OSVVM Release Guide

for 2020.05

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1 Revision 2020.05 May 2020

1.1 Current Revision and Compile Order

The following table lists the files and revision, starting with the files that need to be compiled first. Be sure to turn on the VHDL-2008 compile switch. If you are using Aldec or Mentor simulators, you may also use the osvvm.do script. Also be sure to check out the new scripts in the OSVVM Verification IP library, under scripts.

NamePkg.vhd	2020.01
OsvvmGlobalPkg.vhd	2020.01
VendorCovApiPkg.vhd or VendorCovApiPkg_Aldec.vhd	2020.01
TranscriptPkg.vhd	2020.01
TextUtilPkg.vhd	2020.01
AlertLogPkg.vhd	2020.05
MessagePkg.vhd	2020.01
SortListPkg_int.vhd	2020.01
RandomBasePkg.vhd	2020.01
RandomPkg.vhd	2020.01
CoveragePkg.vhd	2020.05
MemoryPkg.vhd	2020.01
ScoreboardGenericPkg.vhd	2020.05
ScoreboardPkg_slv.vhd	2020.01
ScoreboardPkg_int.vhd	2020.01
ResolutionPkg.vhd	2020.01
TbUtilPkg.vhd	2020.01
OsvvmContext.vhd	2020.01

1.2 AlertLogPkg.vhd 2020.05

Major update to AlertLogPkg. Output formatting of ReportAlerts has changed.

Added count of Log PASSED for each level. Prints by default. Disable by using SetAlertLogOptions (PrintPassed => DISABLED).

Added total count of log PASSED for all levels. Prints in "%% DONE" line by default. Disable as per each level. However, always prints if passed count or affirmation count is > 0.

Added affirmation counts for each level. Prints by default. Disable by using SetAlertLogOptions (PrintAffirmations => DISABLED).

Total count of affirmations is disabled using SetAlertLogOptions above. However, it always prints if affirmation count > 0.

Disabled alerts are now tracked with a separate DisabledAlertCount for each level. These do not print by default. Enable printing for these by using SetAlertLogOptions (PrintDisabledAlerts => ENABLED).

A total of the DisabledAlertCounts is tracked. Prints in "%% DONE" anytime PrintDisabledAlerts is enabled or FailOnDisabledErrors is enabled. FailOnDisabledErrors is enabled by default. Disable with SetAlertLogOptions (FailOnDisabledErrors => DISABLED).

Internal to the protected type of AlertLogPkg is AffirmCount which tracks the total of FAILURE, ERROR, and WARNING and ErrorCount which tracks a single integer value for all errors. Many simulators give you the ability to trace these in your waveform windows.

Added printing of current ErrorCount in the alert and log messages. When enabled, the number immediately follows the "%% Alert" or "%% Log". Enable using SetAlertLogOptions (WriteAlertErrorCount=> ENABLED) and SetAlertLogOptions (WriteLogErrorCount=> ENABLED).

Added enable parameter to SetAlertLogJustify(Enable := TRUE) to allow turning off justification.

Added pragmas "synthesis translate_off" and "synthesis translate_on" in a first attempt to make the package ok for synthesis tools. It has not been tested, so you will need to try it out and report back.

Added a prefix and suffix for Alerts and Logs. They support set, unset, and get operations using SetAlertLogPrefix(ID, "String"), UnSetAlertLogPrefix(ID), GetAlertLogPrefix(ID), SetAlertLogSuffix(ID, "String"), UnSetAlertLogSuffix (ID), and GetAlertLogSuffix (ID).

Added ClearAlertStopCounts and ClearAlertCounts. ClearAlerts clears AlertCount, DisabledAlertCount, AffirmCount, PassedCount for each level as well as ErrorCount, AlertCount, PassedCount, and AffirmCount for the top level. ClearAlertStopCounts resets the stop counts back to their default values. ClearAlertCounts calls both ClearAlerts and ClearAlertStopCounts.

1.3 CoveragePkg.vhd   2020.05

Minor enhancements.

Added GetIncIndex, GetIncBinVal, GetIncPoint which get the index, BinVal, or point of the next bin in the coverage model (following an incrementing with wrap around pattern).

Added GetNextIndex, GetNextBinValue, GetNextPoint which in turn use Random, Incrementing, or Minimum pattern to select the next index, BinVal, or point. The

intent is to allow a test to algorithmically or via a generic select its mode of next item selection. The selection can be made through an explicit parameter of type NextPointModeType (whose values are RANDOM, INCREMENT, or MIN). If no parameter is specified, the internal NextPointModeVar is used. It is set by calling SetNextPointMode(Mode => RANDOM).

GetLastIndex now will return the index that was last used for either used for stimulus generation (in the case of GetRandIndex, GetIncIndex, GetMinIndex, GetMaxIndex, or GetNextIndex) or coverage collection (in the case of ICover).

For consistency in naming, GetRandIndex (new capability), GetRandBinVal, and GetRandPoint are introduced to deprecate RandCovBinVal and RandCovPoint.

Added conversions from integer to_boolean and to_std_logic and from integer_vector to_boolean_vector and to_std_logic_vector (and alias: to_slv).

1.4   ScoreboardGenericPkg.vhd   2020.05

Minor enhancements.

Added Check function that returns true when the check passes.

Added additional counts to track the number of items that have been popped from the FIFO (GetPopCount). Added capability to report the number of items in the FIFO with GetFifoCount. Number of items Pushed into the FIFO is now available as GetPushCount (as well as GetItemCount).

1.5   ResolutionPkg.vhd   2020.05

Added Extend and Reduce functions for type std_logic_vector. Extend is resize that only allows the array size to grow and is used when putting a value into the transaction record. Reduce is resize that only allows the array size to stay the same or shrink and is used when removing a value from the transaction record.

Added ToTransaction to convert from std_logic_vector to the transaction type std_logic_vector_c. Alternately use type conversion std_logic_vector_c. Added FromTransaction to convert from the transaction type std_logic_vector_c to std_logic_vector. Alternately could use type conversion std_logic_vector.

2 Revision 2020.01 January 2020

Updated license to Apache.

3 Revision 2018.04 April 2018

This is a minor release.   No other documentation has been updated for this release.

3.1 Current Revision and Compile Order

See the 2018.04 release notes for details.

3.2 AlertLogPkg.vhd 2018.04

Added minor fix to PathTail. Did some changes to prepare to change AlertLogIDType to a type.

3.3 CoveragePkg.vhd 2018.04

Added minor fix to the calculation of PercentCov so when AtLeast is less than or equal to 0 the value is correct.   Added "string'" fix for GHDL.   Removed deprecated procedure Increment - however see TbUtilPkg as it moved there.

3.4 TbUtilPkg.vhd 2018.04

Added RequestTransaction, WaitForTransaction, Toggle, WaitForToggle for bit. Added Increment and WaitForToggle for integer.

3.5 ScoreboardGenericPkg.vhd 2018.04

Made Pop Functions Visible.   Did preparations for AlertLogIDType to change to a type.

3.6 MessagePkg.vhd 2018.04

Minor updates to Alert message.

4 Revision 2017.05 May 2017

4.1 Current Revision and Compile Order

See the 2017.05 release notes for details.

Changed OSVVM_DIR.   If there is a parameter passed to the script, that parameter specifies the OSVVM_DIR (including path information), otherwise, the OSVVM_DIR is [pwd].   This has been tested with Aldec Riviera-PRO, Aldec Active-HDL, and Mentor/Siemens QuestaSim.

4.2   AlertLogPkg.vhd   2017.05

AffirmIf and AffirmIfNot has additional overloading.   Added AffirmIfEqual, AffirmIfDiff, GetAffirmCount, IncAffirmCount, IsAlertEnabled, and IsLogEnabled.

Deprecated GetAffirmCheckCount (see GetAffirmCount), IncAffirmCheckCount (see IncAffirmCount), and IsLoggingEnabled (see IsLogEnabled and GetLogEnable). Deprecated the overloading of AffirmIf that has an AlertLevel and/or LogLevel as a parameter - for AffirmIf AlertLevel should be ERROR and LogLevel should be PASSED.

4.3   CoveragePkg.vhd   2017.05

Updated the printing of WriteBin so that the bin name is printed (if it is specified by either SetAlertLogID or SetName).   Added ClearCov (which deprecates SetCovZero) - makes naming similar to AlertLogPkg ClearAlerts.

4.4   ScoreboardGenericPkg.vhd   2017.05

Updated printing to correlate with AffirmIf.   First the received (actual) value is printed and then the expected value is printed.   In addition, the expected value is only printed when it does not match the actual value (an ERROR).

5   Revision 2016.11   November 2016

Note that while ScoreboardGenericPkg, TbUtilPkg, and ResolutionPkg are new to OSVVM, they have been distributed with SynthWorks' VHDL training classes for some time now.

5.1   Current Revision and Compile Order

See the release notes for 2016.11.

5.2   VendorCovApiPkg, VendorCovApiPkg_Aldec   2016.11

Provides API to link CoveragePkg to vendor tools.   Compile either VendorCovApiPkg.vhd or VendorCovApiPkg_Aldec.vhd.

5.3   TranscriptPkg   2016.11

Added BlankLine procedure to print blank lines.

5.4   TextUtilPkg   2016.11

Added to_lower and to_upper. These are necessary when using 'instance_name with a call to InitSeed in either RandomPkg or CoveragePkg.

5.5 AlertLogPkg 2016.02

Fixed IsLogEnableType (for PASSED) and AffirmIf (to pass AlertLevel).

5.6 SortListPkg_int 2016.11

Revised Add. When a matching value is found, add the value after the previous value. Supports situations where the key is shorter than the entire word.

5.7 RandomPkg 2016.11

No changes to RandomPkg. Advanced release for both the package and the documentation so they are consistent.

5.8 CoveragePkg 2016.11

Added calls to VendorCovApiPkg to record coverage in the simulator database. Added GetBinName(Index) to return a coverage bin name.

5.9 MemoryPkg 2016.11

Refined MemRead to return value if written, X if previous contained an X, or U if the location has never been written.

5.10 ScoreboardGenericPkg (new) 2016.11

Generic package for creation of Scoreboards and FIFOs inside of a protected type.

5.11 ScoreboardPkg_slv, ScoreboardPkg_int (new) 2016.11

Instance of ScoreboardGenericPkg for types std_logic_vector and integer.

5.12 ResolutionPkg (new) 2016.11

Resolution functions to simplify using records as a transaction interface.

5.13 TbUtilPkg (new) 2016.11

Handshaking utilities for transaction based testbenches. Targeted for use in testbenches that use multiple process (multi-threaded) transaction dispatch.

5.14 OsvvmContext 2016.11

Updated to include ResolutionPkg and TbUtilPkg. Note that ScoreboardPkg_int and ScoreboardPkg_slv are intentionally left out as if they are not used the reference will be a nuisance.

5.15 **osvvm.do**   2016.11

Compile script for OSVVM in ModelSim, QuestaSim, and RivieraPro. Be sure to update the path to your files and choose the correct version of VendorCovApiPkg.

6 Revision 2016.01   January 2016

6.1 **AlertLogPkg**   2016.01

Fixed bug that kept more than 32 bins from being used.

6.2 **CoveragePkg**   2016.01

Revised ConcatenateBins so it does not call Alert to allow it to be a pure function. Added bounds checking to ICover so that if ICover is called with the wrong length of integer_vector, it will cause an Alert FAILURE.

6.3 **MemoryPkg and TextUtilPkg**   2016.01

Changed L.all(1) to L.all(L'left). GHDL does not default objects of type line to have an index of 1.

6.4 **TranscriptPkg**   2016.01

Minor reorganization of code so that all calls to TranscriptOpen eventually call the same code.

7 Revision 2015.06   June 2015

7.1 **MemoryPkg (New)**   2015.06

New to OSVVM. Package with protected type for implementing memories. Methods MemInit, MemRead, MemWrite, MemErase, FileReadH, FileReadB, FileWriteH, FileWriteB, SetAlertLogID, Deallocate.

7.2 **AlertLogPkg**   2015.06

Added AffirmIf. Added PASSED log level. Added IncAlertCount as a silent alert (Used by CoveragePkg). Revised ReportAlerts to print number of affirmations checked. Added GetAffirmCheckCount, IncAffirmCheckCOunt. ClearAlerts also clears affirmations. Added CreateHierarchy final parameter to GetAlertLogID. Added a Get for every Set. Moved EmptyOrCommentLine to TextUtilPkg and revised.

7.3 **CoveragePkg**   2015.06

Implemented Mirroring for WriteBin and WriteCovHoles. When in ILLEGAL_OFF mode, added IncAlertCount (as a silent alert). Added SetAlertLogID(Name, ParentID, CreateHierarchy). Updated Alert output format. Added AddCross(CovMatrix?Type).

Deprecated AddBins(CovMatrix?Type).   Moved EmptyOrCommentLine to TextUtilPkg and revised.

7.4   TextUtilPkg (New)   2015.06

Shared utilities for file reading.   SkipWhiteSpace, EmptyOrCommentLine, ReadHexToken, ReadBinaryToken.

7.5   RandomPkg   2015.06

Revised calls to Alert to 2015.03 preferred format with AlertLogID first.

7.6   NamePkg   2015.06

Added input parameter to Get to specify a return value when NamePtr is not initialized.

7.7   RandomBasePkg   2015.06

Changed GenRandSeed to impure since it calls Alert (and Alert is a parent of a call to a protected type method).

7.8   OsvvmContext.pkg   2015.06

Added MemoryPkg

8   Revision 2015.03   March 2015

8.1   AlertLogPkg   2015.03

Added AlertIfEqual, AlertIfNotEqual, and AlertIfDiff (file).   Added ReadLogEnables to initialize LogEnables from a file.   Added ReportNonZeroAlerts.   Added PathTail to extract an instance name from MyEntity'PathName.   Added ReportLogEnables and GetAlertLogName. See AlertLogPkg_User_Guide.pdf for details.

For hierarchy mode, AlertIfEqual, AlertIfNotEqual, and AlertIfDiff have the AlertLogID parameter first.   Overloading was added for AlertIf and AlertIfNot to make these consistent.   Now with multiple parameters, it is easier to remember that the AlertLogID parameter is first.   The older AlertIf and AlertIfNot with the AlertLogID as the second parameter were kept for backward compatibility, but are considered bad practice to use in new code.

Added ParentID parameter to FindAlertLogID. This is necessary to correctly find an ID within an entity that is used more than once.

Bug fix: Updated GetAlertLogID to use the two parameter FindAlertLogID. Without this fix, Alerts with the same name incorrectly use the same AlertLogID.

Bug fix: Updated NewAlertLogRec (called by GetAlertLogID) so a new record gets Alert and Log enables based on its ParentID rather than the ALERTLOG_BASE_ID. Issue, if created an Comp1_AlertLogID, and disabled a level (such as WARNING), and then created a childID of Comp1_AlertLogID, WARNING would not be disabled in childID.

Bug fix: Updated ClearAlerts to correctly set stop counts (broke since it previously did not use named association). Without this fix, after calling ClearAlerts, a single FAILURE would not stop a simulation, however, a single WARNING would stop a simulation.

9   Revision 2015.01   January 2015

9.1   OsvvmContext (New)   2015.01

OsvvmContext is a context declaration. Rather than referencing osvvm packages with individual use clauses, instead use a single context reference:

```
library osvvm ;
context osvvm.OsvvmContext ;
```

9.2   OsvvmGlobalPkg (New)   2015.01

Manages global report settings for CoveragePkg and AlertLogPkg. Provides constants and base types for AlertLogPkg.

9.3   TranscriptPkg (New)   2015.01

TranscriptPkg simplifies different parts of a testbench using a common transcript file (named TranscriptFile). Also provides overloading for Print and WriteLine that use TranscriptFile when it is opened (via TranscriptOpen), and otherwise, use std.env.OUTPUT.

9.4   AlertLogPkg (New)   2015.01

New package added to allow catching and counting of assert FAILURE, ERROR, WARNING as well as do verbosity filtering for log files.

The package offers either a native OSVVM mode or an interface mode. In the interface mode, the package body is used to redirect OSVVM internal calls to a separate alert/log package. For example, for BitVis Utility Library (BVUL), there is a package body of AlertLogPkg that allows OSVVM to record asserts and logs via BVUL. By only changing the package body, the interface mode can be recompiled without requiring other elements of the OSVVM library to be recompiled. This same methodology allows connection to other packages.

9.5   RandomPkg and RandomBasePkg   2015.01

Replaced all asserts with calls to AlertPkg.

9.6 CoveragePkg   2015.01

9.6.1 Changes

Replaced all asserts and reports with calls to AlertPkg. Added a verbosity flag to WriteBin to allow it to handle debug calls.

WriteBin prints a multiple line report. As a result, instead of calling Log in the AlertPkg, package, when called with a verbosity flag, WriteBin first checks to see if its ScopeID and Verbosity Level are allowed to print. If enabled, it then uses write and writeline to print the report.

The undocumented method, DumpBin, now has a LogLevel parameter. Its interface is:

```
procedure DumpBin (LogLevel : LogType := DEBUG) ;
```

9.6.2 Additions

The following methods were added:

```
procedure SetAlertLogID (A : AlertLogIDType) ;
impure function GetAlertLogID return AlertLogIDType ;
impure function SetName (Name : String) return string ;
impure function GetName return String ;
impure function InitSeed (S : string ) return string ;
procedure WriteBin (LogLevel : LogType ; . . .) ;
procedure WriteCovHoles ( LogLevel : LogType ; . . . ) ;
```

10 Revision 2014.07a   December 2014

10.1 CoveragePkg, MessagePkg, NamePkg   2014.12

Removed memory leak in CoveragePkg.Deallocate. Removed initialized pointers from CoveragePkg, MessagePkg, and NamePkg – when a protected type with initialized pointers is abandoned, such as when declared in a subprogram exits, a memory leak will occur as there is no destructor to deallocate the initialized pointers.

11 Revision 2014.07   July 2014

11.1 RandomPkg

No changes were made to RandomPkg. It is still labeled 2014.01.

11.2 CoveragePkg

CoveragePkg now references both MessagePkg and NamePkg.

Added names to bins. When using WriteBin or WriteCovHoles, if a bin name is set, it will print. For details, see Setting Bin Names in the Reporting Coverage section of the CoveragePkg Users Guide.

Enhanced WriteBin to print "PASSED" if the count is greater than or equal to the goal (AtLeast value), otherwise, it prints "FAILED". Added a number of parameters to WriteBin to control what fields of a WriteBin report get printed. See Enabling and Disabling WriteBin fields in the Reporting Coverage section of the CoveragePkg Users Guide.

12 Revision 2014.01   January 2014

12.1 RandomPkg

Added randomization for time (RandTime), additional overloading for type real (RandReal), and sets of values for types (integer_vector, real_vector, and time_vector. Made Sort and RevSort from SortListPkg_int visible using aliases.

12.2 CoveragePkg

Revised ReadCovDb to support merging of coverage models (from different test runs).

Revised RandCovPoint and RandCovBinVal to log the bin index in the LastIndex variable. Revised ICover to look in bin referenced by LastIndex first. Added method GetLastIndex to get the variable value. Added GetLastBinVal to get the BinVal of LastIndex.

Revised AddBins and AddCross bin merging to allow arbitrary CountBin overlap. With the addition of LastIndex, the overlap is not an issue.

Split SetName into SetMessage (headers) and SetName (printing illegal bins)

Added method GetItemCount to return the count of the number of randomizations and method GetTotalCovGoal to return the sum of the individual coverage goals in the coverage model.

13 Revision 2013.05   May 2013

13.1 RandomPkg

Added big vector randomization.

13.2 CoveragePkg

No substantial changes. Removed extra variable declaration in functions GetHoleBinval, RandCovBinVal, RandCovHole, GetHoleBinVal. Now referencing NULL_RANGE type from RandomPkg to remove NULL range warnings.

14 Revision 2013.04   April 2013

14.1 RandomPkg

Changed DistInt return value. The return value is now determined by the range of the input array. For literal values, this produces the same value as it did previously.   Also added better error checking for weight values.

Added better min, max error handling in Uniform, FavorBig, FavorSmall, Normal, Poisson.

14.2 CoveragePkg

Revised AddBins and AddCross such that bin merging is off by default. Added SetMerging to enable/disable merging. Note: Merging is an experimental feature and still evolving.

Revised AddBins and AddCross to check for changes in BinVal size (different size bin).

Added RandCovPoint for integer.

Added SetThresholding and SetCovThreshold (Percent) to enable/disable(default) thresholding. Revised RandCovPoint and RandCovBinVal to use the new mechanism.

Added SetCovTarget to increase/decrease coverage goals for longer/shorter simulation runs.   Made CovTarget the default percentage goal (via overloading) for methods RandCovPoint, RandCovBinVal, IsCovered, CountCovHoles, GetHoleBinVal, and WriteCovHoles.

Revised SetIllegalMode and ICover to support ILLEGAL_FAILURE (severity FAILURE on illegal bin).

Added manual bin iteration support. Added the following methods that return a bin index value: GetNumBins, GetMinIndex, and GetMaxIndex.   Added the following methods that return bin values: GetBinVal(BinIndex), GetMinBinVal, and GetMaxBinVal.

Added the following methods that return point values: GetPoint(BinIndex), GetMinPoint, and GetMaxPoint.

Added GetCov to return the current percent done of the entire coverage model.

Added FileOpenWriteBin and FileCloseWriteBin to specify default file for WriteBin, WriteCovHoles, and DumpBin.

Added CompareBins to facilitate comparing two coverage models. Added CompareBins to facilitate comparing two coverage models.

Revised WriteBin, WriteCovHoles, and WriteCovDb to check for uninitialized model.

Revised WriteBins and WriteCovHoles to only print weight if the selected WeightMode uses the weight.

Added IsInitialized to check if a coverage model is initialized.

Added GetBinInfo and GetBinValLength to get bin information

Changed WriteCovDb default for File_Open_Kind to WRITE_MODE. Generally only one WriteCovDb is needed per coverage model.

Revised WriteCovDb and ReadCovDb for new internal control/state variables, in the order of ThresholdingEnable, CovTarget, and MergingEnable. To manually edit old file, add FALSE, 100.0, FALSE to end of first line.

Removed IgnoreBin with AtLeast and Weight parameters. These are zero for ignore bins.

Revised method naming for consistency. The following have changed:

New Name	Old Name	Why
GetErrorCount	CovBinErrCnt	Consistency between packages
GetMinCount	GetMinCov[return integer]	Naming clarity
GetMaxCount	GetMaxCov[return integer]	Naming clarity
SetName	SetItemName	SetName now does multi-line messages
RandCovBinVal	RandCovHole	Naming consistency (2.4)
GetHoleBinVal	GetCovHole	Naming consistency (2.4)

Deprecated usage of the AtLeast parameter (integer) with the following methods: RandCovPoint, RandCovBinVal, IsCovered, CountCovHoles, GetHoleBinVal, and WriteCovHoles.

15 Revision 2.4   January 2012

15.1 RandomPkg

No changes

15.2 CoveragePkg

Added bin merging and deletion for overlapping bins.

Working on consistency of naming.   Renamed RandCovHole to RandCovBinVal. Renamed GetCovHole to GetCovBinVal.   Old names maintained for backward compatibility.

New Name	Old Name	Why
RandCovBinVal	RandCovHole	Naming consistency
GetCovBinVal	GetCovHole	Naming consistency

16 Revision 2.3   January 2012

16.1 RandomPkg

No changes

16.2 CoveragePkg

Revision 2.3 adds the function GetBin. GetBin is an accessor function that returns a bin in the form of a record. It is only intended for debugging. In particular, the return value of this function may change as the internal data types evolve.

17 Revision 2.2   July 2011

17.1 RandomPkg

Removed '_' in the name of subprograms FavorBig and FavorSmall to make more consistent with other subprogram names.

17.2 CoveragePkg

Revision 2.2 adds AtLeast and Weights to the coverage database. The AtLeast value allows individual bins to have a specific coverage goal. A conjunction of the AtLeast and Weight (depending on the WeightMode) are used to weight the random selection of coverage holes. These features are at the heart of intelligent coverage.

18 Revision 2.1 June 2011

18.1 RandomPkg

Bug fix to convenience functions for slv, unsigned, and signed.

18.2 CoveragePkg

Removed signal based coverage support.

19 Revision 2.0 April 2011

19.1 CoveragePkg

Coverage modeled in a protected type.

20 Revision 1.X June 2010

20.1 CoveragePkg

Coverage modeled in signals of type integer_vector. The signal based coverage methodology is available in the package, CoverageSigPkg, however, it is recommended that you use CoveragePkg instead.