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Linux on System z:
The s390-tools in a Nutshell

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What is the s390-tools package?

- s390-tools is a package with a set of user space utilities to be used with the Linux on System z distributions.
  - It is **the** essential tool chain for Linux on System z
    - It contains everything from the boot loader to dump related tools for system crash analysis .
    - Version 1.8.1 and was released in May 2009 and latest version is 1.8.3, released in September 2009
  - This software package is contained in all major (and IBM supported) distributions which support s390
    - RedHat Enterprise Linux 4 (s390-tools-1.3.2)
    - RedHat Enterprise Linux 5 (s390-tools-1.8.1 since RHEL 5.4)
    - SuSE Linux Enterprise Server 10 (s390-tools-1.6.3 since SLES 10 SP2)
    - SuSE Linux Enterprise Server 11 (s390-tools-1.8.0)
  - Website: http://www.ibm.com/developerworks/linux/linux390/s390-tools.html

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Shutdown action tools

chreipl: Configure a disk or change a an entry in the Boot menu for the next boot

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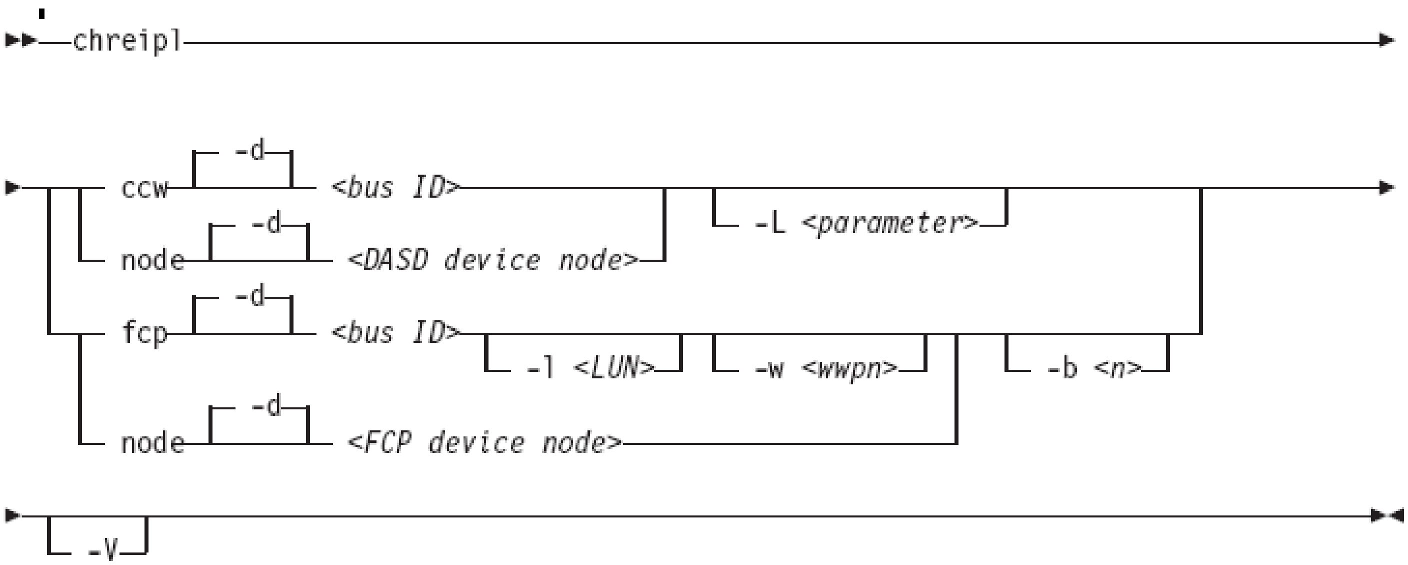
5.4



```
root@larsson:~> chreipl node /dev/dasda
root@larsson:~> chreipl node /dev/sda
root@larsson:~> chreipl ccw -d 0.0.7e78 -L 1
root@larsson:~> chreipl fcp --wwpn 0x500507630300c562 \
--lun 0x401040B300000000 -d 0.0.1700
```

Shutdown action tools (cont.)

chshut: Change the entries in */sys/firmware* to configure the shutdown behaviour

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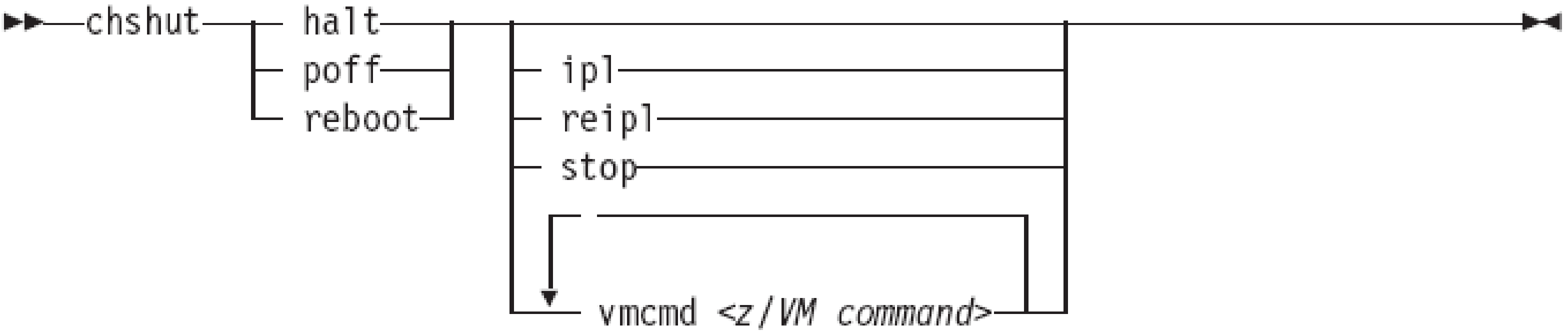
5.4



```
root@larsson:~> chshut halt ipl
root@larsson:~> chshut halt vmcmd LOGOFF
root@larsson:~> chshut poff vmcmd "MSG MASTER Going
down" \ vmcmd "LOGOFF"
```

Shutdown action tools (cont.)

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5.4

lsreipl: command to see from which device your system will boot after you issue the reboot command. Further you can query the system for information about the current boot device.

```
root@larsson:~> lsreipl
Re-IPL type:   ccw
Device:        0.0.4bb8
Loadparm:
root@larsson:~> lsreipl -i
```

lsshut: command to see what the system should do in one of the following states.

```
root@larsson:~> lsshut
Trigger          Action
========================
Halt              stop
Panic             stop
Power off         stop
Reboot            reipl
```

lsluns

Use the **lsluns** command to discover and scan LUNs in Fibre Channel Storage Area Networks (SANs).

