

Building a SUSE Linux distro

With SuseStudio and Kiwi

Revision	Author	Date	Description
0.01	D Snider	15/11/30	Initial Outline
0.02	D Snider	15/12/07	Added suseStudio sample session. Retest OpenSuse builds. Setup a git repo.
0.03	D Snider	15/12/08	Retest OpenSuse OEM build. Added testing screenshots.
0.04	D Snider	15/12/08	Added OpenSuse stick build.

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NOTE: WHILE THIS DOCUMENT IS BEING REFINED, META INFORMATION WILL BE IN < BRACKETS > .

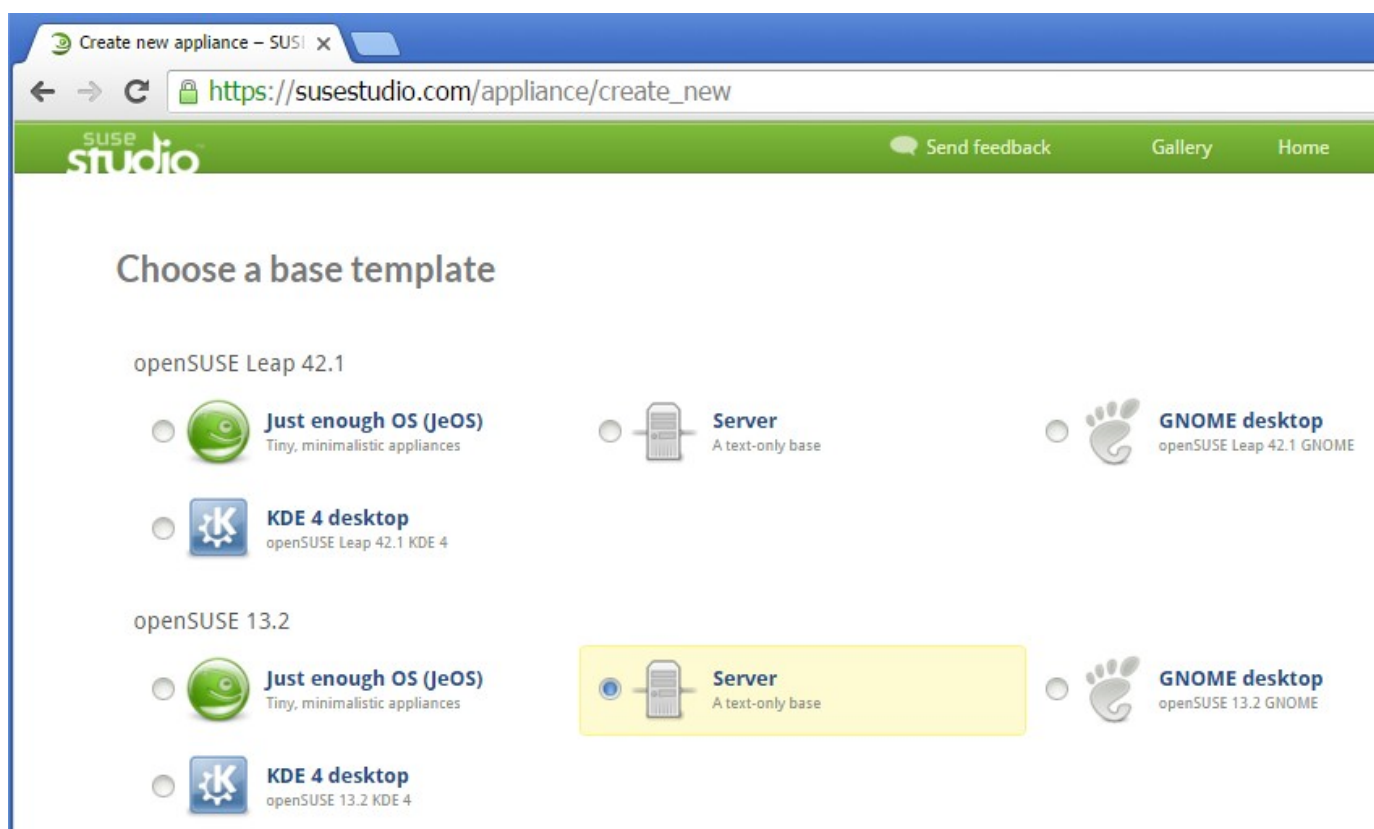
1. SW/HW Requirements

VMware Workstation or an equivalent

2. First distro with SuseStudio.com – OpenSUSE 13.2

Register and Login to susestudio.com.

Start with creating an openSUSE 13.2 server:



Scroll down and name the appliance:

Select your architecture

☐ 32-bit ☒ 64-bit

Name your appliance

This can be changed later

Create appliance

Select: Create appliance

The tabs further configure the new OS.

First there are the off the shelf RPMs that can be installed.

For now, the defaults are sufficient:

The screenshot shows the 'openSUSE_13.2' installer window. The 'Software' tab is selected, showing 'Software sources' and 'Selected software'. The 'Software sources' section lists 'openSUSE 13.2 Updates' and 'openSUSE 13.2 OSS'. The 'Selected software' section lists various packages including 'aaa_base', 'branding-openSUSE', 'e2fsprogs', 'glibc-locale', 'grub2', 'gsettings-backend-dconf', 'hwdm', 'iputils', 'kernel-default', 'less', 'netcfg', 'openssh', 'openSUSE-build-key', 'patterns-openSUSE-base', 'plymouth', 'polkit-default-privs', 'rpcbind', 'SuSEfirewall2', 'syslog-ng', 'timezone', 'vim', 'yast2', 'yast2-firstboot', and 'zypper'. The 'Software information' sidebar on the left shows '0 patterns selected', '24 packages selected', and '297 total packages'.

Select Configuration:

root password: 123456

