

Virtual Radiography™

shaderware.com

Installation Guide

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Table of Contents

1	Introduction	2
1.1	Graphics intensive simulations	2
1.2	TechnicVR™	3
1.3	Version Naming and Upgrade Policy	3
1.4	Licensing Model	4
2	Minimum Requirements	5
2.1	Software	5
2.2	Hardware	5
3	Obtaining the Software	7
4	Installation and removal	8
4.1	Installing the product	8
4.2	Removing the product	8
5	Licensing	9
5.1	Collect hardware fingerprint	9
5.2	Request a licence file from Shaderware	10
5.3	Install the licence file	10
5.4	Troubleshooting	11
6	Configuration	12

Introduction



Virtual Radiography™ is a suite of simulations used to support radiography education; ProjectionVR™ for radiographic positioning practice, LectureVR™ for radiographic projection and TechnicVR™ for radiographic physics. It is not deliverable via a web browser, each workstation requires its own full installation. Virtual Radiography™ simulators are currently supporting thousands of students at universities in USA, Canada, Sweden, Poland, Portugal, South Africa, New Zealand, Australia and the UK.

This guide aims to help in selecting the appropriate hardware and operating system; it walks you through the process of obtaining a licence file for your hardware, installing it and configuring the system. Configuration should be carried out in conjunction with the Radiography lecturers who will be conducting the simulation teaching sessions.

“The development of virtual radiography has been shown to be a defining moment in how the teaching of diagnostic radiography is conveyed to students”

Student Radiographer, 2009

"... healthcare professionals... should learn skills in a simulation environment and using other technologies before undertaking them in supervised clinical practice."

Great Britain: Department of Health, 2011

The Virtual Radiography™ family

Two of the virtual radiography™ applications can use the CT data obtained by the US National Library of Medicine Visible Human Project to generate simulated radiographs based on user supplied parameters (ProjectionVR™ and LectureVR™). TechnicVR™ uses data from the US National Institute of Science and Technology (NIST) and the UK Institute of Physics and engineering in Medicine (IPEM)

1.1 Graphics intensive simulations

How they work

ProjectionVR™ requires users to run two executables: XrayroomVR and ConsoleVR. These communicate with each other using TCP/IP protocol on an open port.



Although each will run independently, both are required for the simulator to work; there is no particular order for running them. 'XrayroomVR' allows the user to set up the geometry of the tube, sensor and virtual human. The 'ConsoleVR' then uses these parameters to trace the path of a virtual x-ray beam as it travels from the tube to the sensor. For a representative set of rays striking the sensor the software calculates how the original beam intensity would have been attenuated, given its individual path through the 1,700 individual frames of the virtual human data. Based on the intensity of the

attenuated beam, a grayscale image is generated based on a simulated receptor response curve.

LectureVR™ is a separate product in the virtual radiography™ family. It allows the user to directly manipulate the position of the patient data by keyboard command while a seemingly constant exposure of simulated radiation is provided. The result is a constantly updating real-time rendition of the radiographic appearance during rotations and angulations of the anatomy.

For both ProjectionVR™ and LectureVR™ the number of calculations required to build the final image is enormous, counted in the billions. Real time calculation is beyond the processing capabilities of standard central processors used in current consumer computers. Fortunately, the impetus of computer gaming has driven the development of graphics processors to the point where these are extremely powerful parallel processing units. LectureVR™ and ConsoleVR uses this specialized hardware to perform the geometric, resampling and attenuation calculations. This means that they must be installed locally on each workstation (along with the virtual human data), and that there is a minimum hardware requirement.

1.2 TechnicVR™

TechnicVR™ requires no fast or intensive graphics representation. It uses tabulated data of attenuation characteristics for elements and best fit deterministic relationships to model a Bremsstrahlung curve representing the spectrum of x-ray photons incident on a patient during irradiation. This is updated in real time to account for user selections of exposure factors. The installation is small and fast and the hardware requirements are nothing out of the ordinary.

1.3 Version Naming and Upgrade Policy

Releases are classified into three types, Major, Minor and Maintenance. The major release or version is defined by the first digit of the product version. It will include significant functional changes compared to the previous version. The minor release, defined by the second digit of the product version, will include small functional changes and bug fixes. A Maintenance release, defined by the third digit of the product version, will include only bug fixes.

Our upgrade policy is as follows: Major upgrades will require a new licence which will be at a reduced rate for existing licence holders*. Minor and maintenance upgrades are free to all licence holders.

***Price Protection.** Note that any upgrade to the same product is always FREE if released within one year of purchase.

1.3 Licensing Model

Perpetual licences for virtual radiography™ products can be purchased on either a "per seat" or "site" basis. Time-limited licences are also available, free of charge, for the purpose of evaluation.

Regardless of the licence type, virtual radiography™ uses a node-locked licensing system. The licence is directly tied to the hardware of the machines on which the licensed application is installed. Therefore, each computer running virtual radiography™ products requires a license for those products. In order to generate a licence file, Shaderware will need to know the host name and the MAC addresses of the Ethernet adapter(s) present in each computer to be licensed.

