
Voom, Inc.

Achieving Multivendor Interoperability with the Milkyway API

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Interoperability Technology

- EDA software still uses mostly text file transfer
- Meanwhile, the rest of the software industry has moved forward with:
 - APIs, plug-ins
 - Inter-process communications
 - Internet protocols XML, SOAP, WDSL



Standard File Formats

- Complicated command line options
- Incompatible versions

Astro

```

auSetDefOutViaRotate #t
auDefOut
setFormField "DEF Out" "Library Name" libraryName
setFormField "DEF Out" "Cell Name" cellName
setFormField "DEF Out" "Output File" (string-append cellName ".def_tmp")
(setFormField "DEF Out" "Units Distance Microns"
  (dbFetchTechInfo (dbOpenLib libraryName) "lengthPrecision")
)
setToggleField "DEF Out" "Output Section" "pins" (if
  (and isHierarchicalLayout (not isTopLevelOfHierarchy)) 1 0)
setToggleField "DEF Out" "Net" "WireEnds - Square" 1
formOK "DEF Out"
; Fix the DESIGN name with sed
system (string-append "sed 's/^DESIGN " cellName "/DESIGN " designName "/"
  " cellName ".def_tmp > " cellName ".prdef")
system (string-append "rm -f " cellName ".def_tmp")

```

DEF

4.5 plus some
5.2 features

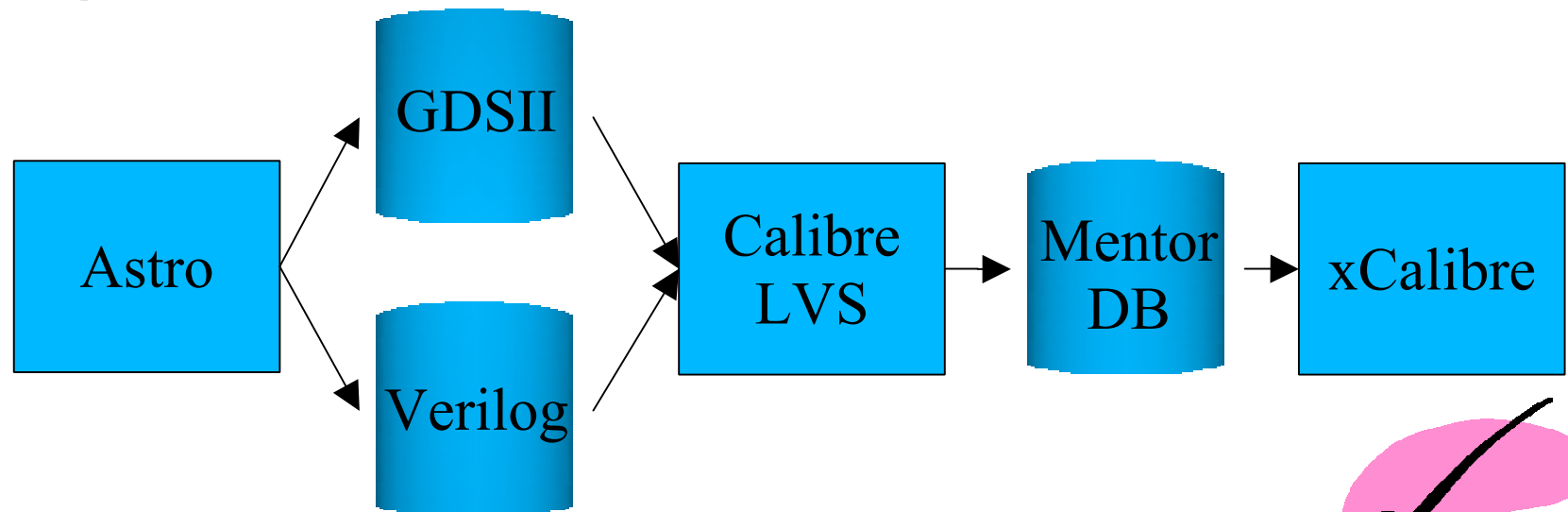
QX

Supports
DEF 5.3



Incomplete Data

- No single format has all the data
- Perfectly good cohesive data must be torn apart, then reconstructed



