

IBIS AMI Model Developers Toolbox

Hemant Shah (shah@cadence.com)

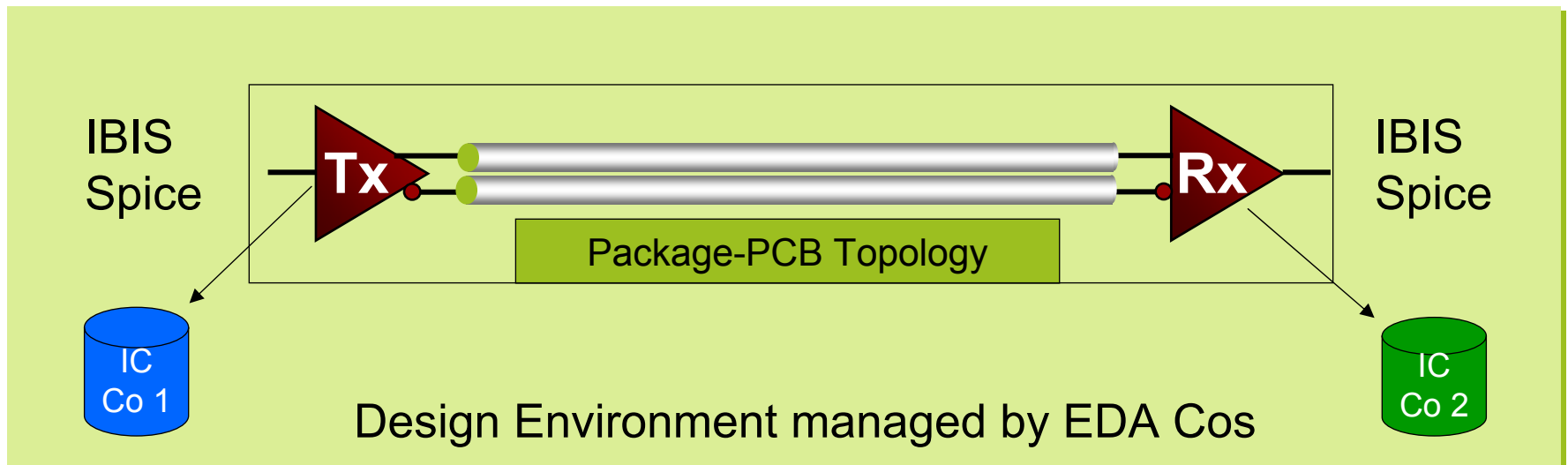
IBIS Summit - Tokyo, Japan

September 14, 2007



Interoperability with < 6Gbps SERDES devices

- PCB Design & Simulation env from EDA companies
 - Simulators need models
 - Models come from IC Companies
- Design Environment managed by EDA companies
- End users happy with Interoperability



Interoperability with > 6Gbps SERDES devices

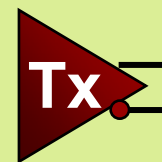
- SERDES Devices that operate at 6+ Gbps can't be modeled with current modeling standards in PCB SI space
 - FFE/DFE tap coefficient optimization
 - CDR algorithms
 - proprietary noise cancellation techniques and post-processing of data
- IC companies
 1. Forced to develop, distribute and support internal tools to model SERDES IP / IO
 2. Must protect IP
- Systems Companies
 3. Have to learn different tools from different IC companies
 4. Want interoperability



INFINIBANDSM



AdvancedTCA[®]