The only technical difference between the "per seat" and the "site" licence is the number of computers that are included. The "per seat" licence will specify how many computers (i.e. seats) are licensed and the hardware ids for each, a "site" licence is the same except the user is not limited in the number of computers they can specify. In addition, all students enrolled at an institution with a "site" licence will be eligible for a single seat licence for their personal use.

Minimum Requirements

This chapter outlines the minimum hardware and software requirements to run virtual radiography™ products.

2.1 Software

All three products (TechnicVR™, LectureVR™ and ProjectionVR™) require a Microsoft windows environment. Apple OSX / Linux are not supported.

Supported operating systems:

- Windows 7 (64 or 32 bit)
- Windows Vista (64 or 32 bit)
- Windows XP 32bit

Additionally, ProjectionVR™ and LectureVR™ also require DirectX 9.0c or higher to be installed (this will be part of the automatic system preparation the installer undertakes).

2.2 Hardware

ProjectionVR™ requires a three button mouse with scroll wheel – trackpads will not allow all functions.

The key hardware product for virtual radiography™ is the graphics processor (GPU). New GPU's are being released all the time, so it is difficult to give a definitive up to date list. However, there are some **minimum** specifications to check for on any new GPU.

- At least DirectX 9 and Shader Model 2.0 hardware support
- At least 128 megabytes of dedicated video RAM
- Support for floating point render buffers

While a GPU with this specification will work, it will not be optimal.

If the budget allows for new hardware to be purchased, these are the considerations:

- Support for Shader Model 3.0 or 4.0
- 512 megabytes or more of dedicated video RAM
- 128bit wide memory bus (wider is faster, but also expensive)
- Performance is related to clock speed, but expense will only give small improvements
- Performance can also be improved by increasing processors
- Support for alpha blending to floating point render targets

These requirements need not result in expensive choices – for example the AMD Fusion APU will happily run all virtual radiography™ products, as will the ‘sandybridge’ variant of the Core i3 (2125 with Intel HD Graphics 3000 embedded).

Note: Newer desktop machines with embedded Intel HD graphics 2000 or 3000 should also work – but the previous generation of Intel embedded graphics DO NOT WORK. It may not be obvious that these are not functioning properly, they may run the Xrayroom effectively only to fail to draw the simulated radiograph, or draw it with distortions.

Typical error messages that signify the GPU is inadequate go something like:

Direct3D - CreateTexture files
error

Obtaining the Software

Where to download your purchased virtual radiography™ product or and evaluation.

3.1 Download location and availability

Installers for the latest release of all virtual radiography™ products, including ProjectionVR™, are available from <http://www.shaderware.com/live/downloads.html>

The setup executables for all three products are available from the website. As well as these, workbooks and user guides can also be sourced. Three ‘wizards’ are provided to assist in managing licencing, they are also available here.

Note: installer naming convention: "Setup_<productName> <version number>.exe" e.g. "Setup_ProjectionVR v4.2.3" for ProjectionVR™ version 4.2.3

3.2 Options for download speed and reliability

Due to the large amount of data required by ProjectionVR™ and LectureVR™, the size of the installers is large. If you have a reliable and fast internet connection you should download the single installer file. For less reliable connections we have created a multi-part download. This is the same as the single download installer, but packaged as a self-extracting file and split in to bite sized chunks that are easier to download. Simply download each individual file to your computer, ensuring that they are all in the SAME directory. To reconstitute the installer execute the first file, it is the only ".exe" file and will be suffixed with "part1.exe".

Note: The multi-part installer will be automatically executed after it has been reconstituted. Assuming that all the files have been downloaded without corruption to the same directory, you should now have the full installer available.

Installing and removing products

How to install, re-install or remove your purchased virtual radiography™ product or evaluation.

4.1 Installing the product

The installer supports side-by-side installations of different major releases of virtual radiography™ products. However, if the installer detects an exist installation of the same major release it will ask the user for permission to either over-write or abort the install.

If no pre-existing installation is found, the installer will ask the user to specify a location, defaulting to a directory called "shaderware" located in the "Program Files" directory. As part of the install, the required DirectX and Visual Studio runtime environments will be updated if necessary. The installer achieves this by invoking the appropriate Microsoft installers.

If this is a re-install of a licensed version then the software should be ready to run and you can skip the sections on installing the licence and configuration. If it is a new install of a major release the software will not run until a licence has been installed. This is described in the next section.

Note: if you are re-installing ProjectionVR™ then you may want to take a backup copy of your ProjectionVR.ini file before running the installer. The .ini file and its customization are described in the configuration section.

4.2 Removing the Product

The installer will have created an un-installer to remove the virtual radiography™ product from the machine. This can be invoked from the Windows start menu or from the Windows control panel.

