Developing for 1149.1-2013 with Intellitech NEBULA Software

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How does NEBULA for 1149.1-2013 help?

- Control and Configure SERDES I/O
  - Set I/O differential swings for IC ATE test
  - Program I/O XCVERs for board interconnect test
  - Disable AC Coupling
- Characterize early system FR4/PCB designs
  - Execute at-speed ecosystem tests on PCBs
  - Run DDR interconnect test
  - Execute SERDES at-speed interconnect
- Perform lab/benchtop IC characterization
  - Run on-chip BIST tests
  - Measure on-chip droop voltage (inject droop)
  - Enable/Disable power domains
  - Check interconnect across TSVs

and more!

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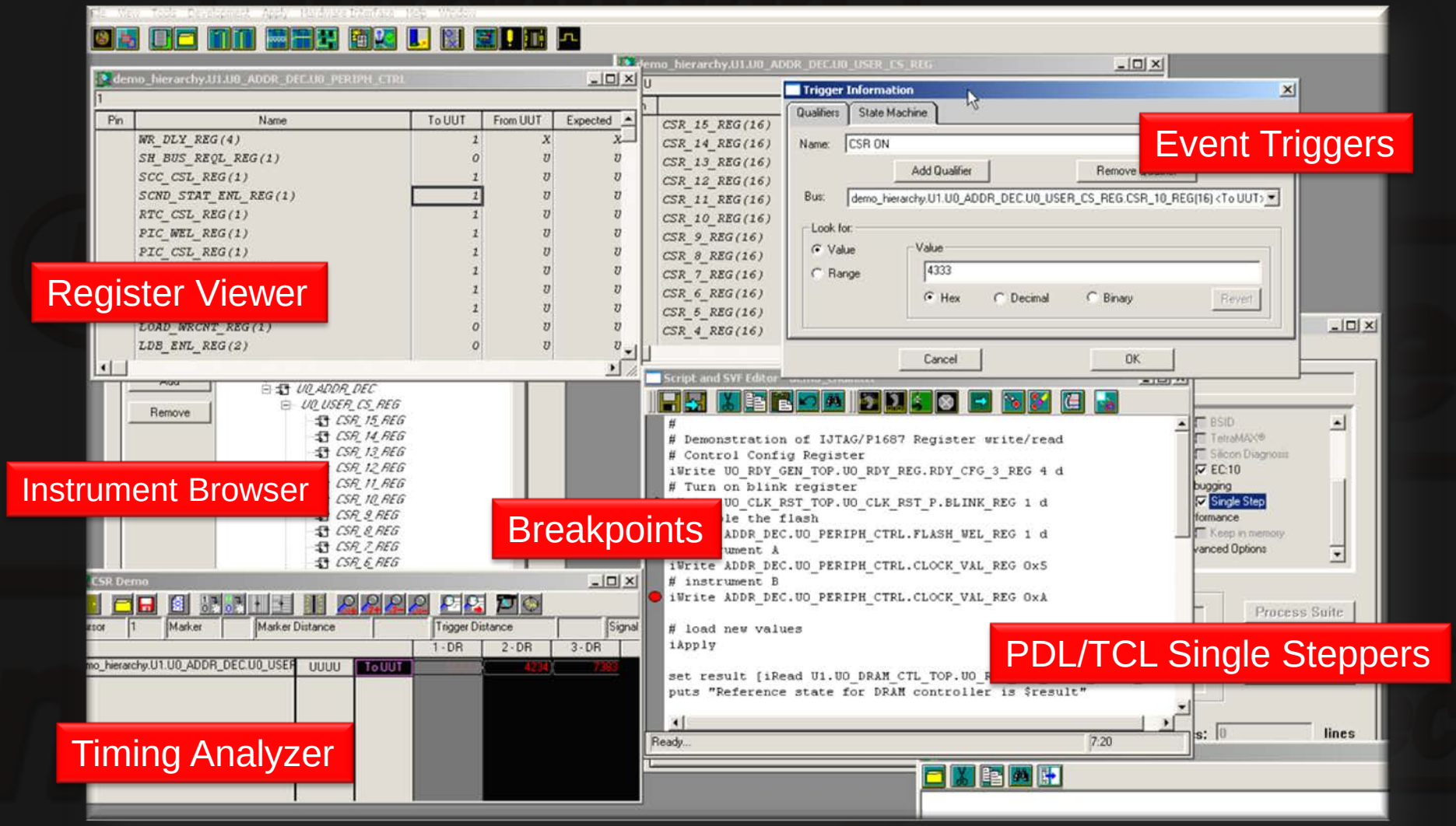
NEBULA for 1149.1-2013 Development