FFE Algorithms

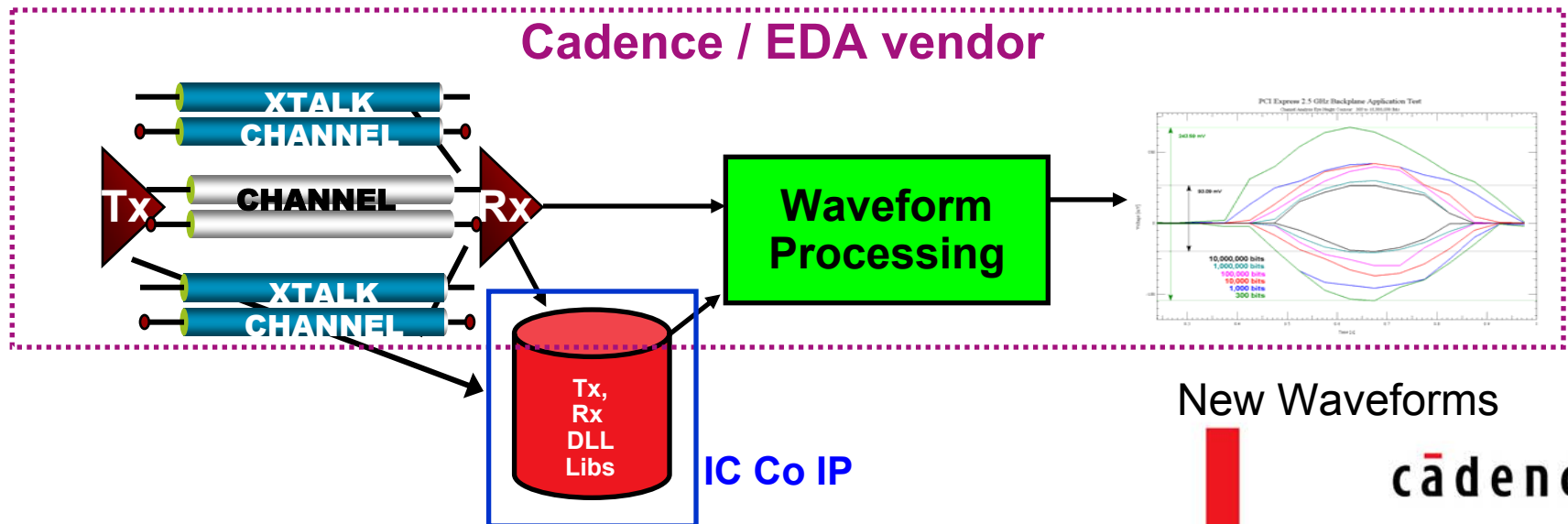


DFE, Clock Recovery Algorithms

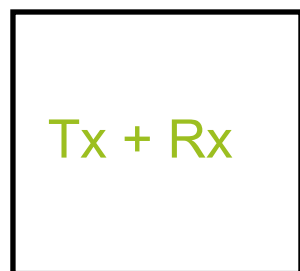
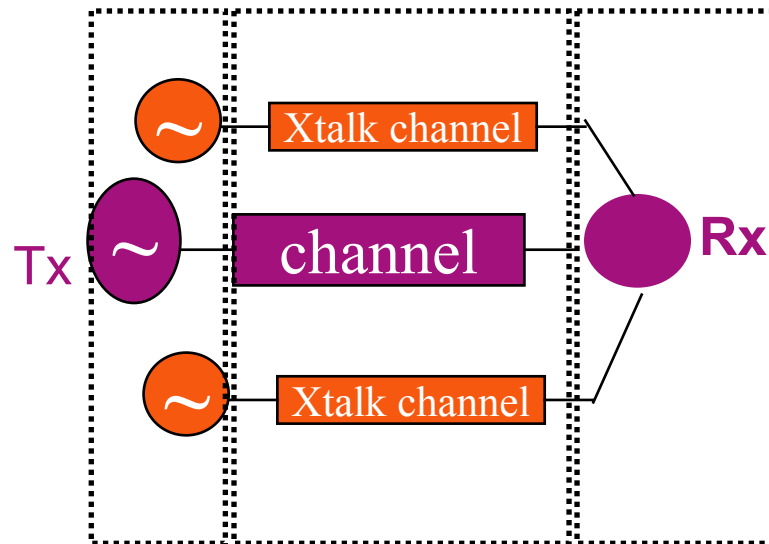
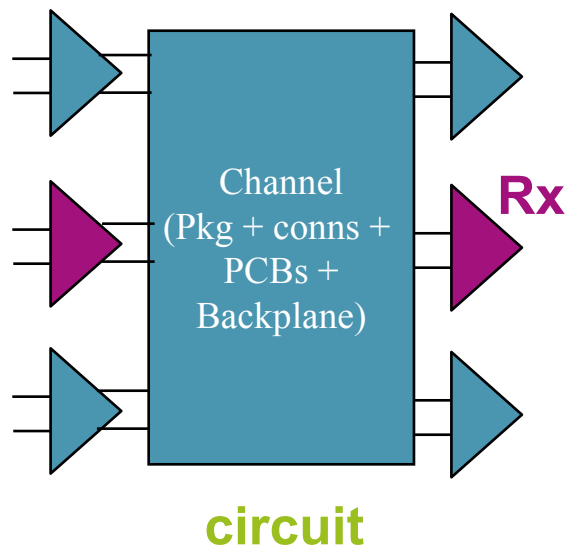
Algorithmic Modeling