The screenshot shows the 'openSUSE_13.2' installer window with the 'Configuration' tab selected. The 'Configuration' tab is divided into several sections: 'Default locale', 'Default time zone', 'Network', 'Firewall', and 'Users and groups'. The 'Default locale' section shows 'Language: English (US)' and 'Keyboard Layout: English (US)'. The 'Default time zone' section shows 'Region: Global' and 'Time Zone: UTC'. The 'Network' section has five radio buttons: 'Do not configure network', 'Configure network during first boot', 'Use NetworkManager to configure the network at run-time', 'Discover network settings automatically (DHCP)' (selected), and 'Manually configure network'. A note below states: 'Note: Your appliance will always run DHCP in Testdrive.' The 'Firewall' section has a checked checkbox 'Enable firewall' and two sub-checkboxes: 'Open SSH port (22)' and 'Open HTTP ports (80, 443)'. The 'Users and groups' section shows a table with columns: 'Login', 'UID (optional)', 'Password', 'Group', 'Home directory', and 'Shell'. The table contains one row for the 'root' user with UID '0', password '123456', group 'root', home directory '/root', and shell '/bin/bash'. There is a button 'Add new user...' below the table.

Login	UID (optional)	Password	Group	Home directory	Shell
root	0	123456	root	/root	/bin/bash

Select → Build tab

Default format: Live CD / DVD (.iso)

The screenshot shows the 'Build' tab of the openSUSE 13.2 web interface. The header includes the openSUSE logo, version '13.2', architecture '64-bit x86', and a '200 MB download' link. Navigation tabs are 'Start', 'Software', 'Configuration', 'Files', and 'Build'. The left sidebar shows 'Software information' with '0 patterns selected', '24 packages selected', and '306 total packages'. Below it, a 'Messages' section contains a tip about using the 'disk image' format. The main content area has a 'Version' field set to '0.0.1'. A 'Default format' dropdown is set to 'Live CD / DVD (.iso)', with a green 'Build' button next to it. A list of 'Additional formats' includes USB Stick / Hard Disk Image, Preload ISO (.iso), VMware Workstation / VirtualBox (.vmdk), OVF Virtual Machine / ESXi (.ovf), Xen guest (.img), Hyper-V Virtual Hard Disk (.vhd), and SUSE Cloud / OpenStack / KVM (.qcow2). A 'Read more about formats...' link is below the list. At the bottom, there are links for 'Changelog...', 'Configuration...', and a note about exporting the Kiwi configuration for local building.

