ctys-**VMW**(7)
Installation and **Configuration**

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1 VMW - Basics for Operations

The ctys-VMW plugin defines a meta-layer for an abstract interface, which is in current version based on the final commandline call of the supported products. The ctys-VMW plugin supports a subset of the products native command line options mapped to the ctys call options, the remaining are bypassed as native options. Future versions are going to provide an abstract encapsulation layer by a common ctys-wrapper script and in addition utilization of the vendor provided management interfaces for batch-mode installation and operations.

The call structure fits into the common structure of ctys but for the current version the ctys-wrapper script is not yet supported for the VMW subsystem.
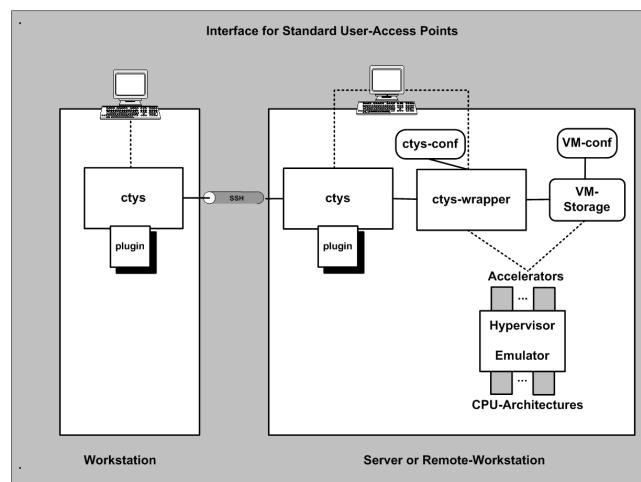

Figure 1: ctys distributed access

The VMW subsystem supports the standard configuration files created by the vendor utilities. Thus any existing installation with any already present VMs and vmx-files could be used without required adaptation. These could be either used by dynamic addressing, dynamic search, or by unmodified scan into the inventory database. The creation of new VMs is foreseen by the standandard procedures as defined by the vendor and supported by the products.

The current version requires the access to the VMX-configuration-files, thus these have to be either registered in the UnifiedSessionsManager inventory database, or provided by the call sub-options for scan-start **base:**, or by explicit addressing **id:**. For newer versions e.g. of VMware-Server-2x(TM) in case of usage of subdirectories for the actual storage of the virtual devices, the configuration and management information is probably still stored in the root of the configured storage. This should be post-merged manual with the virtual device into a unique shared directory comprisingly representing the VM.

The lack of the standard vmx-files is the missing of offline information about the GuestOS. The UnifiedSessionsManager provides for basically two options for the coallocated storage of additional extended GuestOS information.

Coallocated **ctys-configuration-file** created by **ctys-createConfVM**

Extension of the vendor configuration file by **ctys-keywords** within **comment-protected strings**
The **ctys-configuration-file** is defined by convention to be stored within the directory of the virtual machine, coallocated with the vmx-file and named with the same prefix as the vmx-file: **<vmx-file-prefix>.ctys** and the containing directory **..../<vmx-file-prefix>**. Even though this probably could varied, this has to be avaoided due to probable unanounced remove of the required features. The file could be created and added manually by the user with the same following optional "ctys-conf" vmx-file modifications and by the previous naming convention.

Alternatively the keywords could be stored within the vmx-file, due to the key-prefixes defined to begin with a valid vmx-comment character these are protected for unintended evaluation by the hypervisor. The provided example may suffice the most required offline information for the user-management of the VM, including the automated generation of a cache database for the network inventory.

```
#@#MAGICID-VMW

#@#VMSTATE="ACTIVE"
#@#SERNO="20080415051600"
#@#VERSION="01.01.001"
####MAC0 is provided by the eth0 of vmx-file!
#@#IP0="192.168.1.235"
#@#DIST="CentOS"
#@#DISTREL="5"
#@#OS="Linux"
#@#OSREL="2.6"
#@#CATEGORY="VM"
```

The current version is supported by the interactive installer which creates an appropriate addon-configuration file. For examples of CentOS installation as GuestOS refer to **ctys-uc-CentOS(7)** Once VMW is setup, the boot of the VM could be performed by the CREATE action of ctys. Basic Use-Cases for application are contained within the document **ctys-uc-VMW(7)**

2   Supported HOST-OSs

The VMW plugin is supported on all released runtime environments of the UnifiedSessionsManager where the products are available.

