Introduction to the new Linux on System z Terminal Server using IUCV

Session 8463
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Room 203B, Anaheim Convention Center
Introduction to the new Linux on System z Terminal Server using IUCV

Agenda

• Introduction
  – How can IUCV terminals help you?

• Working with IUCV terminals
  – What does an IUCV terminal environment look like?
  – Establishing terminal sessions

• Setting up your IUCV terminal environment
  – Setting up target systems
  – Setting up a terminal server

• Summary and Conclusion
Introduction
Why do you need IUCV terminals?

- **Ask yourself**
  - How often did you reconfigure your network setup using a line-mode terminal?
  - Can you use “ed” to change and correct your configuration files?
    - *Why not using vi or emacs?*
How can IUCV terminals help you?

- Full-screen terminal access to Linux instances on the same z/VM
- Access Linux instances that are not connected to an Internet Protocol (IP) network

- Use cases
  - Provide an alternative terminal access to 3270 and 3215 line-mode terminals
  - Increase availability by providing emergency access if the network for a target system fails
  - Centralize access to systems by providing a terminal server environment
  - Heighten security by separating user networks from administrator networks or by isolating sensitive Linux instances from public IP networks
Working with IUCV terminals
What are Linux terminals and consoles?

- **Linux terminals**
  - Input/output devices through which users interact with Linux and Linux applications
  - Terminals differ in their modes and capabilities

- **Linux consoles**
  - Consoles are output devices which display Linux kernel messages
  - The preferred console
    - The preferred console is the device which displays messages during the boot process when the 'init'-program is called

- **Linux terminal device drivers typically provide combined terminal/console devices**
What is z/VM IUCV and how does Linux use it?

- **Inter-user communication vehicle (IUCV)**
  - A z/VM CP interface for passing data between virtual machines or between CP and a virtual machine

- **The Linux kernel includes IUCV**
  - Base IUCV layer (intra-kernel API)
  - Collaborative Memory Management (CMM), monreader, and vmlogrdr
  - AF_IUCV – *Addressing family for network sockets*
  - IUCV hypervisor console (HVC) terminal device driver
Introducing the IUCV terminal programs

• **IUCV terminal programs (s390-tools)**
  - *iucvconn* – Start terminal connection over IUCV
  - *iucvtty* – Allow remote logins over IUCV
  - *ts-shell* – Login shell for setting up a terminal server using IUCV
  - *chiucvallow* – Restrict access to IUCV HVC terminals

• **Terminal access over IUCV is provided by**
  - iucvtty
  - IUCV hypervisor console (HVC) device driver (Linux kernel)
What does an IUCV terminal environment look like?

Introduction to the new Linux on System z Terminal Server using IUCV
Establishing terminal sessions (iucvttty)

- **iucvconn establishes terminal sessions**
  - Socket communication is based on the AF_IUCV address family
  - Addressing is based on z/VM user ID and an terminal identifier ("term1")

- **iucvttty waits for incoming connections and starts /bin/login to log on users**

```
Linux
   IUCV device driver
   AF_IUCV
   iucvconn

"term1"

Linux
   IUCV device driver
   AF_IUCV
   iucvttty

"term1"

Target system

```

```bash
iucvttty

login program

term1

h2

h3
```
Establishing terminal sessions (z/VM IUCV HVC DD)

- IUCV HVC device driver provides up to 8 terminal devices (/dev/hvc)
  - Using the terminal identifiers “lnxhvc0” .. “lnxhvc7”

- hvc0 can be activated as (preferred) Linux console
What is the difference between iucvtty and IUCV HVC?