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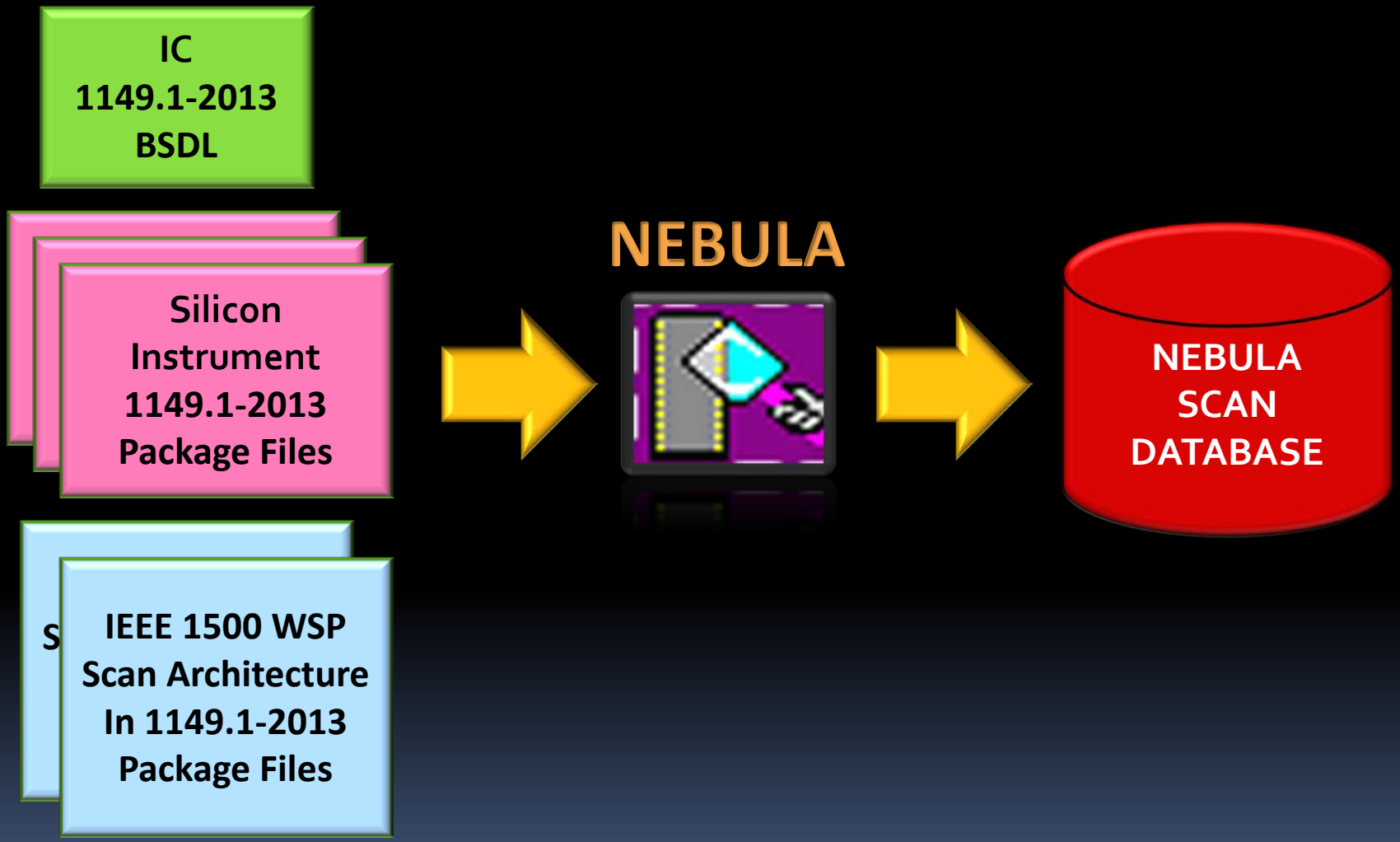
NEBULA Software Flow



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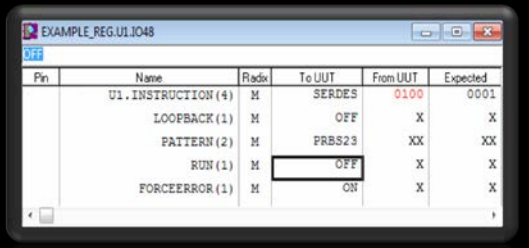
1149.1 PDL and Tcl operate on Scan Database

