Smalltalk Debug Lives in the Matrix

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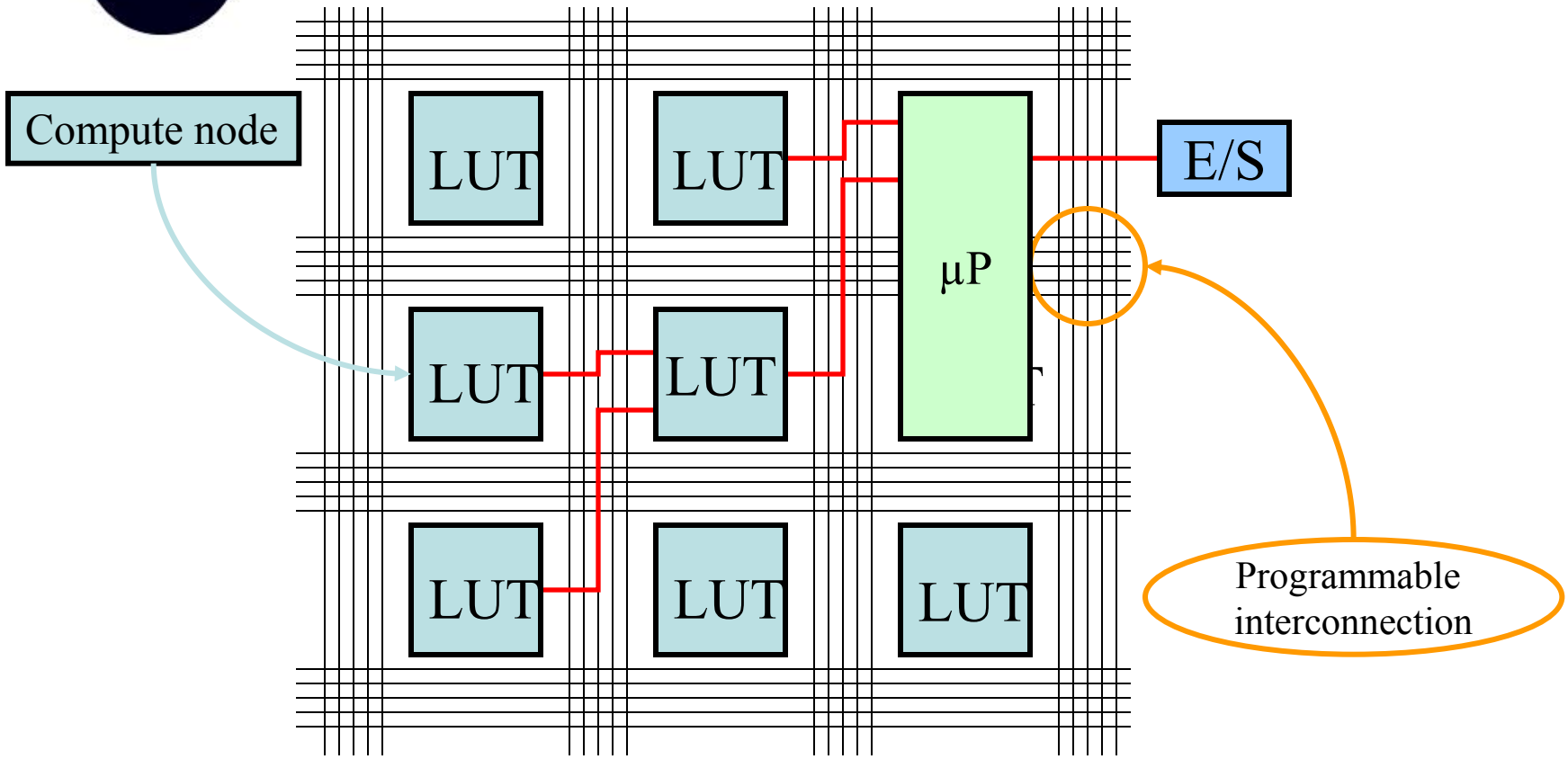
L'Université est une chance

What Matrix?

+ “Flexible” hardware
Time to market

− Hard to program
Hard to debug



What Matrix?

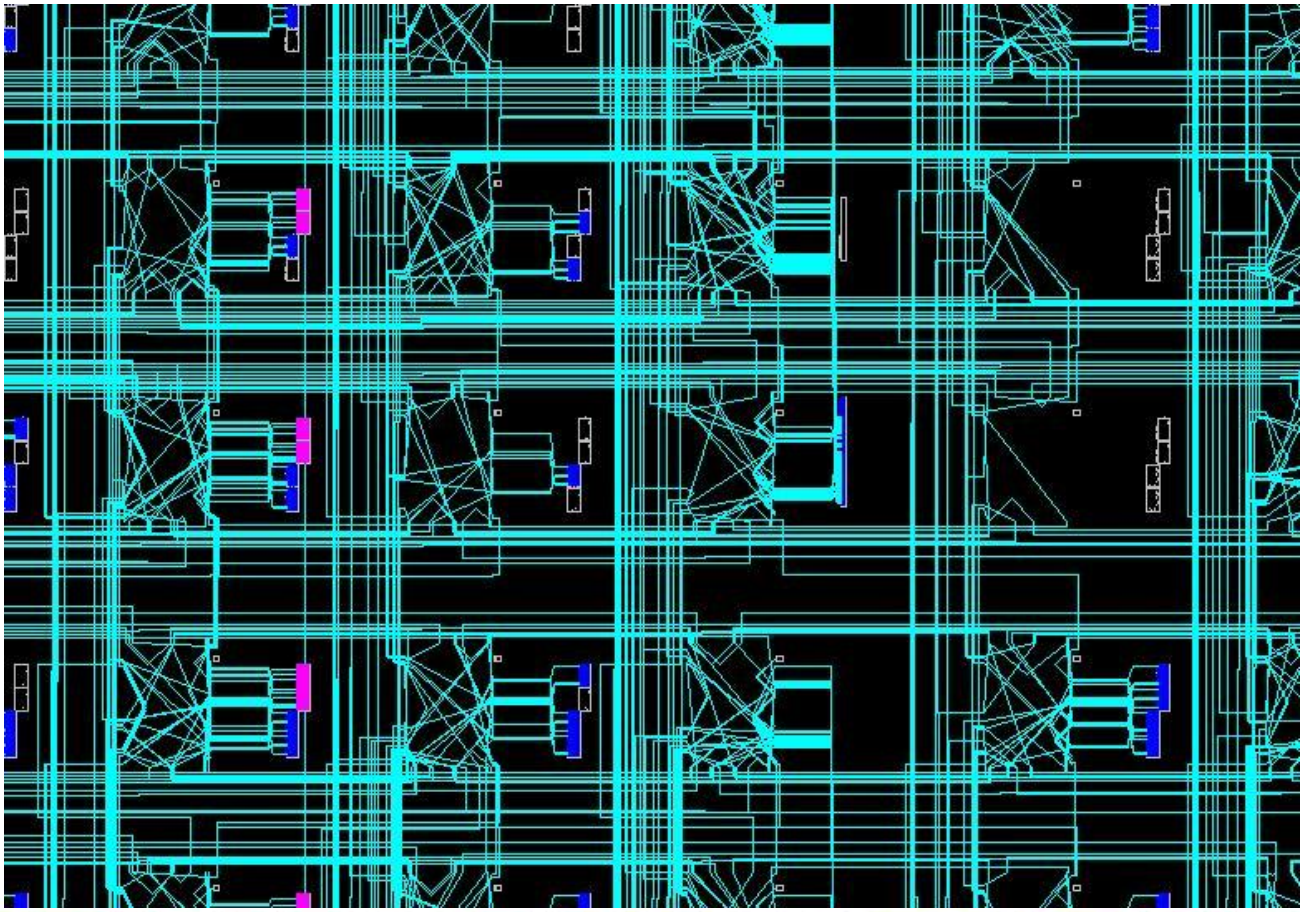
"Flexible" hardware
Time to market

Hard to program
Hard to debug

Specific languages
Specific tools

Performances still requires manual tuning

EE skills required



State of the art debugging

Simplifying Xilinx and Altera FPGA Debug

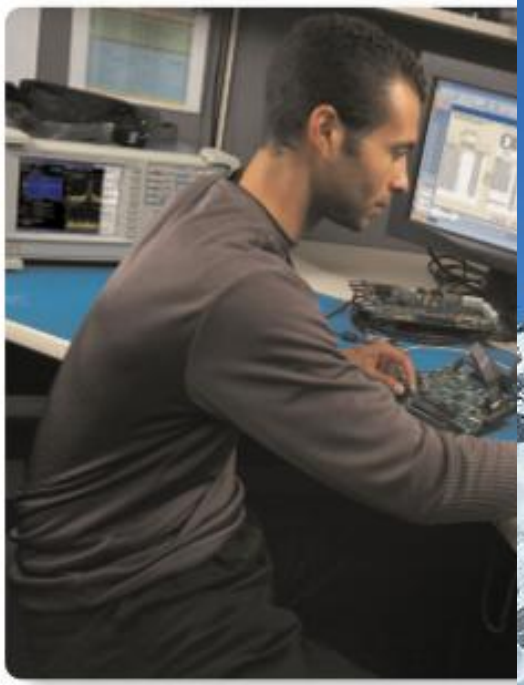
Debug Your FPGA Design At Full Speed

Solutions such as FPGAView™ enable you to instantly move probe points within your Xilinx and Altera FPGAs without the need to recompile your design. Plus the ability to correlate internal FPGA signal activity to board-level signals can make the difference between hitting your schedule and missing your time-to-market window.