<table>
<thead>
<tr>
<th>Criteria</th>
<th>iucvtty</th>
<th>IUCV HVC device driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Origin</td>
<td>s390-tools</td>
<td>Linux kernel</td>
</tr>
<tr>
<td>Number of terminal instances</td>
<td>&gt; 8</td>
<td>max. 8</td>
</tr>
<tr>
<td>Terminal identifiers</td>
<td>variable</td>
<td>fixed</td>
</tr>
<tr>
<td>Direct root login</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Receiving kernel messages</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Acting as preferred console</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Restricting access to terminals</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Typical use case</td>
<td>administrative access</td>
<td>emergency access</td>
</tr>
</tbody>
</table>
What else can you do with iucvconn?

- **Accessing special functions through escape characters**
  - Use Ctrl+_ followed by “d” to disconnect terminal sessions

- **Creating terminal session transcripts**
  - Writing the terminal data stream to a log file (transcript)
  - Replaying transcripts with realistic output delays
What you can do with ts-shell?

• **ts-shell helps you to:**
  – Set up a terminal server to simplify system administration by providing a central access point
  – Authorize users to establish IUCV terminal connections to specific target systems
  – Improve auditing through creating transcripts of terminal sessions with target systems
  – Restrict users from getting access to the terminal server system

• **In a ts-shell session, you can:**
  – List your authorizations
  – Establish terminal connections
How can you secure an IUCV terminal environment?

- ts-shell user authorizations
- ts-shell authorizations
- iucvtty permissions
- Login prompt

Diagram:

- z/VM
  - ts-shell
    - user a
    - user b
  - iucvconn
  - Terminal server
  - z/VM IUCV authorizations

- iucvtty 1
- iucvtty 2
  - hvcO
  - Target system
  - z/VM user ID filter
  - Login prompt
Setting up your IUCV terminal environment
Setting up target systems with IUCV HVC devices

1. **Specifying the number of IUCV HVC devices**
   - Set kernel parameter: `hvc_iucv=2`

2. **Enabling user logins**
   - Start a getty program on the terminal through `/etc/inittab`
     
     ```
     h0:2345:respawn:/sbin/agetty -L 9600 hvc0 xterm
     h1:2345:respawn:/sbin/agetty -L 9600 hvc1 xterm
     ```

3. **Permitting root logins**
   - List hvc device nodes in `/etc/securetty`

4. **Activating hvc0 to receive Linux kernel messages**
   - Set kernel parameter: `console=hvc0 console=ttyS0`
Setting up target systems with iucvtty

1. Choose a terminal identifier
   - For example: lxterm1

2. Enabling user logins
   - Start the iucvtty program through /etc/inittab

```
i1:2345:respawn:/usr/bin/iucvtty lxterm1
```
Setting up a terminal server for iucvconn

- **Authorize the z/VM guest virtual machine for IUCV**
  - Add an IUCV user directory statement, for example, `IUCV ANY`
  - The z/VM user directory for a terminal server might look like:

```plaintext
USER T6313004 XSECRETX 768M 1G G
* General statements
  IPL 0150
  MACH ESA 8
* IUCV authorization
  IUCV ANY
  OPTION MAXCONN 128
* Generic device statements
  CONSOLE 0009 3215 T
  SPOOL 000C 2540 READER *
* ...
Establishing terminal connections with iucvconn

```
hans@larsson:~$ ssh hans@t6313004
Password:

hans@t6313004:~$ iucvconn T6313005 lxterm1
login: hans
Password:

[hans@t6313005 ~]$ ls
[hans@t6313005 ~]$ ps
   PID TTY          TIME CMD
  1731 pts/0    00:00:00 bash
  1762 pts/0    00:00:00 ps
[hans@t6313005 ~]$ 
```
Setting up a terminal server for ts-shell

- Creating a group and a user for ts-shell

```bash
groupadd testgrp
useradd -m -s /usr/bin/ts-shell -g ts-shell -G testgrp bob
```

- Granting authorizations to ts-shell users

  - Edit `/etc/iucvterm/ts-authorization.conf`

    ```bash
    @testgrp = list:t6313006,t6313007,t6313008
    bob = list:t6313005
    ```
Establishing terminal connections with ts-shell

```
hans@larsson:~$ ssh bob@t6313004
Password:
Last login: Fri Mar 5 12:01:32 2010 from dyn-9-152-212-21
Welcome to the Terminal Server shell.
Type 'help' to get a list of available commands.

bob@ts-shell> list
 t6313006
 t6313007
 t6313008
 t6313005
 bob@ts-shell>

bob@ts-shell> connect t6313005
 ts-shell: Connecting to t6313005 (terminal identifier: lnxhvc0)...