LEF & DEF Shortcomings

➤ LEF

- Abstract view only, cannot compare with cell view
- Flat, no cell hierarchy within

➤ DEF

- Flat, not hierarchical
- Incompatible implementations, even obfuscation
- Difference between NETS and SPECIALNETS unclear



GDSII Shortcomings

➤ GDSII

- Limited record types
 - No nets
 - No vias, does not understand their connectivity
 - No Pcells
- Over-reliance on text objects for naming
- DFM
- Binary. Cannot hack with Perl.



Verilog Shortcomings

- Restrictive name space
- Space terminates escape
- Escaping '/' for uniquified hierarchy tricky
- `endmodule` not terminated with ';'
- Scheme
 - Non-standard
- Most all file formats are,
 - Inefficient (large file size)
 - Incomplete
 - Not extensible



Scheme File Format

- Disadvantages
 - Non-standard
 - Visually challenging because of repetition
- Advantages
 - Completeness
 - Extensibility
 - Elegance and simplicity



The File Exchange Flow

- Start with a cohesive Milkyway database
- Output multiple, giant, incomplete files
- Add a custom configuration file or script containing missing data
- Read *all* the files
- Reassemble the data
- Troubleshoot inconsistencies
 - Between writers and readers
 - Between files exchanged



Synopsys Map-In Flow

- Start with a cohesive Milkyway database
- Milkyway Scheme API
 - Complete language to describe physical databases
 - No more legal risk
- Milkyway C API
 - Power to traverse all views of the entire design
- MDE Application
 - Graphical layout editor
 - Translators



Milkyway Benefits

- Unified, cohesive database
- Production proven with thousands of designs taped out, including 90nm
- Astro eats its own cooking

