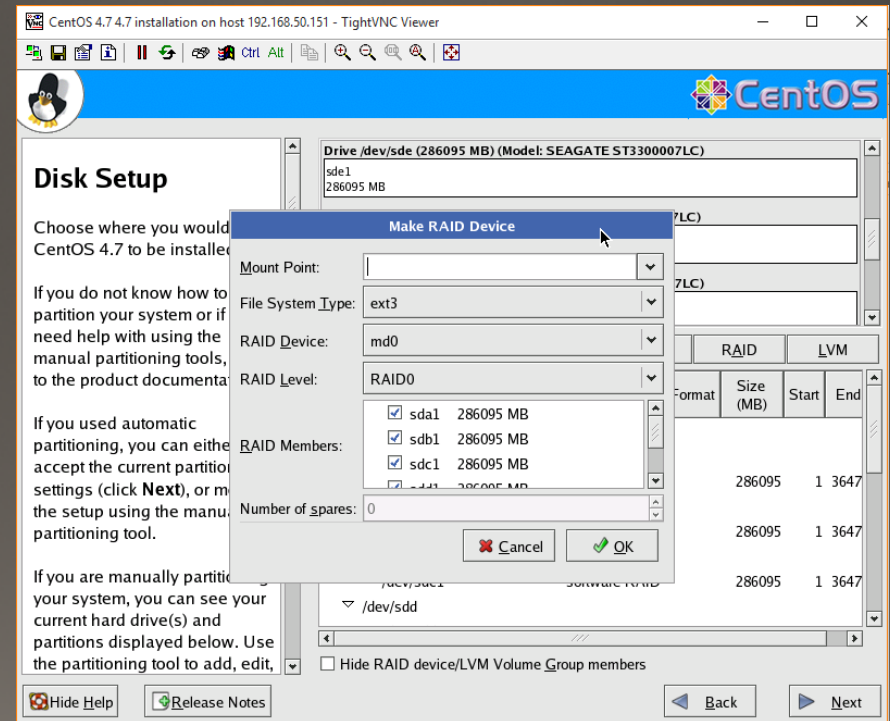
Use the **Back** button to choose

Automatic Partitioning sets partitions based on the selected installation type. You also can customize the partitions once they have been created.

The manual disk partitioning tool, Disk Druid, allows you to create partitions in an interactive environment. You can set the file system types, mount points, partition sizes, and more.

Automatically partition
 Manually partition with **Disk Druid**

Hide Help Release Notes Back Next



CentOS 4.7.4.7 installation on host 192.168.50.151 - TightVNC Viewer

Disk Setup

Choose where you would like to install CentOS 4.7 to be installed.

If you do not know how to partition your system or if you need help with using the manual partitioning tools, go to the product documentation.

If you used automatic partitioning, you can either accept the current partitioning settings (click **Next**), or manually set up the system using the manual partitioning tool.

If you are manually partitioning your system, you can see your current hard drive(s) and partitions displayed below. Use the partitioning tool to add, edit, or delete partitions.

Drive /dev/sde (286095 MB) (Model: SEAGATE ST3300007LC)

sde1
286095 MB

Make RAID Device

Mount Point: /dev/sdd

File System Type: ext3

RAID Device: md0

RAID Level: RAID0

RAID Members:

- sda1 286095 MB
- sdb1 286095 MB
- sdc1 286095 MB

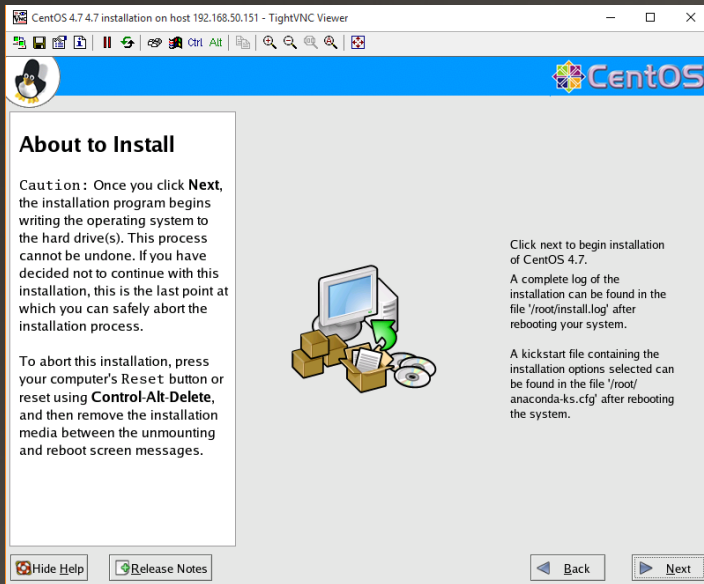
Number of spares: 0

Cancel OK

Format	Size (MB)	Start	End
	286095	1	3647
	286095	1	3647
	286095	1	3647

Hide Help Release Notes Back Next

Ready Set GO!



About to Install


Caution: Once you click **Next**, the installation program begins writing the operating system to the hard drive(s). This process cannot be undone. If you have decided not to continue with this installation, this is the last point at which you can safely abort the installation process.

To abort this installation, press your computer's **Reset** button or reset using **Control-Alt-Delete**, and then remove the installation media between the unmounting and reboot screen messages.

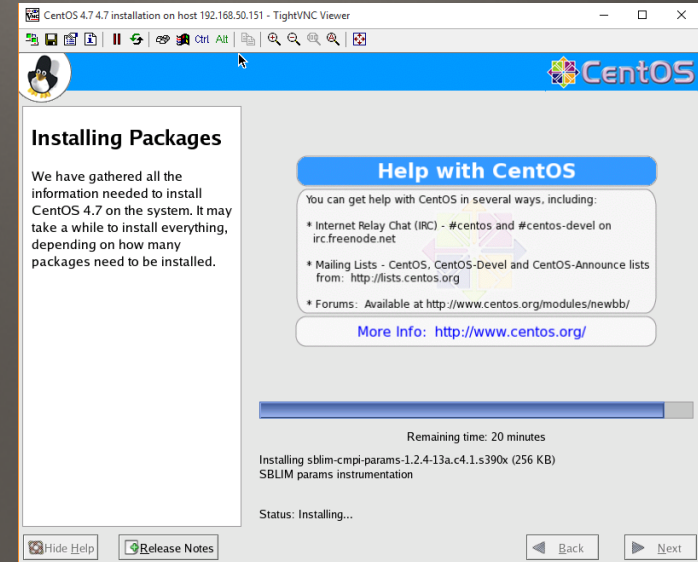
Click next to begin installation of CentOS 4.7.

A complete log of the installation can be found in the file `'/root/install.log'` after rebooting your system.

A kickstart file containing the installation options selected can be found in the file `'/root/anaconda-ks.cfg'` after rebooting the system.



[Hide Help](#) [Release Notes](#) [Back](#) [Next](#)



Installing Packages

We have gathered all the information needed to install CentOS 4.7 on the system. It may take a while to install everything, depending on how many packages need to be installed.

Help with CentOS

You can get help with CentOS in several ways, including:

- Internet Relay Chat (IRC) - #centos and #centos-devel on irc.freenode.net
- Mailing Lists - CentOS, CentOS-Devel and CentOS-Announce lists from: <http://lists.centos.org>
- Forums - Available at <http://www.centos.org/modules/newbb/>

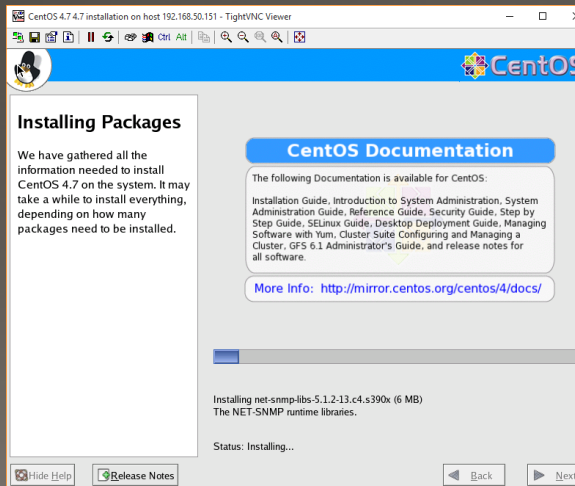
[More Info: http://www.centos.org/](http://www.centos.org/)

Remaining time: 20 minutes

Installing sblim-cmpi-params-1.2.4-13a.c4.1.s390x (256 KB)
SBLIM params instrumentation

Status: Installing...

[Hide Help](#) [Release Notes](#) [Back](#) [Next](#)



Installing Packages

We have gathered all the information needed to install CentOS 4.7 on the system. It may take a while to install everything, depending on how many packages need to be installed.

CentOS Documentation

The following Documentation is available for CentOS:

Installation Guide, Introduction to System Administration, System Administration Guide, Reference Guide, Security Guide, Step by Step Guide, SELinux Guide, Desktop Deployment Guide, Managing Software with Yum, Cluster Suite Configuring and Managing a Cluster, GFS 6.1 Administrator's Guide, and release notes for all software.

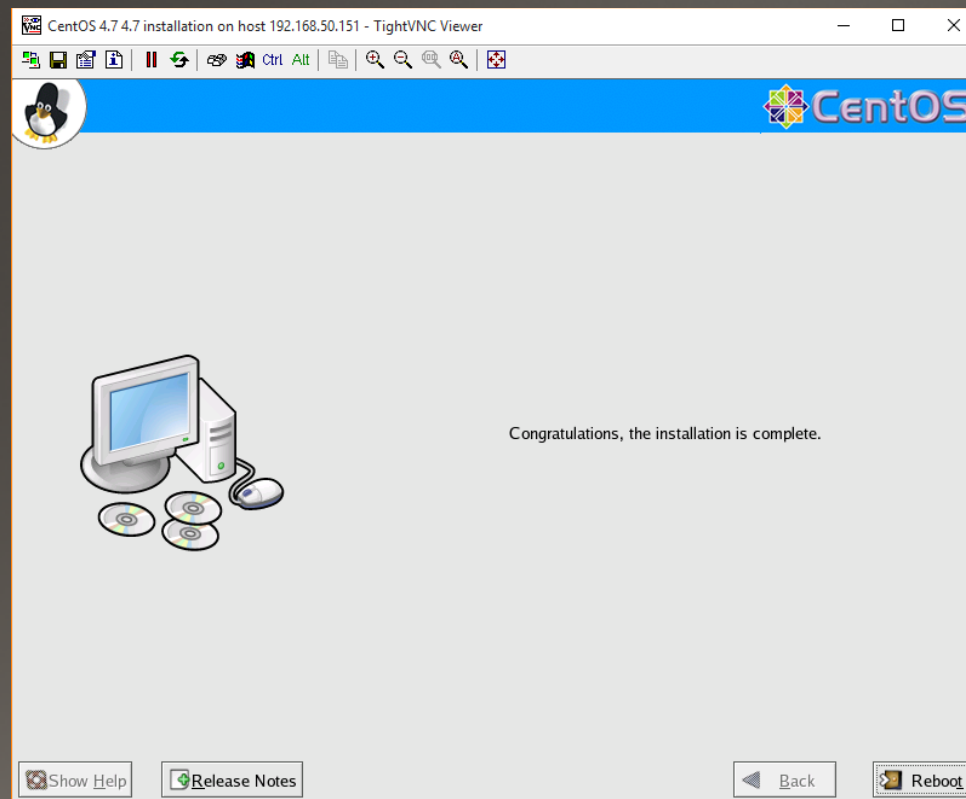
[More Info: http://mirror.centos.org/centos/4/docs/](http://mirror.centos.org/centos/4/docs/)

Installing net-snmp-libs-5.1.2-13.c4.s390x (6 MB)
The NET-SNMP runtime libraries.

Status: Installing...

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Finished!