Red Hat Enterprise Linux Server release 5.4 (Tikanga)
Kernel 2.6.18-164.el5 on an s390x

t6313005 login: root
Password:
Last login: Fri Mar 5 12:02:45 on hvc0
[root@t6313005 ~]# ps
   PID TTY          TIME CMD
 1678 hvc0     00:00:00 bash
 1708 hvc0     00:00:00 ps
[root@t6313005 ~]# logout

```
Summary & Conclusion
Summary and Conclusion

• **IUCV terminals are flexible and easy to use**

• **IUCV terminals help you to**
  – Access your Linux instances in emergency situations
  – Simplify system administration by providing a central access point
Questions?

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Where do you get more information?

- **developerWorks**
  - How to Set up a Terminal Server Environment (SC34-2596)
  - Device Drivers, Features, and Commands (SC33-8411)

- **s390-tools package**
  - Man-pages for iucvconn(1), iucvtty(1), ts-shell(1), af_iucv(7), and hvc_iucv(9)
  - ts-shell Readme
Which Linux distributions include IUCV terminals?

• Red Hat Enterprise Linux (RHEL)
  – RHEL 5 Update 4 or higher

• Novell SUSE Enterprise Linux Server (SLES)
  – SLES 10 Service Pack 3 or higher

• “Upstream” packages
  – Linux kernel 2.6.30
  – s390-tools 1.8.1
Backup
What is `iucvconn_on_login`?

- **`iucvconn_on_login` is an alternative login shell for setting up a terminal server**
  1. Log in to Linux with a user ID that matches the z/VM user ID of the target system
  2. After a successful login, a terminal session is established and the user is prompted to log in to the target system

- **Creating a user for `iucvconn_on_login`**
  - `useradd -m -s /usr/bin/iucvconn_on_login lxguest1`

```
ssh -t lxguest1@termsrv1.example.net lxtterm1
```

![Diagram](image-url)
Using the IUCV terminal programs

- **Using the iucvconn program:**
  - To access the first z/VM IUCV HVC terminal on the Linux instance in z/VM guest LNXSYS02
    $ iucvconn LNXSYS02 lnxhvc0
  - To create a transcript of the terminal session to the Linux instance in z/VM guest LNXSYS99
    $ iucvconn -s ~/transcripts/lnxsys99 LNXSYS99 lnxhvc0

- **Using the iucvtty program:**
  - To allow remote logins using the terminal identifier „lnxterm“
    # iucvtty lnxterm
  - To access the „lnxterm“ terminal on the Linux instance in z/VM guest LNXSYS01
    $ iucvconn LNXSYS01 lnxterm
  - To use /sbin/sulogin instead of /bin/login for terminal identifier “suterm”
    # iucvtty suterm -- /sbin/sulogin

- **Configuring the Linux system for providing terminals over IUCV (using /etc/inittab)**
  - z/VM IUCV HVC terminal devices
    h0:2345:respawn:/sbin/agetty -L 9600 hvc0 linux
  - iucvtty
    t1:2345:respawn:/usr/bin/iucvtty lnxterm
Which Linux kernel components are used?

- Hypervisor Console (HVC)
  - TTY device driver
- TTY core layer
- Other back-ends
- IUCV back-end
- AF_IUCV
- IUCV base device driver

Kernel space:
- /dev/hvc0
- /dev/hvc1

User space:
- socket()
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