Disaster Recovery of Linux on System Z

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Wednesday, February 6th, 2013
Session 12147

http://www.linkedin.com/pub/deric-abel/1/738/581/
Agenda

- Introductions
- Mainframe at AFCU
- DR environment
- Automation
  - Scripts and configuration files
- Testing
Speaker Introduction

• Deric Abel
• I’ve been in IT since 1997
• First installed Linux as a High School project my senior year (1999)
• Hired as a Linux Admin in 2000
• First experience with Virtualization in 2005
• Hired at America First Credit Union as a z/Linux admin in 2008
• Joined the zNextgen group and attended my first SHARE conference in 2008
• Currently serving as a Deputy Project Manager for zNextgen
Disclaimer

• This presentation is for information purposes only.
• This is not an endorsement of America First Credit Union.
• Every environment is different and the scripts used in this presentation most likely will not work in your environment.
Current Environment

- Two z10
  - Z02 at Primary Data Center
  - O01 at Backup Data Center
    - CBU to Z02 during DR test or actual DR event.
- Primary z10
  - 4 z/VM LPARs
    - 2 Production
    - 2 Test/Development
  - 4 IFLs and 2 CPs
  - 56GB Memory
  - Level 9 facility
    - Full redundancy in UPS, switch, and generator systems
    - Building is “base isolated” to withstand a horizontal shift
Primary Mainframe Environment

Z10 BC Z02

Production LPARs
- z/VSE (1)
- z/Linux (9)
- MQ/MB
- DB2

Dev/Test LPARs
- z/VSE (4)
- All
- Development
- z/Linux
- Guests (30)
- Load Test Environment
- Sandbox and Proof of Concept Environment

Complete your sessions evaluation online at SHARE.org/SanFranciscoEval
Primary Mainframe Environment

- Linux OS installed on ECKD disk
- Middleware and Database volumes use SAN disk over FCP
- Hipersocket network used for guest to guest communication
- z/VM LDAP server for Linux users and groups
- DNS servers for mainframe reside on Linux servers (these point back to corporate name servers)
DR Setup

- Replication between primary and backup data centers use Global Mirror Replication (TPC-R)

- Backup mainframe
  - LPAR names are different between data centers
    - Primary DC LPAR name starts with DC
    - Backup DC LPAR name starts with SLC
      - Guests see the LPAR name at boot up and loads its config based on name of LPAR
    - SAN target WWPN and LUN differ between primary and backup data centers
      - Guests automatically configure WWPN and LUN based on LPAR it comes up in
  - Hipersocket address DO NOT change at backup data center
  - External network address DO change at backup data center
DR Setup

• From an OS perspective everything is automatic
• Manual processes
  • Update DNS to reflect DR IP addresses
  • Update middleware to point to external(to mainframe) databases
DR Setup

**Riverdale Data Center**
- **Primary Mainframe Z02**
- IBM DS8100
- SVC
- FCP (x4)
- Ficon (x2)
- Global Mirror Replication (TPC-R)

**SLIC Data Center**
- **Standby Mainframe O01**
- IBM DS8100
- SVC
- FCP (x4)
- Ficon (x2)
DR Event

Riverdale Data Center

Primary Mainframe Z02

SVC

IBM DS8100

Global Mirror Replication (TPC-R)

SLIC Data Center

SVC

IBM DS8100

Standby Mainframe O01

FCP (x4)

Ficon (x2)

FCP (x4)

Ficon (x2)
DR Event
Automation *(From Nationwide Insurance DR presentation)*

- Avoid manual processes
  - Dependence on key individuals
  - Prone to mistakes
  - Slow
- Automated processes
  - Requires only basic knowledge of environment and technologies in use
  - Accuracy
  - Repeatable
  - Faster
  - Does not mean build it once then ignore; Requires regular review and updates
Automation