Select → Build

This screenshot shows the 'Build' tab after the build process is complete. The interface is similar to the previous one, but the 'Version' field is now '0.0.2'. The 'Default format' dropdown remains 'Live CD / DVD (.iso)'. The 'Additional formats' list is the same. A new section at the bottom, titled 'Version 0.0.1', displays the build results. A tooltip on the left indicates 'Uncompressed size: 274MB' and 'Built 2 seconds ago, in 8:05'. The main table shows a single entry: 'Live CD / DVD (.iso)' with a size of '274 MB'. To the right of this entry are links for 'Testdrive', 'Download', and 'View files', along with a close icon. Below the table, there are links for 'Configuration...' and 'Clone'.

After the build finishes,

Select Download to test the iso file.

2.1. ISO testing on VMware Workstation

Under VMware workstation:

Select:

File→New Virtual Machine

Custom (advanced) configuration

Installer disk image file: <path/to>/openSUSE_13.2.x86_64.iso*

Select “power on this virtual machine”



The GRUB2 menu should show. Then go to a linux login:

```
Welcome to openSUSE 13.2 "Harlequin" - Kernel 3.16.7-29-default (tty1).  
  
linux login:
```

Getting to this point means the ISO build was successful.

Use the configured id: root/123456

Check network interface:

```
> ifconfig
eno167777 Link encap:Ethernet HWaddr 00:0C:29:E8:23:44
   inet addr:192.168.17.139 Bcast:192.168.17.255 Mask:255.255.255.0
   inet6 addr: fe80::20c:29ff:fee8:2344/64 Scope:Link
   UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
   RX packets:57 errors:0 dropped:0 overruns:0 frame:0
   TX packets:48 errors:0 dropped:0 overruns:0 carrier:0
   collisions:0 txqueuelen:1000
   RX bytes:7101 (6.9 Kb) TX bytes:9609 (9.3 Kb)
```

SSH into this IP addr

Verify the OS build:

```
> cat /etc/os-release
NAME=opensuse
VERSION="13.2 (Harlequin)"
VERSION_ID="13.2"
PRETTY_NAME="opensuse 13.2 (Harlequin) (x86_64)"
ID=opensuse
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:opensuse:opensuse:13.2"
BUG_REPORT_URL="https://bugs.opensuse.org"
HOME_URL="https://opensuse.org/"
ID_LIKE="suse"
```

Check bundled RPMs:

```
> rpm -qa
...
```

Shutdown the systemd way:

```
> systemctl halt
```

3. Reproducing a suseStudio build with KIWI

The backend of suseStudio is the KIWI imaging system: <https://github.com/openSUSE/kiwi>

And the corresponding configuration files can be downloaded from suseStudio.com:

openSUSE_13.2
64-bit x86, based on openSUSE 13.2
200 MB download

Start Software Configuration Files **Build** Share

Software information

0 patterns selected
24 packages selected
306 total packages

Messages

Tip: During development, you may want to use the *disk image* format to build your appliance, to take advantage of the modified files feature in Testdrive.

Version

Default format:

Additional formats:

- ☐ USB Stick / Hard Disk Image
- ☐ Preload ISO (.iso)
- ☐ VMware Workstation / VirtualBox (.vmdk)
- ☐ OVF Virtual Machine / ESXi (.ovf)
- ☐ Xen guest (.img)
- ☐ Hyper-V Virtual Hard Disk (.vhd)
- ☐ SUSE Cloud / OpenStack / KVM (.qcow2)

[Read more about formats...](#)

[Changelog...](#) [Configuration...](#)

Version 0.0.1

[Configuration...](#)

Builds older than seven days may be deleted to free up space on our servers. But don't worry, you can rebuild them at any time.