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5.4

- This example shows all LUNs for port 0x500507630300c562:

```
root@larsson:~> lsluns --port 0x500507630300c562
Scanning for LUNs on adapter 0.0.5922
at port 0x500507630300c562:
0x4010400000000000
0x4010400100000000
[...]
```

- This example shows all LUNs for adapter 0.0.5922:

```
root@larsson:~> lsluns -c 0.0.5922
at port 0x500507630300c562:
0x4010400000000000
[...]
at port 0x500507630303c562:
0x4010400000000000
[...]
```

lszcrypt

Use the **lszcrypt** command to display information about cryptographic adapters managed by zcrypt and zcrypt's AP bus attributes

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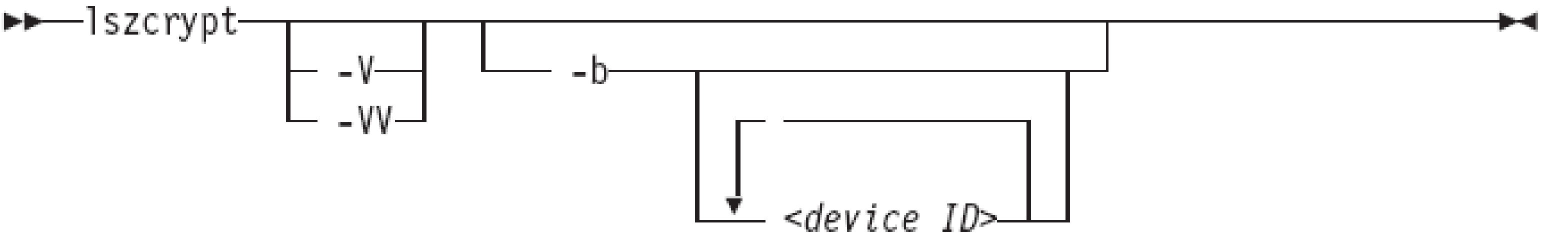
.4



- To display card type and online status of all available cryptographic adapters:

```
root@larsson:~> lszcrypt -V
```

- To display card type, online status, hardware card type, hardware queue depth, and request count for cryptographic adapters 0, 1, 10, and 12

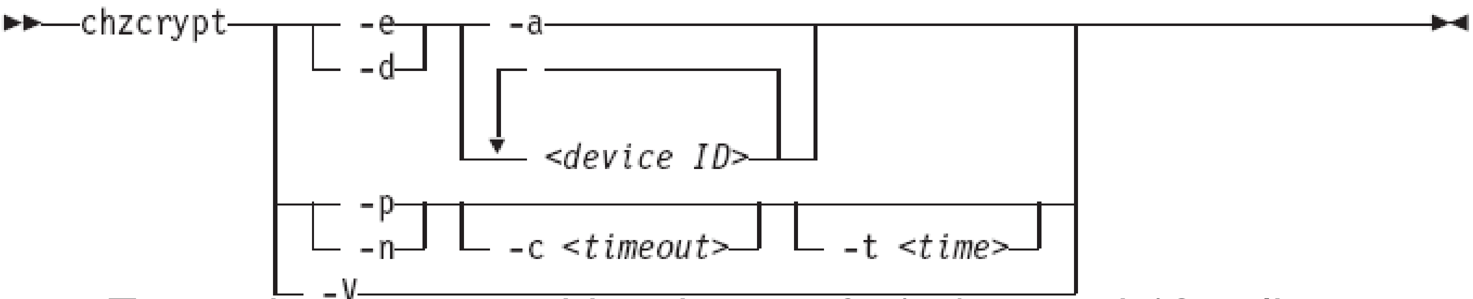
```
root@larsson:~>  lszcrypt -VV 0 1 10 12
```

- To display AP bus information:

```
root@larsson:~> lszcrypt -b
```

chzcrypt

Use the **chzcrypt** command to configure cryptographic adapters managed by zcrypt and modify zcrypt's AP bus attributes.



- To set the cryptographic adapters 0, 1, 4, 5, and 12 online:

```
root@larsson:~>  chzcrypt -e 0 1 4 5 12
```

- To set all available cryptographic adapters offline:

```
root@larsson:~>  chzcrypt -d -a
```

- To set the configuration timer for re-scanning the AP bus to 60

```
root@larsson:~>  chzcrypt -c 60 -n
```

IUCV hypervisor console (HVC) device driver (Linux kernel)