- Linux configuration happens at boot
  - As part of boot, the script boot.config is run
    - Identifies LPAR by interacting with CP using VMCP
    - Configures WWPN and LUN for fcp volumes
    - Configures network IP information (physical and hipersocket)
    - Linux PARM file is stored on a commonly accessible CMS disk
      - Using cmsfscat, the [guestid].parm is written to /tmp/sourceinfo
HOST=lnxlp001
DCIP=10.215.121.17
DCRT=10.215.121.1
DCHSI=10.215.9.110
SLCIP=10.225.121.17
SLCRT=10.225.121.1
SLCHSI=10.215.9.110
DCFCP='2000 2100'
DCWWPN_2000="5005076801302dc0
5005076801202dc0
5005076801302da6
5005076801202da6"
DCWWPN_2100="5005076801403a48
5005076801103a48
5005076801403a55
5005076801103a55"
SLCFCP="2000 2100"
SLCWWPN_2000="5005076801203a48
5005076801303a48
5005076801203a55
5005076801303a55"
SLCWWPN_2100="5005076801103a48
5005076801403a48
5005076801103a55
5005076801403a55"
SLCLUNS="0000 0001"
ENV=PROD
Automation

boot.config

#!/bin/sh
#
### BEGIN INIT INFO
# Provides:          boot.config
# Required-Start:    boot.udev
# Required-Stop:     
# Should-Start:      
# Default-Start:     B
# Default-Stop:      
# Description:       install config files
### END INIT INFO
.

/etc/rc.status

build_nic_config () {
    echo "BOOTPROTO='static'" > $1
    echo "UNIQUE=''" >> $1
    echo "STARTMODE='auto'" >> $1
    echo "IPADDR='$2'" >> $1
    if [ -z $3 ]; then
        echo "NETMASK='255.255.255.0'" >> $1
    else
        echo "NETMASK='$3'" >> $1
    fi
    echo "NETWORK=''" >> $1
    echo "BROADCAST=''" >> $1
    echo "ETHTOOL_OPTIONS=''" >> $1
    echo "MTU=''" >> $1
    echo "NAME=''" >> $1
    echo "REMOTE_IPADDR=''" >> $1
    echo "USERCONTROL='no'" >> $1
    echo "PREFIXLEN=''" >> $1
}


case "$1" in
  start)
  # modprobe required just in case
  modprobe vmcp
  sleep 1
  /sbin/vmcp "link * 191 191 rr"
  sleep 2
  echo "1" > /sys/bus/ccw/devices/0.0.0191/online
  sleep 2
  PARMDEV=`grep 191 /proc/dasd/devices|awk '{print $7}'`
  QUSERID=`/sbin/vmcp query userid`
  GUEST=`echo $QUSERID|awk '{print $1}'`
  LPAR=`echo $QUSERID|awk '{print $3}'`
  echo "GUEST=$GUEST" > /tmp/sourceinfo
  echo "LPAR=$LPAR" >> /tmp/sourceinfo
  cmsfscat -d /dev/$PARMDEV -a ${GUEST}.parm >> /tmp/sourceinfo
  echo "0" > /sys/bus/ccw/devices/0.0.0191/online
  /sbin/vmcp "det 191"
.
  /tmp/sourceinfo
case "ENV" in
  PROD)
    CLR="41"; #Red
    ;;
  TEST)
    CLR="42"; #Green
    ;;
  DR)
    CLR="46"; #Turq
    ;;
esac

echo "CLR=$CLR" >> /tmp/sourceinfo

case "$LPAR" in
  DC*)
    SITE="DC";
    ln -sf /etc/hosts.dc /etc/hosts
    ;;
  SLC*)
    echo DR="[DR]" >> /tmp/sourceinfo;
    ln -sf /etc/hosts.slc /etc/hosts
    SITE="SLC";
    ;;
esac
IP=${SITE}IP
MASK=${SITE}MASK
HIP=${SITE}HSI
RT=${SITE}RT
FCP=${SITE}FCP
WWPN=${SITE}WWPN
LUNS=${SITE}LUNS

for _fcp in ${!FCP}; do
    zfcp_host_configure 0.0.0.0 ${_fcp} 1
    for _lun in ${!LUNS}; do
        _port_list=${WWPN}_${_fcp}
        for _port in ${!_port_list}; do
           zfcp_disk_configure 0.0.0.0 ${_fcp} 0x${_port} 0x${_lun}000000000001
        done
    done
done

