VIP Datasheet

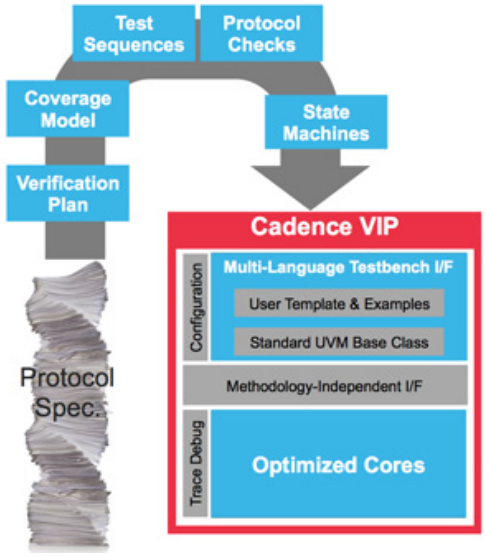
Simulation VIP for Wireless 802.11

Overview

Cadence® Simulation VIP is the world's most widely used VIP for digital simulation. Hundreds of customers have used Cadence VIP to verify thousands of designs, from IP blocks to full systems on chip (SoCs).

The Simulation VIP is ready-made for your environment, providing consistent results whether you are using Cadence Incisive®, Synopsys VCS®, or Mentor Questa® simulators. You have the freedom to build your testbench using any of these verification languages: SystemVerilog, e, Verilog, VHDL, or C/C++. Cadence Simulation VIP supports the Universal Verification Methodology (UVM) as well as legacy methodologies.

The unique flexible architecture of Cadence VIP makes this possible. It includes a multi-language testbench interface with full access to the source code to make it easy to integrate VIP with your testbench. Optimized cores for simulation and simulation-acceleration allow you to choose the verification approach that best meets your objectives.



Specification Support

Cadence Wireless 802.11 VIP is compliant with following versions 802.11 specifications. 802.11 specifications are developed and maintained by IEEE. These can also be obtained on request from IEEE or viewed at http://standards.ieee.org/about/get/802/802.11.html

- 802.11n: IEEE Std 802.11-2012
- 802.11ac: IEEE Std 802.11ac-2013
- 802.11ad: IEEE Std 802.11ad 2014 (Also known as ISO/IEC/IEEE 8802-11 Amendment 3, 2014)
- 802.11ax: IEEE P802.11ax/D1.1, February 2017

Supported Design-Under-Test Configurations

☑ MAC ☑ PHY ☑ MAC + PHY

Deliverables

People sometimes think of VIP as just a bus functional model (BFM) that responds to interface traffic. But SoC verification requires much more than just a BFM. Cadence Simulation VIP components deliver:

- State machine models incorporate the subtle features of state machine behavior, such as support for multi-tiered, power-saving modes
- Pre-programmed assertions that are built into the VIP to continuously watch simulation traffic to check for protocol violations.
- Test suites are provided for most Cadence VIP components.
- Pre-programmed coverage models used to capture interesting combinations of simulation results. By analyzing the results collected by the coverage model, engineers can tell if the simulations have exercised the various modes of operation of an interface.
- Verification plans for most protocols link the "raw" coverage model results back to the protocol specification.

Key Features*

- Support for the header formation for MAC protocol data unit (MPDU), FCS calculation, and validation.
- Channel access:
  –DCF, EDCA and HCCA based access for non-DMG standards.
  –DMG Channel access for DMG standard. Supports all timing periods.
- Interface: Supports the following HDL pin-based interface for exchanging information
  –MAC (Tx Vector, Rx Vector, Data and Control signals)
  –MAC+PHY (IQ Signaling)
  –Currently PHY (SC and CTRL) is supported for 802.11AD. For 802.11n/ac/ad, PHY is under development.
- Supported Frame Types:
  –Control Frames: RTS, CTS, ACK, PSPoll
  –Data Frames: Data, Null Data, QoS Data
  –Management Frames: Probe Request, Probe Response, Beacon, Association Request, Association Response, Authentication, De-authentication, Disassociation, Vendor Specific Commands, Action Frames.
- Fragmentation/De-fragmentation
  –An MSDU or an MMPDU is partitioned into smaller MAC level frames. The fragmentation creates MPDUs smaller than the original MSDU or MMPDU length to increase reliability by increasing the probability of successful transmission of the MSDU or MMPDU
- Scanning:
  –Active Scanning: Generation of Probe request frames and the subsequent processing of received Probe Response frames in order to complete the scanning process.
  –Passive Scanning: Stations (STAs) listen to Beacon from Access Point (AP) and automatically complete the passive scanning process.
- MSDU Aggregation: Multiple MSDUs concatenated in a single MPDU. This improves the efficiency of the MAC layer specifically when there are many small MSDUs.
- MPDU Aggregation: Multiple MPDU sub-frames are joined with a single leading PHY header. This increases the channel efficiency as it reduces the overhead due to PHY/MAC header.
- The Block Acknowledgement mechanism aggregates several acknowledgments into one frame thus improving the channel efficiency. Normal Block ACK, Immediate Block ACK, Delayed Block ACK and GCR Block are supported according to the specifications.
- STA is capable of operating in PS mode and switching modes as per the protocol. AP buffers individual addressed frames for STA operating in PS mode. AP groups addressed frames if any STA in BSS is operating in PS Mode
  –Supported Versions: 802.11n
- Open System Authentication Support.
- Support for the re-association frames to be used during the roaming of mobile station wherein the station can directly re-associate with another AP
- MAC support for Beamforming capabilities of the PHY.
  –Supported Versions: 802.11n (Implicit and explicit), 802.11 ac (only explicit), 802.11ad/ax
- Power Modes:
  –Unscheduled PSMP Operation
  –HT power save mode implementation using uplink and downlink phases for data exchange.
  –TWT Mode of operation for the Ax specification.
- Support for CTS to self.
- Supports Tx Vector/Rx Vector fields for all the PHYs
- Power Management for Non-QoS BSS in Infrastructure BSS: STA is capable of operating in PS mode and switching modes as per the protocol. AP buffers individual addressed frames for STA operating in PS mode. AP groups addressed frames if any STA in BSS is operating in PS Mode
  –Supported Versions: 802.11n
- Supports bypass of Authentication and Association Feature

* Unless mentioned, the features are supported for all the versions 802.11n/ac/ad/ax

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