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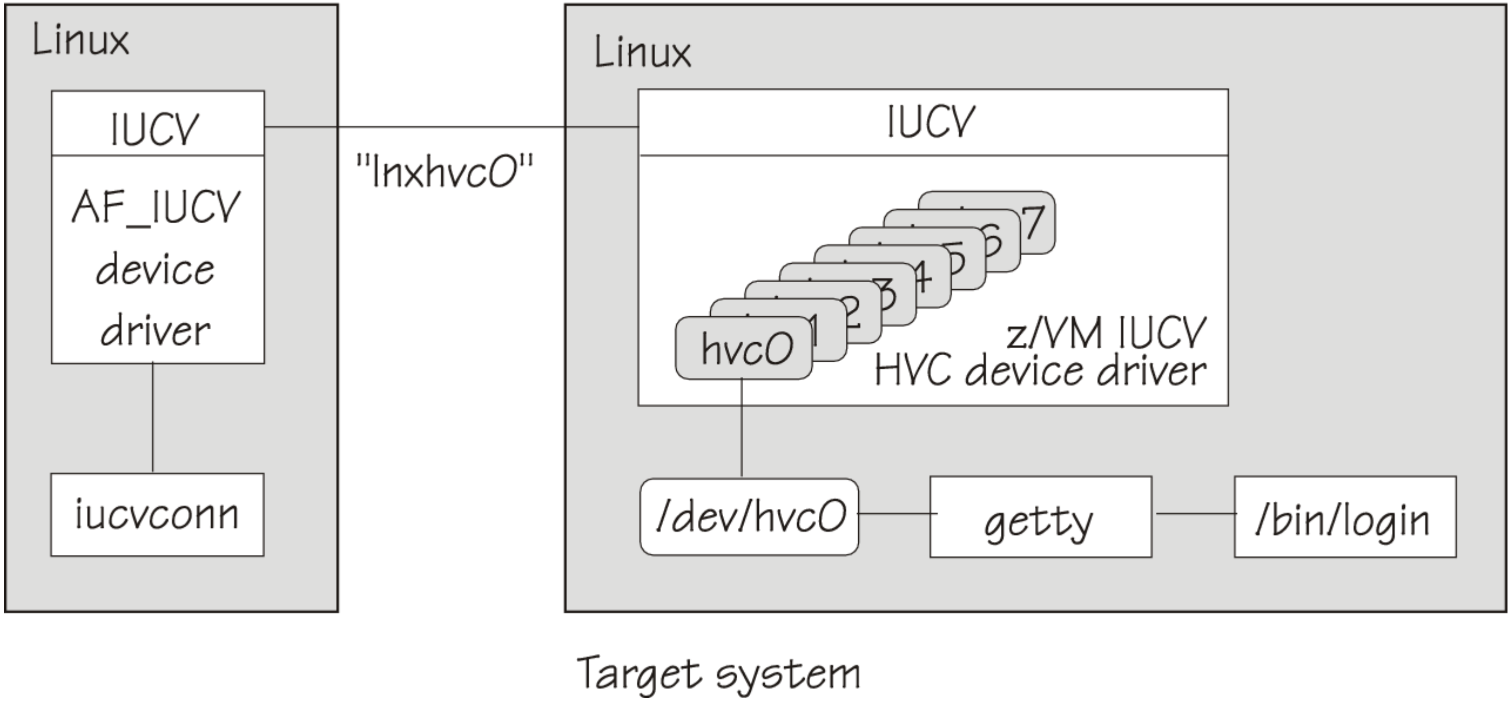
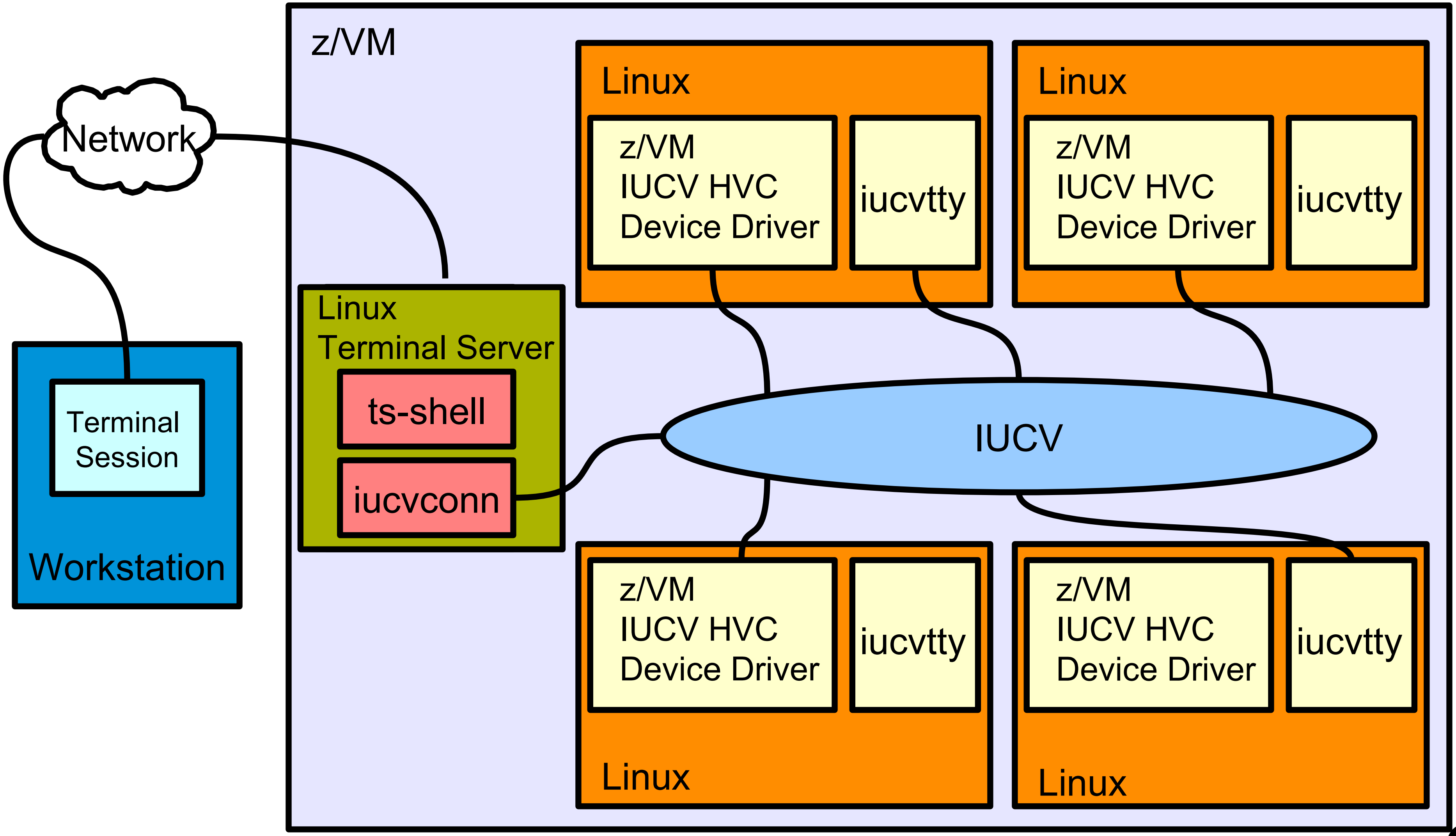
5.4

- Full-screen terminal access to Linux guest operating systems on the same z/VM
- Access Linux instances with no external network because IUCV is independent from TCP/IP



IUCV terminal environment



IUCV terminal applications

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5.4

- The IUCV terminal applications consist of:
  - **iucvconn** – Start terminal connection over IUCV
  - **iucvtty** – Allow remote logins over IUCV
  - **ts-shell** – Login shell for terminal servers over IUCV

- Terminal access over IUCV is provided by:
  - **iucvtty**, or
  - z/VM IUCV hypervisor console device driver (Linux kernel)

IUCV terminal applications – examples

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5.4

- **Using the iucvconn program:**
  - To access the first z/VM IUCV HVC terminal on the Linux instance in z/VM guest LNXSYS02

```
root@larsson:~> iucvconn LNXSYS02 lnxhvc0
```

  - To create a transcript of the terminal session to the Linux instance in z/VM guest LNXSYS99

```
root@larsson:~> iucvconn -s ~/transcripts/lnxsys99
LNXSYS99 lnxhvc0
```

- **Using the iucvtty program:**
  - To allow remote logins using the terminal identifier „lnxterm“

```
root@larsson:~> iucvtty lnxterm
```

  - To access the „lnxterm“ terminal on the Linux instance in z/VM guest LNXSYS01

```
root@larsson:~>  iucvconn LNXSYS01 lnxterm
```