Interactive GUI



NEBULA SCAN DATABASE

NEBULA

Waveform Generation Language (WGL) (for IC ATE)

Silicon Instrument PDL & Tcl Descriptions

PDL (Generation From GUI)

PDL = Procedural Description Language

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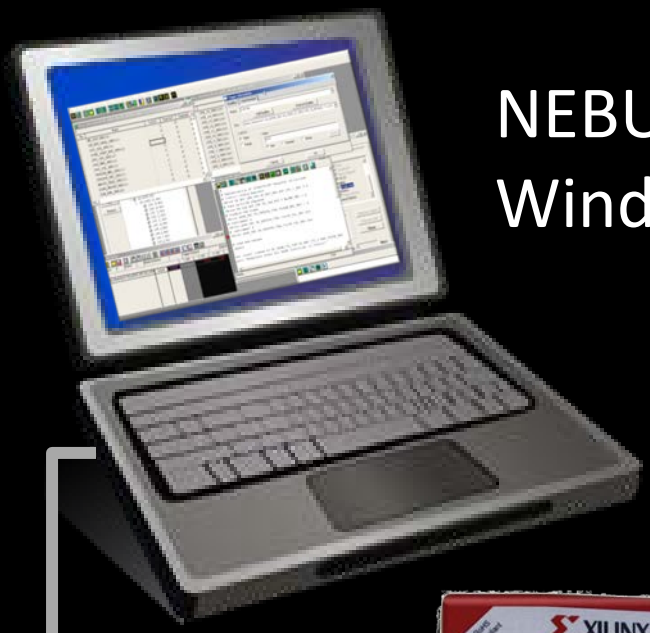
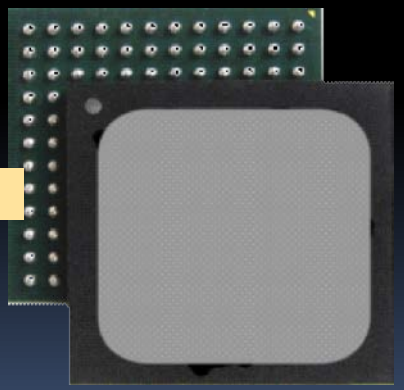
Typical Lab Setup



NEBULA running on
Windows7 Laptop

JTAG cable



SoC or FPGA

FPGA USB
JTAG Controller

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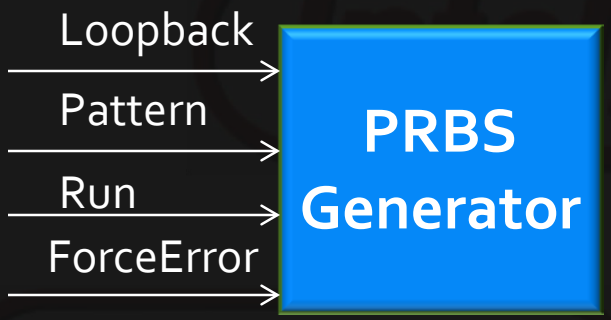
NEBULA reads 1149.1-2013 attributes



- Describe Interface to IP w/o TAP
- Description is "packaged" in compliant IEEE 1149.1-2013 package file
- Describe just interface + mnemonics
- Machine readable

```
Attribute REGISTER_MNEMONICS of SERPRBS : package is
 "OnGroup      (ON (1), OFF (0)),"  &
 "PatGroup     ( PRBS31(1), PRBS23 (2), PRBS7(3) );"

Attribute REGISTER_FIELDS of SERPRBS : package is
"PRBS [5] ( "&
  "(Loopback   [1] IS (4) DEFAULT(OnGroup(ON))), "  &
  "(Pattern    [2] IS (3,2)  DEFAULT(PatGroup(PRBS7)) ), "  &
  "(Run        [1] IS (1)    SAFE(OnGroup(OFF)) ), "  &
  "(ForceError [1] IS (0)) DEFAULT(OnGroup(OFF)));"
```

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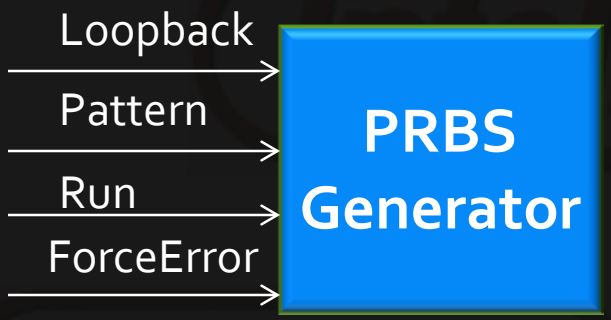
PRBS - Pseudo-Random Bitstream Sequence

