Building a 21st Century IC Design System on OpenAccess Technology at Hewlett-Packard

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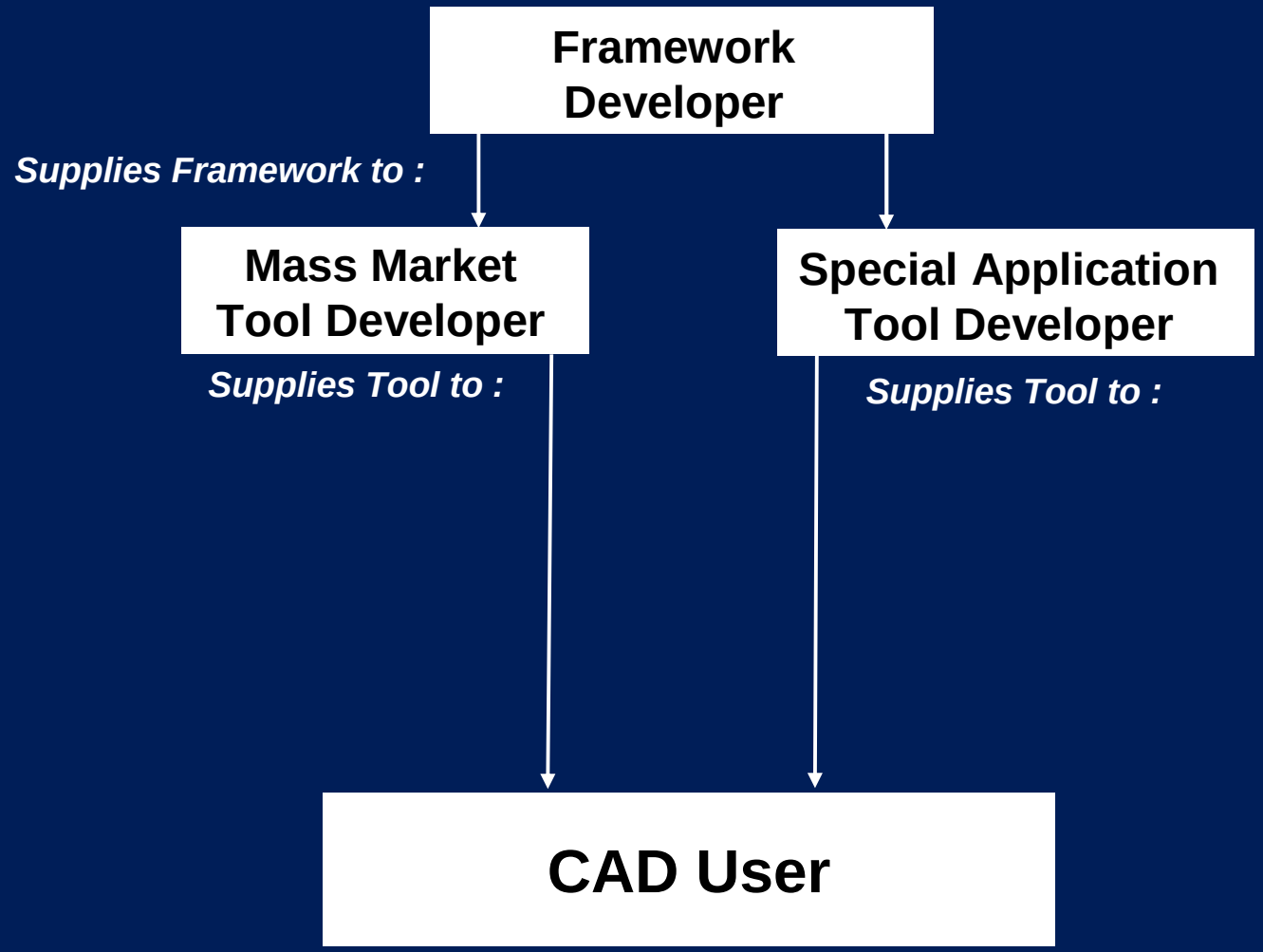
EDA Environment at HP

- *Background*

- Microprocessor and high-end chipset development
  - Significant amount of custom design work
  - Pushing performance to edge of next-generation process
- Long-standing investment in internal infrastructure
  - Proprietary database, API, and Information Model
  - Capacity and performance tuned for HP design system and methodology
  - Allows quick and effective response to critical design issues
- Long history of CAD Integration for our designers

EDA Systems Delivery

The Evolution of CAD Roles



EDA Systems Delivery

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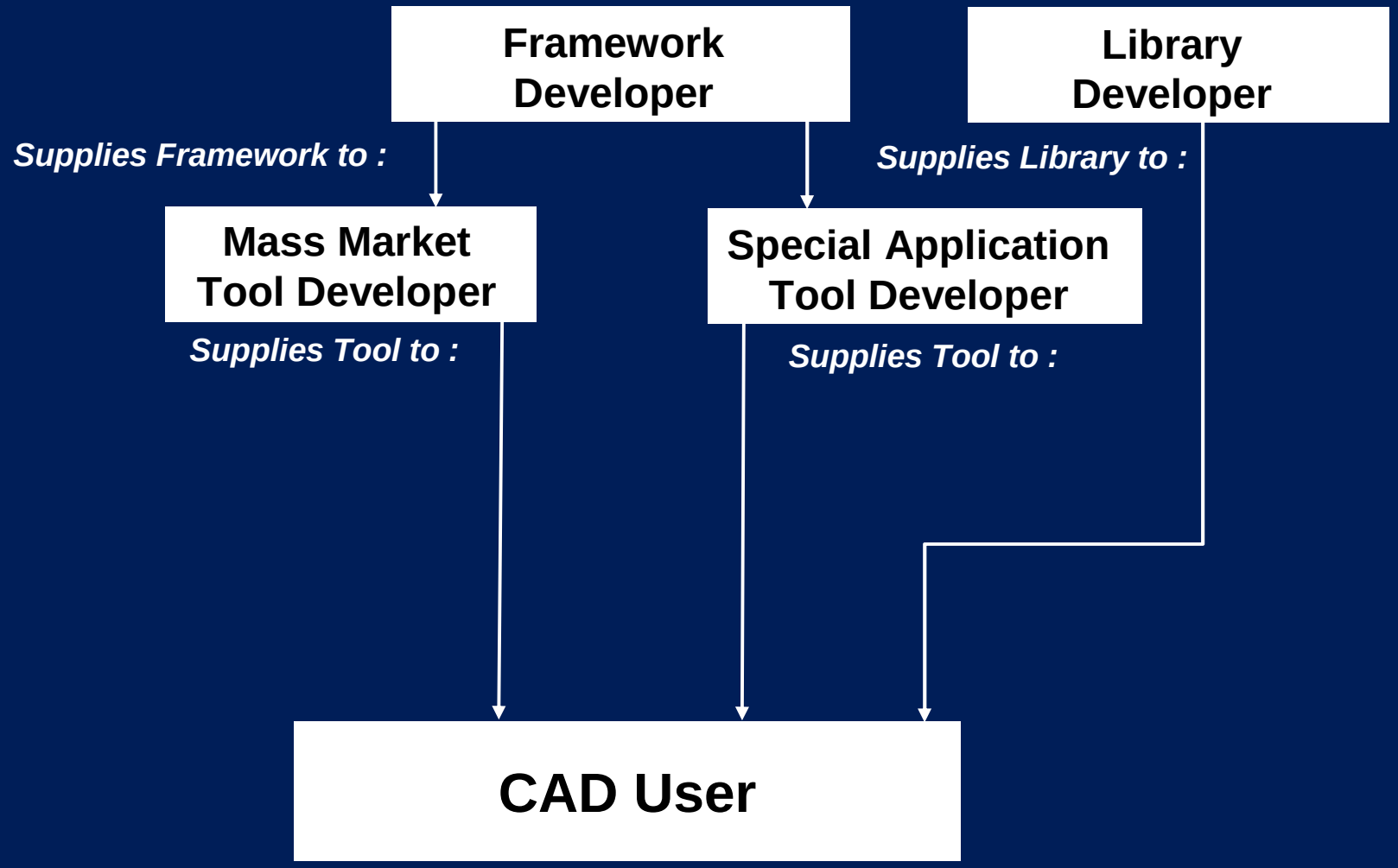