3   Supported GuestOSs

The native GuestOS support is the same as for the PMs and HOSTs plugins.

4   Supported Architectures

The whole set of available CPUs by Products is supported :

x86, AMD64, x86_64

5   Supported Interfaces

Current version supports the commandline interfaces of the products.

6   Supported VM Management Interfaces

The current version supports for basic management facilities by a vendor provided tools. These comprise mainly the creation of runtime entities and the cancellation of running instances a.k.a sessions. Library functions for vendor provided coding interfaces are due to the lack of actual requiremtn not utilized yet. The interface for the commandline based tools varies between the producty and versions. The additional requirements such as a valid account with appropriate permissions including the actual call interface may vary, e.g. for vmrun between Server-1.0.10 and Server-2.0.2. The following tools are utilized for now as required:

vmware

vmplayer

vmware-cmd

vmrun

7 Network Interconnection

7.0.1 NIC-bonding

The Installation of VMware is quite forward. Only some minor pitfalls occur for specific configurations with **NIC-bonding**. When a bonding device is utilized on Linux the **mode=6** is not supported, which is the ARP-negotiation of client and server machines. The success of the support could be easily checked when using a guest system and calling ping. The effect is the lost of about the half of the ping-answers. This is somewhat a pity, because the **mode=6** seems to be the fastest mode which even does not require support of intermediate network equipment. Any other mode seems to work properly.

8 Installation of Components

The provided examples are based - if not stated else - on CentOS-5.4, but may be applicable for any other distribution similar.

8.1 Server-1.0.10

The installation of VMware-Server(TM)-1.0.10 on CentOS-5.4 depends on the used kernel. The description is verified to be applicable to linux-2.6.29.

Download and install rpm of product from VMware(TM) Inc. e.g. VMware-server-1.0.10-203137.i386.rpm

Install new kernel, here linux-2.6.29.

Install init_mm patch for kernel and configure build-parameters. Set kernel-parameter for "Kernel-Hacking" activate "EXPORT UNUSED SYMBOLS" The patch could be downloaded from www.i4p.com.

Build kernel.

Install patches for "/usr/lib/vmware/modules/sources". The patch could be downloaded from www.i4p.com.

Reboot.

Configure vmware: vmware-config.pl

8.2 Server-2.0.2

The installation of VMware-Server(TM)-2.0.2 on CentOS-5.4 depends on the used kernel.

Common

- Download and install rpm of product from VMware(TM) Inc. e.g. VMware-server-2.0.2-203138.x86_64.rpm

- For CentOS-5.4 - install glibc-patch and edit "/usr/sbin/vmware-hostd" script. The patch could be downloaded from www.i4p.com.

- Athentication with Kerberos

  For the following distributions the procedures are verified. But as far as known only the credentials/password are fetched form Kerberos. Currently - eventually due to knowledge-lack - missing the full SSO.

  The only file required be modified is '/etc/pam.d/vmware-authd'.

  - debian-5.0.0 - Kerberos Insert setting from '/etc/pam.d/sudo' **before** the standard contents.

    ```
    @include common-auth
    @include common-account
    ```

  - CentOS-5.4 - Kerberos Insert the following **before** the standard contents.

    ```
    auth      include system-auth
    account   include system-auth
    ```

- Reboot.

- After creation of the first additional user within the VMware GUI, the counter/index for the next user has to be **once** incremented manually within the file

  '/etc/vmware/hostd/authorization.xml'.

  Else the creation of additional users fail with the error message expressing unavailability of the database.

Standard kernel-2.6.18

- Configure vmware: vmware-config.pl

New kernel-2.6.32.6 -Install, configure, and build the new kernel, here linux-2.6.32.6.

- Install patches for "/usr/lib/vmware/modules/sources". The patch could be downloaded from www.i4p.com.

- Configure vmware: vmware-config.pl

Standalone Console

Extract plugin for standalone console from Server installation and install this at "/opt/vmware/vmware-wmrc-x64". The patch could be downloaded from www.i4p.com.

Install "xdg-utils".

8.3 Player-1.0.5

Install the rpm package VMware-player-1.0.5-56455.i386.rpm for the standard kernel **linux-2.6.18-164.el5**.

8.4 Player-2.5.3

Install the rpm package VMware-player-1.0.5-56455.i386.rpm for the standard kernel **linux-2.6.18-164.el5**.

8.5 Player-3.0.1

Install the bundle-package VMware-Player-3.0.1-227600.x86_64.bundle for the standard kernel **linux-2.6.18-164.el5**.