Huge challenge

Touching the void

Simplifying Xilinx and Alte



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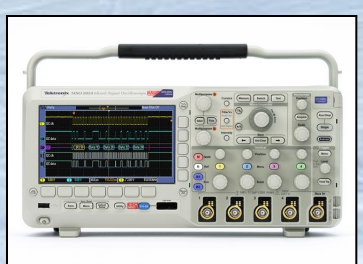
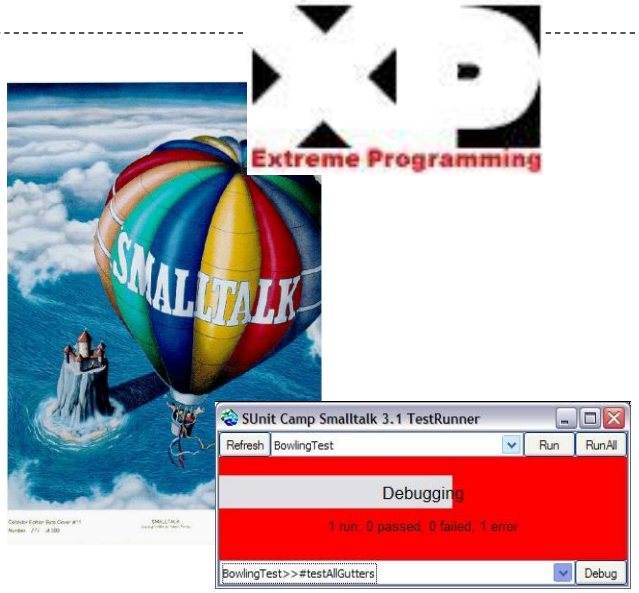
Huge challenge

