# “Xenoppix” which combines “Xen” and “Knoppix”

http://unit.aist.go.jp/itri/knoppix/xen/index-en.html
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**ABSTRACT:** Xenoppix is a combination of Virtual Machine Monitor “Xen” and 1CD/DVD Linux “Knoppix”. Knoppix acts as Host-OS of Xen and prepare device drivers on anonymous PC because Knoppix has strong device recognition and many drivers. Guest-OS of Xen doesn’t need to care the device. The GUI of Guest-OS is mapped on Host-OS’s X Window System using VNC full screen mode and the network is bridged to the real NIC. So Guset-OS(Plan9 or NetBSD) seems to be a standalone 1 DVD OS.

## 1. INTRODUCTION

We customized 1CD/DVD Linux “Knoppix[1]” to include a virtual machine monitor “Xen[2]”. We call it "Xenoppix". Xenoppix can boot Guest-OS as a standalone 1DVD OS form user viewpoint. Guest-OS can get global IP address and act as a server OS. The GUI of Guest-OS is offered by full screen using VNC. The feature of host-OS (Knoppix) is hidden but the device drivers are supported by Knoppix.

## 2. XEN AND KNOPPIX

Xen[1] is a virtual machine monitor for x86 that supports execution of multiple guest operating systems. It offers us para-virtualized interface called “domain”. Operating systems can run atop Xen, but their kernels must be modified to adjust domain. One Operating System which runs on initial domain acts as Host-OS and can control the real hardware. The other Operating Systems run on other domains which are offered virtualized hardware and act as Guest-OS. The para-virtualized interface offers low cost of performance.

KNOPPIX is a bootable CD/DVD with a collection of GNU/Linux software. It is not necessary to install anything on a hard disk and enables to run GNU/Linux on IBM PCs. KNOPPIX is popular CD/DVD bootable Linux, because of “Autoconfig” automatic hardware detection/configuration function. Autoconfig detects individual devices and load suitable device drivers. Autoconfig is achieved by “/etc/init.d/knoppix-autoconfig” script. The script consists of hardware detection part and driver setup part. Hardware detection is done by the “hwsetup” binary which is based on “kudzu”; Red Hat Linux hardware probing library. After hardware detection, driver is setup by setup-scripts like “mkxf86config”. If network card is detected and DHCP is available, IP address is automatically set up.

## 3. CUSTOMIZATION FOR XENOPPIX

We customized Linux kernel of Knoppix to run as a Xen’s Host-OS. Autoconfig function of Knoppix setups device drivers automatically on anonymous PC. The Guest-OS (Plan9 or NetBSD) depends on the prepared environment and acts as a standalone. From here we mention about the customization for Guest-OS on Xenoppix.

### 3.1 As an standalone Guest-OS

The feature of host-OS is hidden and Gust-OS is exhibited to the fore. The Graphical User Interface of Guest-OS is mapped on HostOS’s X Window System using VNC full screen mode. The virtual network interface of Guest-OS is bridged

and gets IP-address form DHCP server. It enables Guest-OS to work as a server. The selection of Guest-OS is done at the Boot time with the menu of Boot loader "GRUB".

### 3.2 Copy-On-Write of Guest-OS disk image

The loopback device file which includes Guest-OS root file system is wrapped by Low Level logical volume management "Device Mapper", because it supports pseudo write-able file. The loopback device file is stored on DVD-ROM and can't be updated. "Device Mapper" offers Copy-On-Write function on the loopback device.

### 3.3 Shrink Guest-OS disk image

To include the disk image of Guest-OS to DVD-ROM, "zisofs/Rock Ridge" file system is used. It can compress the loopback device file and fit to save DVD-ROM.

## 4. FUTURE PLAN

### 4.1 HTTP-FUSE

We are developing a network compressed loopback device "HTTP-FUSE" and adapt it to KNOPPIX. "HTTP-FUSE KNOPPIX"[3,4] gets root file system form Web Server after booting. It makes small iso image, because iso image is a minimum set of booting and the most parts of Knoppix is downloaded at run time. The current size of HTTP-FUSE KNOPPIX is 6MB but enables us to use 7GB applications after booting.

We plans to adapt HTTP-FUSE to Xenoppix. It makes small iso image and don't care about the size of Xenoppix. We add many Guest-OS to HTTP-FUSE Xenoppix.

### 4.2.PXE network boot

KNOPPIX includes a server software for PXE network boot called "knoppix-terminal server". We customized it for Xenoppix. Unfortunately it uses "pxelinux" as a boot loader. "GRUB" is required to boot Xen. So we replaced "pxegrub" instead of "pxelinux". Unfortunately "pxegrub" supported a few network cards. The current version supports only "EEPro100" card.

The terminal server enables us to boot GuestOS of Xen from network.

### 4.3 Install to Windows File System

Japanese Knoppix has a function of "install2win" to install Knoppix on Windows XP and 2000 File System. Fortunately the boot load of "install2win" is "grubinstall"[5] which boots Xen. "grubinstall" is a boot loader which parasitizes Windows boot loader NTLDR.

We customized "install2win" for Xenoppix and freed from DVD-ROM.

### 4.4 New Guest-OS

We plan to adapt OpenSolaris and Gnu/Hurd as a Guest-OS of Xenoppix.

## 5. CONCLUSIONS

We developed Xenoppix which combines virtual machine monitor "Xen" and 1DVD Linux "KNOPPIX". It enables us boot Guest-OS on anonymous PC. The Guest-OS seems to be a standalone.

Xenoppix is still developing to boot with some methods. We customize Xenoppix for PXE network boot, install2win and HTTP-FSUE.

## ACKNOWLEDGEMENT

We refer to 1CD Xen "xendemo" to build Xenoppix. We thank to the developers. We also thank to Takeshi Yamanashi at Tokyo Institute of Technology to build disk image of Plan9.

## Reference

[1] Knoppix: http://www.knopper.net/knoppix/

[2] Xen: http://www.cl.cam.ac.uk/Research/SRG/netos/xen/

[3] HTTP-FUSE-KNOPPIX: http://unit.aist.go.jp/itri/knoppix/http-fuse/index-en.html

[4] K.Suzaki, T.Yagi, K.Iijima, K.Kitagawa, and S,Tashiro, "Network compressed loopback device HTTP-FUSE-CLOOP and Linux which boot form it.", (Written in Japanese),Internet Conference, Oct. 2005. http://www.internetconference.org/ic2005/

[5] grubinstall: http://www.geocities.com/lode_leroy/grubinstall/