EDA Systems Delivery

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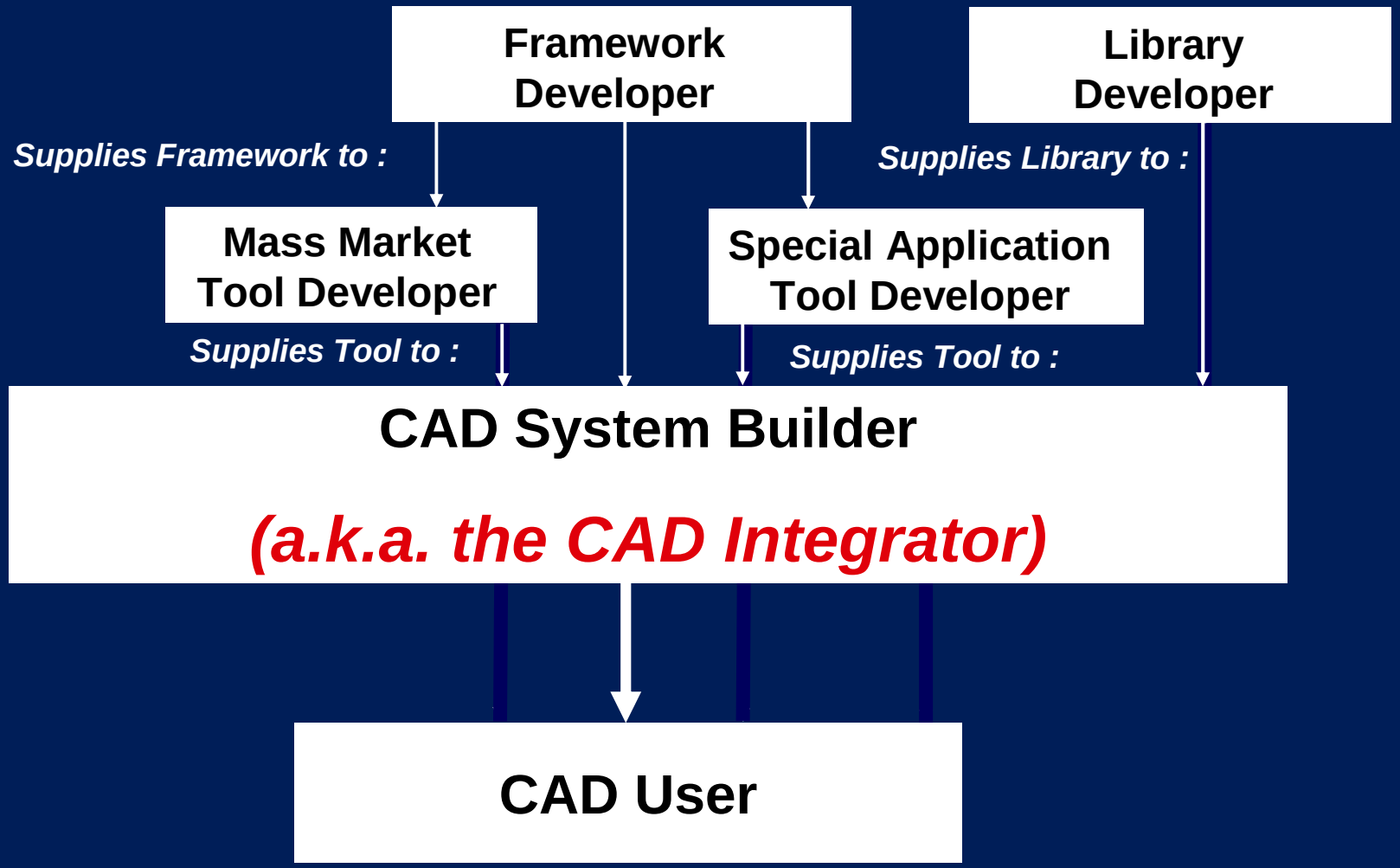