  - To use /sbin/sulogin instead of /bin/login for terminal “suterm”

```
root@larsson:~>  iucvtty suterm -- /sbin/sulogin
```

cpuplugd

10.2

5.3

- Use the **cpuplugd** command to:
  - Enable or disable CPUs based on a set of rules. This increases the performance of single threaded applications within a z/VM or LPAR environment with multiple CPUs. The rules can incorporate certain system load variables.
  - Manage memory under z/VM.
- Configuration file: */etc/sysconfig/cpuplugd*
- Init-Script: */etc/init.d/cpuplugd* {start, stop, restart}

cpuplugd: Example Configuration

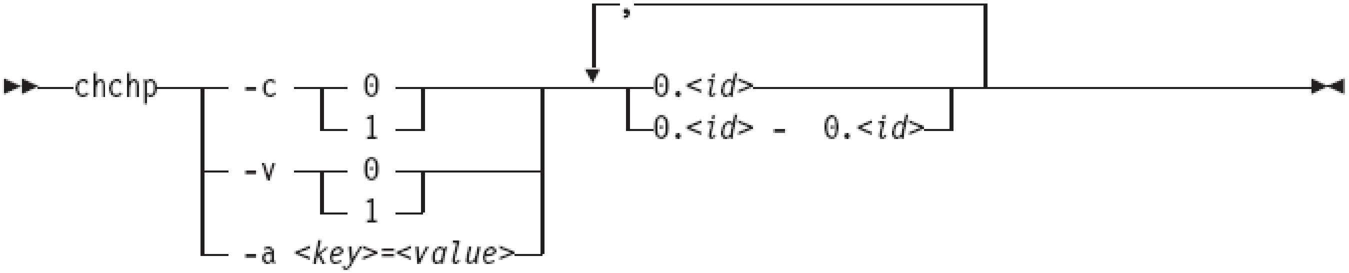
```
UPDATE="60"

CPU_MIN="2"
CPU_MAX="10"

HOTPLUG = "(loadavg > onumcpus +0.75) & (idle < 10.0)"
HOTUNPLUG = "(loadavg < onumcpus -0.25) | (idle > 50)"


CMM_MIN="0"
CMM_MAX="8192"
CMM_INC="256"

MEMPLUG = "swaprate > freemem+10 & freemem+10 < apcr"
MEMUNPLUG = "swaprate > freemem + 10000"
```

chchp

10.2

5.4

Use **chchp** (Change channel path status) to set channel paths online or offline.



chchp -c 0 1 -v 0 1 -a <key>=<value> , 0.<id> 0.<id> - 0.<id>

The -c option is equivalent to performing a Configure Channel Path Off or Configure Channel Path On operation on the hardware management console.

- To set channel path 0.40 to standby configuration state:

```
root@larsson:~>  chchp --configure 0 0.40
Configure standby 0.40... done.
```

- To set the channel path with the channel path ID 0.40 to the configured state issue:

```
root@larsson:~> chchp --configure 1 0.40
Configure online 0.40... done.
```

chchp (cont.)

10.2

5.4

- To set channel-paths 0.65 to 0.6f to the configured state issue:

```
root@larsson:~>  chchp -c 1 0.65-0.6f
```

Use the -v option to change the logical channel path state to online or offline

- To set channel-paths 0.12, 0.7f and 0.17 to 0.20 to the logical offline state issue:

```
root@larsson:~>  chchp -v 0 0.12,0.7f,0.17-0.20
```

Use the -a option to change the channel path sysfs attribute (e.g. Configure, status) to a value.

- To set channel path 0.19 into standby state issue:

```
root@larsson:~>  chchp -a configure=0 0.19
```

lschp

10.2

5.4

The **lschp** command lists status and type information about available channel-paths.

```
root@larsson:~> lschp
CHPID  Vary  Cfg.  Type  Cmg  Shared
====================================
0.00   1     1     22     -    0
0.01   1     1     22     -    0
0.02   1     1     22     -    0
[...]
```

- CHPID: Channel-path identifier.
- Vary: Logical channel-path state: 0 = channel-path is not used for I/O 1 = channel-path is used for I/O
- Cfg.: Channel-path configure state: 0 = stand-by, 1 = configured, 2 = reserved, 3 = not recognized
- Type: Channel-path type identifier.
- Cmg: Channel measurement group identifier.
- Shared Indicates whether a channel-path is shared between LPARs: 0 = channel-path is not shared 1 = channel-path is shared

dbginfo.sh

dbginfo.sh is a script to collect various system related files, for debugging purposes.

- It generates a tar-archive which can be attached to PMRs / Bugzilla entries
- It is similar to the RedHat tools sosreport

```
root@larsson:~>  dbginfo.sh
Create target directory /tmp/DBGINFO-2010-02-25-22-06-20-
t6345057
Change to target directory /tmp/DBGINFO-2010-02-25-22-06-
20-t6345057
Get procfs entries
Saving runtime information into runtime.out
Get file list of /sys
Get entries of /sys
[...]
```

Please use the data from this tool is you open a Bugzilla (Novell/ RedHat) or a PMR

Multi Volume Dump

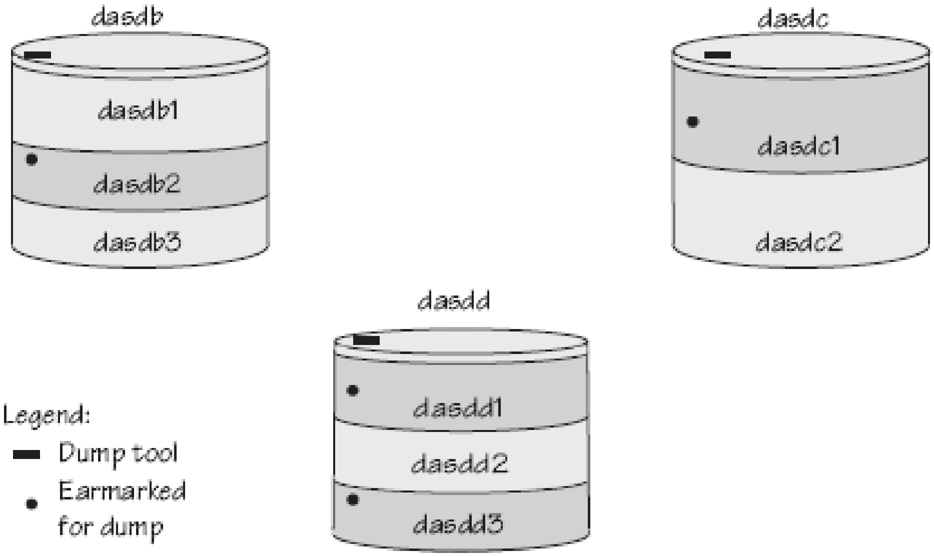
zipl can now dump to multiple DASDs. It is now possible to dump system images, which are larger than a single DASD.

You can specify up to 32 ECKD DASD partitions for a multi-volume dump

10.3

5.4

- **What are dumps good for?**
  - Full snapshot of system state taken at any point in time (e.g. after a system has crashed, of or a running system)
  - Can be used to analyse system state beyond messages written to the syslog
  - Internal data structures not exported to anywhere



Obtain message, which have not been written to the syslog due to a crash

Multi Volume Dump

10.3

5.4

How to prepare a set of ECKD DASD devices for a multi volume dump? (64-bit systems only).

- We use two DASDs in this example:

```
root@larsson:~> dasdfmt -f /dev/dasdc -b 4096
root@larsson:~> dasdfmt -f /dev/dasdd -b 4096
```

- Create the partitions with fdasd. The sum of the partition sizes must be sufficiently large (the memory size + 10 MB):

```
root@larsson:~> fdasd /dev/dasdc
root@larsson:~> fdasd /dev/dasdd
```

- Create a file called sample_dump_conf containing the device nodes (e.g.
- /dev/dasda1) of the two partitions, separated by one or more line feed characters
- Prepare the volumes using the zipl command.

```
root@larsson:~>  zipl -M sample_dump_conf
[...]
```

How to obtain a dump

To obtain a dump with the multi-volume DASD dump tool, perform the following steps:

- Stop all CPUs, Store status on the IPL CPU.
- IPL the dump tool using one of the prepared volumes, either 4711 or 4712.
- After the dump tool is IPLed, you'll see a messages that indicates the progress of the dump. Then you can IPL Linux again

```
==> cp cpu all stop
==> cp cpu 0 store status
==> cp ipl 4711
```

- Copying a multi-volume dump to a file
- Use zgetdump command without any option to copy the dump parts to a file:

```
root@larsson:~>  zgetdump /dev/dasdc > mv_dump_file
```

How to obtain information about a multi volume dumps

- Display information on the involved volumes:

```
root@larsson:~>  zgetdump -d /dev/dasdc
'/dev/dasdc' is part of Version 1 multi-volume dump,which is
spread along the following DASD volumes:
0.0.4711 (online, valid)
0.0.4712 (online, valid)
[...]
```

- Display information about the dump itself:

```
root@larsson:~>  zgetdump -i /dev/dasdc
Dump device: /dev/dasdc
>>>  Dump header information  <<<
Dump created on: Thu Feb  25 15:12:41 2010
[...]
Multi-volume dump: Disk 1 (of 2)
Reading dump contents from
0.0.4711.................................
Dump ended on:   Thu Feb  25 15:12:52 2010
Dump End Marker found: this dump is valid.
```

dumpconf

10.1

5.4

- The dumpconf tool configures a dump device that is used for automatic dump in case of a kernel panic.
  - The command can be installed as service script under `/etc/init.d/dumpconf` or can be called manually.
  - Start service: `service dumpconf start`
  - It reads the configuration file `/etc/sysconfig/dumpconf.`
  - Example configuration for CCW dump device (DASD) and reipl after dump:

```
ON_PANIC=dump_reipl
DUMP_TYPE=ccw
DEVICE=0.0.4711
```

dumpconf (cont.)

- Example configuration for FCP dump device (SCSI disk):

```
ON_PANIC=dump
DUMP_TYPE=fcp
DEVICE=0.0.4714
WWPN=0x5005076303004712
LUN=0x4047401300000000
BOOTPROG=0
BR_LBA=0
```

- Example configuration for re-IPL without taking a dump, if a kernel panic occurs:

```
ON_PANIC=reipl
```

- Example of executing a CP command, and rebooting from device 4711 if a

```
ON_PANIC=vmcmd
VMCMD_1="MSG MASTER Starting VMDUMP"
VMCMD_2="VMDUMP"
VMCMD_3="IPL 4711"
```

Dump Tools Summary

Tool	Stand alone tools			VMDUMP
	DASD	Tape	SCSI	
Environment	VM&LPAR		LPAR	VM
Preparation	Zipl -d /dev/<dump_dev>		Mkdir /dumps/mydumps zipl -D /dev/sda1 …	---
Creation	Stop CPU & Store status ipl <dump_dev_CUU>			Vmdump
Dump medium	ECKD or FBA	Tape cartridges	LINUX file system on a SCSI disk	VM reader
Copy to filesystem	Zgetdump /dev/<dump_dev> > dump_file		---	Dumpload ftp … vmconvert …
Viewing	Lcrash or crash			

See “Using the dump tools” book at http://www.ibm.com/developerworks/linux/linux390/

vmcp

Using the z/VM CP interface device driver (vmcp), you can send control program (CP) commands to the VM hypervisor and display VM’s response.

```
root@larsson:~> modprobe vmcp
root@larsson:~> vmcp "q dasd"|grep T6345057
DASD 4DE0 ATTACHED TO T6345057 4DE0 R/W 0X4DE0
DASD 4DE1 ATTACHED TO T6345057 4DE1 R/W 0X4DE1
DASD 4DE2 ATTACHED TO T6345057 4DE2 R/W 0X4DE
DASD 4DE3 ATTACHED TO T6345057 4DE3 R/W 0X4DE3
```

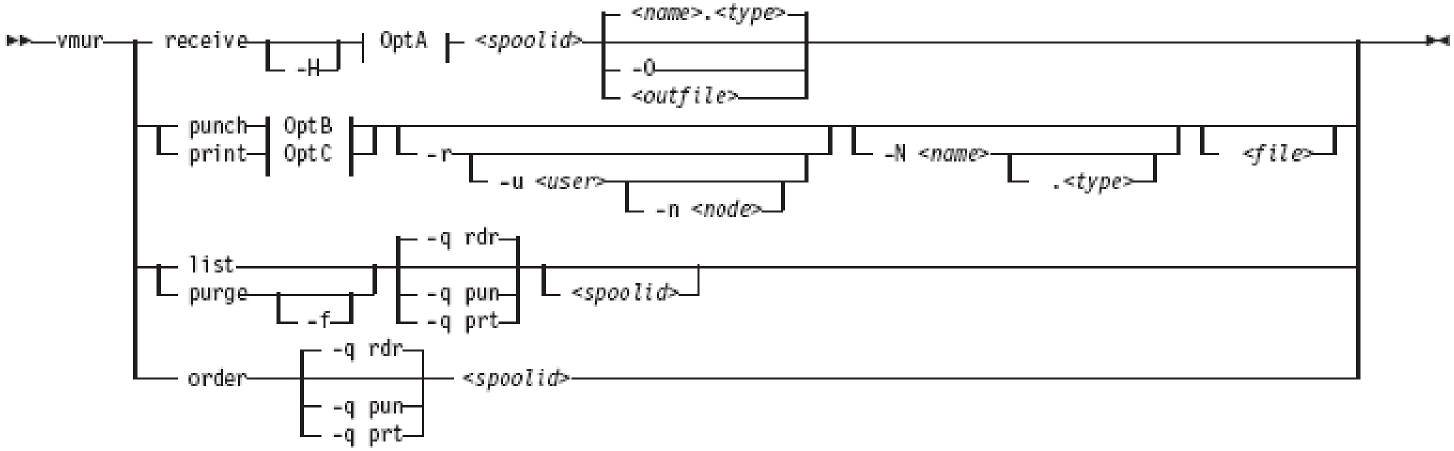
vmur

10.1

5.2

The **vmur** command provides all functions required to work with z/VM spool file queues:

- Receive: Read data from the z/VM reader file queue
- Punch or print: Write data to the z/VM punch or printer file queue and transfer it to another user’s virtual reader, optionally on a remote z/VM node.
- List: Display detailed information about one or all files on the specified spool file queue.
- Purge: Remove one or all files on the specified spool file queue.
- Order: Position a file at the top of the specified spool file queue.



vmur: Produce and read Linux guest machine dump

- Produce guest machine dump:

```
root@larsson:~>  vmcp vmdump
```

- Find spool ID of VMDUMP spool file in the output of the `vmur li` command:

```
root@larsson:~> vmur li
ORIGINID FILE CLASS RECORDS CPY HOLD DATE TIME NAME TYPE
DIST T6360025 0463 V DMP 00020222 001 NONE 06/11 15:07:42
VMDUMP FILE T6360025
```

- Move vmdump file to top of reader queue with the vmur order command:

```
root@larsson:~>  vmur or 463
```

- Read and convert the vmdump file to a file on the Linux file system in the current working directory and close the virtual reader

```
root@larsson:~> chccwdev -e 000c
root@larsson:~> vmconvert /dev/vmrdr-0.0.000c linux_dump
root@larsson:~> vmcp cl c
```

vmur: Log and read Linux guest machine console

- Begin console spooling:

```
root@larsson:~>  vmcp sp cons start
```

- Produce output to VM console (for example, with CP TRACE).
- Close the console file and transfer it to the reader queue, find the spool ID behind the FILE keyword in the corresponding CP message.

```
root@larsson:~>   vmcp sp cons clo \* rdr
RDR FILE 0398 SENT FROM T6360025 CON WAS 0398 RECS 1872
CPY 001 T NOHOLD NOKEEP
```

- Read the guest machine console file into a file on the Linux file system in the current working directory:

```
root@larsson:~>  chccwdev -e 000c
root@larsson:~>  vmur re -t 398 linux_cons
```

vmur: Prepare z/VM reader to IPL Linux image

- Send parmfile to VM punch and transfer it to the reader queue and find the parmfile spool id message

```
root@larsson:~>  vmur pun -r /boot/parmfile
[...]
Reader file with spoolid 0465 created.
```

- Send image to VM punch and transfer it to reader queue:

```
root@larsson:~> vmur pun -r /boot/vmlinuz -N image
```

- Move image to first and parmfile to the second position in the reader queue:

```
root@larsson:~>  vmur or 465
root@larsson:~>  vmur or 466
```

- Prepare re-IPL from the VM reader and boot the Linux image

```
root@larsson:~>  chreipl ccw 0.0.000c
root@larsson:~>  reboot
```

cio_ignore

- When a Linux on System z instance boots, it senses and analyses all available devices.
- You can use the cio_ignore kernel parameter to specify a list of devices that are to be ignored.
- The following applies to ignored devices:
  - Ignored devices are not sensed and analyzed. The device cannot be used unless it has been analyzed.
  - Ignored devices are not represented in sysfs.
  - Ignored devices do not occupy storage in the kernel.
  - The subchannel to which an ignored device is attached is treated as if no device were attached.
  - cio_ignore might hide essential devices such as the console under z/VM. The console is typically device number 0.0.0009.
- This example specifies that all devices in the range 0.0.b100 through 0.0.b1ff, and the device 0.0.a100 are to be ignored.

```
cio_ignore=0.0.b100-0.0.b1ff,0.0.a100
```

cio_ignore (cont.)

- Display ignored devices:

```
root@larsson:~>  cat /proc/cio_ignore
0.0.0000-0.0.78ff
0.0.f503-0.0.ffff
```

- Free a individual device from the ignore list

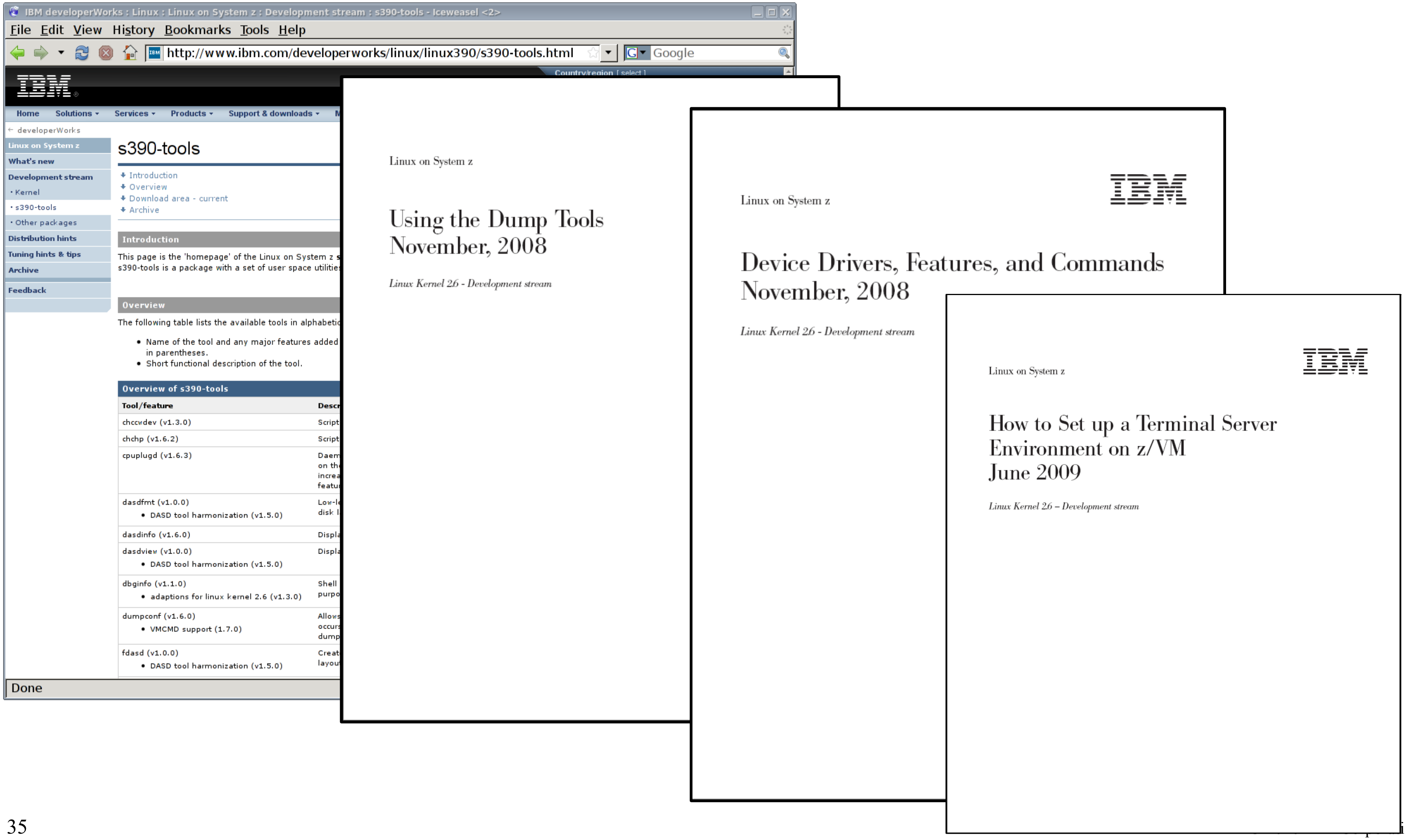
```
root@larsson:~>  echo free 0.0.4711 >/proc/cio_ignore
```