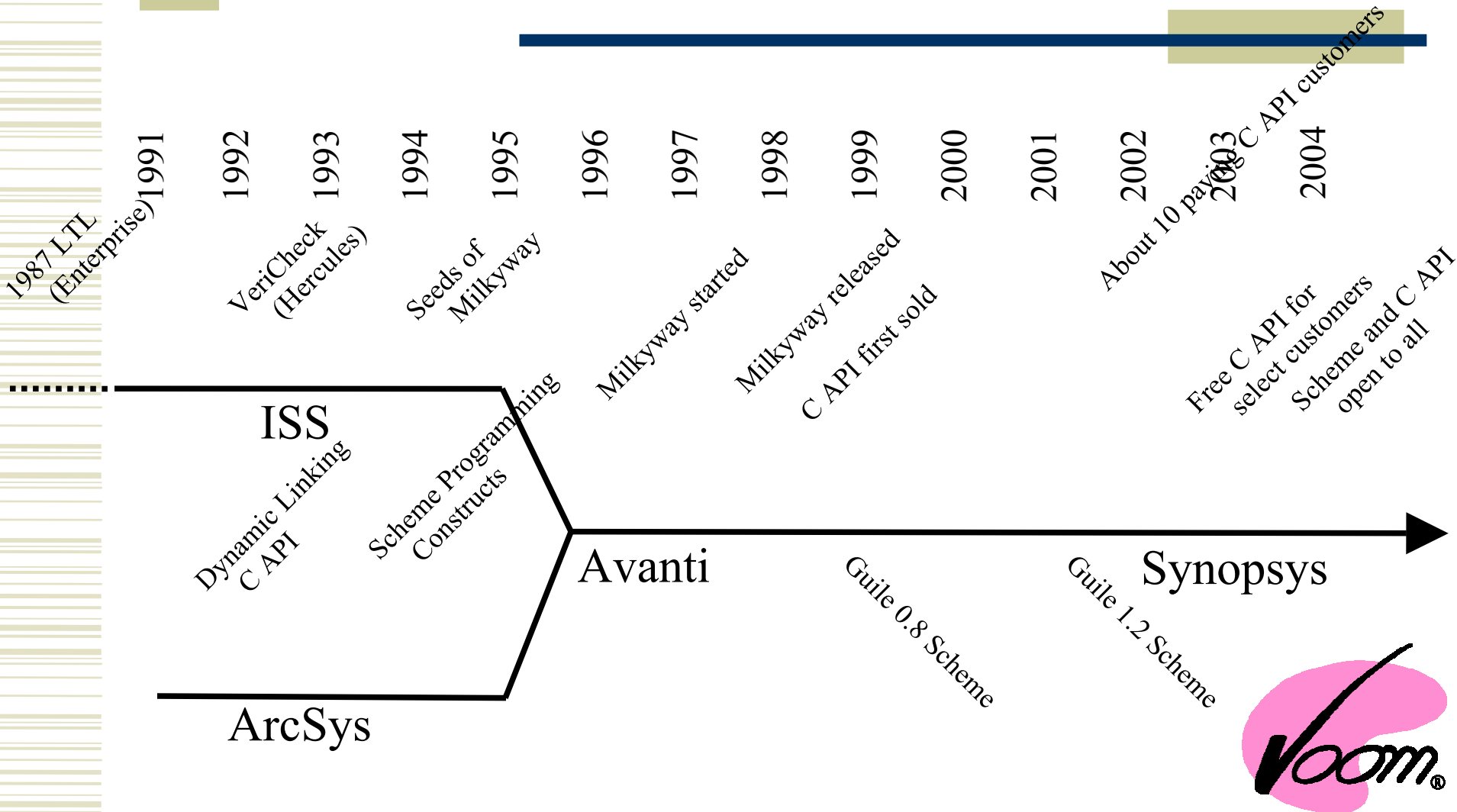


Synopsys Map-In Solution

- Milkyway Scheme API
 - Complete language to describe physical databases
 - No more legal risk
- Milkyway C API
 - Power to traverse all views of the entire design
- MDE Application
 - Graphical layout editor
 - Translators

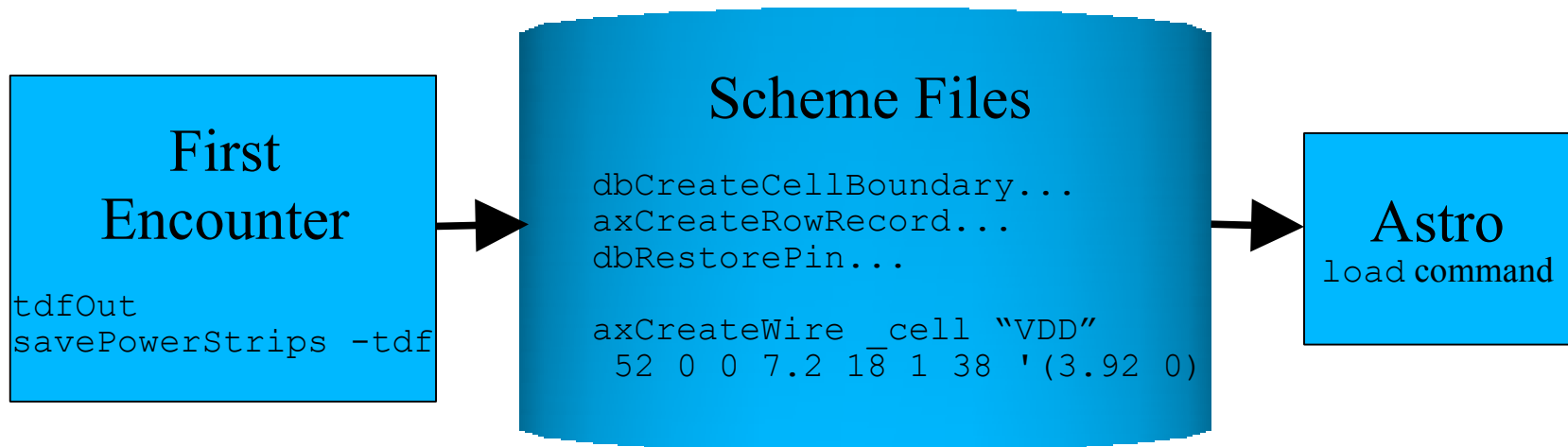


Milkyway History



Scheme Input

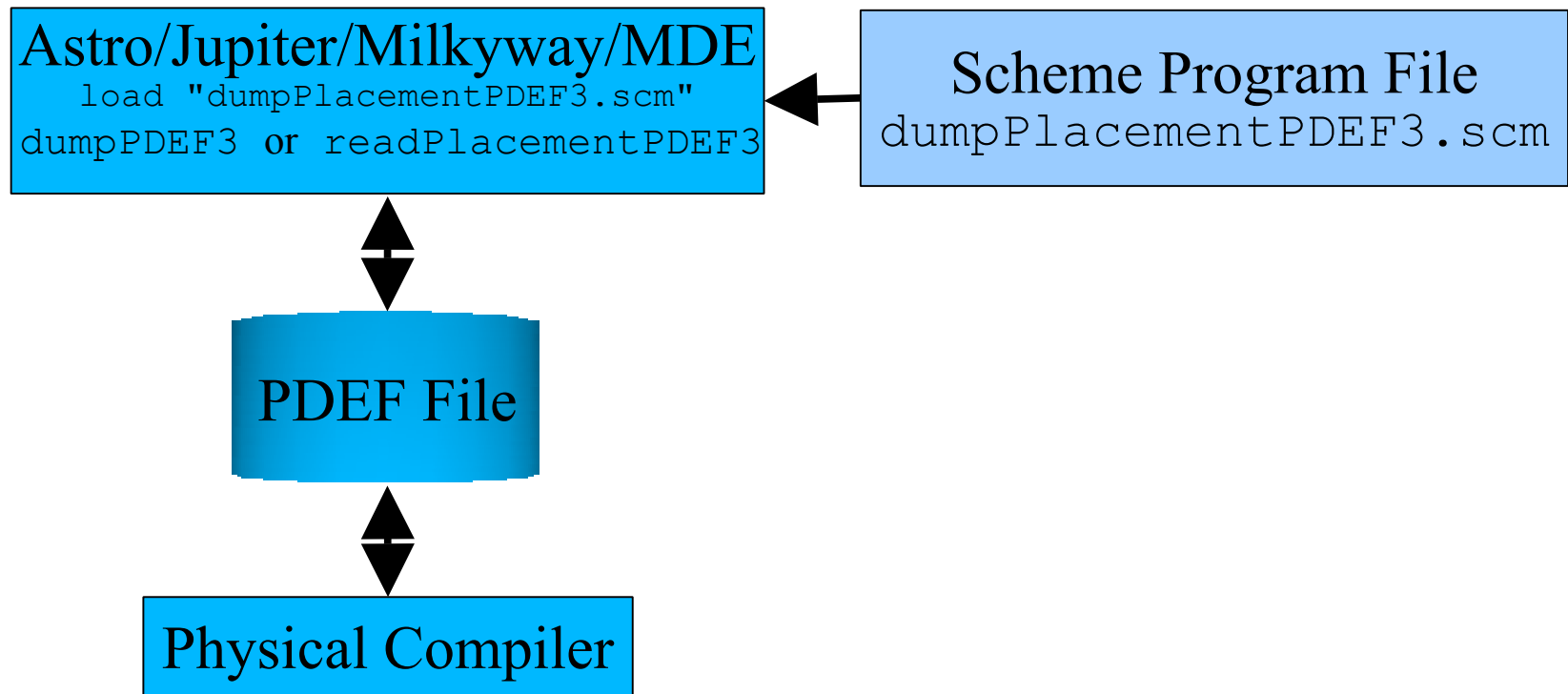
- Complete language for file transfer



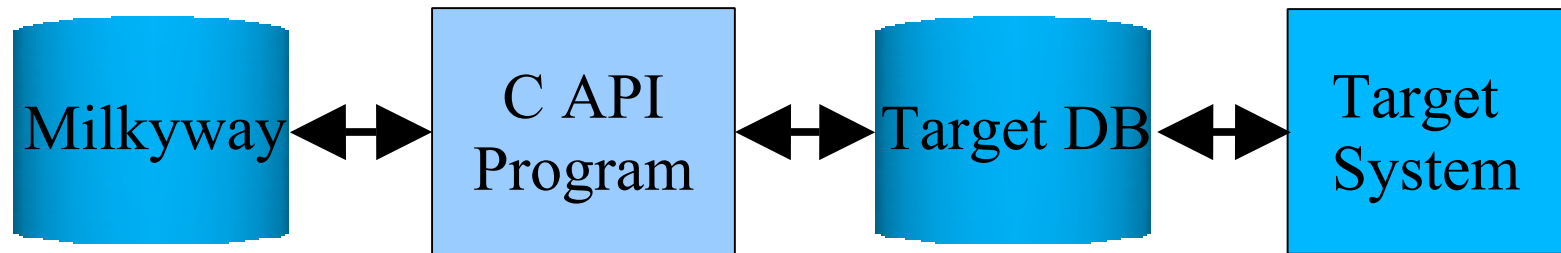
- Use variables & programming constructs
- Extend by defining Scheme functions



Scheme Output

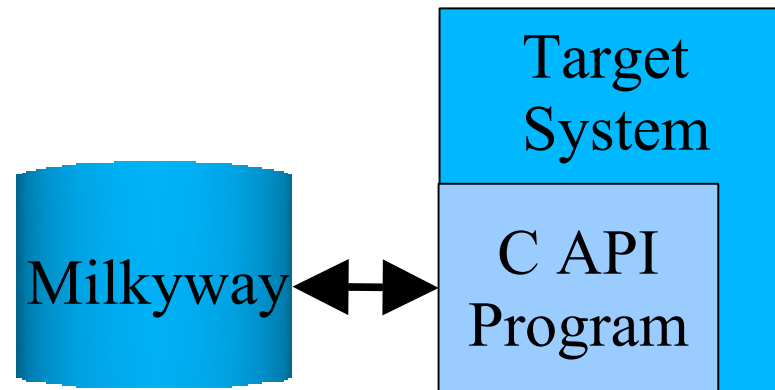


Stand-Alone Translator



- Simple, modular
- Static

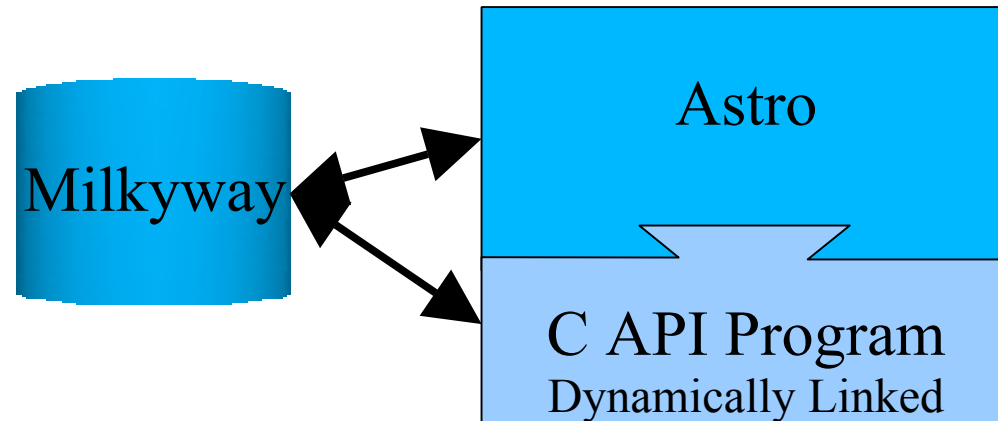
Integrated Interface



- Add a Milkyway menu to your tool
- Translate the only data you need when you need it
- The most natural and appealing solution



Dynamically Linked



- Only available to certain major customers
- However, it consumes an Astro license
- Can also control Astro via TCL inter-process communications



MDE

Milkyway Development Environment

- Equivalent to ArcUtil/AUtil/Milkyway
- Same basic graphical layout editor as Astro & Jupiter
- Standard file format input and output
 - DEF, LEF, PDEF, GDSII
 - Verilog, VHDL, EDIF
- UI extensible with menus and TCL/Tk