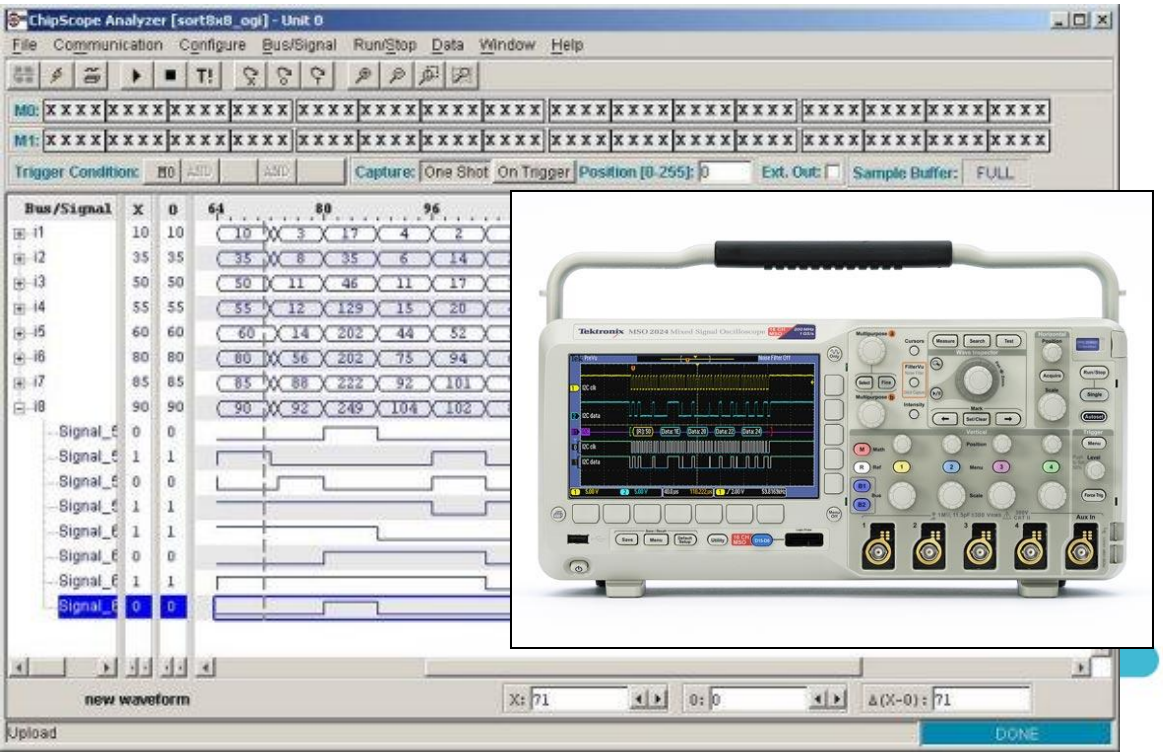
Meet in the middle



Debug silver bullet

- Observability
- Controlability
- Abstract analysis
- Fast changes

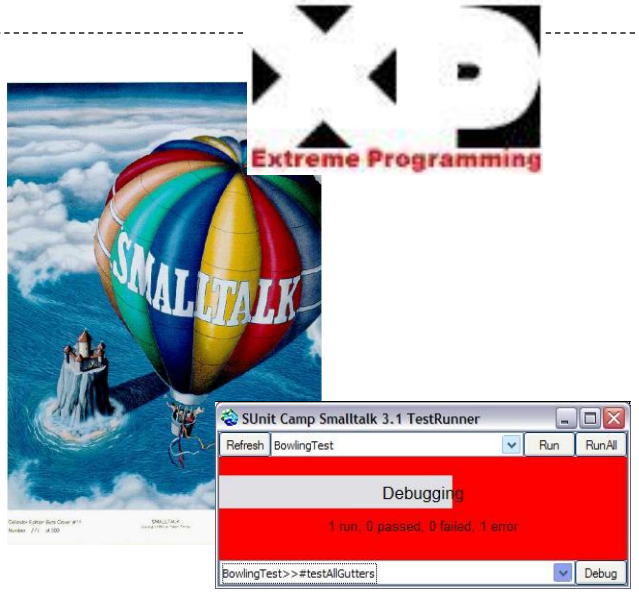


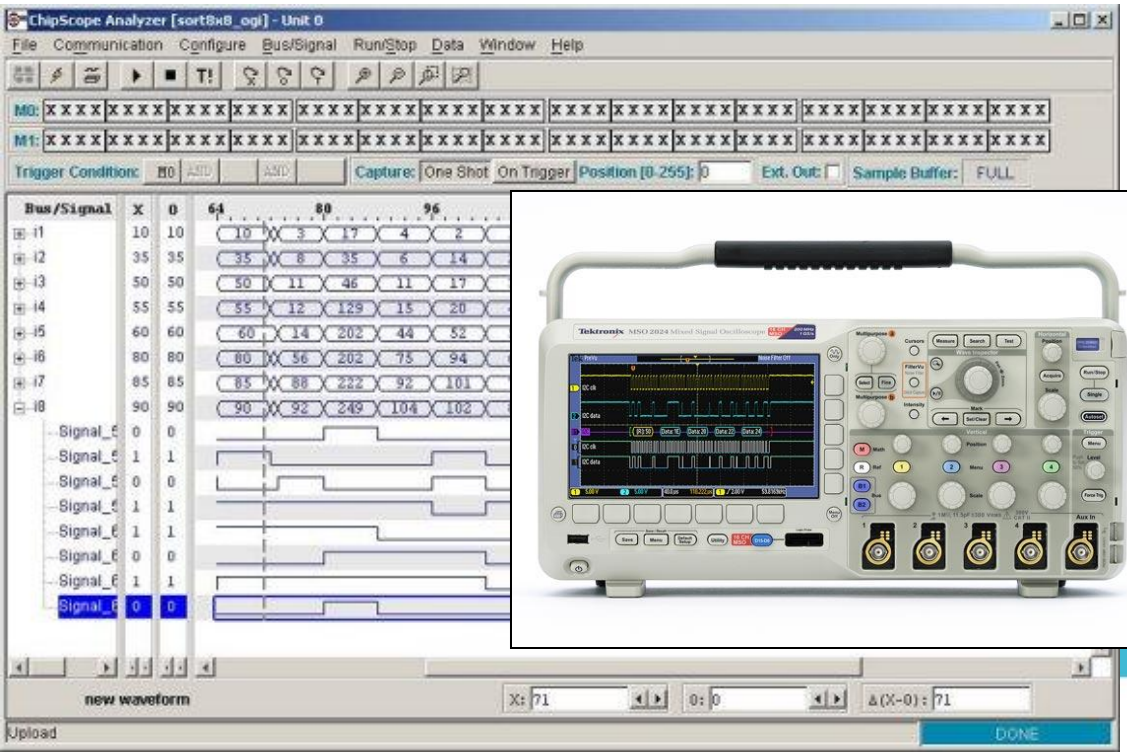


- Time to market
- Multiple runs
- Long cycles
- Simulation is not enough

Debug silver bullet

- Observability
- Controlability
- Abstract analysis
- Fast changes





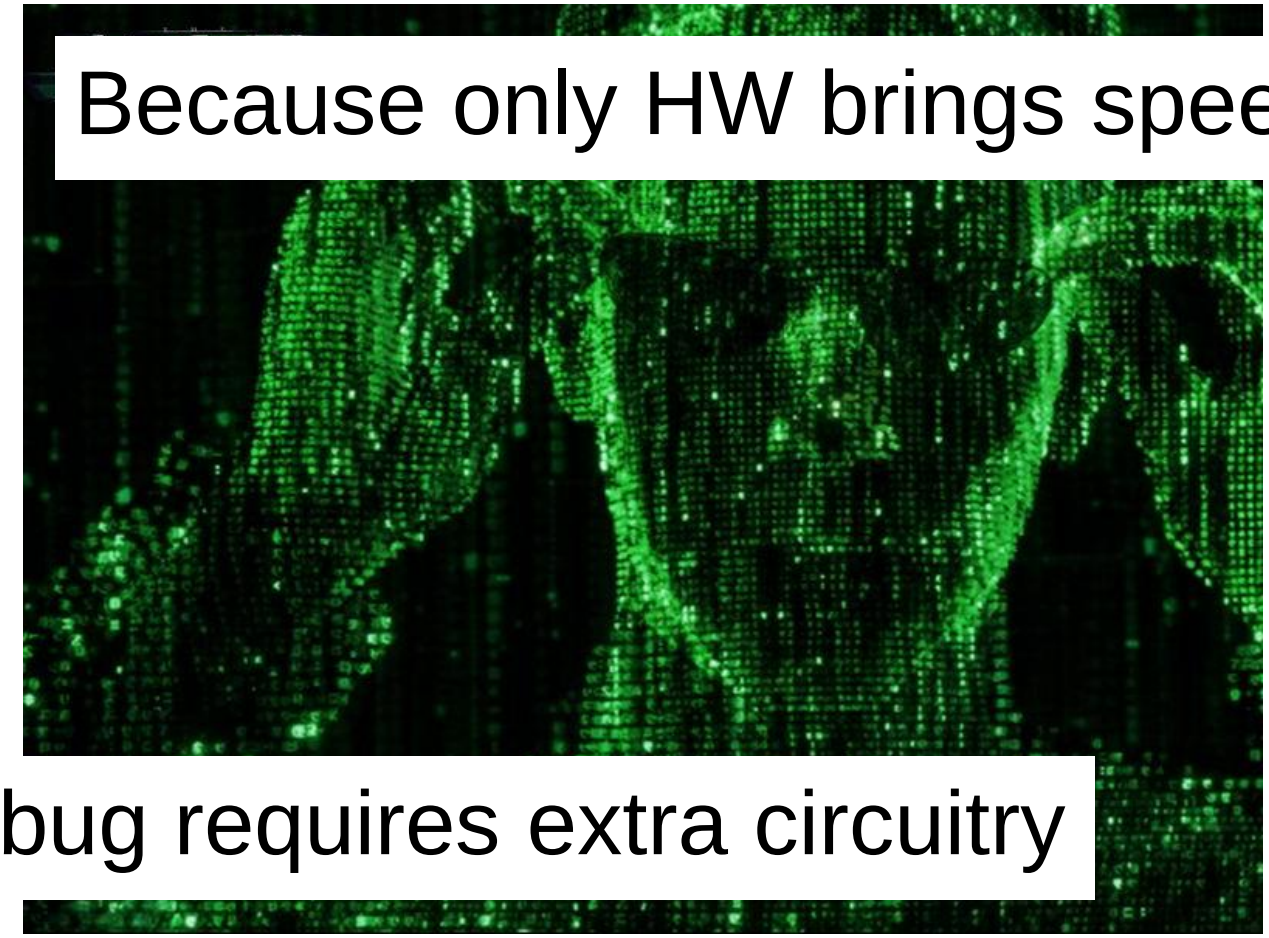
- Time to mar
- Multiple r
- Long
- Sin is not

New challenges ?
Threat or opportunity?

Operate at-speed

Multiple runs prohibit any over time penalty

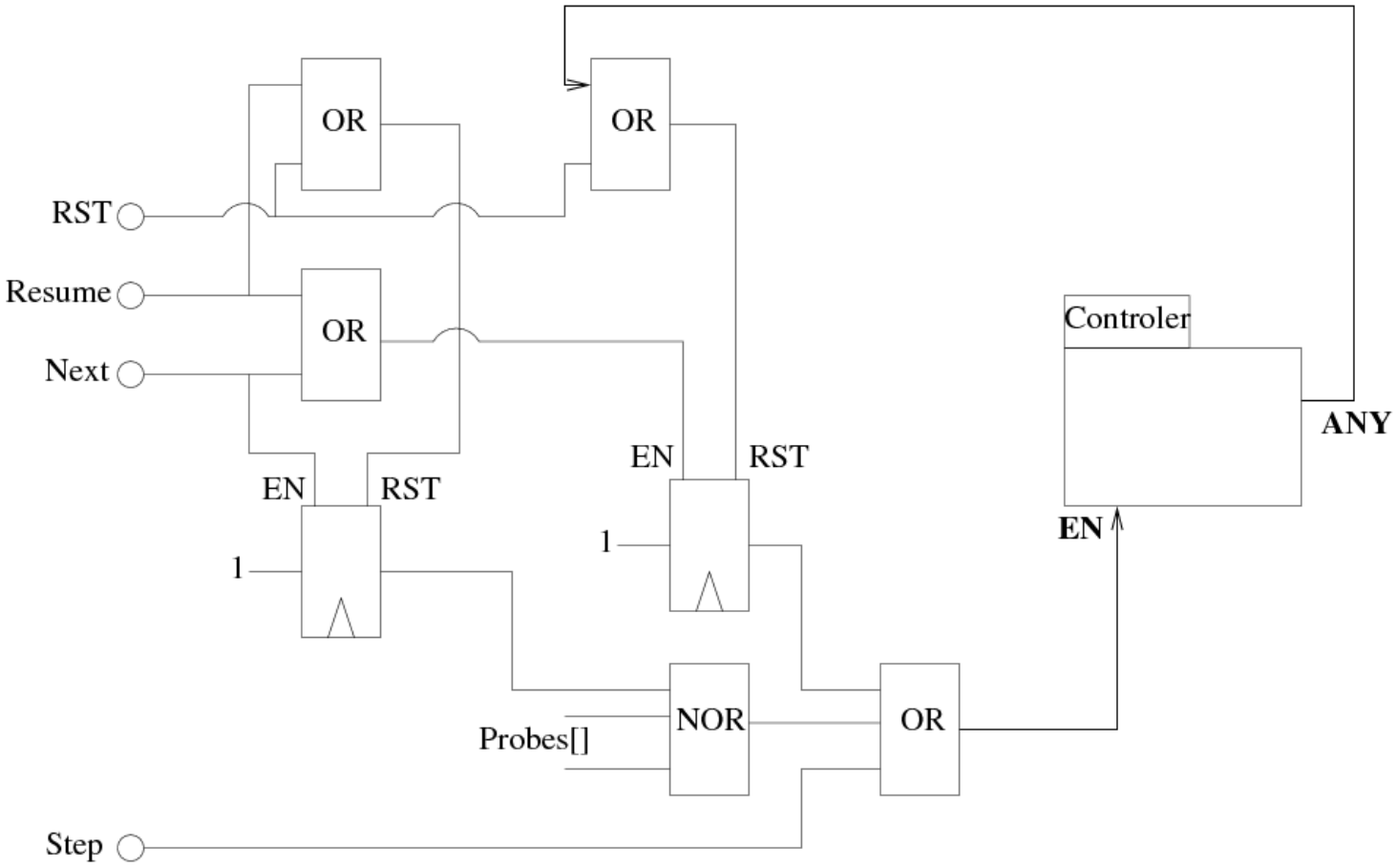
Operate in-situ



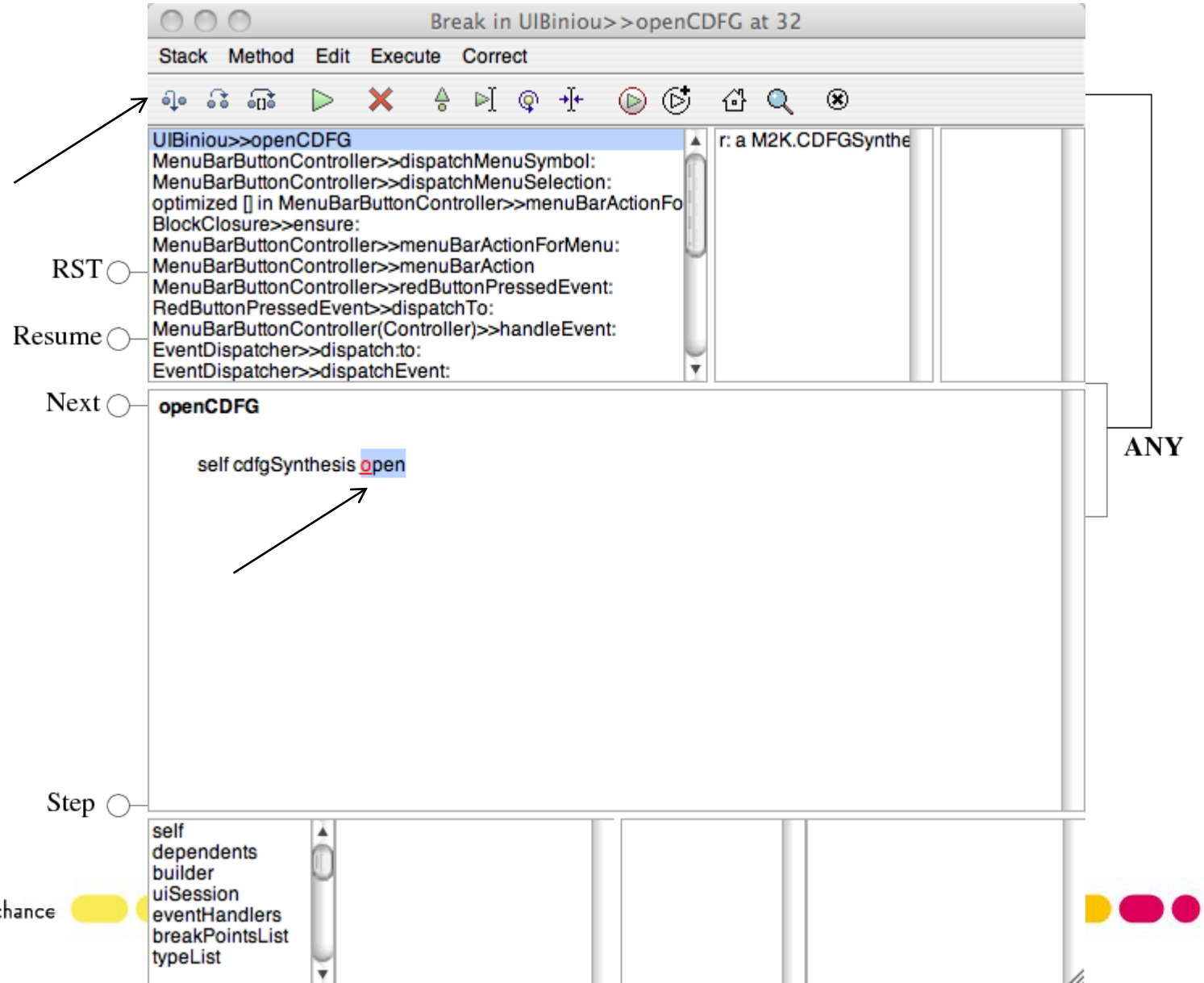
Because only HW brings speed-up

Debug requires extra circuitry

Debugging facilities are circuits



Debugging facilities are circuits



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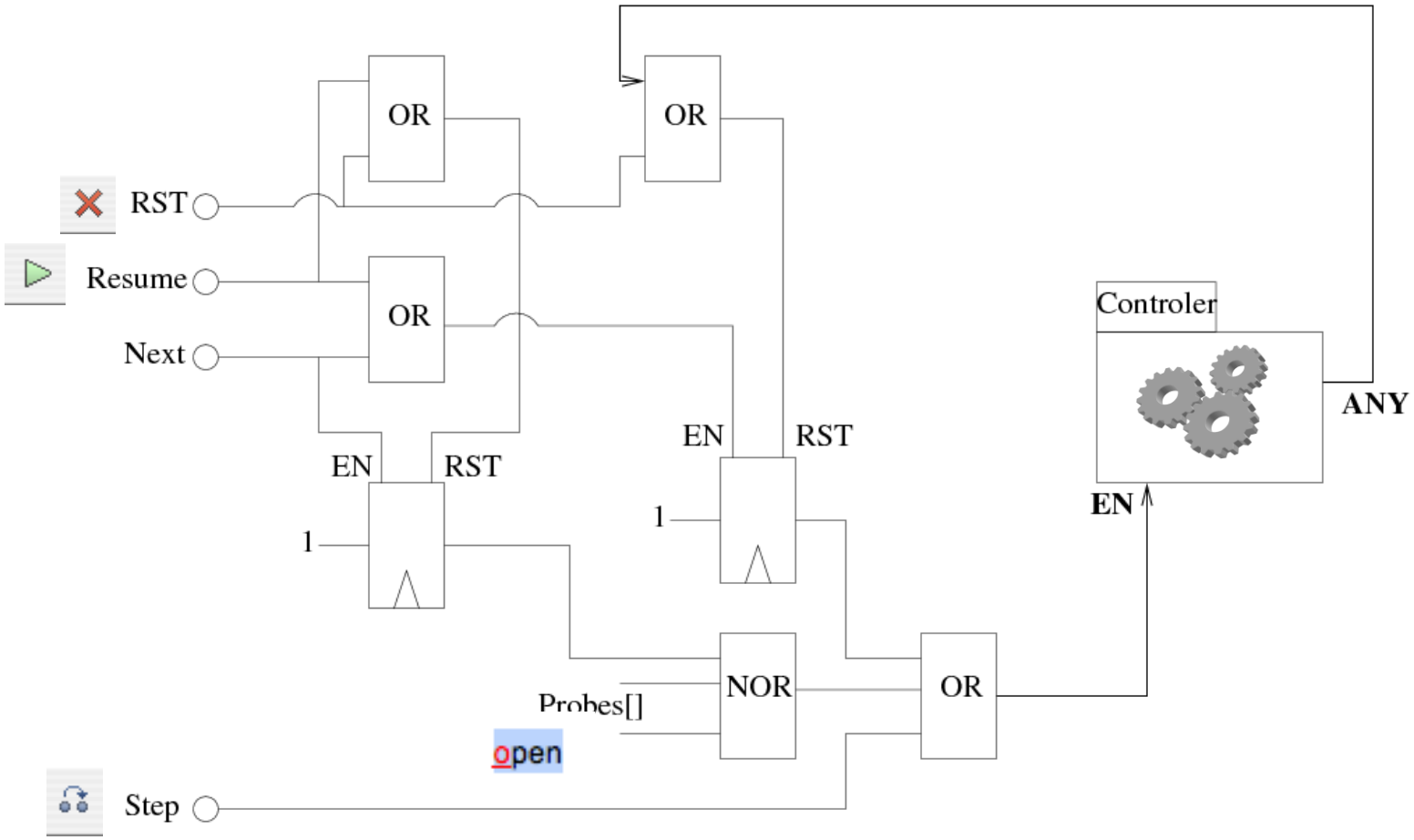
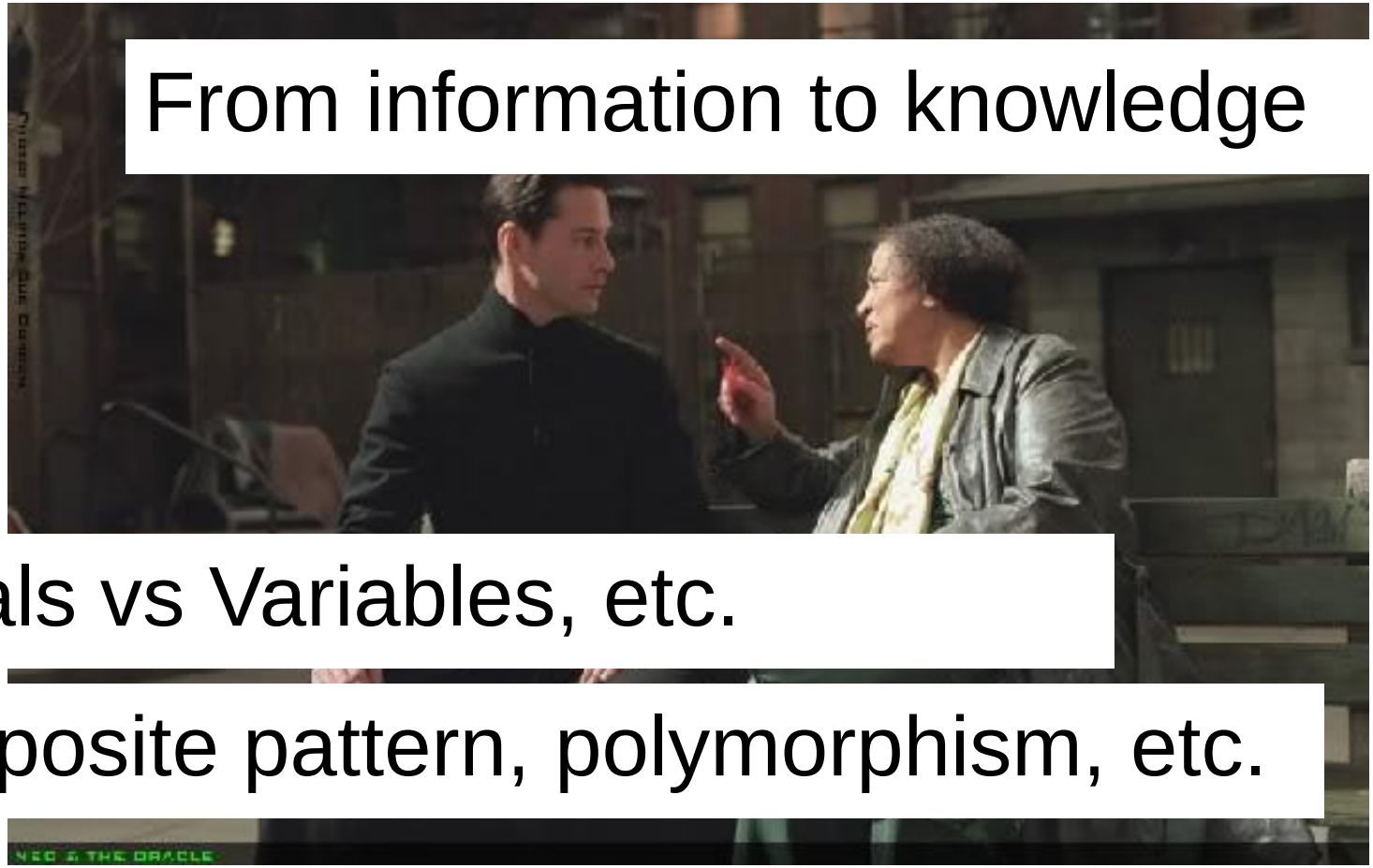


Observe and monitor

You cannot watch everything

Abstract analysis: semantic needed

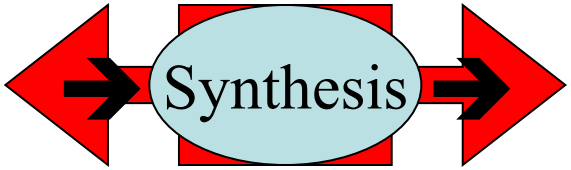


From information to knowledge

Signals vs Variables, etc.

Composite pattern, polymorphism, etc.

From a technical point of view



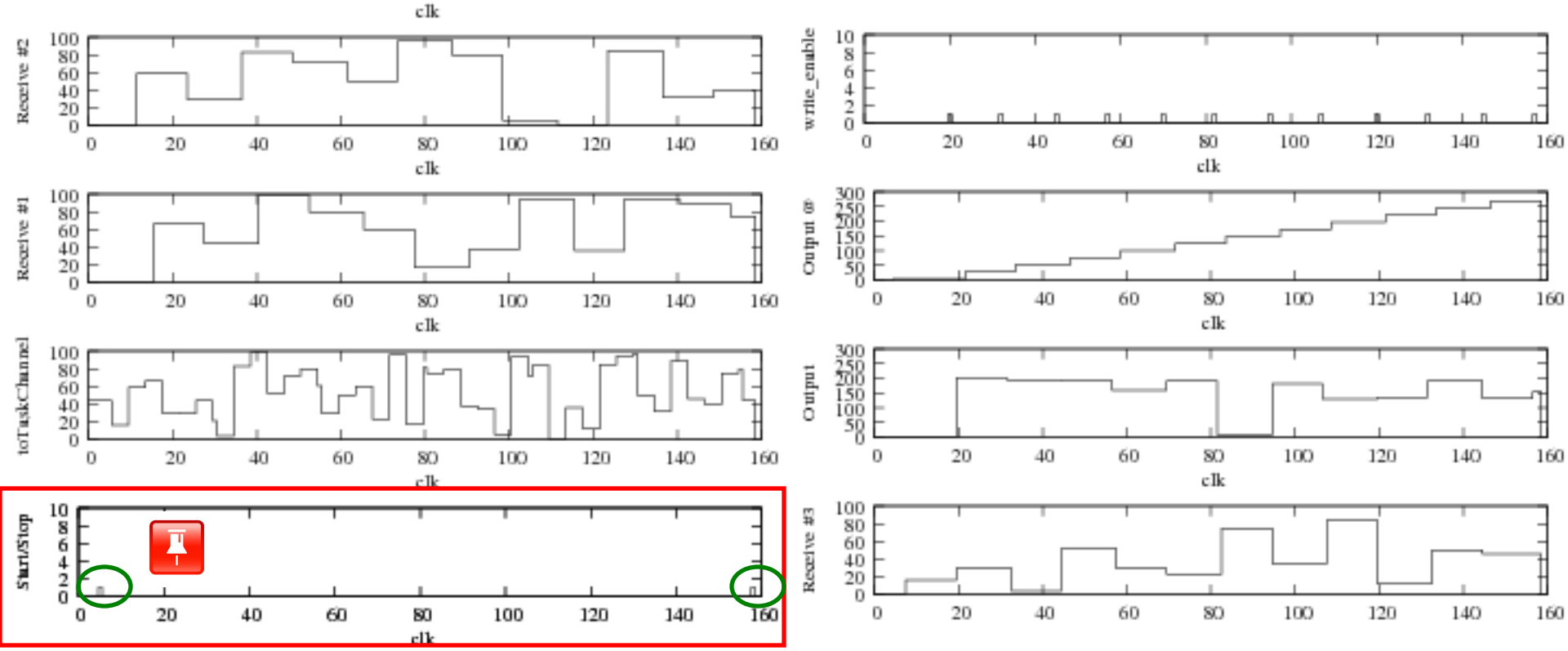
Software abstraction

Implementation in hardware

From D. Picard's ESUG 2009 talk

Full observabiliy isn’t scalable

Focus on POI



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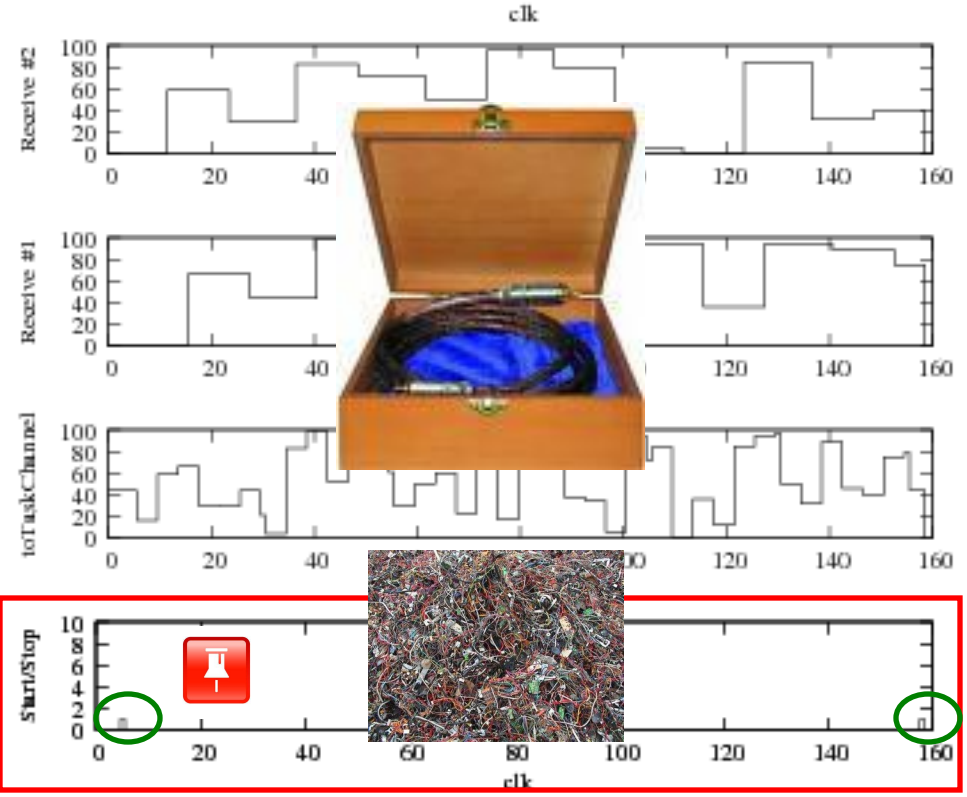
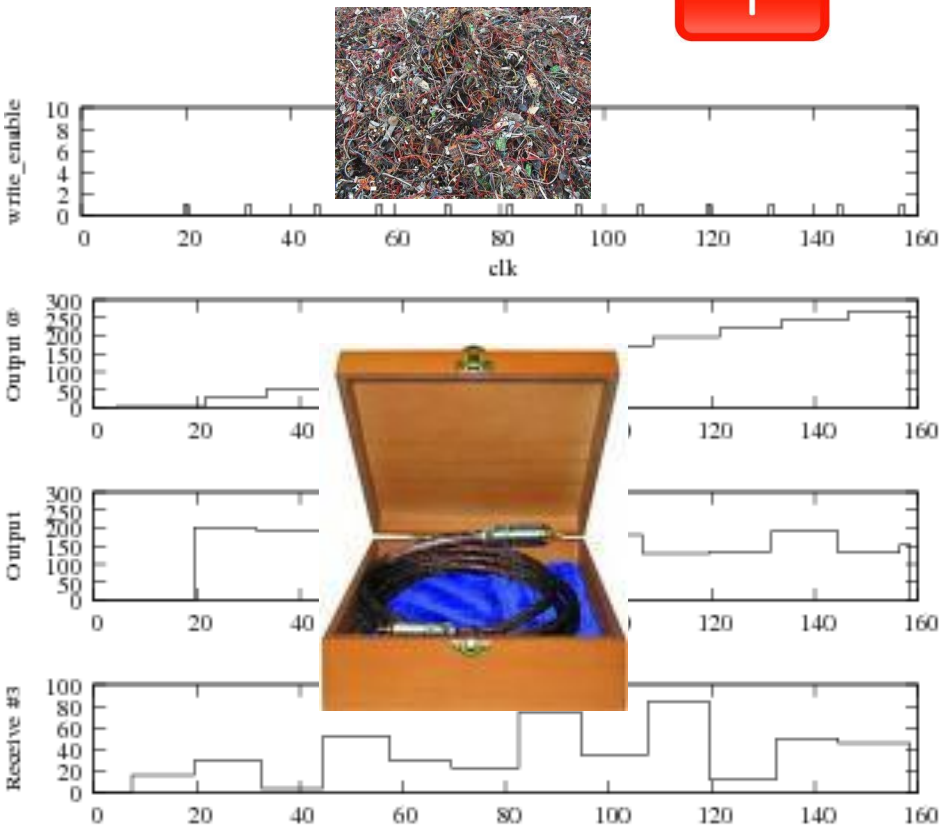
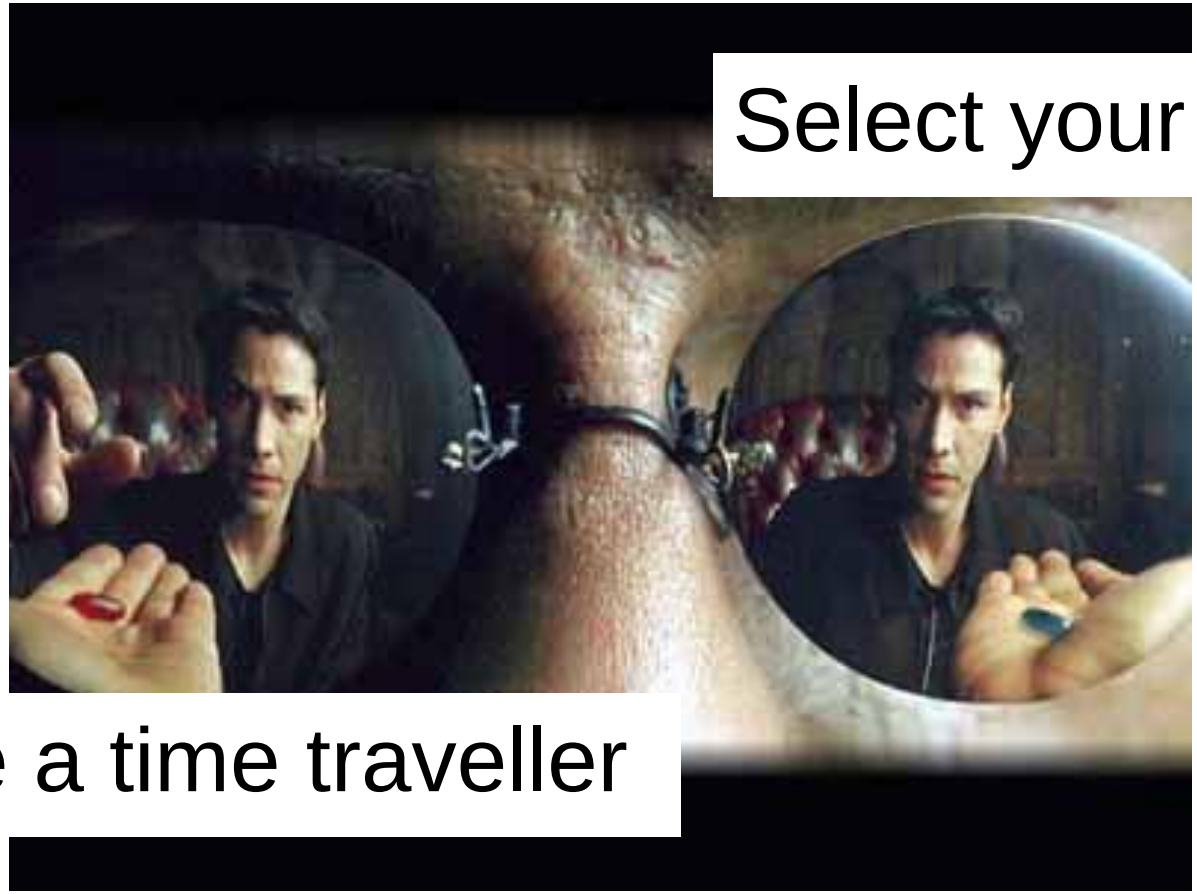




Take control



Smalltalk debugger

- Just fit approach
- Run code and catch exception
- Code hot replacement, variable update, etc.
- Step on or resume execution
- Possible rollback

- Multiple runs
- Breakpoints update, earlier exception
- Same conceptual behavior

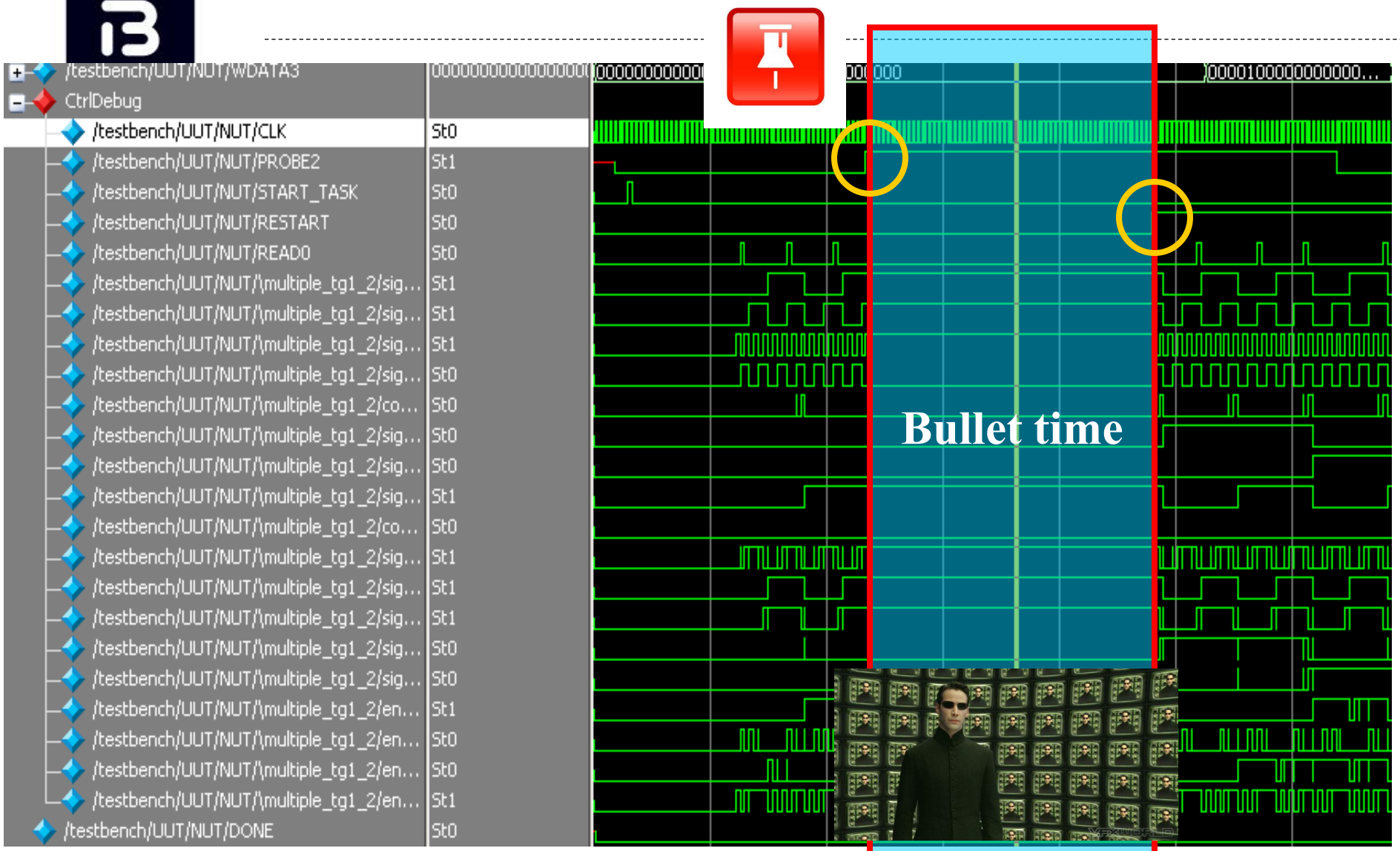
Become a time traveller

Dodge bullets

Once the time has stopped

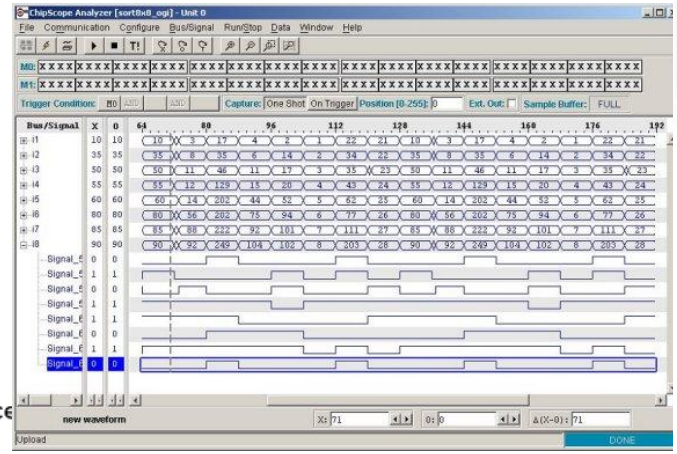
… just operate !

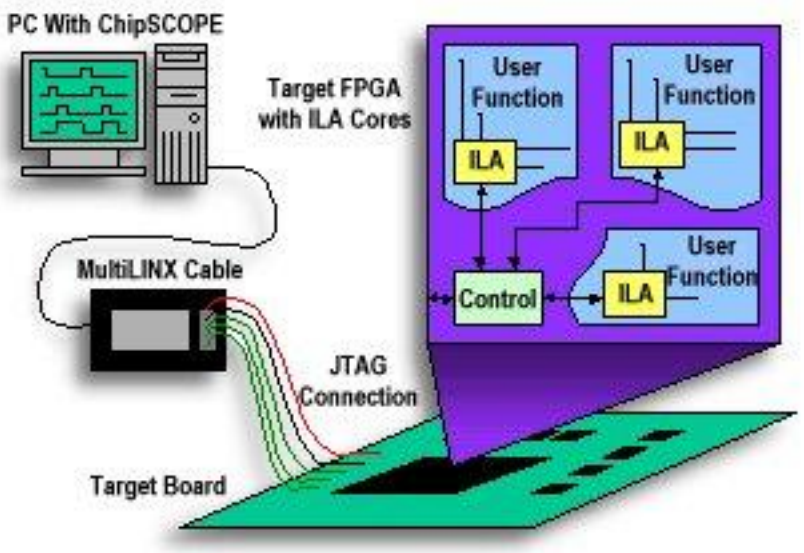
Bullet time explained



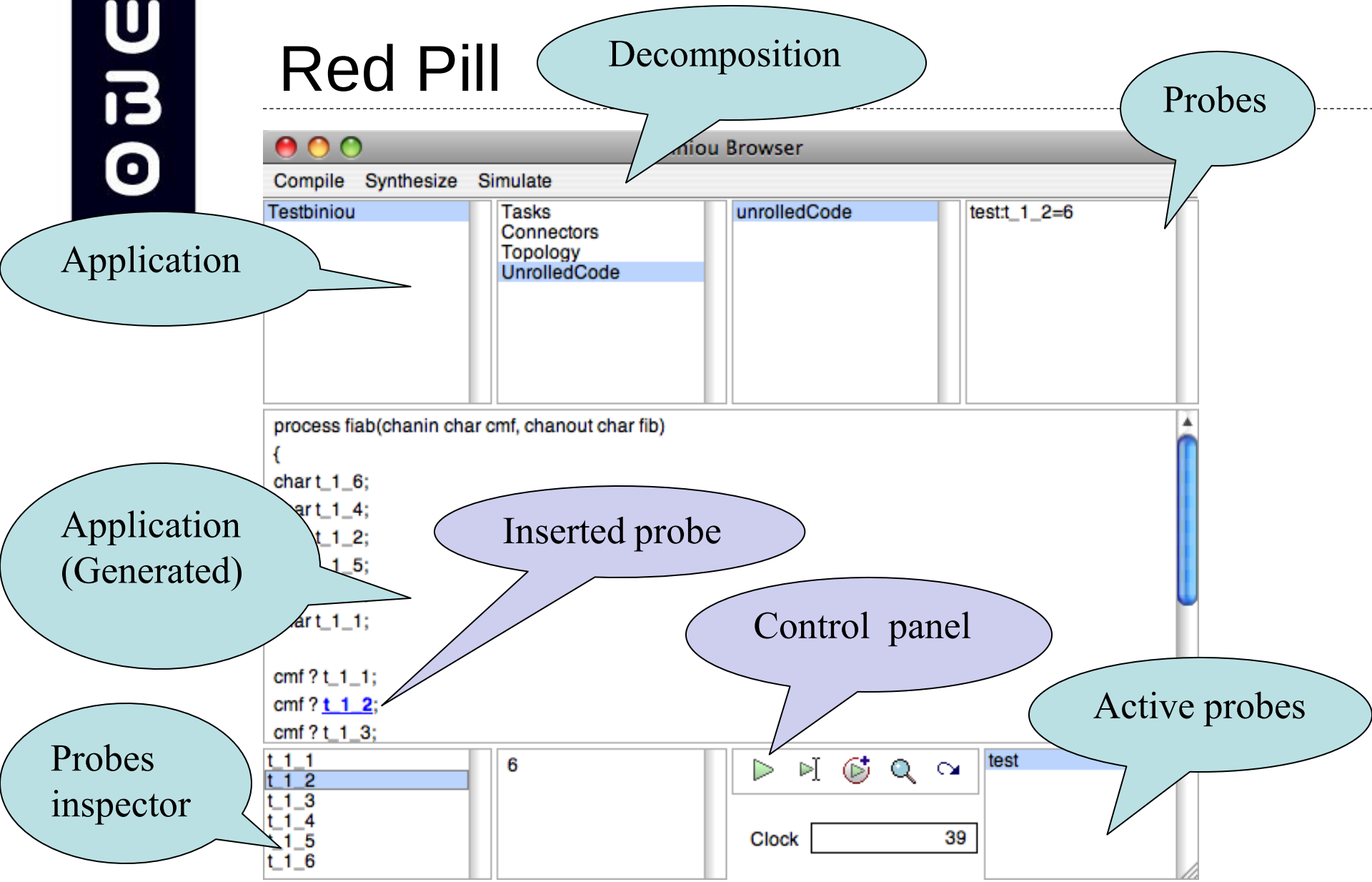
Conditional probes

- Conditional probes offer the controlabily that lacks in commercial tools
- Observability can be gained at the cost of adding some variable look-up wires
- … But also using vendor's tool such as Chipscope