[View MD5 checksums](#), for verification that your appliance's download was successful.

[Export your appliance's Kiwi configuration](#), for building your appliance locally. (For advanced users only)

Export

Build your appliance locally, using [Kiwi](#), a command-line tool. Please consult the [README](#) in your download for more details.

Note: For a local build you will need a Kiwi version that supports building schemaversion 5.2 or higher.

Kiwi Cookbook html version: <https://doc.opensuse.org/projects/kiwi/doc/>

pdf version: <https://github.com/openSUSE/kiwi/blob/master/doc/kiwi.pdf>

4. OS Builder Environment – OpenSUSE

4.1. Repos/ISOs

Obtain the x86_64 ISO from the official site: <http://download.opensuse.org/distribution/13.2/iso/>

While downloading 'openSUSE-13.2-DVD-x86_64.iso' is possible, it will be slow.

A torrent client with the corresponding *.torrent file is much faster.

4.2. OS install

Using a Virtual environment like Vmware Workstation can speed up the iterations of OS installs.

Attach the ISO to a virtual CDROM, power up the virtual machine, and install the OpenSuse 13.2.

4.3. Kiwi installation

Once the OS is installed, the zypper repositories need to point to the most recent updates:

```
> zypper lr -u
# | Alias | Name | Enabled | GPG Check | Refresh
|-----|-----|-----|-----|-----|-----|
1 | download.opensuse.org-13.2-non-oss | Update Repository (Non-Oss) | Yes | ( p) Yes | Yes
| http://download.opensuse.org/update/13.2-non-oss/
2 | download.opensuse.org-non-oss | Main Repository (NON-OSS) | Yes | ( p) Yes | Yes
| http://download.opensuse.org/distribution/13.2/repo/non-oss/
3 | download.opensuse.org-oss | Main Repository (OSS) | Yes | ( p) Yes | Yes
| http://download.opensuse.org/distribution/13.2/repo/oss/
4 | download.opensuse.org-oss_1 | Main Repository (Sources) | Yes | ( p) Yes | Yes
| http://download.opensuse.org/source/distribution/13.2/repo/oss/
5 | download.opensuse.org-update | Main Update Repository | Yes | ( p) Yes | Yes
| http://download.opensuse.org/update/13.2/
6 | openSUSE-13.2-0 | openSUSE-13.2-0 | Yes | ( p) Yes | No
| cd:///devices=/dev/disk/by-id/ata-Vmware_Virtual_IDE_CDROM_Drive_10000000000000000001
7 | repo-debug | openSUSE-13.2-Debug | No | ---- | Yes
| http://download.opensuse.org/debug/distribution/13.2/repo/oss/
8 | repo-debug-update | openSUSE-13.2-Update-Debug | No | ---- | Yes
| http://download.opensuse.org/debug/update/13.2/
9 | repo-debug-update-non-oss | openSUSE-13.2-Update-Debug-Non-Oss | No | ---- | Yes
| http://download.opensuse.org/debug/update/13.2-non-oss/
```

<Show deleting an entry>

<Show adding an entry>

<Add the latest kiwi repo>

latest kiwi repo for OpenSuse 13.2:

http://download.opensuse.org/repositories/Virtualization:/Appliances/openSUSE_13.2/x86_64/