Proposed Architecture & Flow

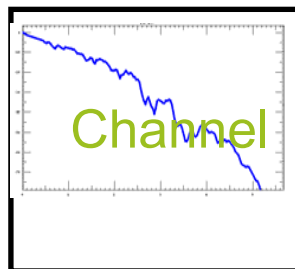
- Operate on “traditional” CA waveform output with additional algorithms
 - SERDES transmitter, receiver models as DLL
- Provide framework for customers to evaluate IP in PCB system environment that offers interoperability with other drivers/receivers



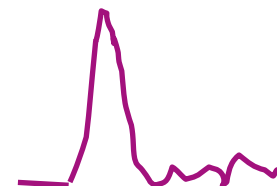
Integration with PCB Design Environment



+



=

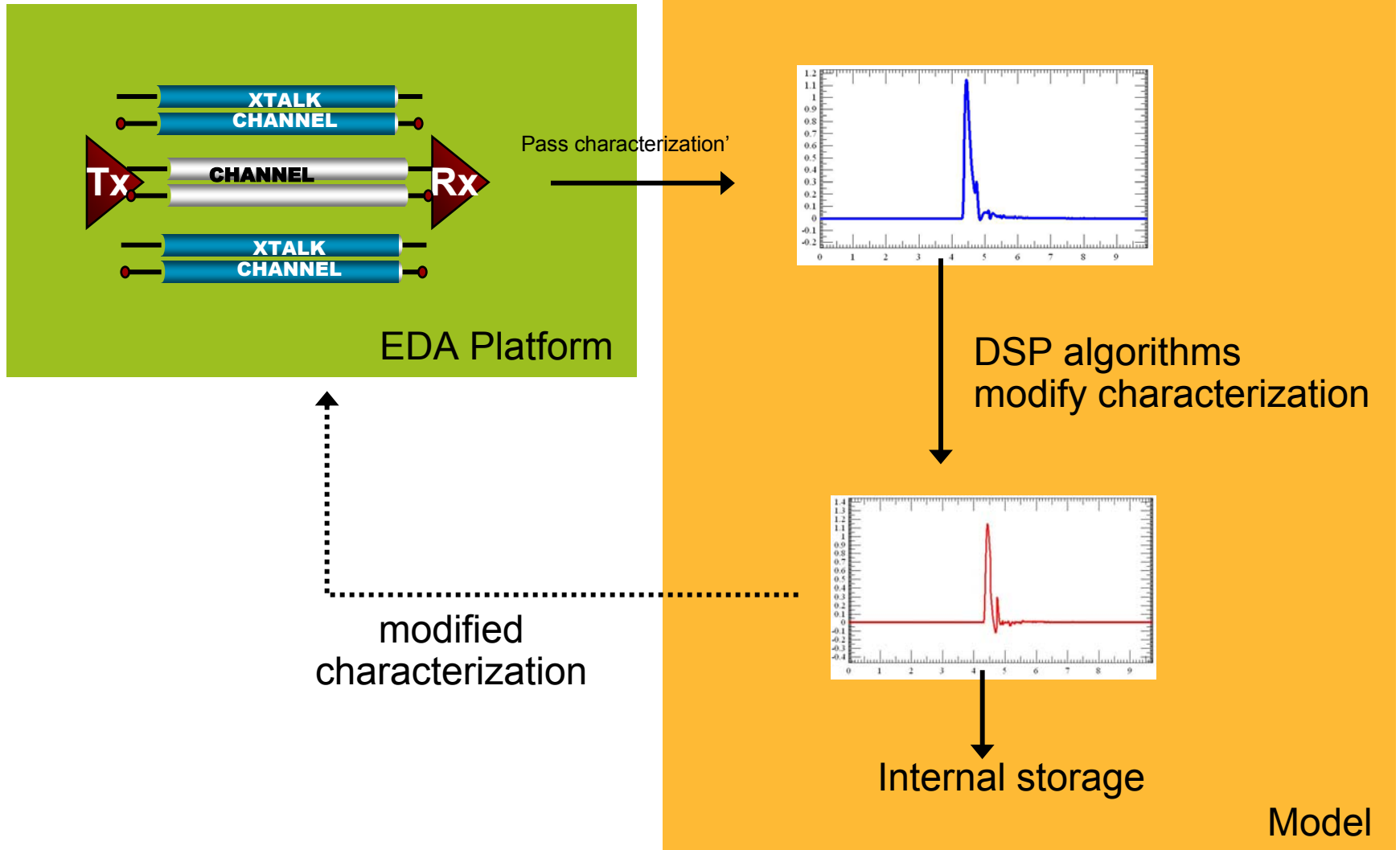


Simple API

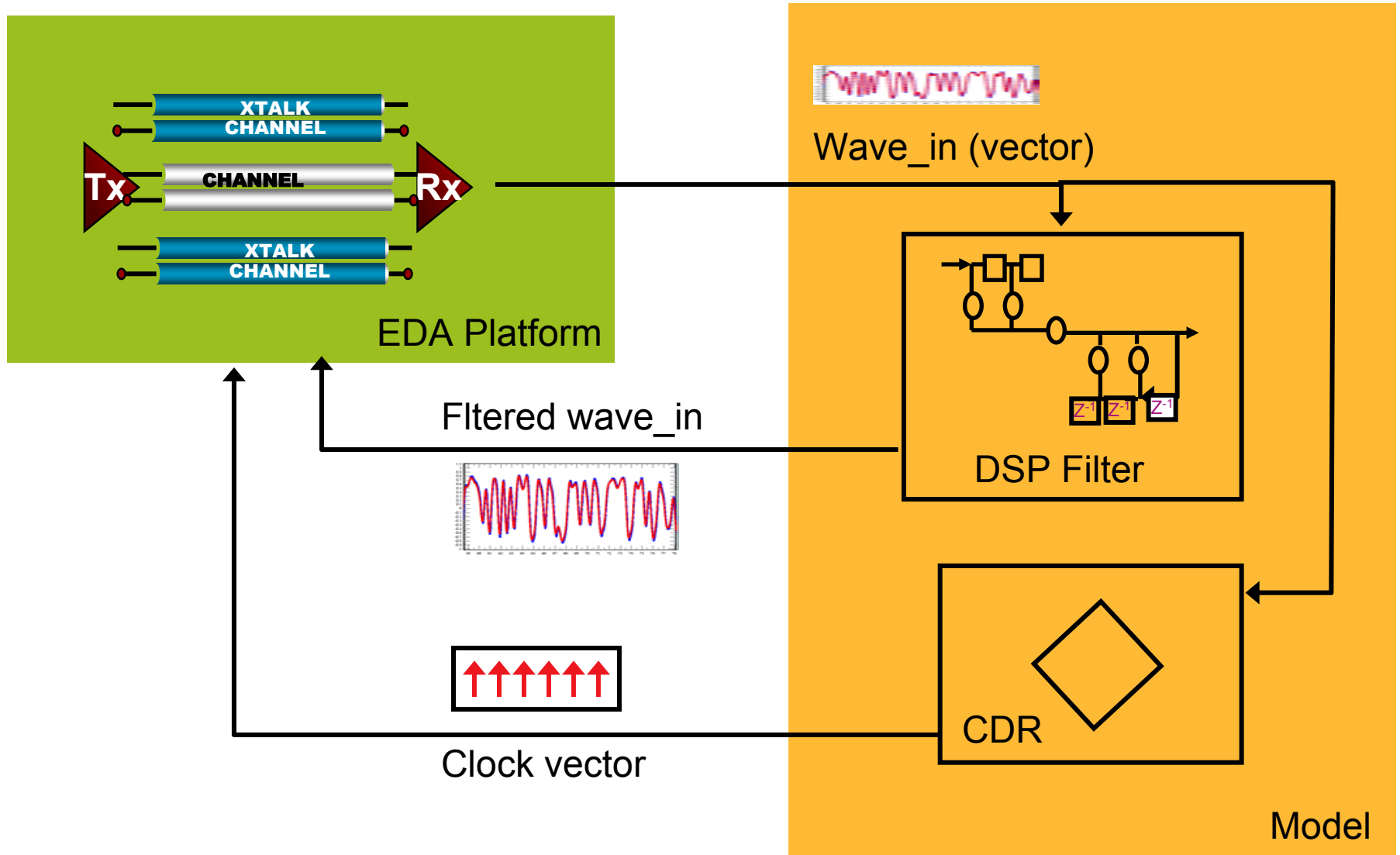
- Init
 - Initialize and optimize channel with Tx / Rx Model
 - This is where the IC DSP decides how to drive the system: e.g., filter coefficients, channel compensation, ...
 - Input: Channel Characterization, system and dll specific parameters from config file
 - bit period, sampling intervals, # of forward/backward coefficients, ...
 - Output: Modified Channel Characterization, status
- GetWave
 - Modify continuous time domain waveform [CDR, Post Processing]
 - Input: Voltage at Rx input at specific times
 - Output: Modified Voltage, Clock ticks, status
- Close
 - Clean up, exit

