Using Virtual Machines

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Basics

Virtualization defines a framework to run an OS within an OS.

Most common solutions today, using full hardware virtualization

Userlevel

- VMWare (commercial), VMWare Player free for private use
- VirtualBox (installed on AIfA workstations)
- available on all OSs

System level

- KVM (runs unmodified system)
- Xen (runs system under own ”Xen kernel”)

Why?

- Run another OS, without full installation on harddisk (Windows on Linux, Linux on Windows, Linux on MacOS, etc.)
- Run another distribution or OS Version (Scientific Linux on Ubuntu, Windows XP on Windows 7, etc.)
- Run an older/newer version of your distribution (Ubuntu 8.04 on Ubuntu 14.04, ...)
- Today, even nesting is possible (within limits) (Windows XP on Debian 8 on Ubuntu 14.04, ...)

- Test different setups quickly
- Can create snapshots to revert back to
- For distributing pre-configured system

Prerequisites

- Low demand on hardware
  (typically, overhead by VM engine is $<$5%), but memory may be an issue
- Some, like KVM, require special kernel functions for efficient hardware access
  check with `cat /proc/cpuinfo` for Kernel flags `vmx` (Intel) or `svm` (AMD)
  may need activation in BIOS (look for $\sim$AMD-V/IntelVT)
- VMWare/Virtualbox should run out of the box on any PC today

Networking

Different networking variants possible

Typically

- NAT (easiest in most cases):
  host provides internal DHCP address,
  does local NAT mapping to outside world
  (comparable to DSL router at home)
- bridged (if fixed IP required):
  host passes guest network traffic through to ethernet device
  guest does not see host network, needs to care for network setup itself (fix IP, DHCP, ...)
- other variants...

For better performance

- Always (!!!) use a local disk for the VM disk image
- Leave some memory to the host system
  (on 4GB, leave ∼2GB)
- If possible, use paravirtualized interfaces (aka `virtio`) for disk and ethernet
  (can be set in the VM configuration)
  Careful with disk interface: VM internal device names may change (`sda` → `vda`)
- Install “guest additions” (VirtualBox) / “VMWare Tools” (VMWare)

Now, let’s play...