- Free all devices from the ignore list

```
root@larsson:~>  echo free all >/proc/cio_ignore
```

More Information

http://www.ibm.com/developerworks/linux/linux390/distribution_hints.html



IBM developerWorks : Linux : Linux on System z : Development stream : s390-tools - Iceweasel <2>

s390-tools

Introduction

This page is the 'homepage' of the Linux on System z s
s390-tools is a package with a set of user space utilitie

Overview

The following table lists the available tools in alphabetic

- Name of the tool and any major features added in parentheses.
- Short functional description of the tool.

Overview of s390-tools

Tool/feature	Descr
chccwdev (v1.3.0)	Script
chchp (v1.6.2)	Script
cpuplugd (v1.6.3)	Daem on the increa featu
dasdfmt (v1.0.0) • DASD tool harmonization (v1.5.0)	Low-le disk l
dasdinfo (v1.6.0)	Displa
dasdview (v1.0.0) • DASD tool harmonization (v1.5.0)	Displa
dbginfo (v1.1.0) • adaptions for linux kernel 2.6 (v1.3.0)	Shell purpo
dumpconf (v1.6.0) • VMCMD support (1.7.0)	Allows occurs dump
fdasd (v1.0.0) • DASD tool harmonization (v1.5.0)	Creat layou

Linux on System z

Using the Dump Tools
November, 2008

Linux Kernel 2.6 - Development stream

Linux on System z

Device Drivers, Features, and Commands
November, 2008

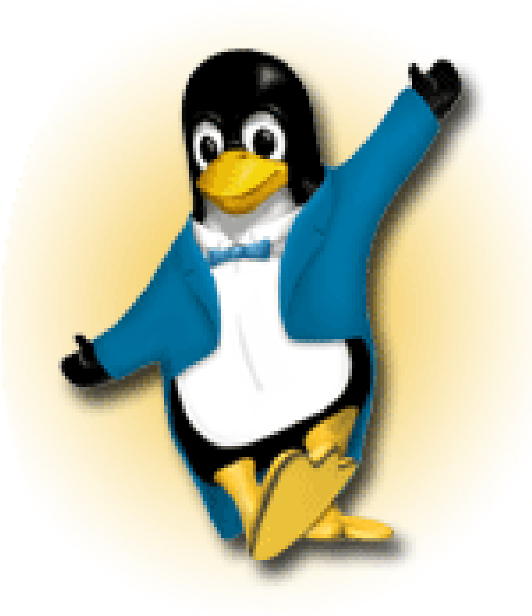
Linux Kernel 2.6 - Development stream

Linux on System z

How to Set up a Terminal Server Environment on z/VM
June 2009

Linux Kernel 2.6 – Development stream

Questions?



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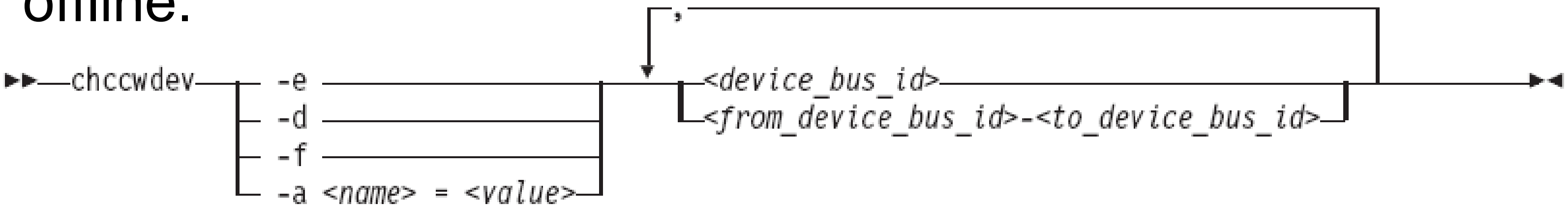
Your tool requirements

- Are you missing a certain feature or tool?
- We'd love to hear from you!
- We will evaluate each request and (hopefully) develop the additional functionality you need.

Appendix

chccwdev

Use the **chccwdev** command is used to set CCW devices online or offline.



chccwdev
-e
-d
-f
-a *<name>* = *<value>*
,
<device_bus_id>
<from_device_bus_id>-*<to_device_bus_id>*

-e or --online sets the device online.

-d or --offline sets the device offline.

-f or --forceonline forces a boxed device online, if this is supported by the device driver.