EDA Systems Delivery

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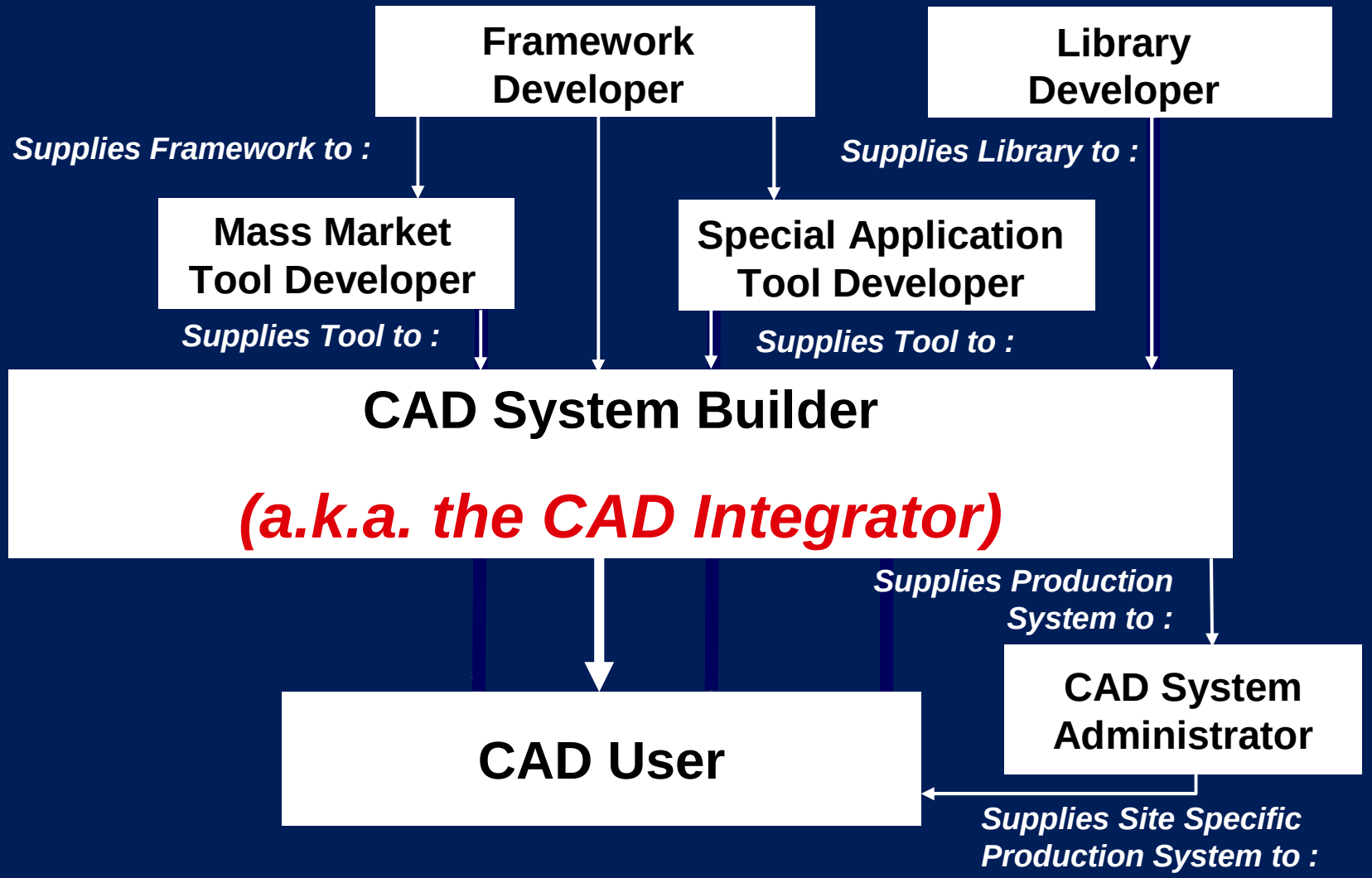
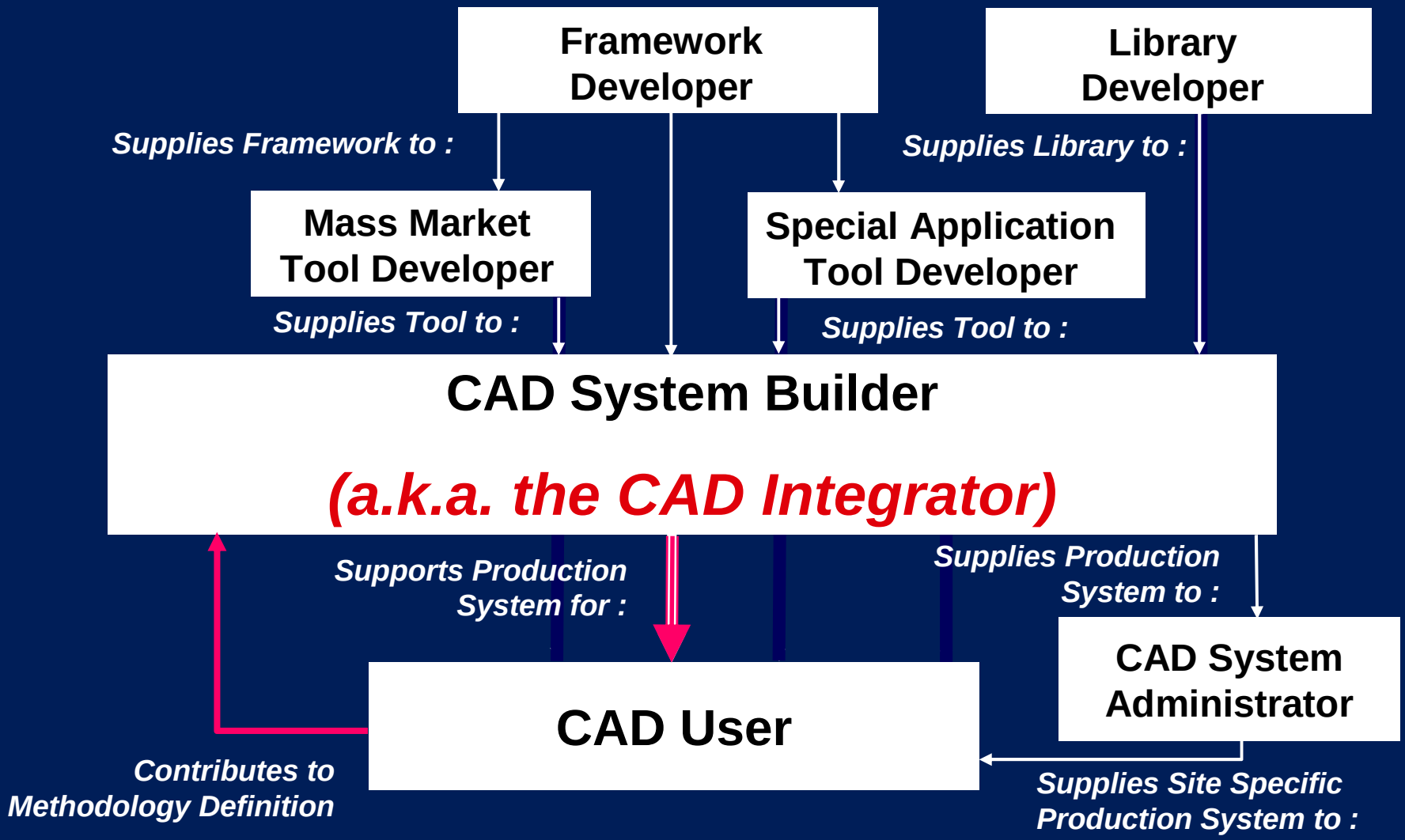


EDA Systems Delivery

The Design System 'Food Chain'