#Build IP config files
build_nic_config "/etc/sysconfig/network/ifcfg-qeth-bus-ccw-0.0.1000" ${!IP} ${!MASK}
buidl_nic_config "/etc/sysconfig/network/ifcfg-hsi-bus-ccw-0.0.e000" ${!HIP}
echo "default ${!RT} - -" > /etc/sysconfig/network/routes

echo "$HOST.systems.americafirst.com" > /etc/HOSTNAME
hostname $HOST

#Build MOTD

echo "zLinux $LPAR $GUEST `hostname`" > /etc/motd

echo "`head -1 /etc/SuSE-release`" >> /etc/motd

echo "`uname -rv`" >> /etc/motd

[ -f /etc/motd.skel ] && cat /etc/motd.skel >> /etc/motd

rc_status -v

;;
   stop)
   #do nothing
   rc_status -v
   ;;
 *)
   echo "Usage: $0 {start|stop}"
   exit 1
   ;;
esac

rc_exit
GUEST=LNXLP001
LPAR=DCPROD1
HOST=lnxlp001
DCIP=10.215.121.17
DCRT=10.215.121.1
DCHSI=10.215.9.110
SLCIP=10.225.121.17
SLCRT=10.225.121.1
SLCHSI=10.215.9.110
DCFCP='2000 2100'
DCWWPN_2000="5005076801302dc0 5005076801202dc0 5005076801302da6 5005076801202da6"
DCWWPN_2100="5005076801402dc0 5005076801102dc0 5005076801402da6 5005076801102da6"
DCLUNS="0000 0001"
SLCFCP="2000 2100"
SLCWWPN_2000="5005076801303a48 5005076801203a48 5005076801303a55 5005076801203a55"
SLCWWPN_2100="5005076801403a48 5005076801103a48 5005076801403a55 5005076801103a55"
SLCLUNS="0000 0001"
ENV=PROD
CLR=41
Automation
MOTD and Prompt

Live Production (non-DR)

This system is the property of America First Credit Union.
All connections are logged!
Unauthorized connections are prohibited!
Automation
MOTD and Prompt

Guest in DR Mode

This system is the property of America First Credit Union.
All connections are logged!
Unauthorized connections are prohibited!

root@lnxlp001:[DR] PROD:~ #
source /tmp/sourceinfo

_t=""
_e="\\e[${CLR}m\}ENV\\e[0m]"
_dr="\\e[34m\}DR\\e[0m]"

if test "UID" = 0 ; then
  _u="\\e[1;31m\}u\\e[0m]@\h"
  _p="\\e[1;31m \}#\\e[0m]"
else
  _u="\u@\h"
  _p="\>"

if test \( "$TERM" = "xterm" -o "$\{TERM#screen\}" != "$TERM" \) \( -a -z "$EMACS" -a -z "$MC_SID" -a -n "$DISPLAY" \) then
  _t="\$(ppwd \1)"
fi

PS1="$_t$_u:$_dr$_e:\w$_p"
Testing

- Test annually
- Document everything during your test.
  - Track all issues found during test.
    - Included issues that were resolved.
- In our DR test we take a snapshot (Point-in-Time Copy) of our production data and use that as our DR test dataset.
- We test our DR environment in a “test” mode only.
  - Production traffic continues to our non-DR mainframe.
- Once test is complete, DR test dataset is discarded.
Questions
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