Then the kiwi tools can be installed:

```
> zypper in kiwi kiwi-doc kiwi-templates kiwi-tools kiwi-desc-vmxboot kiwi-desc-isoboot kiwi-desc-oemboot squashfs clicfs
...
> rpm -qa 'kiwi*'
kiwi-7.01.18-5.1.x86_64
kiwi-doc-7.01.18-5.1.noarch
kiwi-tools-7.01.18-5.1.x86_64
kiwi-desc-vmxboot-7.01.18-5.1.x86_64
kiwi-desc-isoboot-7.01.18-5.1.x86_64
kiwi-templates-7.01.18-5.1.x86_64
kiwi-desc-oemboot-7.01.18-5.1.x86_64
> kiwi --version
Dec-08 09:48:15 <1> : Version:
Dec-08 09:48:15 <1> : --> vnr: 7.01.18
```

4.4. Kiwi documentation

Or a config.xml file can be reverse engineered from the installed RPMs:

```
# kiwi.pdf is the best first place to learn about config.xml files
> rpm -ql 'kiwi-doc'
/usr/share/doc/packages/kiwi/kiwi.pdf
...
/usr/share/doc/packages/kiwi/examples/suse-13.2/suse-live-iso/config.xml

> rpm -ql 'kiwi-desc-oemboot'
...
/usr/share/kiwi/image/oemboot/suse-SLES12/config.xml
...

> rpm -ql 'kiwi-desc-isoboot'
...
/usr/share/kiwi/image/isoboot/suse-13.2/config.xml
```

5. OpenSUSE 13.2 OEM build

This generates an ISO image that immediately installs Linux to a harddrive.

Build:

```
# checkout
> git clone https://github.com/dsnider0909/suse_builds.git

# build
> cd suse_builds/opensuse_iso
> kiwi --build $PWD/source --destdir /tmp/opensuse_iso
Dec-08 11:37:16 <1> : Find build results at: /tmp/opensuse_iso
done
Dec-08 11:37:16 <1> : KIWI exited successfully
```

Here are the relevant changes to config.xml:

```
=== source/config.xmll ===
<type checkprebuilt='true' boot='oemboot/suse-13.2' fsnocheck='true' filesystem='ext3'
bootloader='grub2' installiso='true' installboot='install' kernelcmdline='quiet'
fsmountoptions='acl' image='oem'>
  <oemconfig>
    <oem-swap>true</oem-swap>
    <oem-swapsize>512</oem-swapsize>
    <oem-boot-title>openSUSE_13.2_svr</oem-boot-title>
  </oemconfig>
</type>

<repository type='rpm-md'>
  <source path='http://download.opensuse.org/update/13.2/'/>
</repository>
<repository type='yast2'>
  <source path='http://download.opensuse.org/distribution/13.2/repo/oss/'/>
</repository>
```

Test:

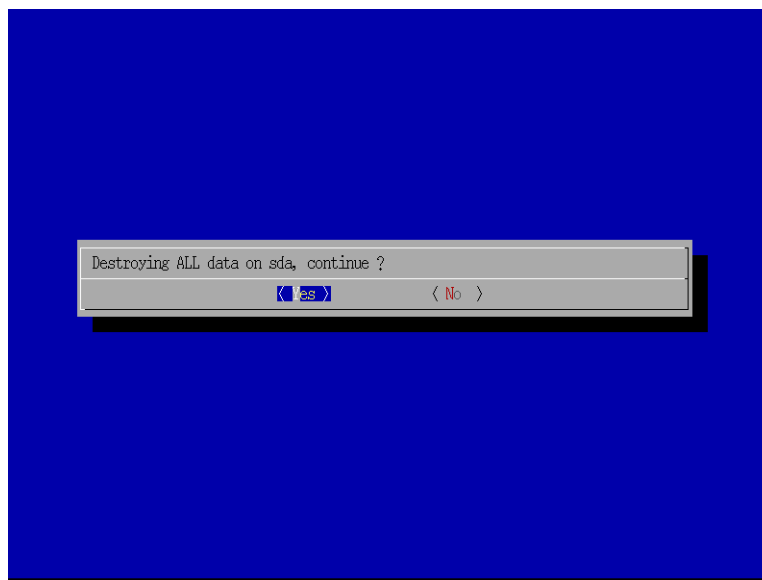
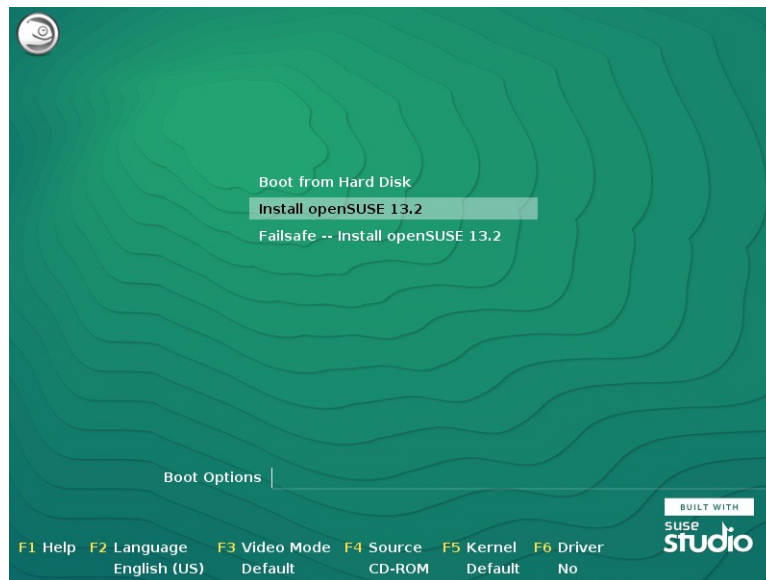
```
# copy out the ISO from the guest build environment
cygwin> scp root@<guest_ip>:/tmp/opensuse_iso/openSUSE_13.2.x86_64-0.0.2.install.iso .
```

Under VMware workstation:

Select:

*File→New Virtual Machine
Custom (advanced) configuration
Installer disk image file: <path/to/>openSUSE_13.2.x86_64-0.0.2.install.iso
Guest OS: Linux
Version: OpenSUSE 64-bit
Processors – number of processors: 2
Memory for this virtual machine: 2048MB
Network connection: NAT
SCSI Controller: LSI Logic
Virtual disk type: SCSI
Create a new virtual disk*

Select "power on this virtual machine"



```
Welcome to openSUSE 13.2 "Harlequin" - Kernel 3.16.7-29-default (tty1).
```

```
linux login:
```

Getting to this point means the ISO build was successful.

Use the configured id: root/123456

6. OpenSUSE 13.2 stick build

This generates a raw USB image that immediately installs Linux to a harddrive.

Build:

```
# checkout
> git clone https://github.com/dsnider0909/suse_builds.git

# build
> cd suse_builds/opensuse_stick
> kiwi --build $PWD/source --destdir /tmp/opensuse_stick
Dec-08 11:37:16 <1> : Find build results at: /tmp/opensuse_stick
done
Dec-08 11:37:16 <1> : KIWI exited successfully
```

Here are the relevant changes to config.xml:

```
=== source/config.xml ===
<type checkprebuilt='true' boot='oemboot/suse-13.2' fsnocheck='true' filesystem='ext3'
bootloader='grub2' installstick='true' installboot='install' kernelcmdline=''
fsmountoptions='acl' image='oem' >
  <oemconfig>
    <oem-swap>>false</oem-swap>
    <oem-boot-title>openSUSE_13.2</oem-boot-title>
  </oemconfig>
</type>

<repository type='rpm-md'>
  <source path='http://download.opensuse.org/update/13.2/'/>
</repository>
<repository type='yast2'>
  <source path='http://download.opensuse.org/distribution/13.2/repo/oss/'/>
</repository>
```

Test:

```
# copy raw image to a USB flash drive
> cd /tmp/opensuse_stick
> dd if=opensUSE_13.2_svr.x86_64-0.0.4.raw.install.raw of=/dev/sdb bs=1M
```