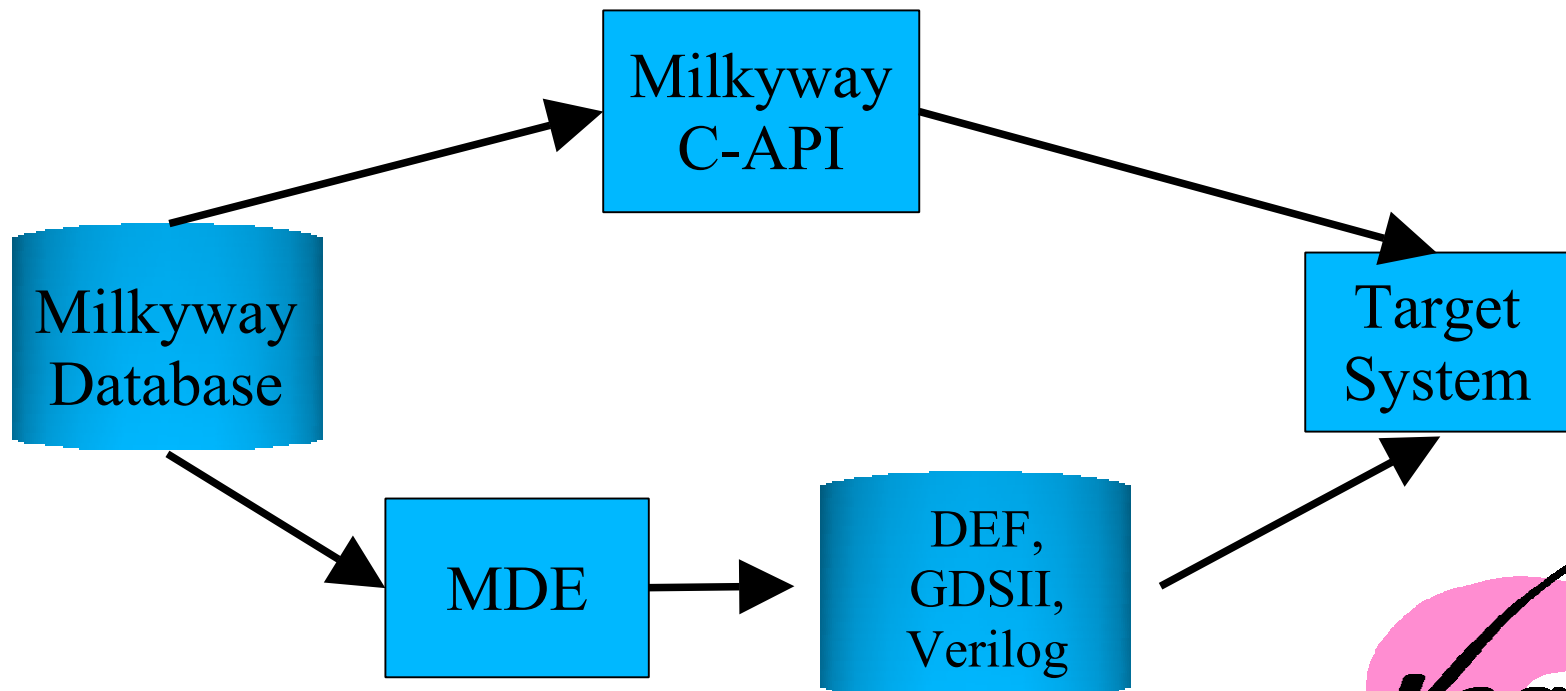
MDE Applications

- Milkyway viewer and editor
- File translator
- Platform for your Milkyway applications
- Demo platform
- API program test bed