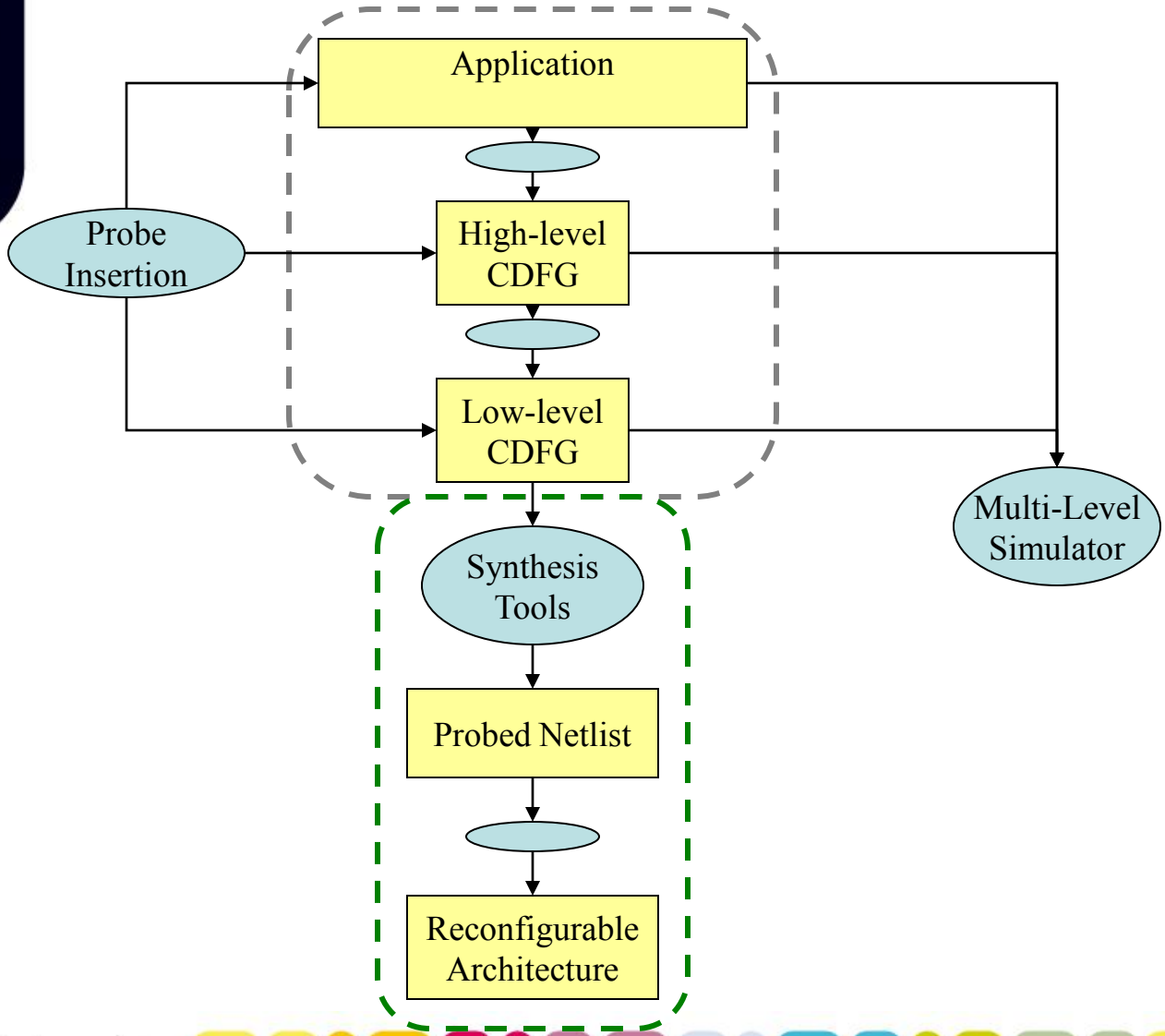




Red Pill


Decomposition
Probes
Application
iniou Browser
Compile
Synthesize
Simulate
Testbiniou
Tasks
Connectors
Topology
UnrolledCode
unrolledCode
test:t_1_2=6
process fiab(chanin char cmf, chanout char fib)
{
char t_1_6;
ar t_1_4;
t_1_2;
1_5;
ar t_1_1;
cmf ? t_1_1;
cmf ? t_1_2;
cmf ? t_1_3;
Application (Generated)
Inserted probe
Control panel
Active probes
Probes inspector
t_1_1
t_1_2
t_1_3
t_1_4
1_5
t_1_6
6
Clock
39
test

RedPill Flow extends Biniou (HLS)