Parameters passed by the system simulation platform are in red

AMI_init



AMI_getwave



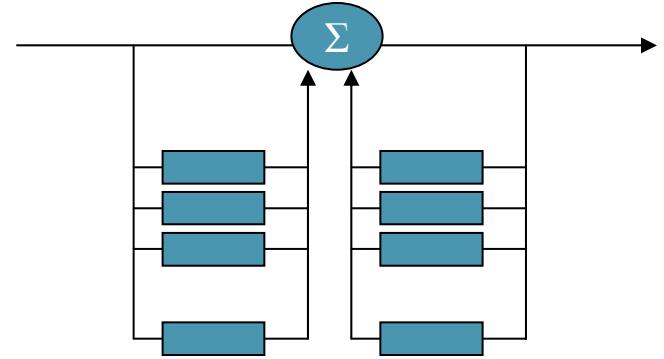
What's in it

- Sample Model Rx
 - Source code
 - Executable on Linux
 - Model params file
- Tester Program
 - Executable on Linux
 - Tester config file
- Starter model templates
- Documentation

- Use sample model and tester program to understand the details of the IBIS AMI API
- Create your own algorithmic models using starter model templates
- Use the tester program to test the model

Sample Rx Model

- Continuous Time Filter (CTF) RX model
 - Combination of feed forward and feed backward filter
 - Modifies the waveform given a set of coefficients
 - Tested for 6.25Gbps data rate
 - User configurable forward and backward taps
- Parameters needed by the model
 - Number of forward taps, Number of backward taps, Coefficients
 - Can be provided in a file
- To Compile:
 - a) `gcc -c ibis_ctf_rx.c`
 - b) `gcc -shared -o ibis_ctf_rx.dll ibis_ctf_rx.o`



CDNS AMI Tester Program

- Inputs

- Bit Stream: “(0111100001111)”
 - Alternatively, users can specify the number of bits and let tester generate random bits
- Data Rate
- Impulse Response
- DLL to interface to
- Model specific parameters

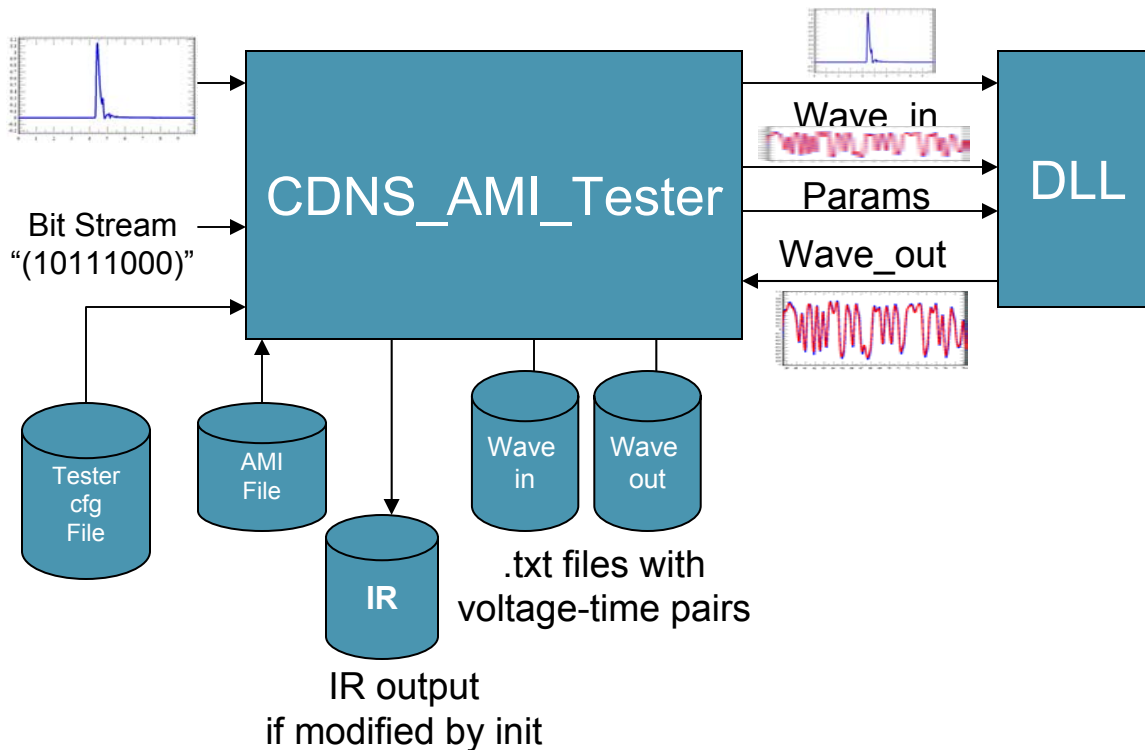


- Outputs

- Wave_out: *voltage-time pairs in txt file*
wave form data modified by the Model
- Wave_in: *voltage-time pairs in txt file*
Represents waveform passed to the model
- ImpulseResponse: IR data if it is modified by the model (init)

CDNS AMI Tester Program

- Usage:
`CDNS_TESTER [-h] ctf_rx_model`



AMI File contains:

- Measurement Delay
 - Ignore data for spec delay
- Model specific parameters

Tester config file contains

- Information generally set by end users through the EDA platform
- Data Rate
- Number of bits
- Input file names
- Output files names



How to get the kit

- Cadence AMI Developers toolbox will be available through IBIS web site soon
- In the mean time, you can send request for the toolbox to: shah@cadence.com

Resources

- Many presentations on Algorithmic Modeling starting from June 2006 can be found at:
http://www.vhdl.org/pub/ibis/macromodel_wip/archive-date.html
- Updates on the AMI work can also be found in ATM subcommittee updates provided at DAC 2007 and DesignCon 2007 IBIS Summits
 - Presentations can be accessed from this page:
<http://www.vhdl.org/pub/ibis/summits/>
- To reach the IBIS-ATM group on this topic, you can send email to: ibis-ami-toolkit@freelists.org



cā dence™