8.6 Workstation-6.5.3

Install the bundle-package VMware-Workstation-6.5.3-185404.x86_64.bundle for the standard kernel **linux-2.6.18-164.el5** and execute vmware-config.pl.

8.7 Workstation-7.0.1

Install the bundle-package VMware-Workstation-Full-7.0.1-227600.x86_64.bundle* for the standard kernel **linux-2.6.18-164.el5**.

8.8 Standalone Console VMWRC

Extract plugin for standalone console from Server installation and install this at "/opt/vmware/vmware-wmrc-x64". The patch could be downloaded from www.i4p.com.

Install "xdg-utils".

9 Install Procedures

9.1 General Remarks

The most of the installation is performed with PXE if possible. Therefore the PXELINUX is switched to version 3.6.2 and a menu system for the management of the whole test-environment is setup. When difficulties occur due to specific network requirement, the CD-mount on ISO files option is used, which is almost in any case experienced to be quite safe for VMware products.

9.2 Installation and Maintenance by Product Console

For initial creation or basic maintenance the console of the specific product has to be started. The following options are available.

Product	Version	Available Console
Server	1.x	Proprietary
Server	2.x	Browser, VMWRC
Workstation	x	Proprietary, VNC
Player	-	-

The console could be started e.g. by usage of the X11 plugin. This is the case for the 2.x versions of the Server-Products.

```
ctys -t x11 \
    -a create=l:vmware,cmd:firefox%http:://127.0.0.1::8222 \
    delphi
```

The double column masks this character as a native to be bypassed, else it would be interpreted as a seperator of subarguments. The non-SSL port is required in some cases, where the other is not operable.

Any X11 program could be executed, e.g. the proprietary console by:

```
ctys -t x11 \
    -a create=l:vmware,cmd:vmware \
    delphi
```

9.2.1 Server-2.x

The example installation here is based on Server-2.0.2 and debian-5.0.0/amd64 installed by ISO image from a mounted local storage.

1. Start remote console by browser. Here as non-encrypted.

   ```
   ctys -t x11 \
       -a create=l:vmware,cmd:firefox%http:://127.0.0.1::8222 \
       delphi
   ```

   Here the non-encrypted local port is utilized, whereas the encrypted port is the default.

   It is recommended to use a the "Product Compatibility" for "Virtual Hardware" as "4" or "6". This assures the presence of a vmx-file.

2. Create a VM by 'Create Virtual Machine' command entry and perform the required steps. The following steps assume an ISO image as the install media.

3. Start the VM by calling:

   ```
   ctys -t vmw \
       -a create=l:debian-5.0.0,console:vmwrc,user:acue,\
                 p:/mntn/vmpool/vmpool01/vmw/templates/debian-5.0.0 \
       delphi
   ```

   This enters the native install procedure of the debian distribution.

4. Start installation by choosen install media.

9.3 PXE-Boot

The folowing steps are applied to an installation by PXE. This anyhow requires the proper setup of DHCP, TFTP, and one of HTTP/FTP/NFS. For some OSs a so calld **kickstart** file could be used to automate the whole procedure.

For Linux and BSD refer to [1, SYSLINUX] and [2, ETHERBOOT].

1. Create a VM by native means of a VMware product, but do not start it yet. When the base machine is created, close the VM.

   The common convention within ctys is, that the following items are all literally the same.

   - LABEL
   - DisplayName
   - <vmx-filenameprefix>
   - <directory-containing-vmx>

2. Edit the VMX file manually and apply following changes and addons:

   - Check "displayName" as mentioned before.
   - Change the ethernet interface entries for the MAC-address and behaviour as required for PXE/DHCP.

3. The default behaviour is described as "generatedAddress", which could change and is somewhat challenging to be continuously maintained for PXE/DHCP. Therefore it should be changed to "static". The resulting entries depend on the actual product, but the essential entries seem to be common as for following example:

   - ethernet0.present = "TRUE"
   - ethernet0.addressType = "static"
   - ethernet0.address = "00:50:56:13:11:4D"

4. When the cache database is already populated by values from **/etc/dhcpd.conf** or a manually created database similar to **/etc/ethers**, the utility **ctys-macmap** could be used for management of address-mappings.