Biniou

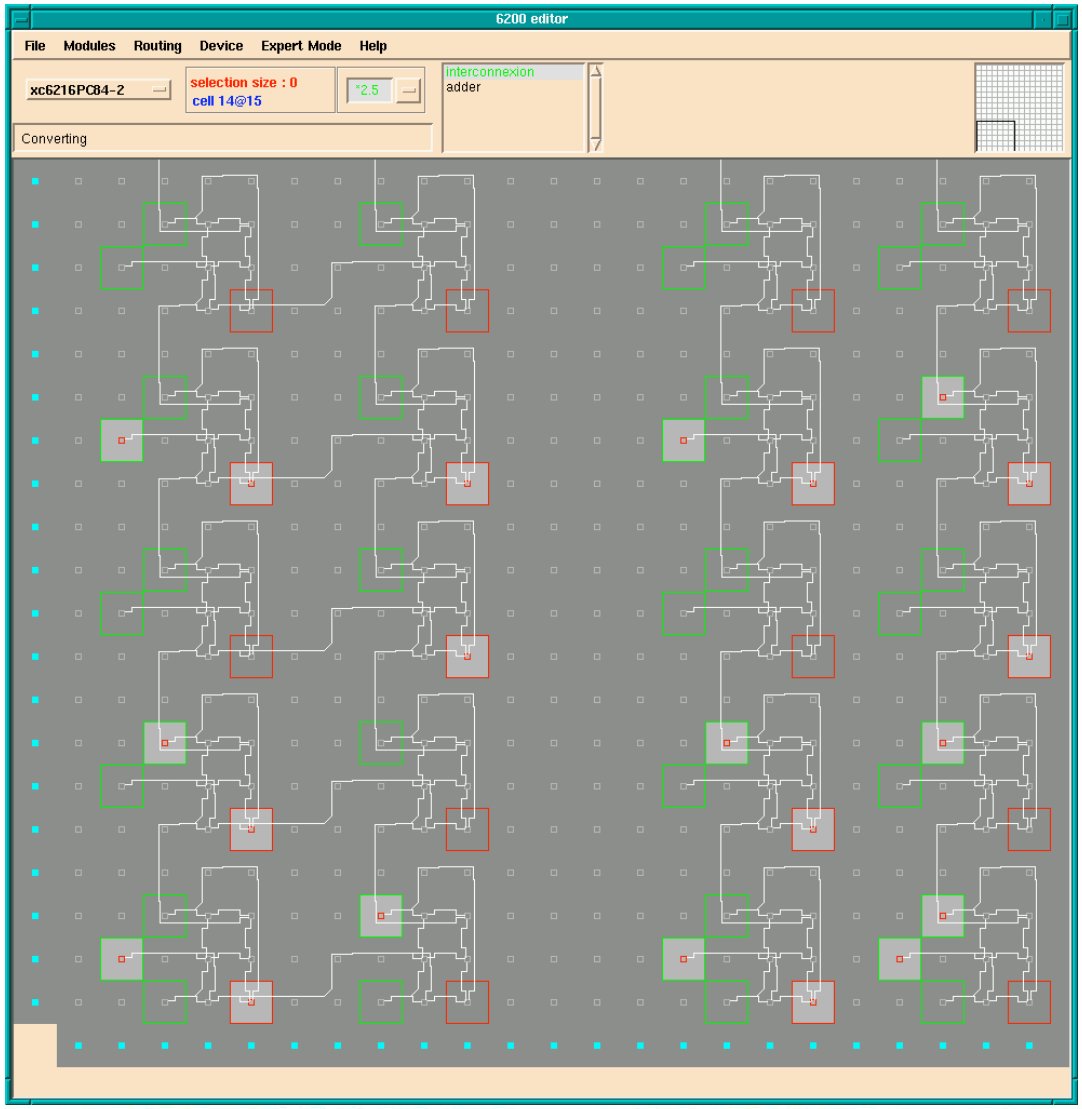
Abstract analysis

Encapsulate circuit modules as smalltalk blocks

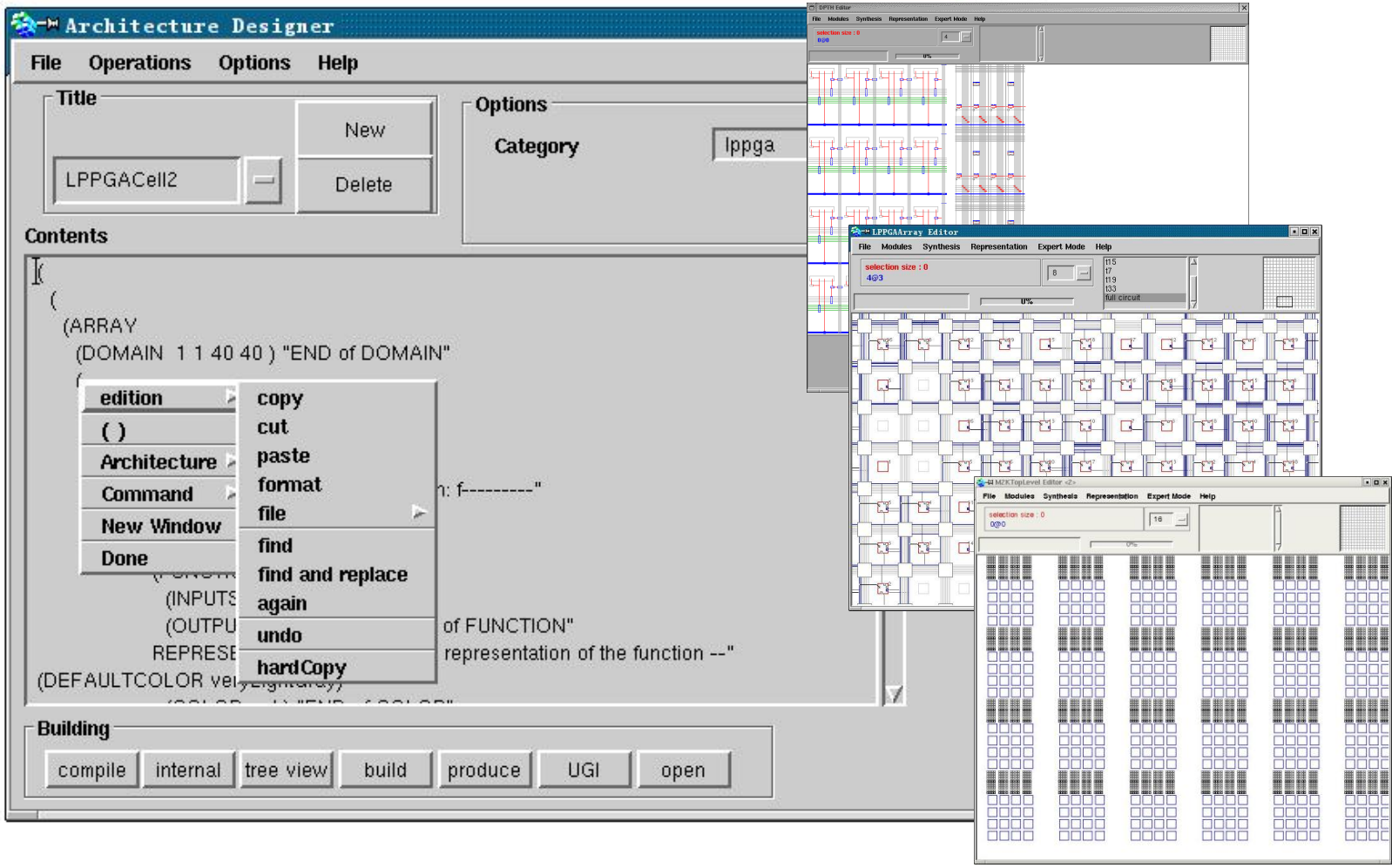
- Enables soft and hard objects to communicate
- Delivers the power of Sunit to hardware

Abstract analysis (example)

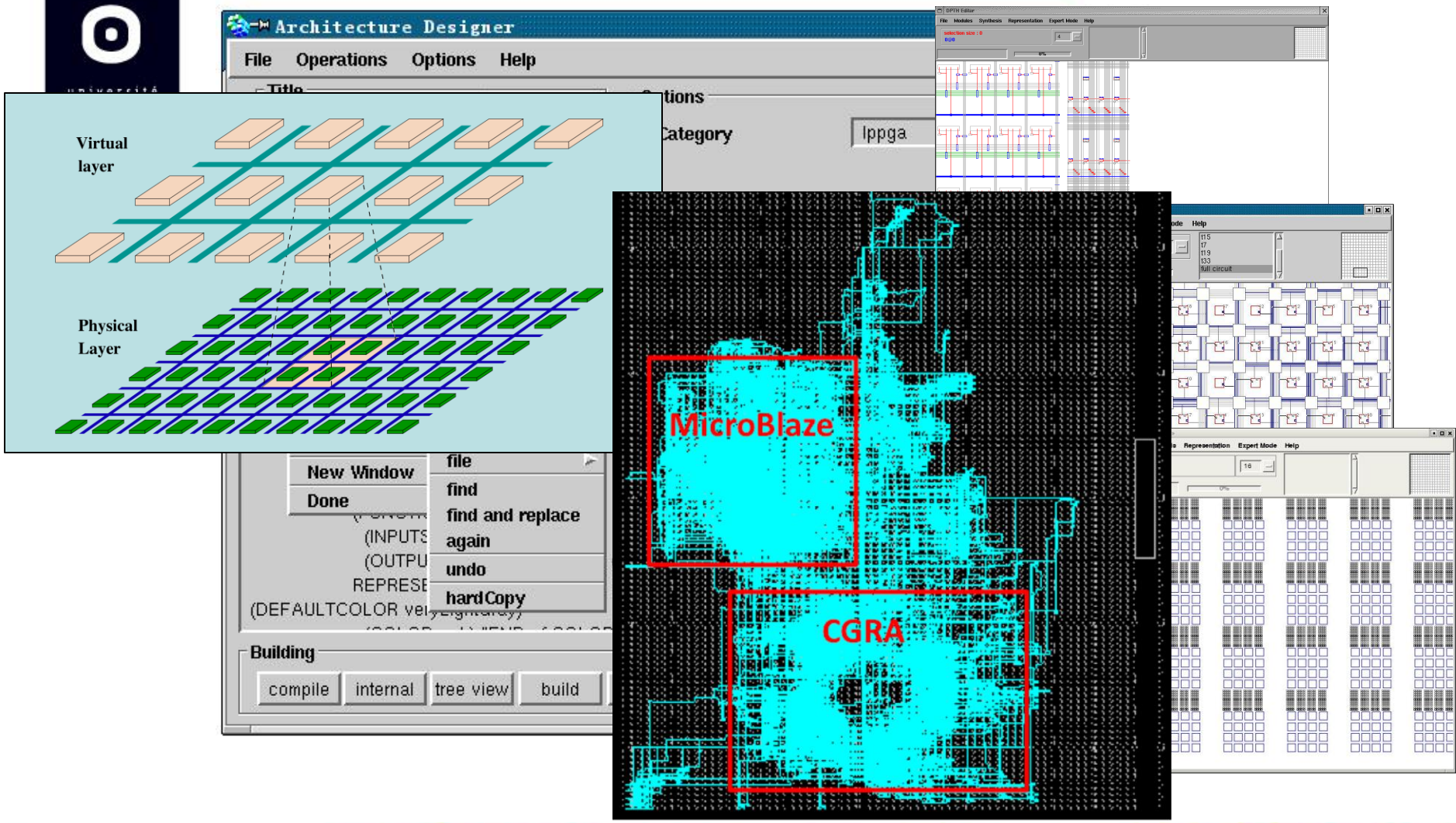
Characterization tests & SUnit



How Many matrix?



Reboot the Matrix

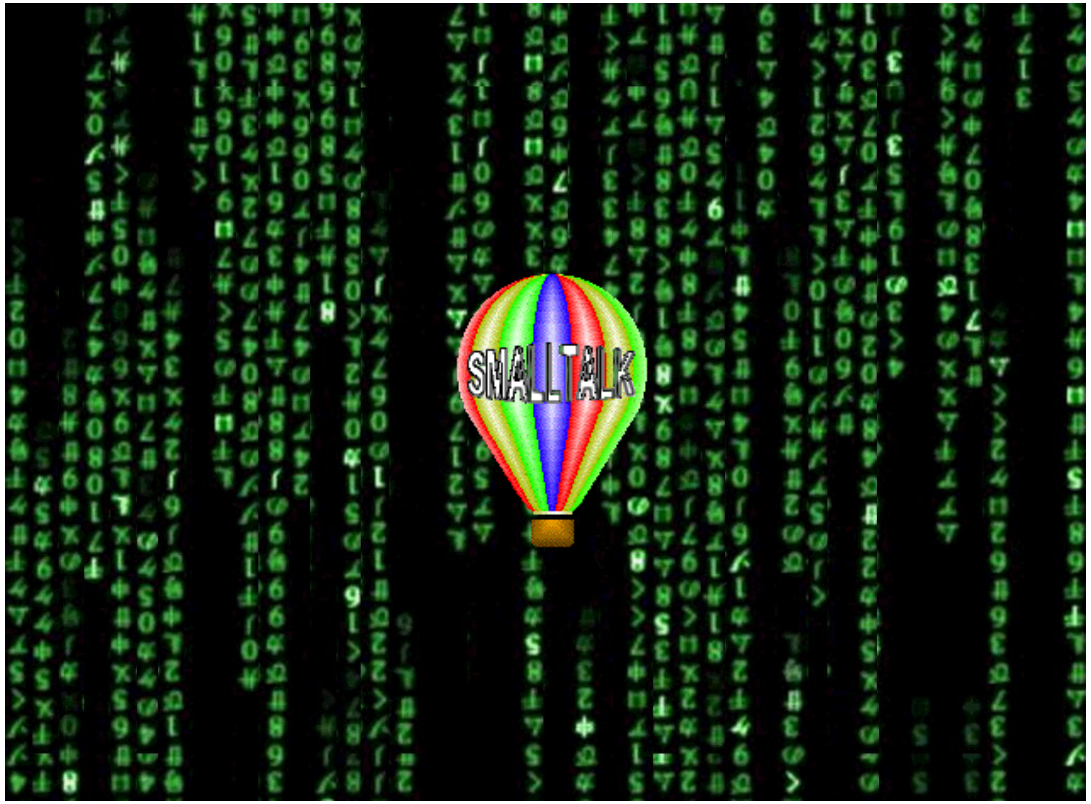


Will you take the red pill?

- HLS (Biniou) offers a path from HL languages to circuits
- Vendors tools offer observability
- Red Pill offers controlability
- Object encapsulation offers abstract analysis and polymorphism.

Smalltalk debug definitively lives in the Matrix

Thank you for your attention



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