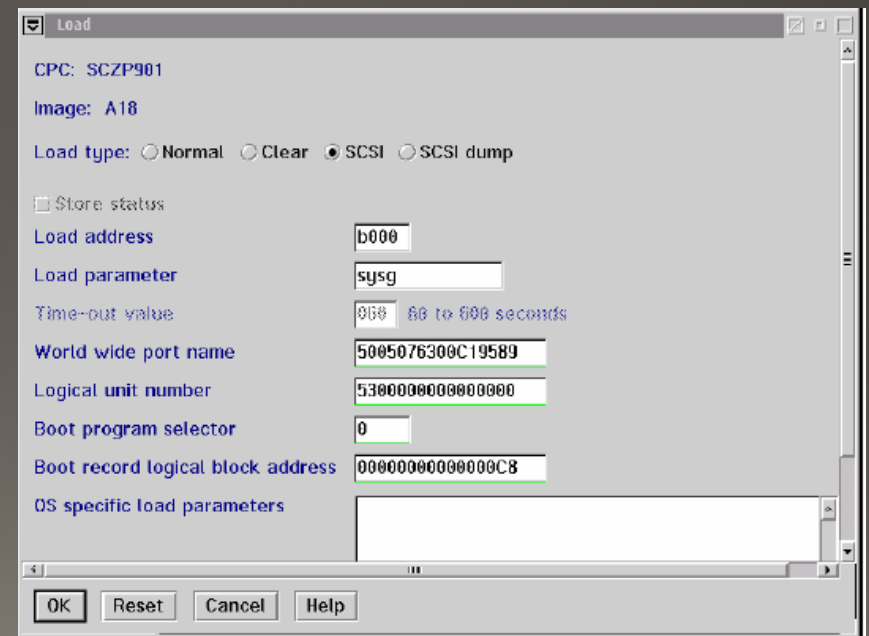


Eighth Roadblock: IPL

- Currently I am at the issue of being able to IPL the machine.
- Don't have proper FICON/ESCON/BUS&TAG storage.
- Don't have Feature Code FC 9904.
- May be a way to use the installer to IPL the install.
- Main priority is to find FICON/ESCON based storage.

FC 9904

- So why not ask IBM about getting Feature Code 9904?
- I did, its not offered anymore.
- It was even a FREE feature code.



The screenshot shows a 'Load' configuration window with the following fields and values:

CPC:	SCZP901
Image:	A18
Load type:	<input type="radio"/> Normal <input type="radio"/> Clear <input checked="" type="radio"/> SCSI <input type="radio"/> SCSI dump
<input type="checkbox"/> Store status	
Load address	b000
Load parameter	sysg
Time-out value	000 60 to 600 seconds
World wide port name	5005076300C19589
Logical unit number	5300000000000000
Boot program selector	0
Boot record logical block address	00000000000000C8
OS specific load parameters	

Buttons at the bottom: OK, Reset, Cancel, Help

Overview

- Disassemble machine.
- Move the machine to its desired location.
- Reassemble the machine
- Get power run for it.
- Find suitable storage.
- Setup IOCDS/Reset Profile/LPAR.
- Load installer over FTP or via DVD.
- Install to storage.
- IPL!

Cost Breakdown

IBM z890	\$ 237.39
Thermal Adhesive Epoxy	\$ 6.53
IBM 2108-G07 SAN Data Gateway	\$ 34.80
IBM 2005-B16 SAN 16 Port Switch	\$ 16.56
Ancot PBSED616A-03 Differential SCSI Converter	\$ 15.95
2x 3m LC-LC Duplex Fiber Optic Cable	\$ 7.98
2x 5m LC-SC Duplex Fiber Optic Cable	\$ 9.55
HP StorageWorks MSA30 with 10x 300GB 10Krpm Drives	FREE
Hitachi IBM 4Gb 1300nm GBIC SFP Transceiver	\$ 11.84
Total:	\$ 340.60

Relationship with IBM

- A few people from IBM have given me good info.
- Haven't tried contacting anyone specifically.
- They don't seem interested in having me speak at one of their conferences?
- Learned that you can get z/OS 1.13 (max version for this machine) for \$125/month.

What's Next?

- Finding a FICON/ESCON/BUS&TAG storage solution.
- Once Linux is running setting up 3270 packages.
- Having the machine accessible via 3270/SSH over the internet.
- Hooking a real 3270 terminal to the machine via 3174-61R.
- Possibly play with z/VM 5.3 Evaluation Edition.



Conclusion, Thanks, and Q/A