   - Change the UUID entries from dynamic behaviour to static values, otherwise they will change when the machine is reallocated. The values could be kept as already present, else should be generated by "uuidgen".
   - uuid.action = "keep"
   - uuid.location = "56 4d 66 ff 5a 76 d1 19-35 11 73 3d 0f 8d 26 9a"
   - uuid.bios = "56 4d 5e 88 71 0e a5 79-59 6c 34 15 44 a7 7e 96"

5. Add ctys-meta information as required for ENUMERATE. Additional values might be applied to the following example. The values are not recognized by VMware, thus has to be kept synchronous by the user. The main intention is to get cacheable information for off-line guests to be utilized by ENUMERATE and therefore by **ctys-vhost**

```
#@#MAGICID-VMW

#@#VMSTATE="ACTIVE"
#@#SERNO="20080415051600"
#@#VERSION="01.01.001"
####MAC0 is provided by the eth0 of vmx-file!
#@#IP0="192.168.1.235"
#@#DIST="CentOS"
#@#DISTREL="5"
#@#OS="Linux"
#@#OSREL="2.6"
#@#CATEGORY="VM"
```

6. Close the file within the editor and open it again within the VMware frontend.

7. From now on the following steps could be already proceeded either by native call of "vmware", or by usage of the UnifiedSessionsManager, which has some advances for monitoring and LIST of current active sessions.

   The following example illustrates the call, when for a new machine the <**machine-adress**> is not yet registered within the cacheDB("ctys-vdbgen")

```
ctys -t vmw \
    -a create=p:\$HOME/vmware/tst-ctys/tst116/tst116.vmx,reuse \
    -c off \
    -C off \
    host1
```

- Start the VM and set the emulated BIOS appropriately, by entering with *F12*.

- Boot into PXE, which might be a simple or more advanced Menu, or just a command line for entering a boot string [1, SYSLINUX] .

- Install by means of current GuestOS and/or any generic installer.

9.4 ISO-Image and DHCP

The install procedure for usage of an ISO-Image is almos the same as for PXE, just a few formal differences apply.

Add a CD/DVD-ROM-drive with a link to an ISO-Image, similar to an actual physical drive.

Select the appropriate boot order, where instead or in addition to PXE the CD/DVD-drive has to be registered.

9.5 Remote Console for 2.x-versions - vmware-vmrc

The remote console plugin of the Server-2.0 versions could be started standalone too, thus integrates seamless as a graphic terminal into ctys.

The compressed plugin for various architectures is stored in the directory:

```
/usr/lib/vmware/webAccess/tomcat/apache-tomcat-6.0.16/webapps/ui/plugin
```

This directory contains the files:

build_doNotErase.txt

vmware-vmrc-linux-x64.xpi

vmware-vmrc-linux-x86.xpi

vmware-vmrc-win32-x86.exe

vmware-vmrc-win32-x86.xpi

These can be uncompressed with **unzip**, the **plugins** directory is the only subdirectory required, which contains the executable **vmware-vmrc**. This requires the containing directory as base for relative search for shared libaries, thus should be the call directory for simplicity.

In ctys it is in current pre-configuration expected this directory to be renamed and located as one of the following directories. These are searched in the given order until first match.

$MYADDONSPATH/vmware-rc-x64

The advance is here, that the whole package is distributed together with ctys when using **ctys-distribute** with a file copy mode.

$HOME/vmware/vmware-rc-x64

/opt/vmware/vmware-rc-x64

/usr/bin

/usr/local/bin

/usr/share/vmware-rc

/usr/share/vmware-rc-x64

/usr/share/vmware-rc-x86

/opt/bin

/opt/vmware/vmware-rc

When calling ctys with the console type **VMWRC** now it should be considered whether the password will be provided by commandline or inserted into the dialogue mask when omitting. An alternative is the Single-Sign-On configuration.

The resulting call could be :

```
ctys -t vmw \
  -a create=l:tst502,reuse,user:root\%tst,console:vmwrc \
  -c local root@lab02
```

9.6   Supported/Tested Install-Mechanisms

The current version relies on the provided intstall mechanisms of the product supplier, and pre-requires an installed system.

10   Installation of GuestOS

10.1   CentOS

Installation is in general quite straight-forward. Here performed by PXE on a i386 machine with one CPU.

10.2   Debian-4.0_r3

Installation is quite straight-forward, once the required additional netboot-image is downloaded and in place. The differences and additions to the predefined environment are:

- Only the kernel image "linux" and the ramdisk "initrd.gz" are imported into a common boot environment with several UNIX variants as provided by [1, SYSLINUX].