- To set a CCW device 0.0.b100 online issue:

```
root@larsson:~>  chccwdev -e 0.0.b100
```

- To set all CCW devices in the range 0.0.b200 through 0.0.b2ff online issue:

```
root@larsson:~>  chccwdev -e 0.0.b200-0.0.b2ff
```

- To set a CCW device 0.0.b100 and all CCW devices in the range 0.0.b200

```
root@larsson:~>  chccwdev -d 0.0.b100,0.0.b200-0.0.b2ff
```

DASD low level format

dasdfmt formats a DASD (ECKD) disk to prepare it for usage with Linux on System z

```
root@larsson:~> dasdfmt -d cdl -b 4096 -f /dev/dasdb
Drive Geometry: 10017 Cylinders * 15 Heads =  150255 Tracks

I am going to format the device /dev/dasdb in the following way:
   Device number of device : 0xec27
   Labelling device        : yes
   Disk label              : VOL1
   Disk identifier         : 0XEC27
   Extent start (trk no)   : 0
   Extent end (trk no)     : 150254
   Compatible Disk Layout  : yes
   Blocksize               : 4096

--->> ATTENTION! <<---
All data of that device will be lost.
Type "yes" to continue, no will leave the disk untouched: yes
Formatting the device. This may take a while (get yourself a coffee).
```

DASD: Partitioning

- Compared to other architectures, Linux on System z makes use of its own partitioning tool for DASD devices.
  - The common Linux tool fdisk can **not** be used in this environment!
- Nevertheless the handling is similar.
  - The system is limited to 3 partitions per disk when using DASD

```
root@larsson:~> fdasd /dev/dasdb
reading volume label ..: VOL1
reading vtoc ..........: ok

Command action
   m   print this menu
   p   print the partition table
   n   add a new partition
   d   delete a partition
   v   change volume serial
   t   change partition type
   r   re-create VTOC and delete all partitions
   u   re-create VTOC re-using existing partition sizes
   s   show mapping (partition number - data set name)
   q   quit without saving changes
   w   write table to disk and exit

Command (m for help):
```

DASD: Partitioning (cont'd)

- To create a partition:

```
root@larsson:~> fdasd /dev/dasdb
[...]
Command (m for help): n
First track (1 track = 48 KByte) ([2]-150254):
Using default value 2
Last track or +size[c|k|M] (2-[150254]):
Using default value 150254

Command (m for help): p

Disk /dev/dasdb:
  cylinders ............: 10017
  tracks per cylinder ..: 15
  blocks per track .....: 12
  bytes per block ......: 4096
  volume label .........: VOL1
  volume serial ........: 0XEC27
  max partitions .......: 3

 ------------------------------- tracks -------------------------------
               Device      start      end   length   Id  System
          /dev/dasdb1          2   150254   150253    1  Linux native
```

DASD: Partitioning (cont'd)

- Your configuration is not completed before you write the changes to the disk

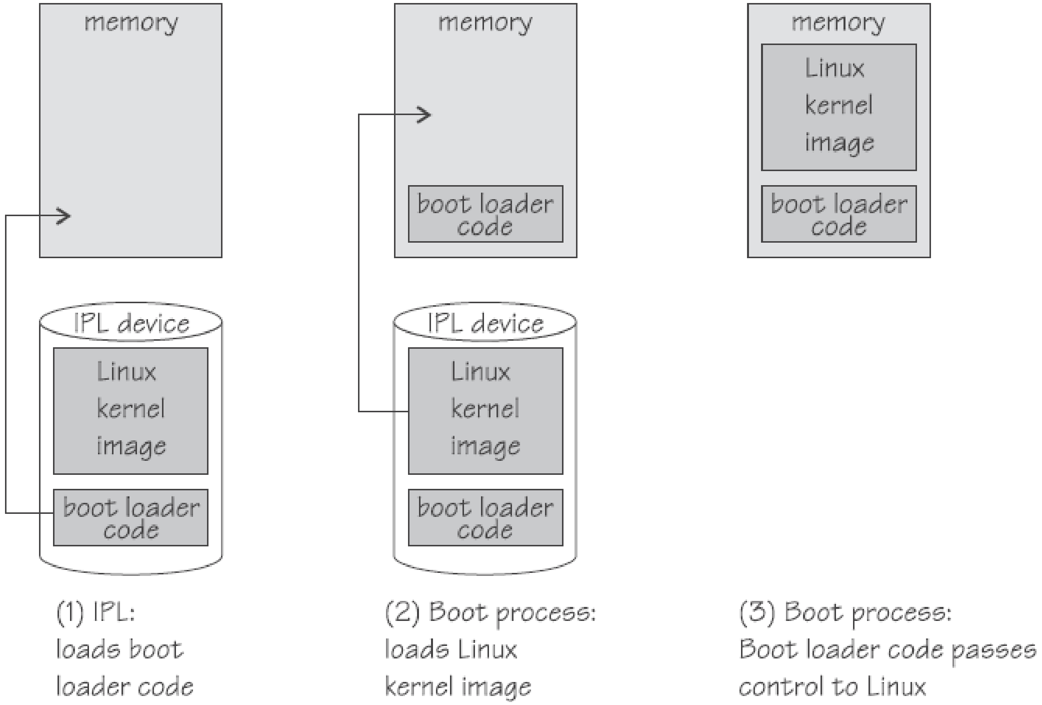
```
root@larsson:~> fdasd /dev/dasdb
[...]
Command (m for help): w
writing VTOC...
rereading partition table...
```

- Now we have a new device partition (e.g. /dev/dasdb1) which can be used as any other Linux disk

```
root@larsson:~> mke2fs -j /dev/dasdb1
mke2fs 1.41.4 (27-Jan-2009)
[...]
Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done
This filesystem will be automatically checked every 28 mounts or 180 days,
whichever comes first.  Use tune2fs -c or -i to override.
```

The IPL & Boot procedure

- The IPL process accesses the IPL device and loads the Linux boot loader code to the mainframe memory.
- The boot loader code then gets control and loads the Linux kernel.
- At the end of the boot process Linux gets control.



The zipl Bootmanager

- Zipl is the default bootmanager for Linux on System z
- It writes a bootloader to DASD or zFCP-attached SCSI disk
- Configuration file: `/etc/zipl.conf`
- zipl command must be executed after
  - altering the configuration
  - altering files referenced in configuration, e.g. initrd
- Choosing a kernel from a multi-boot configuration:
  - LPAR HMC operating system messages console
    - <number of kernel to boot>
  - z/VM 3270 console
    - #cp vi vmsg <number>

Example /etc/zipl.conf configuration file

```
[defaultboot]
defaultmenu=menu
[2.6.25]
        image=/boot/vmlinuz-2.6.25
        ramdisk=/boot/initrd-2.6.25.img
        target=/boot/
        parameters="root=/dev/disk/by-path/ccw-0.0.beef TERM=dumb"
[...]
:menu
target = "/boot"
1 = "2.6.25"
2 = "2.6.27"
default = 2
prompt = 1
timeout = 10
```

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NOTES: Linux penguin image courtesy of Larry Ewing (lewing@isc.tamu.edu) and The GIMP

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