NEBULA reads PDL/Tcl control sequences



Procedural Description Language

- **new vectorless re-targetable language for describing IP operation**

Set data

Shift data

```
iWrite Loopback   ON
iWrite Pattern    PRBS23
iWrite Run        ON
iWrite ForceError OFF
iApply
```

Format: <iWrite > <Register> <value or mnemonic>

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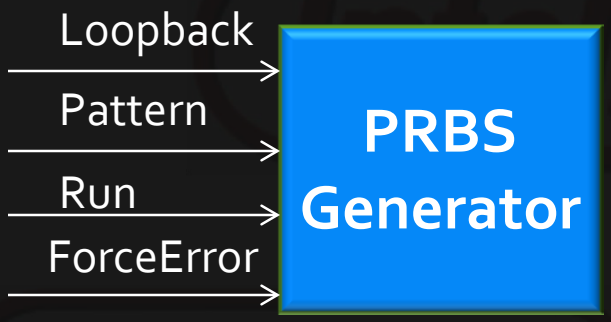
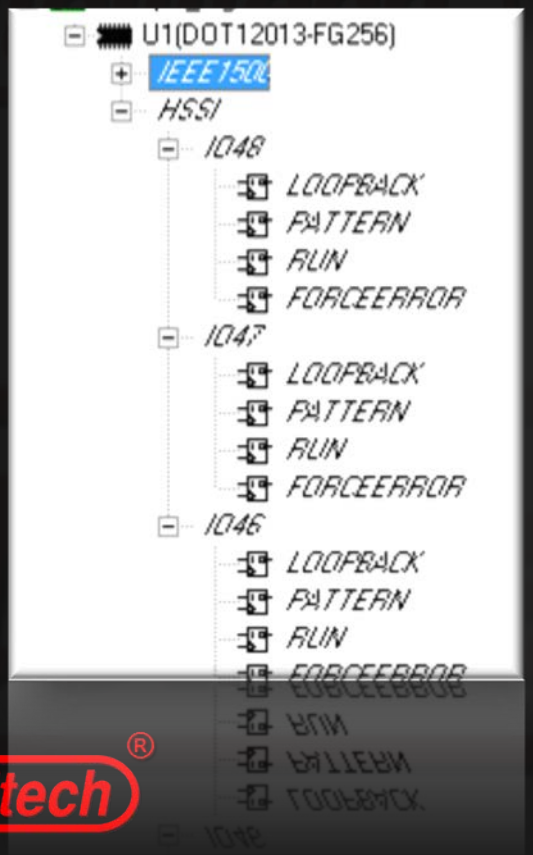
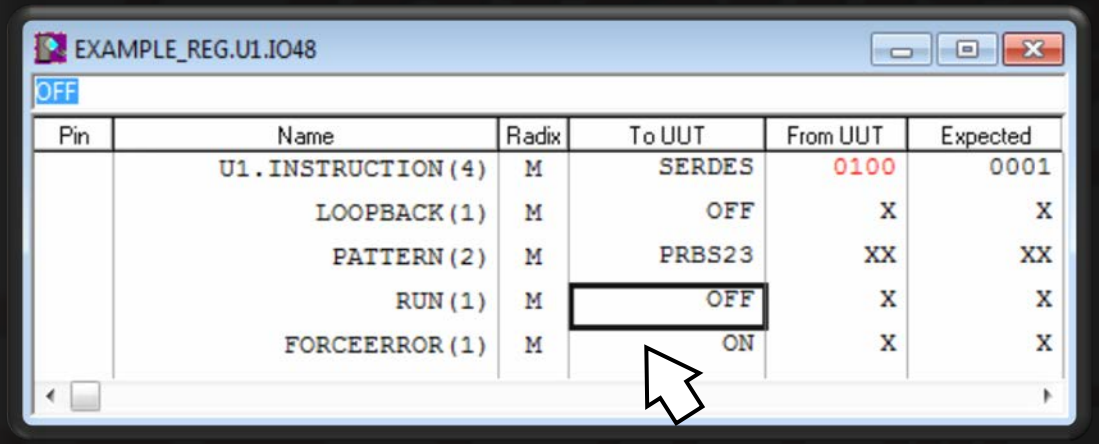
NEBULA software reads IP package files



Creates hierarchy from IP to IC level TAP

Interactive display





Example Silicon Instrument GUIs in NEBULA