DESIGN & VERIFICATION DVCON 2014 CONFERENCE & EXHIBITION

Complementing EDA with Meta-Modelling and Code Generation

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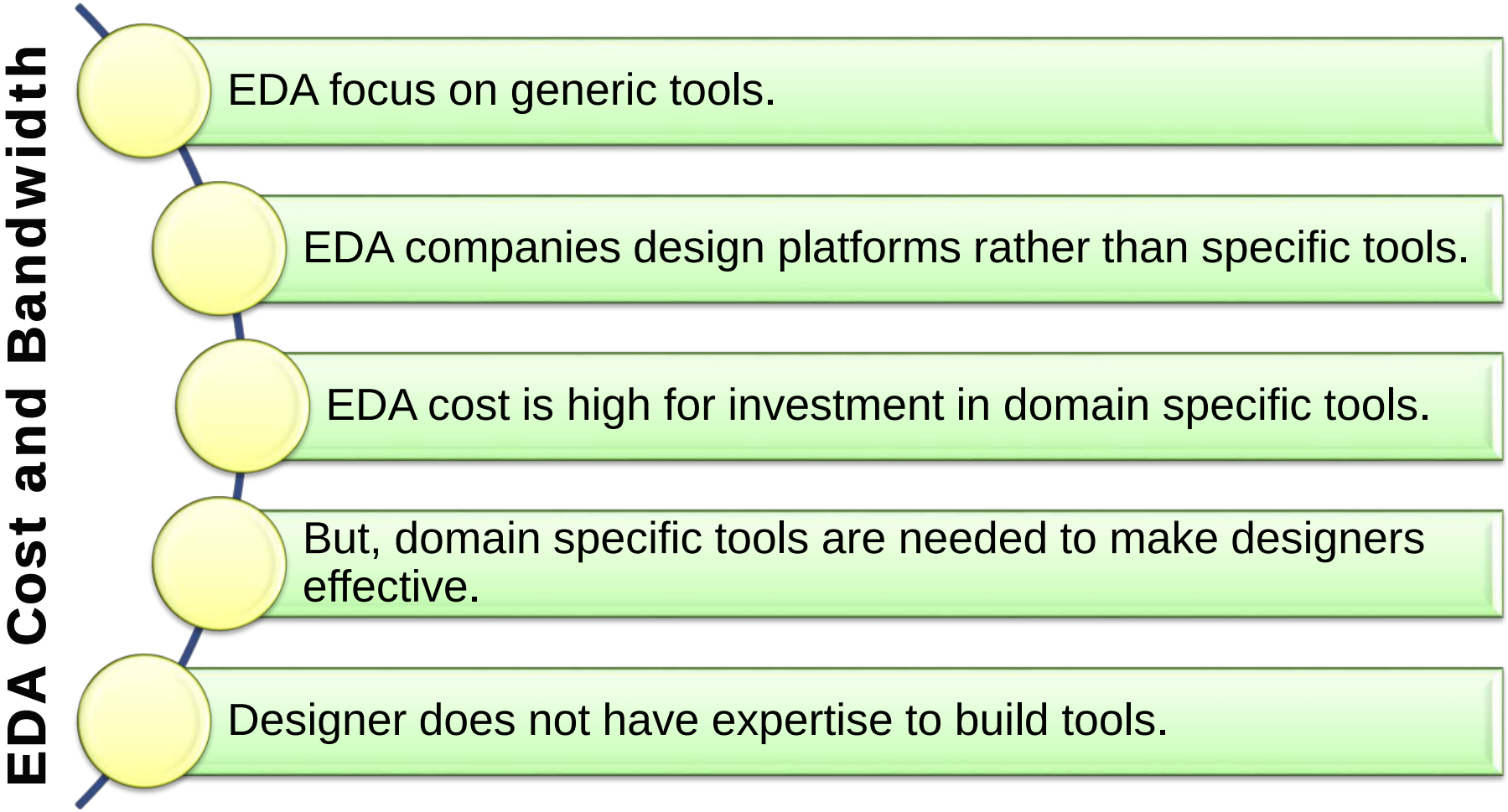
Outline

- Motivation & Idea
- Concept – Abstraction Levels
- Meta-Modelling Infrastructure
- Previous/Related Work
- Flexibility of Infrastructure
- Features and Benefits of Infrastructure
- Competition with EDA and Applications
- Challenges of Technology
- Conclusion & Future Work

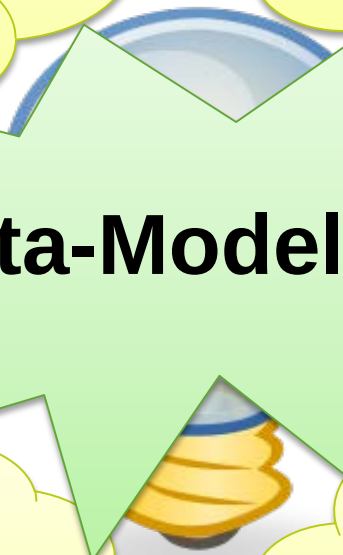
Motivation



Idea

Provide automation wherever possible in development process

Framework to support homogeneous and well structured code



Meta-Modelling!!!

Methodology to develop sophisticated domain specific tools

Provide framework to develop methodology around existing flow and data

Concept – Abstraction Levels

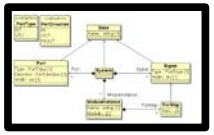
Meta-Meta Model

MMAnalyze (meta- meta model)

- Defines Structure of Meta-Model

Generates structured Meta-model

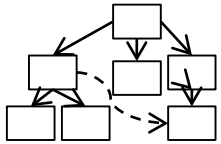
Meta-Model



- Defines Structure of Model

Generates structured way to access model

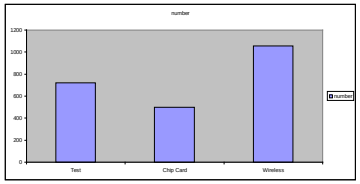
Model



- Defines content of view language independently

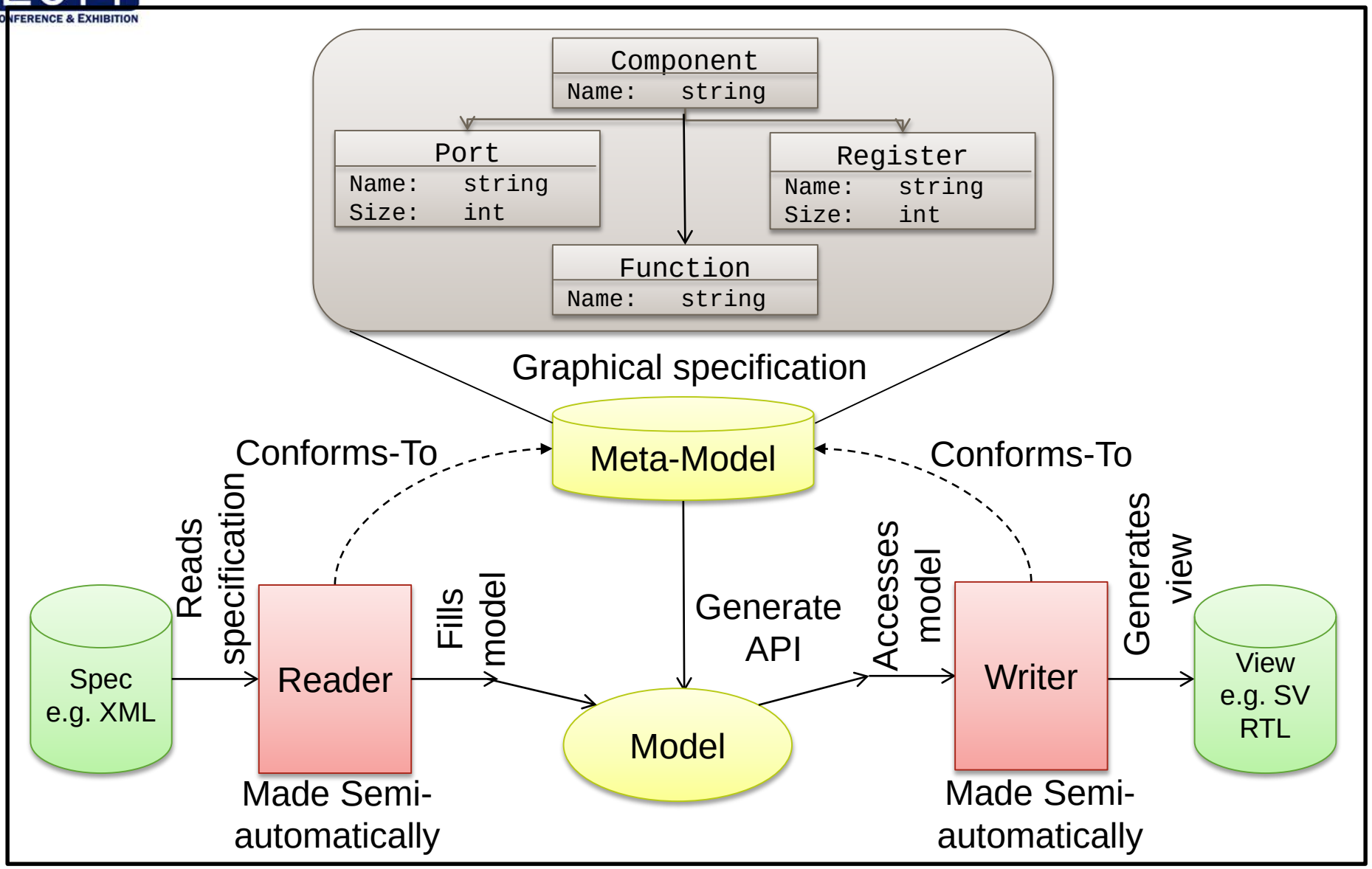
Generates view in a structured/systematic way

View



- Implementation of content

Meta-Modelling Infrastructure



Previous/ Related Work

Model Driven Software Technology has been actively investigated by the industry for 10+ years. But none of the related work has been utilized by hardware/ design industry.

Eclipse Modelling Framework

❑ The Eclipse Modelling Framework

- EMF is Java based, which implies some overhead in implementation due to Java's strict object oriented approach.
- The template engine is less intuitive and user friendly.

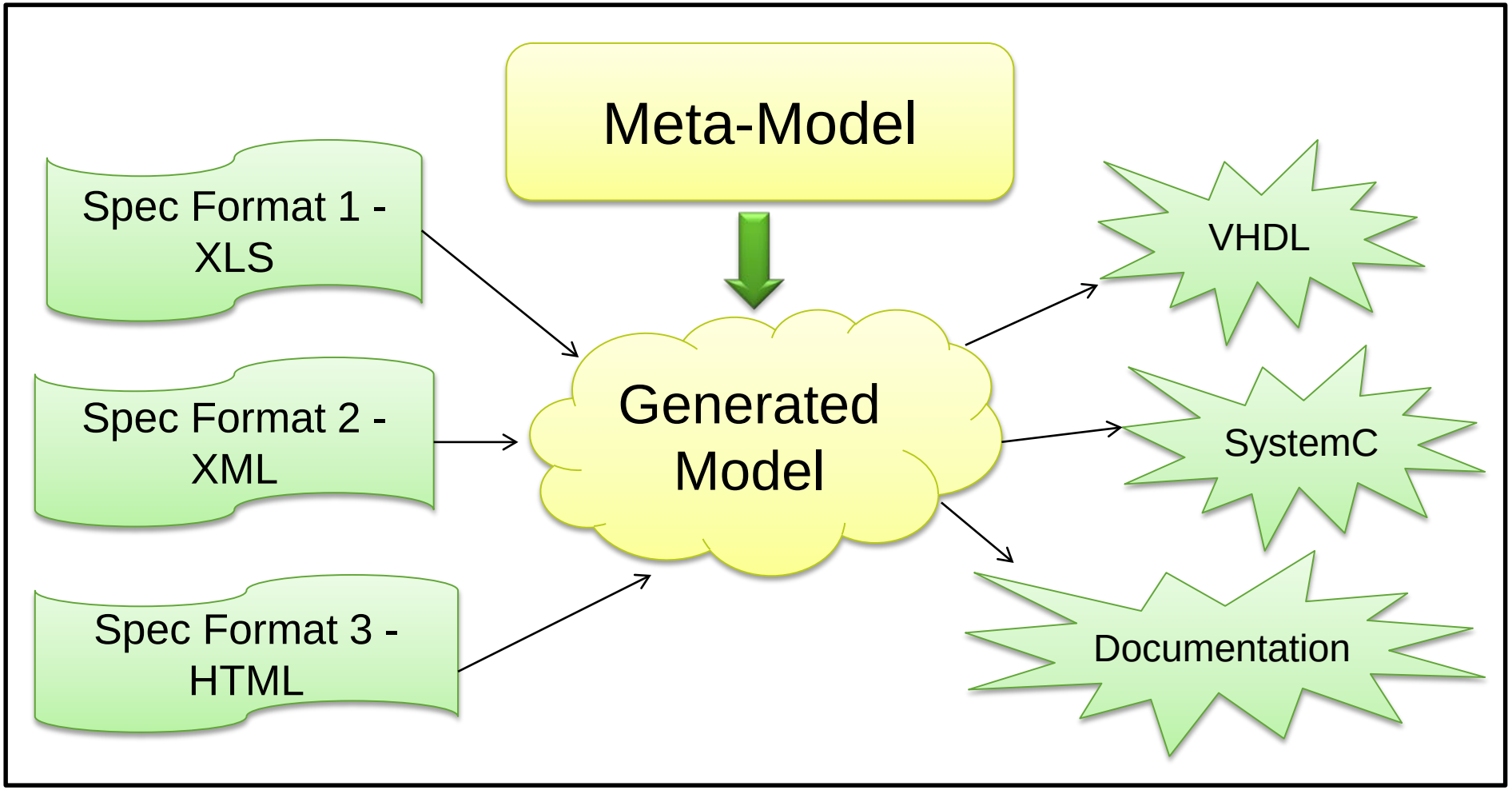
MetaCase/ MetaEdit

❑ MetaCase / MetaEdit

- In this tool, a graphical domain specific language can be developed.
- Wide applicability and hence reported use cases are from SW development, e.g. software for fish pond management.

Flexibility of Infrastructure

Same model used for multiple Input & Output formats



Features of Infrastructure

Reusability

- VHDL/Verilog, XML parsers, etc are integrated in infra-structure

Extendibility

- Model Extension easy due to automatic generation

Linkability

- Multiple models can be linked to make complex data structures.

Transferability

- Easier knowledge transfer as data structure has visual look.