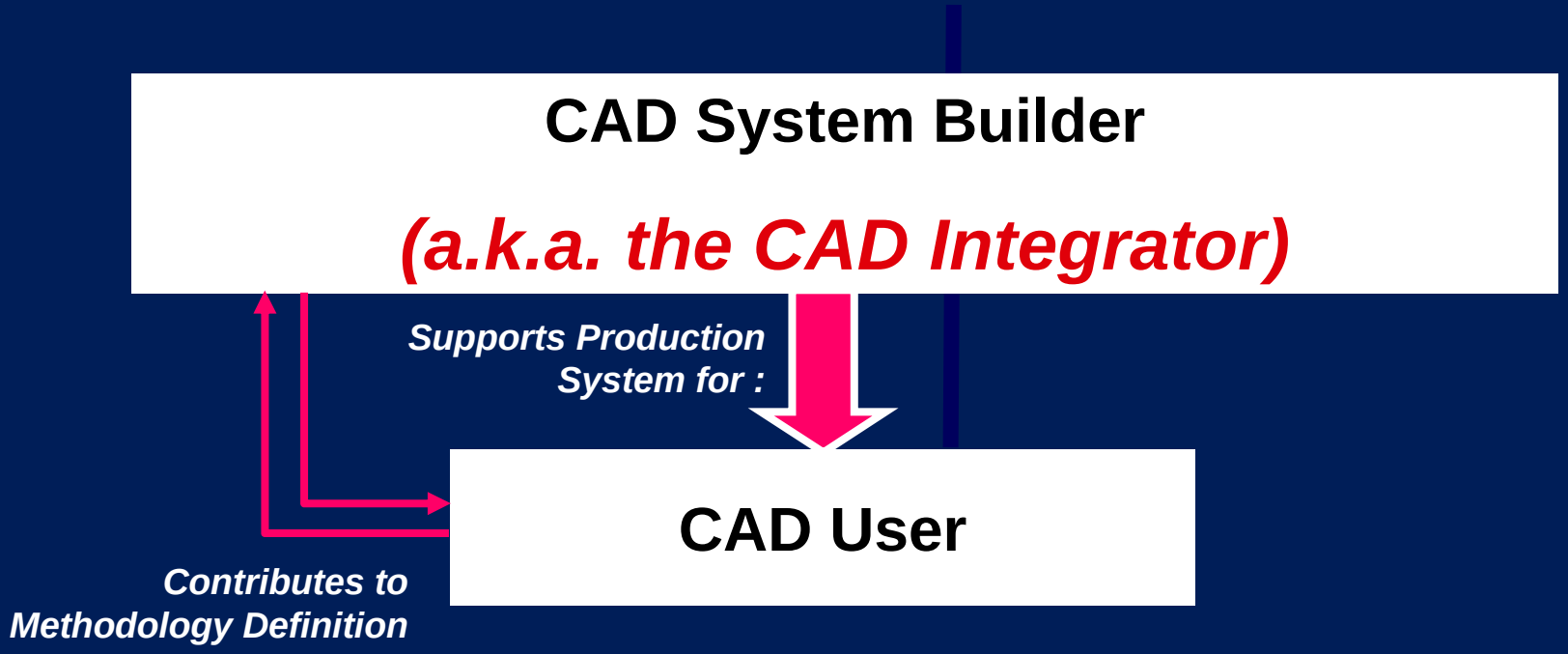


EDA Systems Delivery

Design System 'Food Chain'

Support

Is Our Most Important Product



EDA Environment at HP

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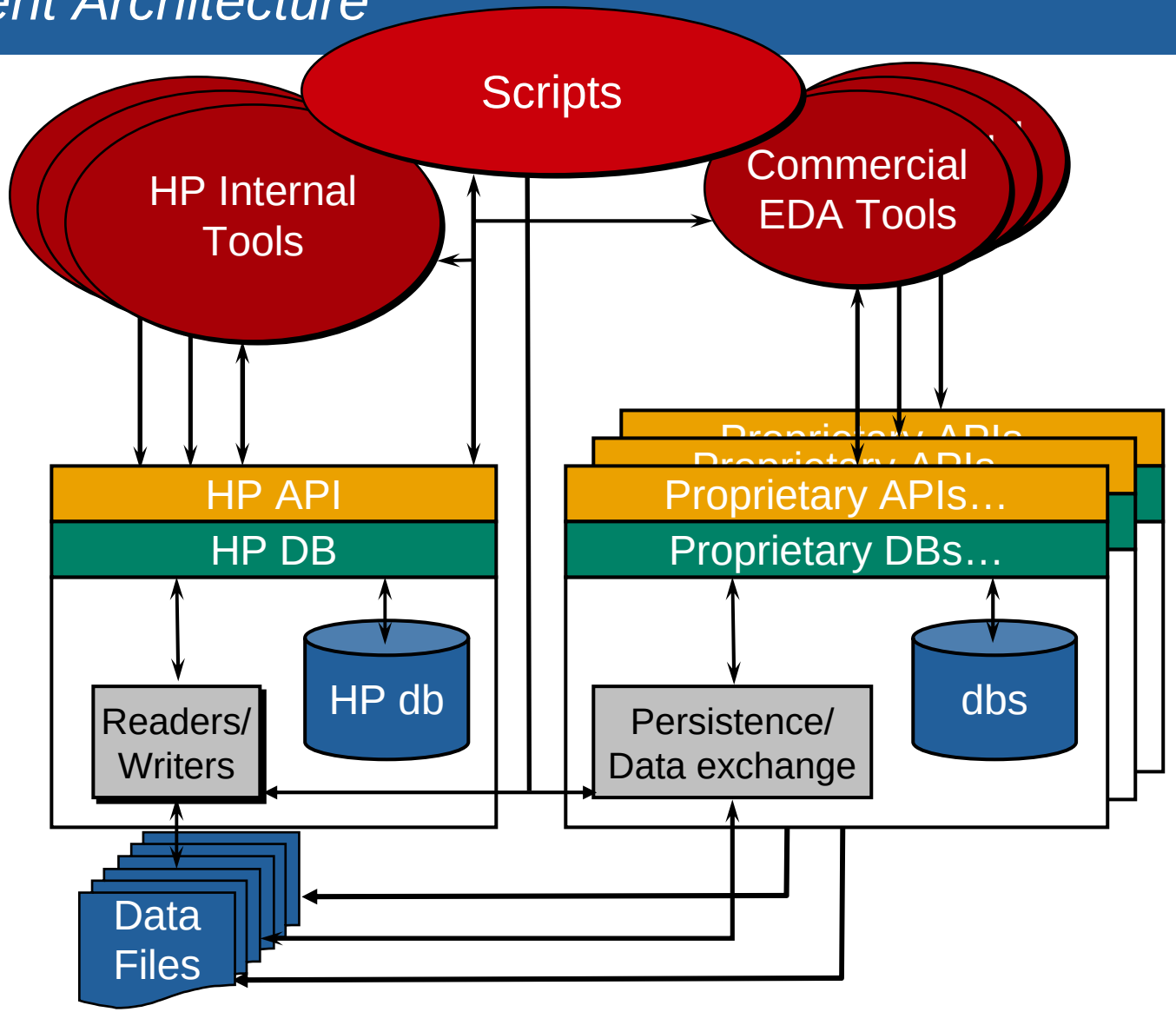
- Microprocessor and high-end chipset development
  - Significant amount of custom design work
  - Pushing performance to edge of next-generation process
- Long-standing investment in internal infrastructure
  - Proprietary database, API, and information model
  - Capacity and performance tuned for HP design system and methodology
  - Responsiveness to critical design issues
- Key HP IC-CAD system attributes for excellent support
  - Fine-grained control of the system and its components
  - Robust, efficient API access to design data

HP Design Environment

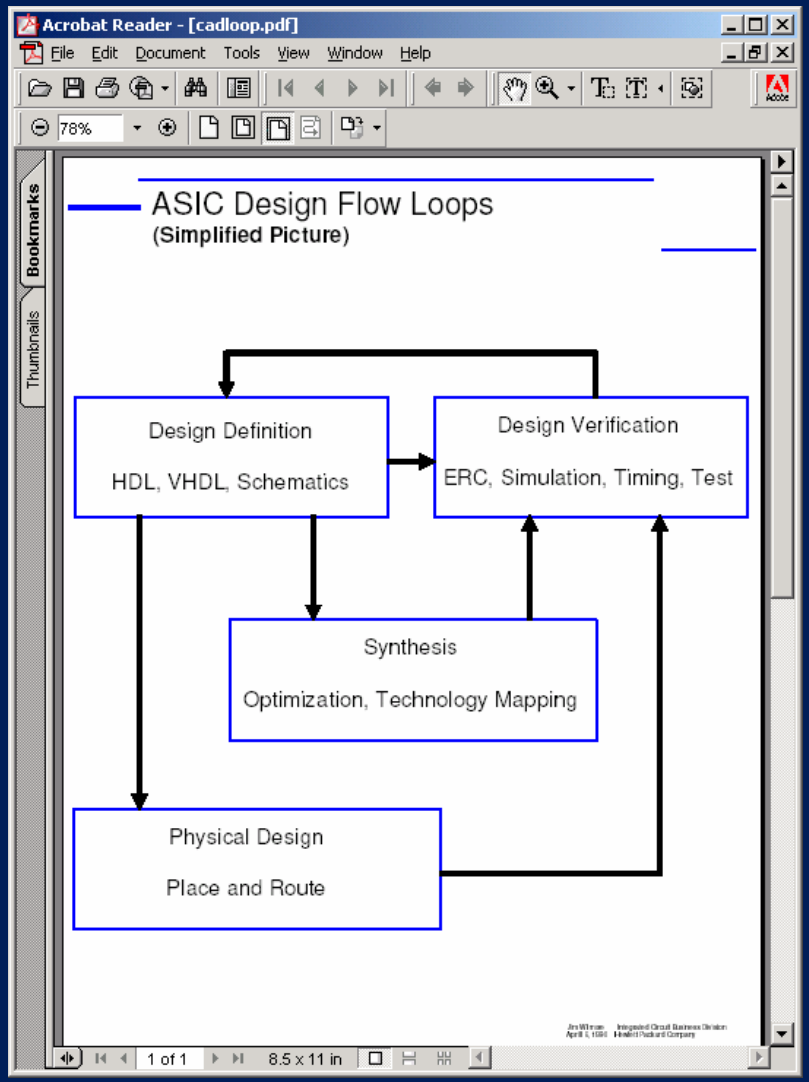
- *Current Architecture*

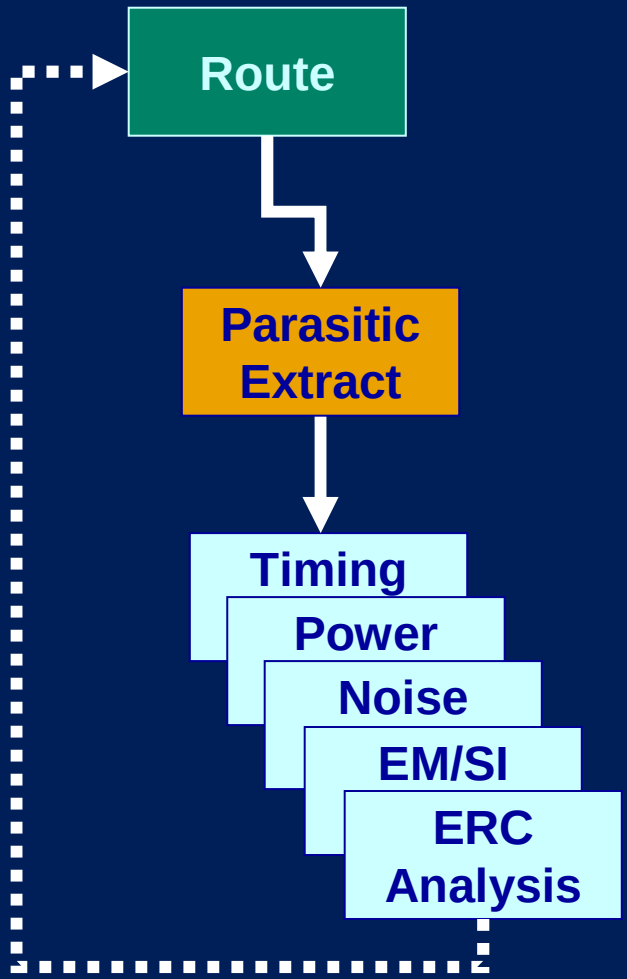


Driving Factors for Change
- *The need for OpenAccess*

- Create best-in-class flows:
  - Reduce new tool integration cost
  - Reduce new tool evaluation cost
- Redirect HP's current Infrastructure investment
  - Higher value-add infrastructure and components
- Higher productivity via tighter integration
  - Migrate toward interoperability model
    - Finer grained components/engines on shared run-time data
- Essential to address complexities of nanometer design
    - Reduce number of design iterations

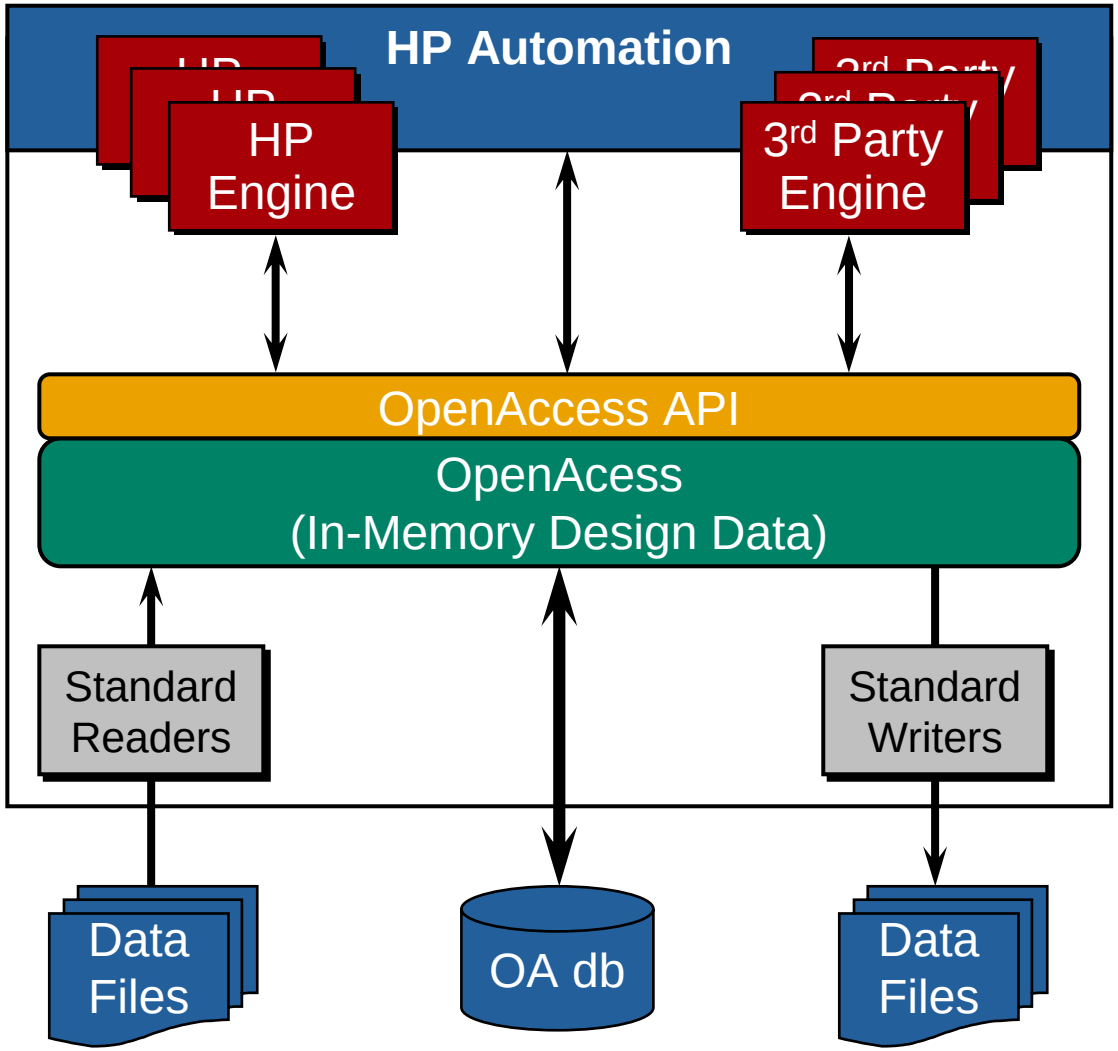
Design Loops
in nanometer designs





Achieving Interoperability

- *CAD System Architectural Vision*



OpenAccess Migration at HP

- *How do we get there?*

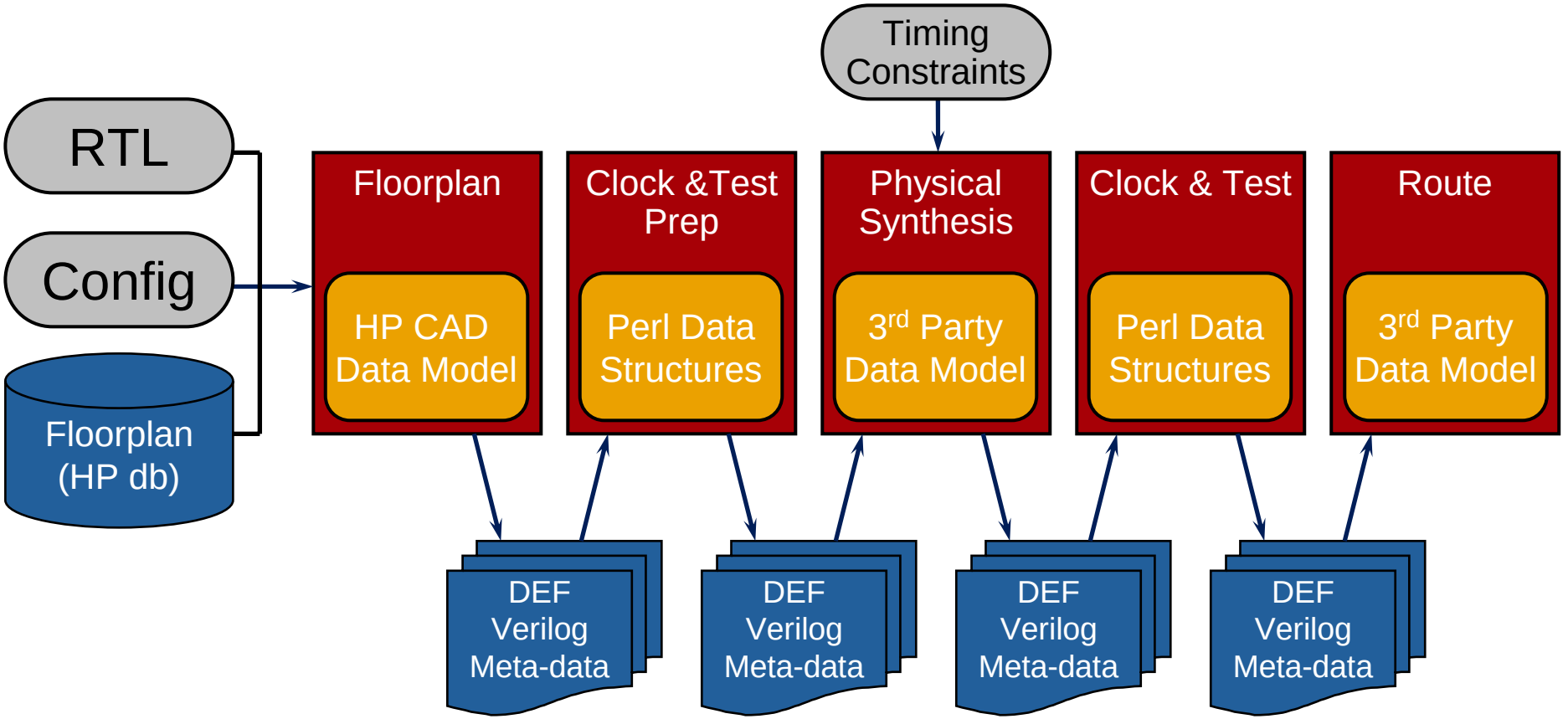
- Participate in OpenAccess Coalition *& Working Groups*
  - Provide feedback to the OAC
  - Review applicability of OA technology to HP
  - Influence OA technology

- Evaluate the Reference Implementation
  - Baseline capacity and performance
  - Support for current algorithms
  - Provide feedback to the OAC/Cadence

- Identify a lead tool flow to migrate
  - Synthesis, Place and Route flow identified
  - Production flow for a 90-nm design program

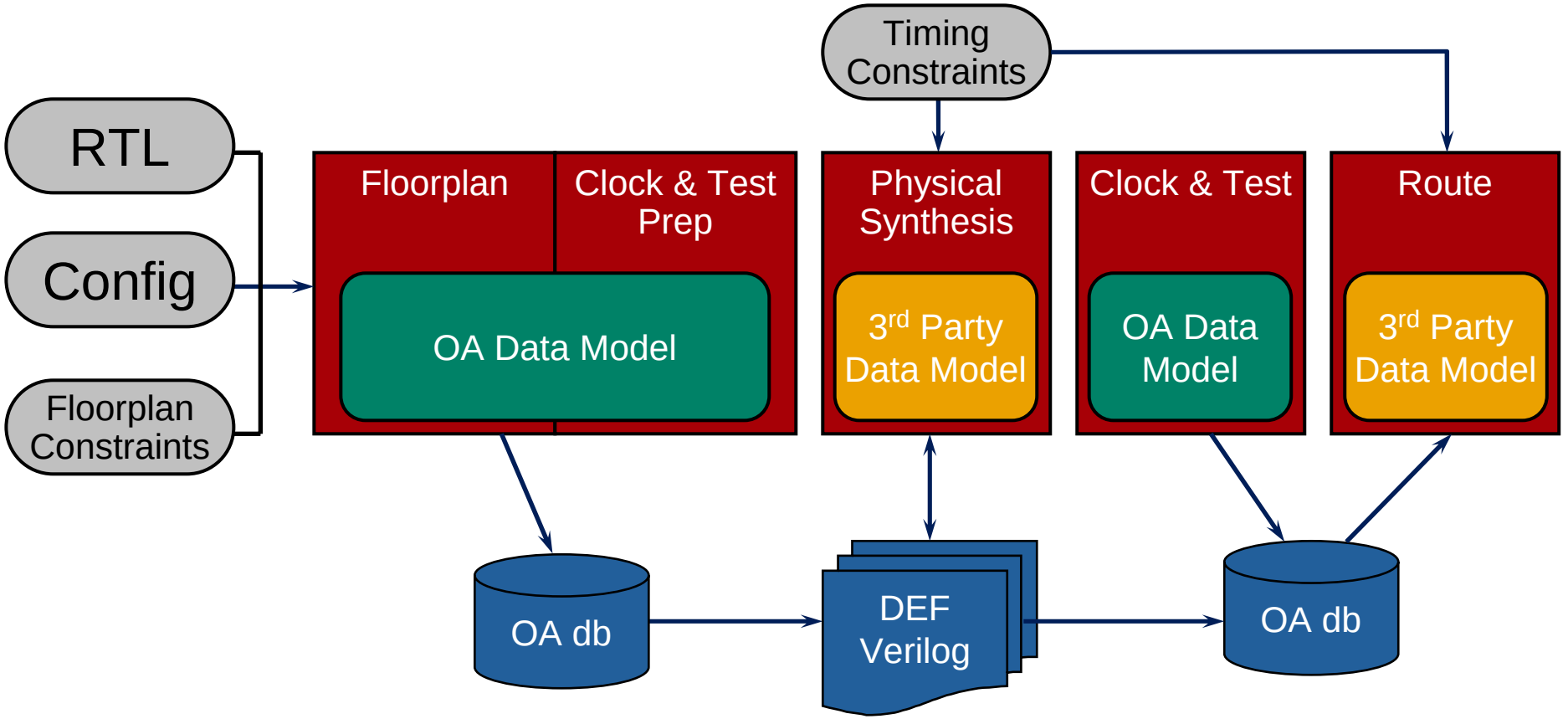
Historical SP&R Flow

- *Data File Transfer*



Current SP&R Flow

- *OpenAccess db Transfer*



HP SP&R Flow Migration

- *Initial Results*

- Development Status
  - Implementation has stayed on schedule
  - Initial resource investment on par with previous flow upgrade (~9 em)

- Deployment Status:
  - Phase 1 – Baseline SP&R released – November, 2003
    - Primary flow for block build tasks
    - Design champions can craft their own special stages
    - Platform for enhancing design methodology

HP SP&R Flow Migration

- *Continuing Results*

- Deployment Status:
  - Phase 2 – Full SP&R production flow – April, 2003
  - Methodology enhancements and tuning
  - Enhanced data management
  - Interactive flow interface
    - Richer query and scripting interface
  - Extended flow on OA
    - Geometric operations for early checking

Advantages to using OpenAccess

- *Positive Experiences*

- Openness of OpenAccess
  - Enables design debug and support for tool flows
  - OAC Openness to HP feedback!
- OpenAccess Quality has been excellent
  - Builds cleanly on HP-UX and Linux, PA-RISC and Itanium
- Documentation and Training materials
  - Extensive set of reference materials

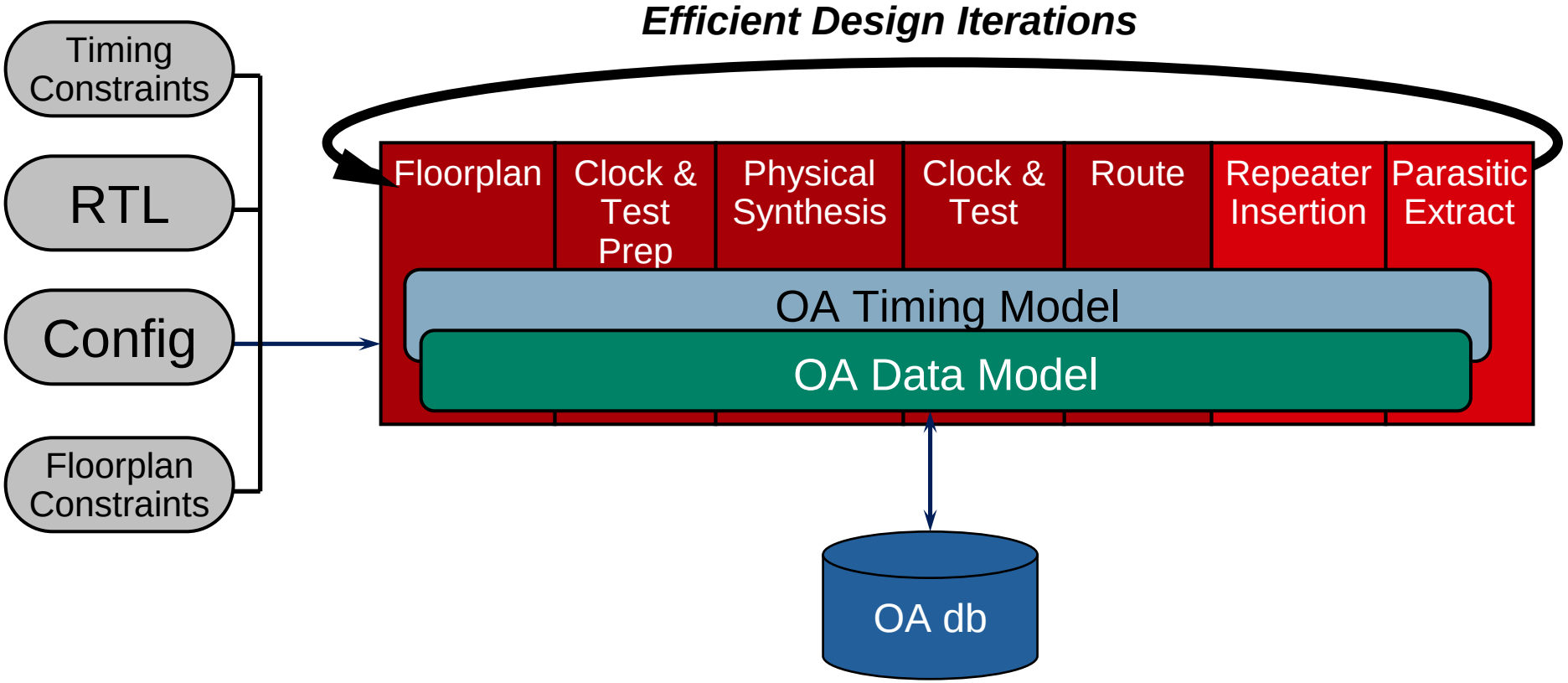
Challenges and Opportunities

- *OpenAccess Evolution and Issues*

- Enrich base utilities available to developers
  - Verilog Reader/Writer (developed with Cadence)
  - Hierarchical traversal engines
  - Higher level access methods
- Potential early instability of new flow:
  - Mixed environment of OpenAccess and legacy infrastructure
  - When do we go to OA v2.2 ?
- ***EDA business models must evolve***
  - Evaluate impact of “engines” vs. “tools”
    - Marketing, sales, support
    - Distribution, integration, licensing