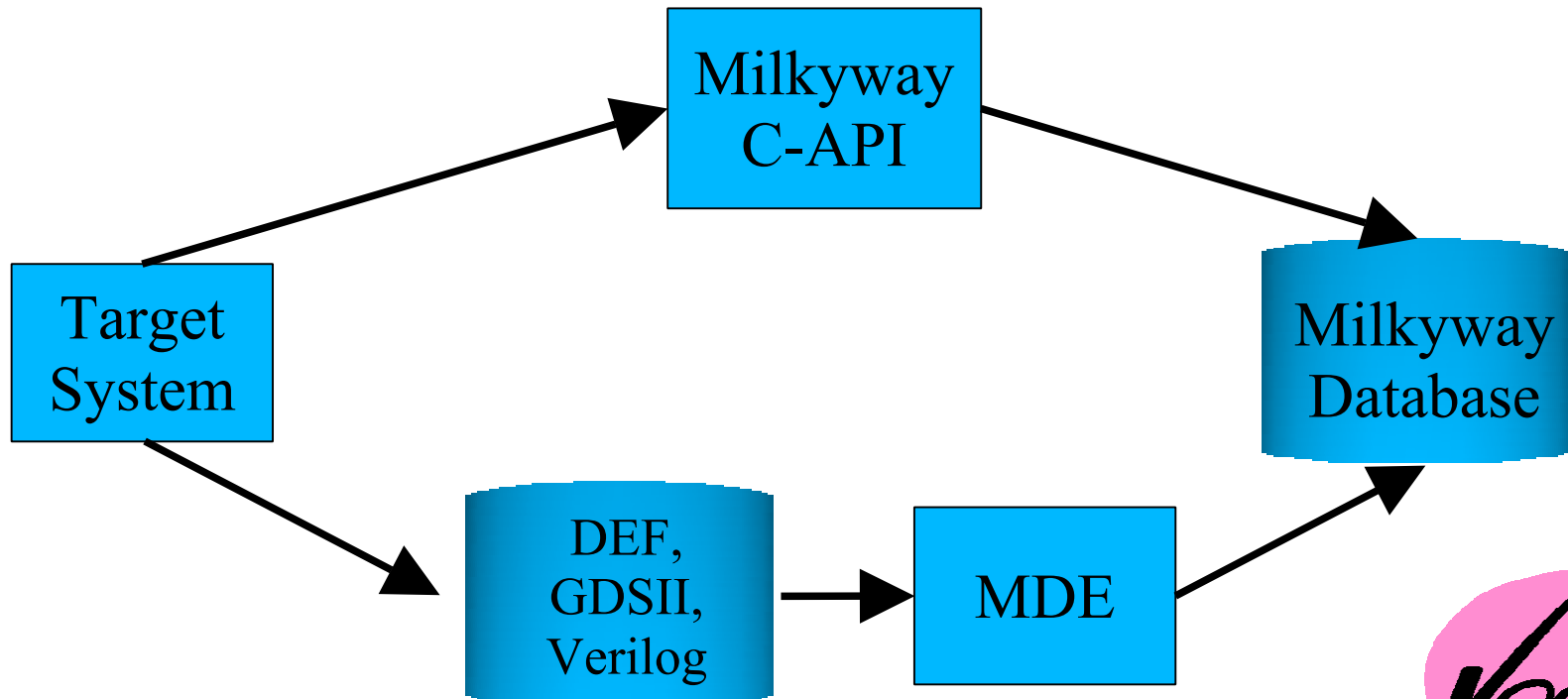
Output Test Harness Using MDE

- Test against existing legacy translators

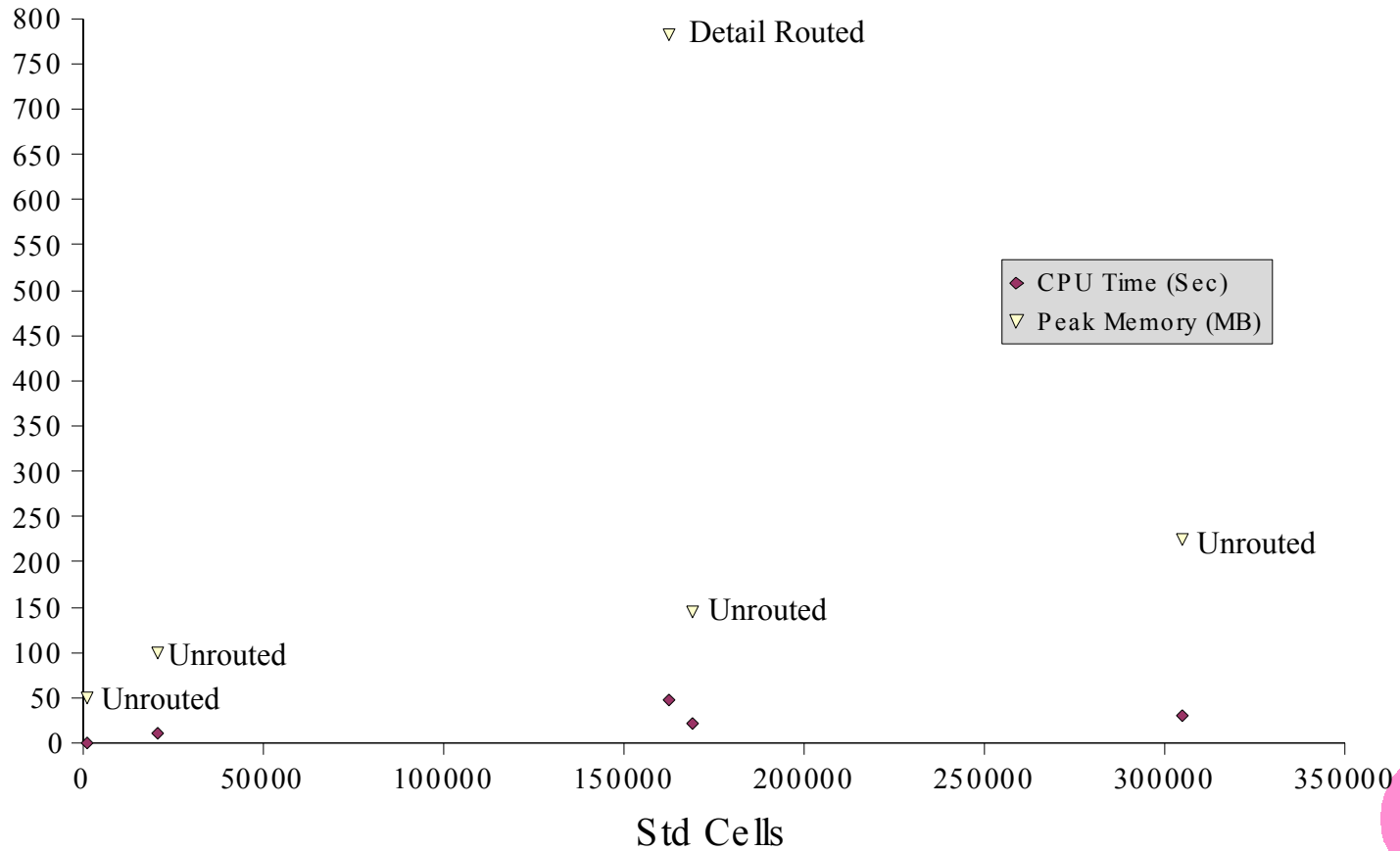


Input Test Harness Using MDE

- Use the MDE GUI as the tiebreaker



Performance



Development Time

Company	Lines	Days	Functionality
Apache	3700	31	Read Milkyway
Silicon Canvas		65	Two way
Pulsic	6000	40	Two way
Voom	4000	32	Read Milkyway



Build Environment

- Use the exact OS and compiler versions specified by Synopsys

Milkyway API	OS	Compiler
2003.09	Red Hat Linux 7.2	gcc 3.2
	Solaris 8	gcc 2.95.2
2004.06	Red Hat Linux 7.2	gcc 3.2.2
	Solaris 8	gcc 2.95.2



Development Tools

➤ Debugging

➤ *gdb*

➤ *ddd*, Motif GUI for *gdb* with visual representation of data structures

➤ Profiling

➤ *dmalloc*, a library to replace *malloc* et al. with versions that do memory accounting

➤ *gprof*, a source profiler



Wish List

- Parasitic (PARA) view access
- Technology file access