Then boot the USB flash drive on real hardware or boot this VM within VMware workstation to then boot a USB stick:
<https://www.plop.at/en/bootmanagers.html>

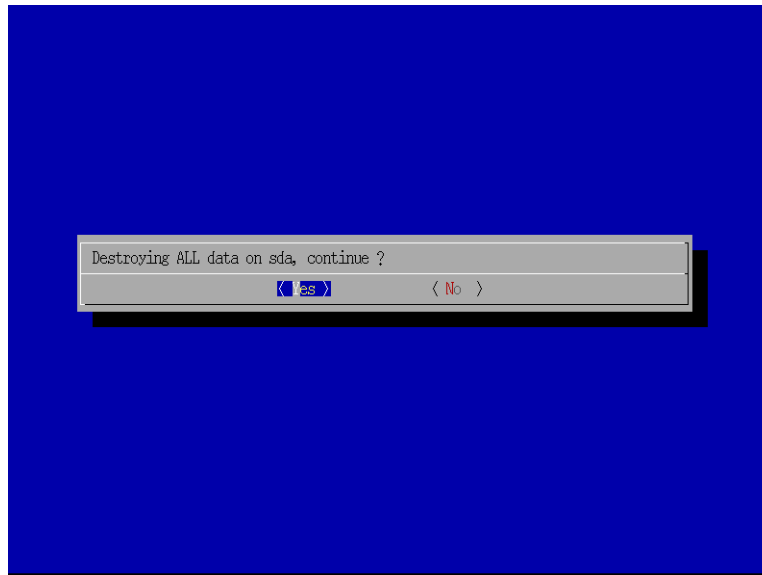
Boot to Plop Boot Manager
Ensure the USB stick is attached
Select: USB



Grub2 screen:



Starting hard drive initialization:



And then the login screen:

```
[ 288.328370] NET: Registered protocol family 17
Welcome to openSUSE 13.2 "Harlequin" - Kernel 3.16.7-29-default (tty1).

linux login:
```

7. SLES 12 build

```
# checkout
> git clone https://github.com/dsnider0909/suse_builds.git

# build
> cd suse_builds/sles_12_iso
```

SLES 12 requires the following repo files accessible in a local directory. In this case in '/media/flash/suse'.

```
> ls -l /media/flash/suse
SLE-12-SDK-DVD-x86_64-GM-DVD1.iso
SLE-12-SDK-DVD-x86_64-GM-DVD2.iso
SLE-12-Server-DVD-x86_64-GM-DVD1.iso
SLE-12-Server-DVD-x86_64-GM-DVD2.iso
```

Official installation ISOs can be obtained with registration here:

<https://www.suse.com/products/server/download/>

The config.xml the following repository parameters to point to the '/media/flash/suse' directory.

```
=== config.xml ===
<repository type='yast2'>
  <!-- source path='{SLE 12 SDK x86_64}'/> -->
  <source path="iso:///media/flash/suse/SLE-12-SDK-DVD-x86_64-GM-DVD1.iso "/>
</repository>
<repository type='yast2'>
  <!-- source path='{SLES 12 x86_64}'/> -->
  <source path="iso:///media/flash/suse/SLE-12-Server-DVD-x86_64-GM-DVD1.iso "/>
</repository>
```

Build:

```
# prepare
> cd suse_builds/sles_12_iso
> kiwi -p $PWD/source --root /tmp/sles_12_root
...
Nov-27 20:41:07 <1> : KIWI exited successfully
Nov-27 20:41:07 <1> : Complete logfile at: /tmp/sles_12_root.log

# create
> kiwi -c /tmp/sles_12_root -d /tmp/sles_12_out
...
Nov-27 20:52:10 <1> : KIWI exited successfully
Nov-27 20:52:10 <1> : Complete logfile at: /tmp/sles_12_root.log

> ls /tmp/sles_12_out
# <recheck>
dsnider_SLES_12.x86_64-0.0.4.install.iso
```

Test: