

Verification Continuum™

VC Verification IP

Installation and Setup Guide

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Contents

Preface	4
Chapter 1	
Overview of the VIP Installation and Setup	6
Chapter 2	
VIP Installation	9
2.1 Specify the VIP Central Repository	9
2.2 Download a VIP	9
2.3 Execute the .run File	10
2.4 Set the VIP Licenses	11
2.5 VIP Installation Utility	11
2.6 Running the Example With +incdir+	12
2.7 Running the Example With IEEE Common Encryption	13
Chapter 3	
Project Directory Creation	15
3.1 Build a Project Directory	15
3.2 Run a Sanity Test	17
3.3 Set Up the SATA, SAS and Fibre Channel VIPs	18
3.3.1 Run a Sanity Test	18
3.4 Set Up the Interlaken VIPs	19
3.4.1 Run a Sanity Test	19
Appendix A	
Summary of Commands, Documents, and Examples	20
A.1 Commands in This Document	20
A.2 Primary Documentation for VC Verification IP	20
A.3 Example Home Directory	21
A.4 Primary Documentation and Example Directory for VC VIP SATA, SAS and Fibre Channel	21
A.5 Primary Documentation and Example Directory for VC VIP Interlaken	21

Preface

About This Document

This installation and setup guide presents information about installing Verification IP (referred to as VIP) and setting up a project directory for using the VIPs.

Web Resources

- ❖ Documentation through SolvNet: <https://solvnet.synopsys.com> (Synopsys password required)
- ❖ Synopsys Common Licensing (SCL): <http://www.synopsys.com/keys>

Customer Support

To obtain support for your product, choose one of the following:

- ❖ Enter a call through SolvNet.
 - ◆ Go to <http://solvnet.synopsys.com/EnterACall> and provide the requested information, including:
 - ❖ Product: **Verification IP**
 - ❖ Sub Product: **VIP_title**
 - ❖ Tool Version: **VIP_version**
 - ❖ Fill in the remaining fields according to your environment and your issue.
- ❖ Send an e-mail message to support_center@synopsys.com.
 - ◆ Include the Product name, Sub Product name, and Tool Version (as noted above) in your e-mail so it can be routed correctly.
- ❖ Telephone your local support center.
 - ◆ North America:
Call 1-800-245-8005 from 7 AM to 5:30 PM Pacific time, Monday through Friday.
 - ◆ All other countries:
<https://www.synopsys.com/support/global-support-centers.html>

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as our IPs implement industry-standard specifications that are currently under review to remove exclusionary language.



1

Overview of the VIP Installation and Setup

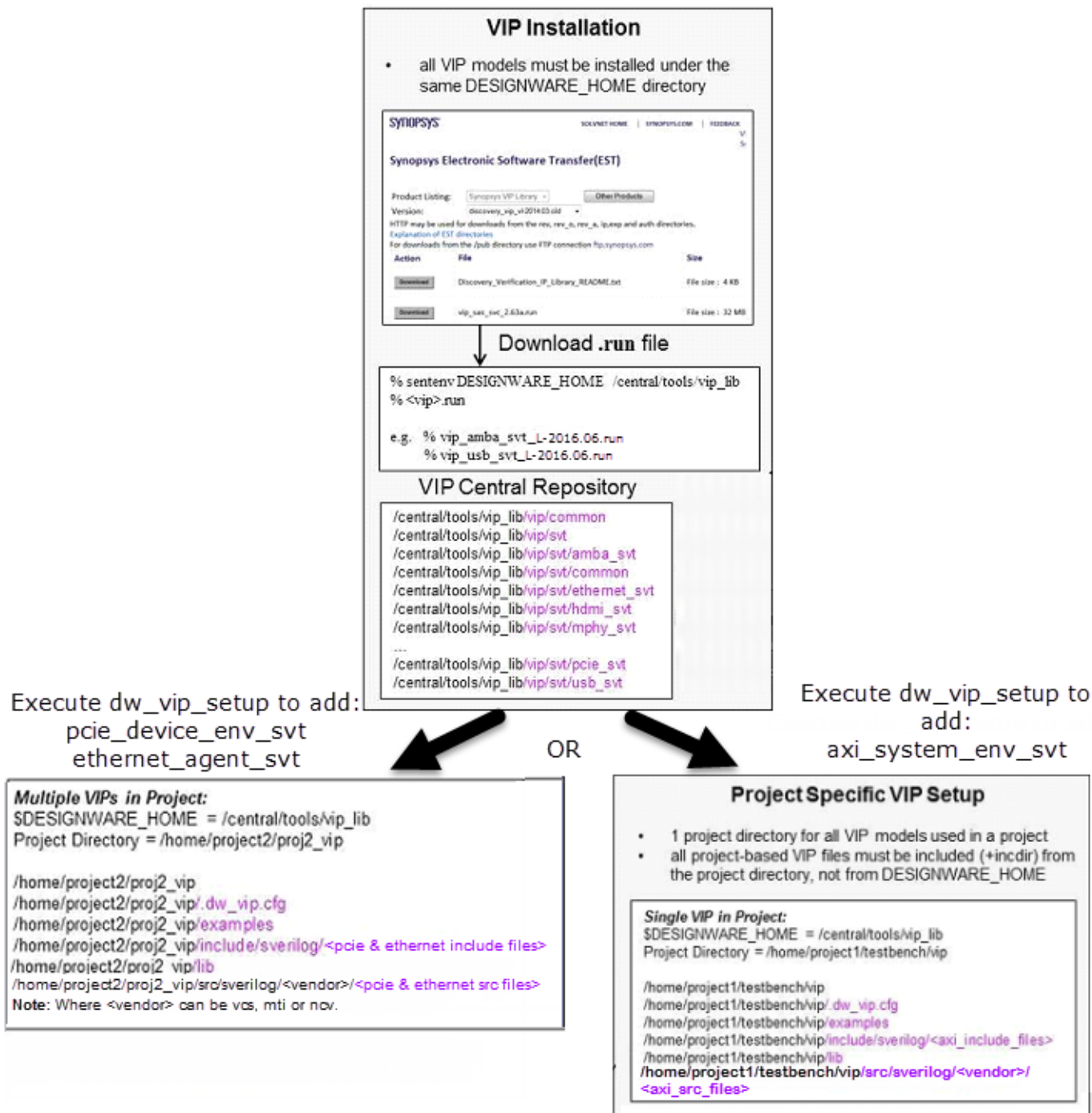
This installation and setup guide explains how to install Verification IP and use selected VIP titles in a specific project.

The following steps are required to be performed for VIP installation:

1. Select and download [VC VIP <Product>](#) from SolvNet.
2. Create a central installation repository where the [VC VIP <Product>](#) is unpacked.
3. Create a project directory (also known as the design directory in the VIP User Guide) to further configure VIP models and versions used by each project during compile and runtime.

[Figure 1-1](#) displays the VIP installation flow as well as the directory structures of the VIP installation and the project directory.

Figure 1-1 VIP Installation Flow and Directory Structures



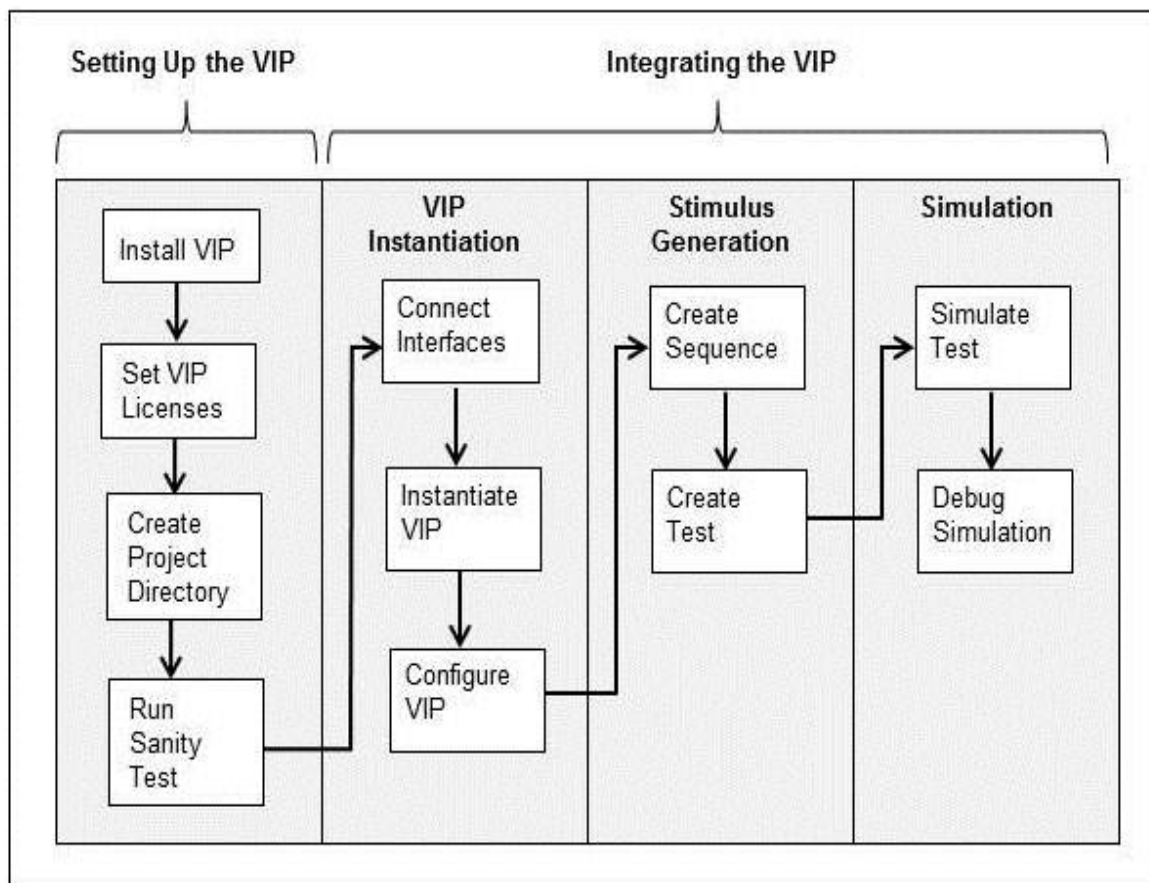
Each VIP provides a suite of advanced SystemVerilog verification components and data objects that are compliant to UVM. After the VIPs are installed, you can integrate these components and objects into any UVM compliant testbench. [Figure 1-2](#) is the VIP integration and test work flow.

If you find the DESIGNWARE_HOME is correct, then rebuild your design_dir to be consistent with your DESIGNWARE_HOME. If you find the design_dir is correct, then you should confirm you are using the

appropriate `DESIGNWARE_HOME` for the `design_dir`.

When you use a `design_dir`, you have to make sure that the `DESIGNWARE_HOME` is consistent with the `design_dir`. To do this you must confirm that the SVT version identified in the `design_dir` is available in the `DESIGNWARE_HOME` you have specified. The `design_dir` and `DESIGNWARE_HOME` must be consistent with all of the versions, such as common, SVT, and VIPs referenced in the `design_dir`.

Figure 1-2 VIP Integration and Test Work Flow



For more information on integrating the VIPs, see the VIP Getting Started Guides. These guides are available on the SolvNet Documentation page and in the VIP installations at the following location:

`$DESIGNWARE_HOME/vip/svt/vip_title/latest/doc/vip_title_uvm_getting_started.pdf`

2

VIP Installation

All Verification IP must be installed into a single installation directory specified by the DESIGNWARE_HOME environment variable. This directory is a central repository for all supported versions of all different VIPs.



Note

Only a single DESIGNWARE_HOME path is allowed per project setup.

The steps for installing a VIP are described in the following sections:

- ❖ “Specify the VIP Central Repository”
- ❖ “Download a VIP”
- ❖ “Execute the .run File”
- ❖ “VIP Installation Utility”
- ❖ “Running the Example With +incdir+”

2.1 Specify the VIP Central Repository

If a VIP is installed by another user, complete the following steps and continue to Section 2.3, “Set the VIP Licenses”:

- ❖ Obtain the installation path of the VIP.
- ❖ Set the DESIGNWARE_HOME environment variable to the VIP installation directory.

```
% setenv DESIGNWARE_HOME VIP_installation_path
```



Note

If the VIP has not been installed, follow the instructions in the next section to download the VIP.

2.2 Download a VIP

The following are the steps to download and install a VIP:

1. Logon to the SolvNet online support site
<http://solvnet.synopsys.com>
2. Perform the following selection on SolvNet to download the .run file of the VIP based upon your license access:
 - a. Navigate to the **Downloads** tab.

- b. Select the VC VIP <Product> from the list of Product Releases.
 - c. Select the required <release_version> from the list of release version.
 - d. Click the **Download Here** button.
 - e. Read the Electronic Software Transfer notice.
 - f. If you agree that you have read and understood the notice, and agree to its terms regarding the downloading of the software, then click the **Yes, I Agree to the Above Terms** button. Otherwise, click **No, I do not Agree**.
3. Download the .run file for the VIP.
 4. Set the DESIGNWARE_HOME environment variable to a path where you want to install the VIP (see [Figure 1-1](#)).

```
% setenv DESIGNWARE_HOME VIP_installation_path
```

2.3 Execute the .run File

After the .run file is downloaded, you execute the .run file by invoking its filename on a UNIX machine. The VIP is unpacked and all files and directories are installed under the path specified by the DESIGNWARE_HOME environment variable. The .run file can be executed from any directory. The important step is to set the DESIGNWARE_HOME environment variable before executing the .run file. Set the DESIGNWARE_HOME environment variable to the path where you want to install the VIP (see [Figure 1-1](#)).

```
% setenv DESIGNWARE_HOME VIP_installation_path
```

For example,

```
% setenv DESIGNWARE_HOME /central/tools/vip_lib  
% vip_amba_svt_<version_number>.run
```

Following is a partial list of directories and files installed by the vip_amba_svt_<version_number>.run executable file.

```
/central/tools/vip_lib/vip/common  
/central/tools/vip_lib/vip/svt  
/central/tools/vip_lib/vip/svt/common  
/central/tools/vip_lib/vip/svt/amba_svt  
/central/tools/vip_lib/vip/svt/amba_svt/<version_number>  
/central/tools/vip_lib/vip/svt/amba_svt/latest -> ./<version_number>/  
/central/tools/vip_lib/vip/svt/amba_svt/<version_number>/doc  
/central/tools/vip_lib/vip/svt/amba_svt/<version_number>/examples  
/central/tools/vip_lib/vip/svt/amba_svt/<version_number>/sverilog  
/central/tools/vip_lib/vip/svt/amba_svt/<version_number>/ahb_master_agent_svt  
/central/tools/vip_lib/vip/svt/amba_svt/<version_number>/axi_system_env_svt
```

2.4 Set the VIP Licenses

You need to set the `SNPSLMD_LICENSE_FILE` environment variable to the file that contains the VIP license keys. The following are the methods for setting the environment variable.

```
% setenv SNPSLMD_LICENSE_FILE port@host  
or  
% setenv SNPSLMD_LICENSE_FILE absolute_path_of_license_file
```

For example,

```
% setenv SNPSLMD_LICENSE_FILE 4321@projlic  
% setenv SNPSLMD_LICENSE_FILE /central/tools/license/vip_licenses
```

You can specify multiple license servers separated by a colon; however, searching for available licenses through multiple license servers may take time and impact performance. To minimize the potential performance impact, Synopsys recommends that you set the `DW_LICENSE_FILE` environment variable in addition to `SNPSLMD_LICENSE_FILE`, and only set VIP license servers into the `DW_LICENSE_FILE`.

For example,

```
% setenv SNPSLMD_LICENSE_FILE 4321@svr1:5678@svr2:9999@svr3  
% setenv DW_LICENSE_FILE 4321@svr1:5678@svr2
```

For more information on the installation and setup process, see the VIP UVM User Guide in the VIP installation at the following location:

```
$DESIGNWARE_HOME/vip/svt/vip_title/latest/doc/vip_title_uvm_user_guide.pdf
```

For example,

```
$DESIGNWARE_HOME/vip/svt/usb_svt/latest/doc/usb_svt_uvm_user_guide.pdf
```

2.5 VIP Installation Utility

The following utility has been added

```
$ snps_vip_install -help
```

This utility is developed to manage the `DESIGNWARE_HOME` installation.

Usage:



```
snps_vip_install <argument> ...
```

The `<argument>` can be any one as defined in the [Table 2-1](#).

Table 2-1 Arguments

Argument	Description
-help	Displays the usage of this tool

Table 2-1 Arguments

Argument	Description
-show	Displays all products and versions available in the <code>DESIGNWARE_HOME</code> installation
-remove <product> [<version>]	Remove the specified product version from the <code>DESIGNWARE_HOME</code> installation and execute <code>dwh_install</code> . If the version is not specified, then the tool removes the product and all the versions.  Note Write access to the <code>DESIGNWARE_HOME</code> installation is required to use this argument.
-incdir <product> [<version>]	Displays the minimal set of include directories that must be specified on the command line during the compile phase of the simulation to reference the corresponding VIP product and version. If no version is specified, then the 'latest' version is assumed.  Note This switch is used if you are using the <code>incdir</code> method of loading VIP files.

2.6 Running the Example With +incdir+

In the current setup, you install the VIP under `DESIGNWARE_HOME` followed by creation of a design directory which contains the version-ed VIP files.

With every newer version of the already installed VIP requires the design directory to be updated.

This results in:

- ❖ Consumption of additional disk space
- ❖ Increased complexity to apply patches

The new alternative approach of directly pulling in all the files from `DESIGNWARE_HOME` eliminates the need for design directory creation. VIP version control is now in the command line invocation. The following code snippet shows how to run the basic example from a script:

```
cd /examples/sverilog/<vip>_svt/tb_<vip>_svt_<methodology>_basic_sys/  
// To run the example using the generated run script with +incdir+  
./run_<vip>_svt_<methodology>_basic_sys -verbose -incdir base_test vcsvlog
```

Or

```
make base_test VERBOSE=1 INCDIR=1 USE_SIMULATOR=vcsvlog
```



Note

This feature is supported with VCS and MTI only.

For example, the following compile log snippet shows the paths and defines set by the new flow to use VIP files right out of DESIGNWARE_HOME instead of `design_dir`.

```
vcs -l ./logs/compile.log -q -Mdir=./output/csdc
+define+DESIGNWARE_INCDIR= \
+define+SVT_LOADER_UTIL_ENABLE_DWHOME_INCDIRS \
+incdir+/vip/svt/<vip>_svt/sverilog/include \
-ntb_opts <methodology> -full64 -sverilog
+define+<methodology>_PACKER_MAX_BYTES=16000
+define+<methodology>_PACKER_MAX_BYTES=1500000 \
+define+<methodology>_DISABLE_AUTO_ITEM_RECORDING -timescale=1ns/1ps
+define+SVT_<methodology>_TECHNOLOGY
+define+SYNOPSISYS_SV \
+incdir+<testbench_dir>/examples/sverilog/<vip>_svt/tb_<vip>_svt_<methodology>_bas
ic_sys/
. \
+incdir+<testbench_dir>/examples/sverilog/<vip>_svt/tb_<vip>_svt_<methodology>_bas
ic_sys/
../env \
+incdir+<testbench_dir>/examples/sverilog/<vip>_svt/tb_<vip>_svt_<methodology>_bas
ic_sys/
../env \
+incdir+<testbench_dir>/examples/sverilog/<vip>_svt/tb_<vip>_svt_<methodology>_bas
ic_sys/
env \
+incdir+<testbench_dir>/examples/sverilog/<vip>_svt/tb_<vip>_svt_<methodology>_bas
ic_sys/
dut \
+incdir+<testbench_dir>/examples/sverilog/<vip>_svt/tb_<vip>_svt_<methodology>_bas
ic_sys/
hdl_interconnect \
+incdir+<testbench_dir>/examples/sverilog/<vip>_svt/tb_<vip>_svt_<methodology>_bas
ic_sys/
lib \
+incdir+<testbench_dir>/examples/sverilog/<vip>_svt/tb_<vip>_svt_<methodology>_bas
ic_sys/
tests \
-o ./output/simvcssvlog -f top_files -f hdl_files
```

**Note**

For VIPs with dependency, include the `+incdir+` for each dependent VIP.

2.7 Running the Example With IEEE Common Encryption

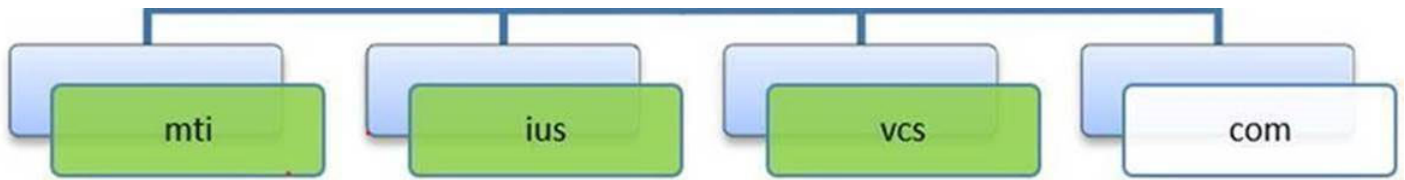
IEEE Encryption:

To optimize the release package and enable single run script usage for all simulators in SVT VIPs, the `com` directory is included in the VIP package. This directory has VIP encryption based on the *IEEE Verilog Standard 1364-2005 Encryption*. By adding `+define+SVT_ENABLE_COMMON_ENCRYPT` to the compile script, you can direct the VIP to pick the encrypted files from `com` directory instead of `vcs` or `mti` directory.

**Note**

This feature is supported with VCS and MTI only. Also, the exiting vendor-specific directories of the VIP release package are intact. These vendor-specific directories would be removed from the VIP package in future.

Figure 2-1 Simulator Support



3

Project Directory Creation

You need to create a project directory (also known as the design directory in the VIP UVM User Guide) to use VIP models or to run VIP examples. All VIP models required by a particular project must be added to a single common project directory (see [Figure 1-1](#)). You can specify any directory as a project directory. However, the project directory should not reside within the installation directory specified by the `DESIGNWARE_HOME` environment variable

The steps to create a project directory and complete the VIP setup are described in the following sections:

- ❖ [“Build a Project Directory”](#)
- ❖ [“Run a Sanity Test”](#)
- ❖ [“Set Up the SATA, SAS and Fibre Channel VIPs”](#)
- ❖ [“Set Up the Interlaken VIPs”](#)

**Note**

The VIP setup after installing a VIP and the location of the VIP documents are different for the following titles.

SATA, SAS, Fibre Channel

For more information, see the [Sections 3.3](#).

Interlaken

For more information, see the [Sections 3.4](#).

3.1 Build a Project Directory

The VIP installation includes a `dw_vip_setup` setup utility that can be used to add VIP models and examples selected by users to a project directory. The following command displays a list of available VIP models and examples installed under the VIP installation directory specified by `$DESIGNWARE_HOME`:

```
% $DESIGNWARE_HOME/bin/dw_vip_setup -info home
```

Figure 3-1 VIP Models and Examples

```
prasadg@vgvip3% $DESIGNWARE_HOME/bin/dw_vip_setup -info design
#-----#
# Synopsys VIP Setup; Copyright(C) 1994-2016 Synopsys, Inc.      #
#-----#
#-----#
# DESIGNWARE_HOME = /slowfs/vgviprelease1/vip_latest
#
# Using vmt version J-2014.12-SP2
# Using vrt version L-2016.03
# Using svt version L-2016.03-3
#-----#
# Setup information for design at /slowfs/vgcs15/prasadg/designs_dir
#
# LIBRARIES:
# -lib svt -v L-2016.03-1
# -lib amba_svt -v L-2016.03-1-T0304
# -lib ethernet_svt -v L-2016.03
# -lib ethernet_test_suite_svt -v K-2015.12
# -lib mphy_svt -v K-2015.12
# -lib onfi_svt -v K-2015.12
# -lib pcie_svt -v K-2015.12
# -lib pcie_test_suite_svt -v K-2015.12
#
# MODELS:
axi_interconnect_env_svt -v L-2016.03-1-T0304
axi_interconnect_svt -v L-2016.03-1-T0304
axi_ip_master_agent_svt -v L-2016.03-1-T0304
axi_ip_port_monitor_svt -v L-2016.03-1-T0304
axi_master_agent_svt -v L-2016.03-1-T0304
axi_master_svt -v L-2016.03-1-T0304
axi_port_monitor_svt -v L-2016.03-1-T0304
axi_slave_agent_svt -v L-2016.03-1-T0304
axi_slave_svt -v L-2016.03-1-T0304
axi_system_env_svt -v L-2016.03-1-T0304
axi_system_monitor_svt -v L-2016.03-1-T0304
ethernet_agent_svt -v L-2016.03
ethernet_monitor_svt -v L-2016.03
ethernet_test_suite_configuration_svt -v K-2015.12
ethernet_txrx_svt -v L-2016.03
mphy_agent_svt -v K-2015.12
mphy_monitor_svt -v K-2015.12
mphy_txrx_svt -v K-2015.12
onfi_agent_svt -v K-2015.12
```

You can add any VIP models on the list to the project directory by executing the following command.

```
% $DESIGNWARE_HOME/bin/dw_vip_setup -path project_directory -add
VIP_model
```

where `-path` specifies the project directory and `-add` specifies the VIP model to be added. The VIP files are placed under the project directory.

VC VIP for PCIe example:

```
% $DESIGNWARE_HOME/bin/dw_vip_setup -path /home/project1/testbench/vip -add
pcie_agent_svt
```

The VIP files are placed under the project directory `/home/project1/testbench/vip`.

VC VIP for AMBA example:

```
% $DESIGNWARE_HOME/bin/dw_vip_setup -path /home/project1/testbench/vip -add
amba_system_env_svt
```


The VIP files, including files for AHB, APB, AXI and ATB, are placed under the project directory /home/project1/testbench/vip.

**Note**

Only a single DESIGNWARE_HOME path is allowed per project setup.

3.2 Run a Sanity Test

Each VIP installation includes a list of VIP examples. The following command displays the available examples:

```
% $DESIGNWARE_HOME/bin/dw_vip_setup -info home
```

You can add the following example to your project directory and run the example to verify the VIP installation and setup.

```
$DESIGNWARE_HOME/vip/svt/vip_title/latest/examples/sverilog/  
tb_vip_title_uvm_basic_sys
```

For example,

```
$DESIGNWARE_HOME/vip/svt/usb_svt/latest/examples/sverilog/  
tb_usb_svt_uvm_basic_sys
```

Complete the following steps to verify the VIP installation and setup:

- ❖ From the project directory, add the tb_*vip_title*_uvm_basic_sys example by executing the following command:

```
% $DESIGNWARE_HOME/bin/dw_vip_setup -e vip_title/tb_vip_title_uvm_basic_sys
```

- ❖ Go to the example directory

```
% cd ./examples/sverilog/vip_title/tb_vip_title_uvm_basic_sys
```

- ❖ Execute the simulation command

VCS/VCS MXusers:

```
% gmake USE_SIMULATOR=vcsvlog test_name
```

NC Verilog/Incisive users:

```
% gmake USE_SIMULATOR=ncvlog test_name
```

ModelSim/Quarta users:

```
% gmake USE_SIMULATOR=mtivlog test_name
```

To find out the available examples of a VIP title, use:

```
% dw_vip_setup -info home[:<product>[:<version>[:<methodology>]]]
```

If the simulation completes without an error and the following message is displayed at the end of the simulation, then the VIP installation and setup was successful:

```
"SvtTestEpilog: Passed"
```

If the simulation fails, then review the VIP UVM User Guide for more information on the installation and setup process. If the problem persists, contact Synopsys customer support as described in the ["Customer Support"](#) of this document.

Note

For the AMBA interfaces (AHB, APB, AXI and ATB), the *vip_title* is *amba_svt* and the *vip_title* of the example is the interface name. For example, the example of the VC VIP for AXI is at the following location:

```
$DESIGNWARE_HOME/vip/svt/amba_svt/latest/examples/sverilog/tb_axi_svt_uvm_basic_sys
```

3.3 Set Up the SATA, SAS and Fibre Channel VIPs

The VC VIP for SATA, SAS and Fibre Channel do not support the *dw_vip_setup* setup utility. Each of these VIP installations includes a list of VIP examples. You can run an example to verify the VIP installation and setup.

3.3.1 Run a Sanity Test

Complete the following steps to verify the VIP installation and setup:

- ❖ Go to the Verilog directory.

```
% cd  
$DESIGNWARE_HOME/vip/svc/vip_title/latest/simulator/protocol/  
Verilog
```

```
vip_title  
sata_svc, sas_svc, fc_svc  
simulator  
vcs, ncv, mti  
protocol  
SATA, SAS, FC
```

- ❖ Execute the following commands:

```
% setenv EXPERTIO_protocolSVC_INSTALL_PATH  
$DESIGNWARE_HOME/vip/svc/vip_title/latest/simulator/proto  
col/Verilog  
  
% setenv SVC_SIM simulator_variable
```

Where, *simulator_variable* is VCS, NC or MT.

```
% setenv ARCH lnx86
% make
% cd Example
% make test_basic_uvm_vcs
  VC_ARGS="$DESIGNWARE_HOME/vip/common/latest/C/lib/amd64/
  VipCommonNtb.so"
```

For more information on the installation and setup process, refer to the VIP user guide in the VIP installation at the following location:

\$DESIGNWARE_HOME/vip/svc/vip_title/latest/simulator/protocol/Verilog/Doc/vip_title_user_guide.pdf

3.4 Set Up the Interlaken VIPs

The VC VIP for Interlaken do not support the `dw_vip_setup` setup utility. Each of these VIP installations includes a list of VIP examples. You can run an example to verify the VIP installation and setup.

3.4.1 Run a Sanity Test

Complete the following steps to verify the VIP installation and setup:

- ❖ Go to the sim directory.

```
% cd $DESIGNWARE_HOME/vip/nvs/vip_title/latest/sim
```

```
vip_title
  intlkn_nvs
```

- ❖ Execute one of the following commands based on your simulator and platform selections.

```
% run_vcs_uvm_prt
% run_vcsmx_uvm_prt
% run_vcs_partition_compile_uvm_prt
% run_ncv_uvm_prt
% run_questa_uvm_prt
```

For more information on the installation and setup process, see the VIP user guide in the VIP installation at the following location:

https://solvet.synopsys.com/dow_retrieve/latest/snps_vip_lib/vip_library.html

A

Summary of Commands, Documents, and Examples

A.1 Commands in This Document

Display VIP models and examples under the VIP installation directory specified by \$DESIGNWARE_HOME:

```
% $DESIGNWARE_HOME/bin/dw_vip_setup -info home
```

Add VIP models to the project directory:

```
% $DESIGNWARE_HOME/bin/dw_vip_setup -path project_directory -add  
VIP_model
```

Add VIP examples to the directory where the command is executed:

```
% $DESIGNWARE_HOME/bin/dw_vip_setup -e VIP_example
```

A.2 Primary Documentation for VC Verification IP

The primary documentation for the following guides can be accessed from the following location,
https://solvnet.synopsys.com/dow_retrieve/latest/snps_vip_lib/vip_library.html

- ❖ VC VIP UVM Getting Started Guide
- ❖ VC VIP UVM User Guide
- ❖ VC VIP UVM Class Reference
- ❖ VC VIP QuickStart
- ❖ VC VIP Test Suite



Note

For the AMBA interfaces (AHB, APB, AXI and ATB), the *vip_title* is *amba_svt* and the *vip_title* of the “doc” subdirectory is the interface name (e.g. *axi*).

For the MIPI interfaces (CSI-2 and DSI), the *vip_title* is *mipi_svt* and the *vip_title* of the “doc” subdirectory is “mipi” followed by the interface name (e.g. *mipi_csi2*).

The VC VIP Verification Plans are available in the following location:

`$DESIGNWARE_HOME/vip/svt/vip_title/latest/doc/VerificationPlans`

A.3 Example Home Directory

Directory that contains a list of VIP example directories:

`$DESIGNWARE_HOME/vip/svt/vip_title/latest/examples/sverilog`

View simulation options for each example,

```
gmake help
```

A.4 Primary Documentation and Example Directory for VC VIP SATA, SAS and Fibre Channel

The primary documentation for VC VIP SATA, SAS and Fibre Channel can be accessed from the following location, https://solvnet.synopsys.com/dow_retrieve/latest/snps_vip_lib/vip_library.html

- ❖ VC VIP UVM Getting Started Guide
- ❖ VIP VIP Verilog and UVM User Guide

Directory that contains a list of VIP examples

`$DESIGNWARE_HOME/vip/svc/vip_title/latest/simulator/protocol/Verilog/Example`

A.5 Primary Documentation and Example Directory for VC VIP Interlaken

The primary documentation for VC VIP Interlaken can be accessed from the following location https://solvnet.synopsys.com/dow_retrieve/latest/snps_vip_lib/vip_library.html

- ❖ VC VIP UVM Getting Started Guide
- ❖ VIP VIP UVM User Guide

Directory that contains a list of VIP examples:

`$DESIGNWARE_HOME/vip/nvs/vip_title/latest/sim`