- The following key has probably to be applied

```
debian-installer/allow\_unauthenticated=true
```

10.3   Debian-5.0.0

Refer to the example in chapter "Installation and Maintenance by Product Console".

10.4   Fedora 8

Installation is quite straight-forward and very similar to CentOS.

10.5   MS-Windows-NT-4.0-S

Installed from ISO image.

10.6 MS-Windows-2000-WS

Installed from ISO image.

10.7 OpenBSD

Installation is quite straight-forward, just the two-level boot has to be considered.

10.8 SuSE

Installation is quite straight-forward.

11   Installed Systems

OS	name	Inst-VM	Media
CentOS-5.0	tst117	Server-1.x, 2.x	PXE,ISO
CentOS-5.1	tst112	Server-1.0.4	PXE,ISO
CentOS-5.2	tstxxx	Server-1.0.4	PXE,ISO
CentOS-5.3	tstxxx	Server-1.0.4	PXE,ISO
CentOS-5.4	tst131	Server-1.0.10, 2.0.2	PXE,ISO
CentOS-5.5	x	Server-2.0.2	PXE,ISO
Debian-4.0r3	tst106	Server-1.0.4	PXE,ISO
Debian-5.0.0	tst200	Server-1.0.10	PXE,ISO
Debian-5.0.0-amd64	debian-5.0.0	Server-2.0.2	ISO
Fedora 8	tst103	Server-1.0.4	PXE
Fedora 10	tstxxx	Server-1.0.10	ISO
Fedora 12	tst201	Server-1.0.10	ISO
FreeBSD-7.1	tst208	Server-2.0.2	ISO
FreeBSD-8.0	tst209	Server-2.0.2	ISO
Gentoo-2009	(tst231)	Server-2.0.2	ISO
Mandriva-2010-free	tst227	Server-2.0.2	ISO
Mandriva-2010	tst203	Server-2.0.2	ISO
OpenBSD-[2-4]	tstXYZ	WS5/6,Server-1.0.[1-5]	PXE,ISO
OpenBSD-4.0	tst109	Server-1.0.4	PXE
OpenBSD-4.2	tstxxx	Server-1.0.4	PXE
OpenBSD-4.3	tst155	Server-1.0.4	PXE
OpenBSD-4.6	tst207	Server-1.0.4	PXE
ScientifiLinux-5.4.1	tst204	Server-1.0.10	PXE,ISO
SuSE-9.3	tst003	WS6,Server-1.0.[345]	PXE,ISO
OpenSuSE-10.3	tst116	WS6,Server-1.0.[345]	PXE,ISO
OpenSuSE-11.2	tst205	WS6,Server-1.0.[345]	PXE,ISO
Solaris 10	tst115	WS6	ISO
OpenSolaris 2009.6	tst242	Server-2.0.2	ISO
Ubuntu-6.06.1-D	tst128	Server-1.0.4	ISO
Ubuntu-6.06.1-S	tst120	Server-1.0.4	PXE
Ubuntu-7.10-S	tst005	Server-1.0.4	PXE
Ubuntu-8.04-D	tst132	Server-1.0.4	ISO
Ubuntu-8.04-S	tst133	Server-1.0.4	PXE
Ubuntu-9.10-D	tst133	Server-2.0.2	ISO
Ubuntu-10.10-D	tstXYZ	Server-2.0.2	ISO
MS-Windows-2000WS	tstXYZ	WS4/5/6,Server-1.0.[1-5]	PXE,ISO
MS-Windows-2000S	tstXYZ	WS4/5/6,Server-1.0.[1-5]	PXE,ISO
MS-Windows-2003S	x	Server-2.0.2	ISO
MS-Windows-XP	tstXYZ	WS4/5/6,Server-1.0.10	PXE,ISO
MS-Windows-NT-4.0S	tstXYZ	WS4/5/6,Server-1.0.[1-5]	PXE,ISO

Table 1: Overview of Installed-VMW-VMs

12 SEE ALSO

ctys(1) , *ctys-createConfVM(1)* , *ctys-VMW(1)* , *ctys-uc-VMW(7)* , *ctys-plugins(1)* , *ctys-vhost(1)* , *vmware(1)* *ctys-uc-CentOS(7)*

References

[1] *PXE-SYSLINUX-PXELINUX-ISOLINUX:* <http://syslinux.zytor.com>,

[2] *PXE-ROM-Images-Etherboot:* <http://www.etherboot.org>

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