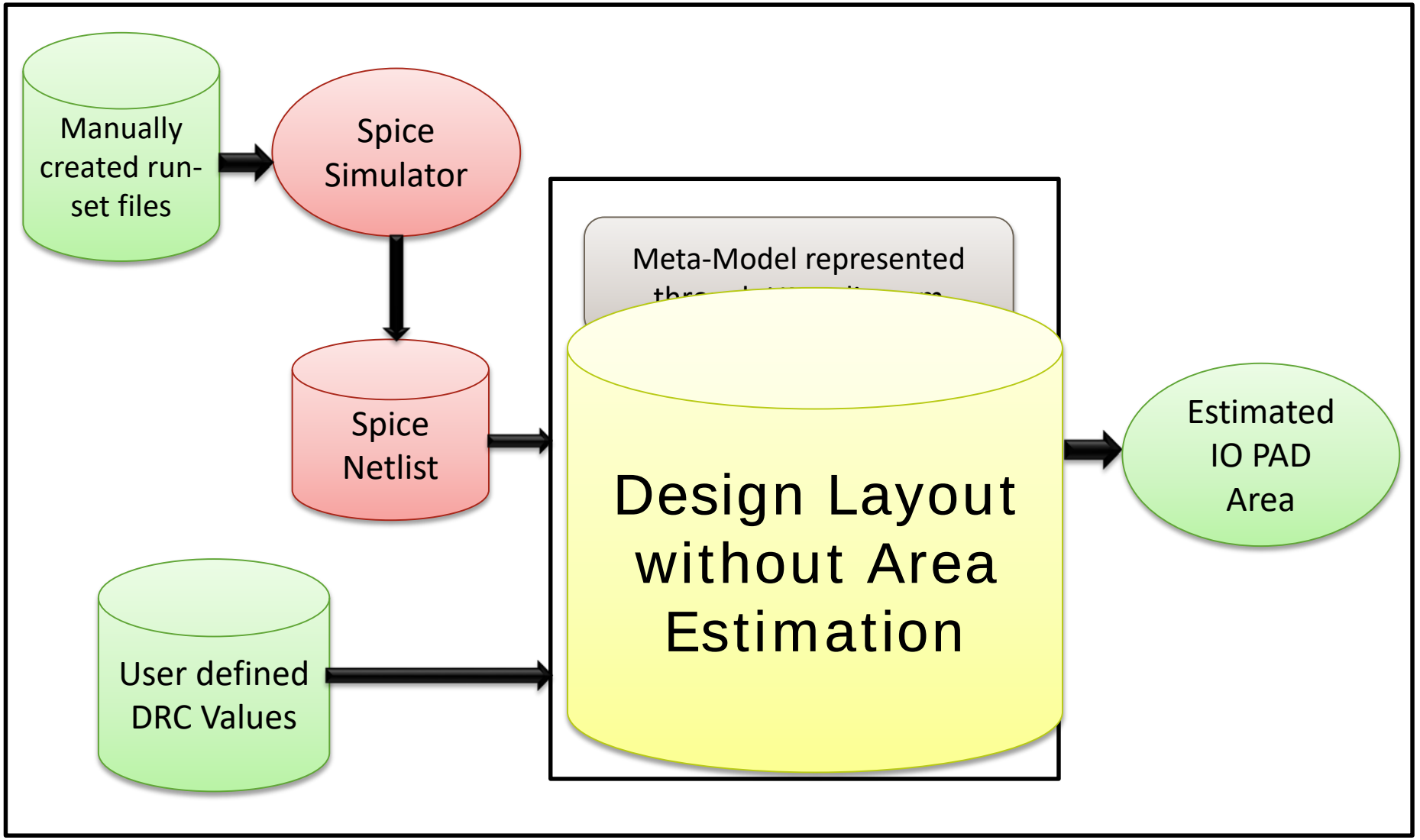
Competition with EDA?

- No point in re-inventing the technology wheel. Point is to extend and adapt application of EDA tools.