Notes: If you have made any customisation that you wish to keep you should make a copy of the ProjectionVR.ini file, as this will be removed as part of the un-install process.

Licencing

How to obtain and install a valid licence for your virtual radiography™ products

The product's licences are stored in one or more plain text files as XML. The executable will attempt to locate and read a licence file at runtime in order to confirm that a valid licence exists before it will function.

The following information is intended for customers who have already purchased virtual radiography™ licences and are wishing to install the software. This is accomplished in a three stage process:

1. Collect hardware fingerprints of the computers to be licensed.
2. Request a licence file from Shaderware
3. Install the licence file

Each stage is described in the following sections.

5.1 Collect hardware fingerprint of the computers to be licensed

In order to generate a licence file Shaderware will need to know the host name and the MAC addresses of the Ethernet adapter(s) present in each computer to be licensed.

This can be accomplished manually using appropriate system utilities e.g. ipconfig, getmac. However, a Shaderware supplied 'wizard'/utility called GetNodeId is available from the download page that will help collect the necessary information accurately and easily.

When run, the utility will append the necessary information to a file named "nodes.txt" located in the same directory. This file can then be emailed to Shaderware who will generate a valid licence file.

The steps for collecting hardware fingerprints using the "GetNodeId" utility are:

- 1 Obtain GetNodeId from the following link
<http://www.shaderware.com/distrib/Utilities/GetNodeId.exe>
- 2 Save GetNodeId somewhere it can be accessed by all computers to be licensed. This could be either a portable USB drive or a network accessible drive. Be aware that you will need write permissions as GetNodeId will need to update a file with each hardware fingerprint.
- 3 Visit each computer to be licensed and run the utility. The hardware fingerprint information needed to generate a licence will be written into a file named "nodes.txt" located in the same directory as the utility. If the file exists the fingerprint will be appended to the file, if it does not exist it will be created.

Note: If you need to amend existing nodes or add new ones in the future, simply send the details of the changes to Shaderware who will re-issue the licence file.

5.2 Request a licence file from Shaderware

Email the "nodes.txt" file obtained in the first stage to Shaderware. On receipt of this email Shaderware will generate a valid licence file and return it to you via email.

5.3 Install the licence file

Once you have obtained a valid licence file from Shaderware, you need to make it available to the software at runtime. This section describes the various options for installing your licence file.

Simple Option

Place the licence.xml file in the Shaderware installation directory on each licensed computer. Assuming a default installation that will be the "Shaderware" directory within the "Program Files" directory. Most likely "C:\Program Files\shaderware" on a 32bit operating system or "C:\Program Files (x86)\shaderware" on a 64bit machine". However, it is possible that your program files directory has been moved by your systems administrator.

Note: The licence file being used is shown in the "About" dialog box.

Advanced Options

By default the software will search for a valid licence starting in the same directory as the executable file and then try successively higher parent directories until either a licence file is found or the root of the directory structure is reached. As described in the previous section it is recommended that users deploy a single licence file containing all their licences for all their computers into the top level Shaderware installation directory. In that way, all your licensing information is in one file and it will be found by all virtual radiography™ products.

Note: For ProjectionVR™ only, it is possible to relocate and/or rename the licence file by amending the ProjectionVR.ini file that can be found in the same directory as the executable files. Please see the comments embedded within the initialization file or documented in the user guide. This will allow a system administrator to locate and name the license where ever they wish.

5.4 Troubleshooting

If, after installing your licence file, the software fails to run with a message saying it cannot find a valid licence file it could be due to one of the following situations:

- The file has not been found because the name is not what the software expects ("licence.xml "by default, or as specified in the initialization file)
- The file has not been found because it is not located in a place the software looks.
- A Licence file has been found but it is invalid. Please note that any changes to the contents will invalidate the licence and it will have to be re-issued by Shaderware to incorporate any required changes.
- A Licence file has been found, it is valid but it does not contain a licence for the Virtual Radiography product and version you are trying to run on the computer you are running on. Possibly because this host has not been added or the hardware fingerprint has subsequently changed. In either case you will need to contact Shaderware to update your licence.
- You have a valid licence file correctly located within the install directory structure but the software has found another invalid licence file elsewhere. As the software searches from the location of the executable up through the parent directories, it may find an incorrectly located file before the one you intend. This could also happen if the initialization (ProjectionVR.ini) file has been amended to point at another location. You will need to remove the incorrect licence file or correct the initialization file as appropriate.

Configuration of ProjectionVR™

Only ProjectionVR™ allows local configuration. This section explains how to set configuration options

Some of the functionality and defaults used by ProjectionVR™ can be customized by the user to better suit their computer environment or teaching methods. These parameters are specified in a text file that is read when the program starts up. It is called "ProjectionVR.ini" and a default file is placed in the same directory as the executable files during the install process.

The various parameters are described in the ProjectionVR™ user guide and also as comments within the file itself.

Note: The configuration file being used by ProjectionVR is shown in the "About" dialog box.