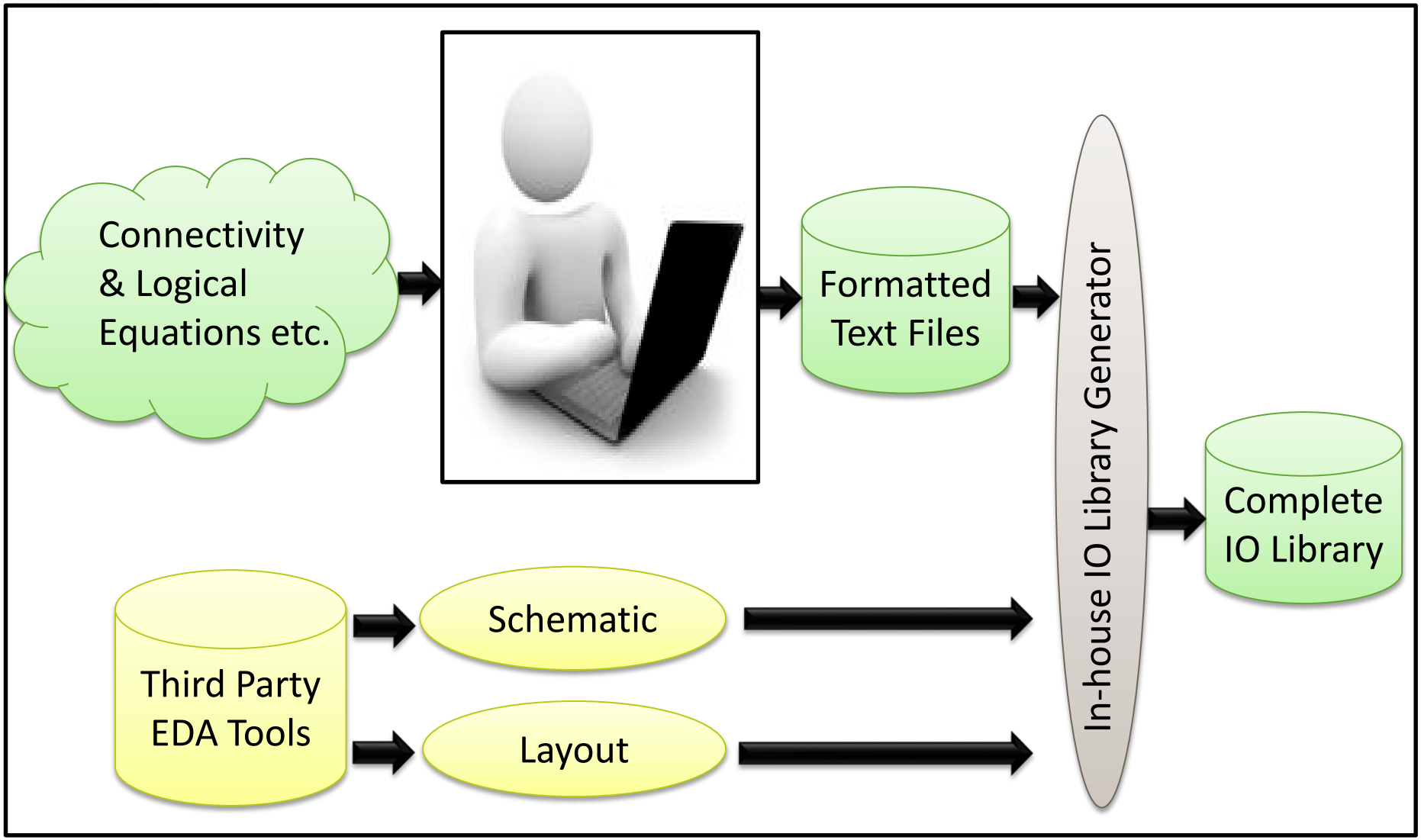
- In fact, the created automation enables designers to use EDA tools more productively.

- Target is to create domain specific tools for particular design formats and specification which are not generic in nature.

IO PAD Area Estimator



IO Lib Info Collector



Can EDA Further Help?

- Creating more libraries/ parsers for HDL etc which can be integrated with the infra-structure and provided to designers.
- Open access to internal structures/databases →can help to replace today's language interface (e.g. VHDL, UPF, …)
- XML based tool reports to ease parsing of results.
- Windows support, since automation mostly starts at concept/specification level, and that is Windows domain!

Benefits for Designers

Generation enables handling late specification changes easier

LATE SPECIFICATION CHANGES

Tools can be designed to reduce entry barriers to EDA tools

EASIER TOOL INTEGRATION

Automation leads to better productivity

PRODUCTIVITY IMPROVEMENT

Code, Documentation, etc. are generated from single source

CONSISTENCY INCREASE

Copy/ Paste errors are eliminated due to automation

QUALITY INCREASE

Challenges of Technology

Learning Curve	Modelling infrastructure needs to be learned.
Understanding of Domain	Good understanding of the design flow required to automate it.
Management Support	It takes some time to learn the methodology and create own automation.
Language Wars	Currently Python used for generation but continuous discussions on using Perl, Tcl etc.
Excessive Interest	Automation eases design flow so much that designer becomes more interested in code generation rather than designing.

Conclusion and Future Work

Tool Creation

- Domain specific tools can be easily created.
- Extends EDA and make tool usage more productive.

Effort

- Meta-Modelling features assures flexibility, consistency and reusability of the design flow
- Needs initial effort from designer to learn and automate flows

Future Work

- Extend infrastructure to generate automatic GUI from the model
- Create utilities to read diagrams and generate code
- Create utilities to DIFF models easily

QUESTIONS?