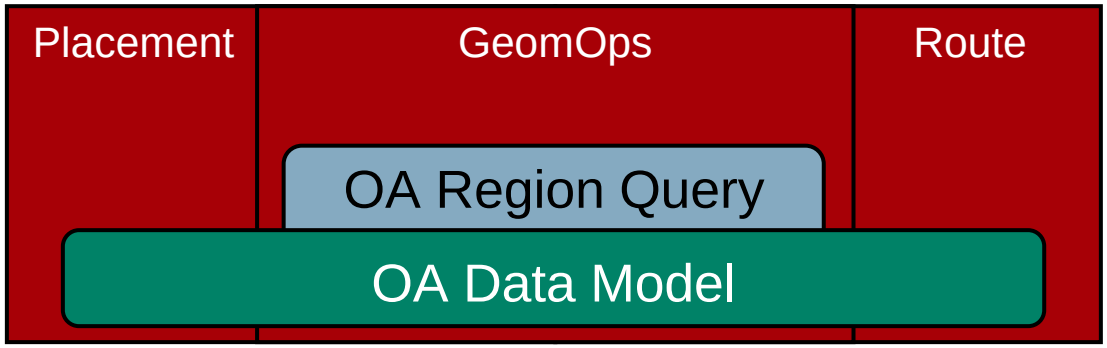
Future SP&R Flow

- *OpenAccess-based System with Engines*



Component-based Architecture

Fine Grained Components/Engines
- a simple example



The Benefits of

Component-based Architecture

OpenAccess Migration at HP

- *Next Steps*

- Expand SP&R Flow to meet other needs of HP CAD system
  - Evaluation of other arenas of the OpenAccess technology
    - Parasitic data representation with Geometric associations
    - Embedded Module Hierarchy for net-centric analysis
  - Migration plans for other key flows
    - Electrical Rules Checking
    - Timing analysis
- Conversion/Evolution of applications that are currently based on legacy DB/API
  - Development of API Emulation layer
    - Legacy API overlays on OA API and run-time OA DB
  - Evolutionary migration/conversion strategy
    - Always able to test against existing, production system

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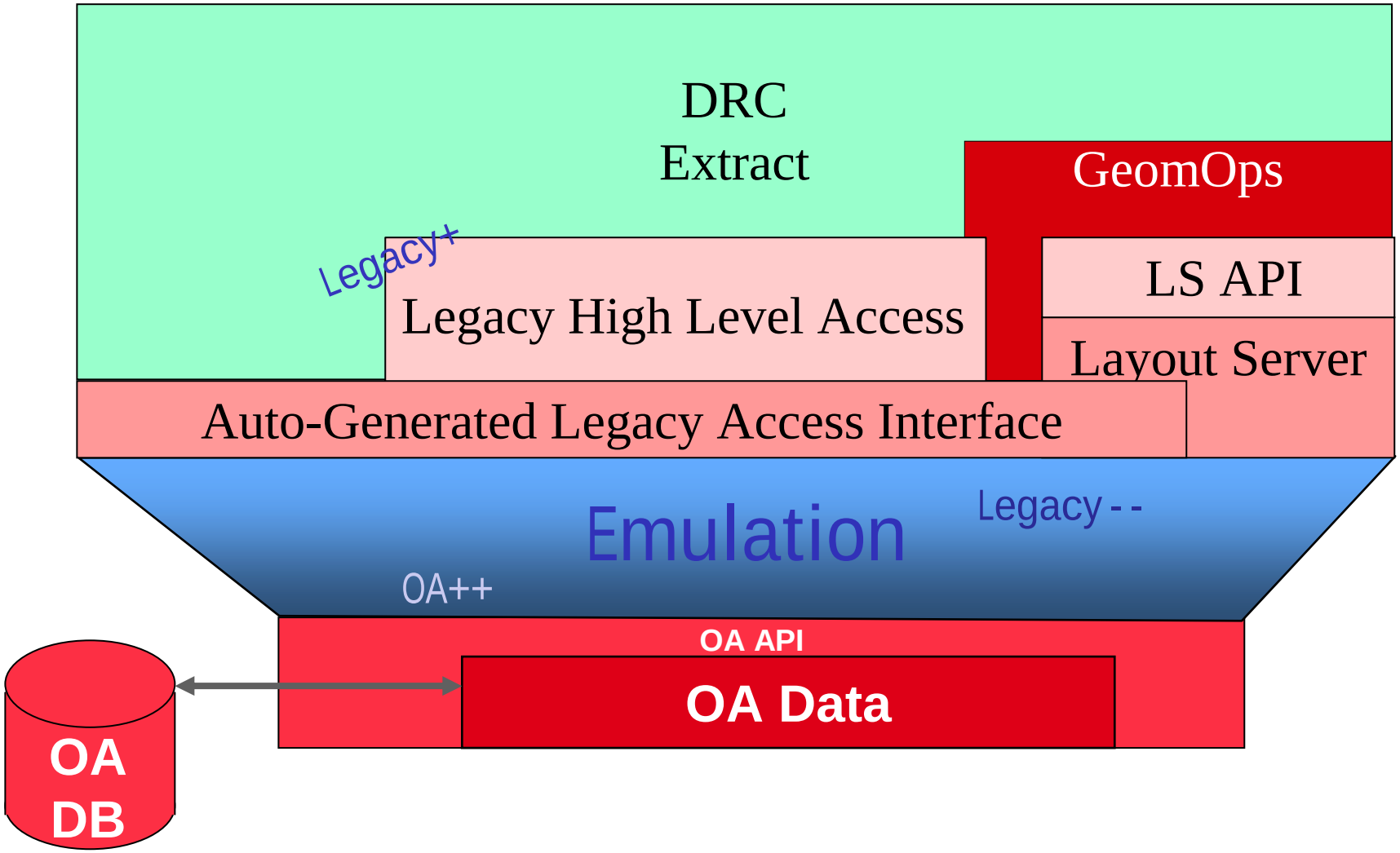
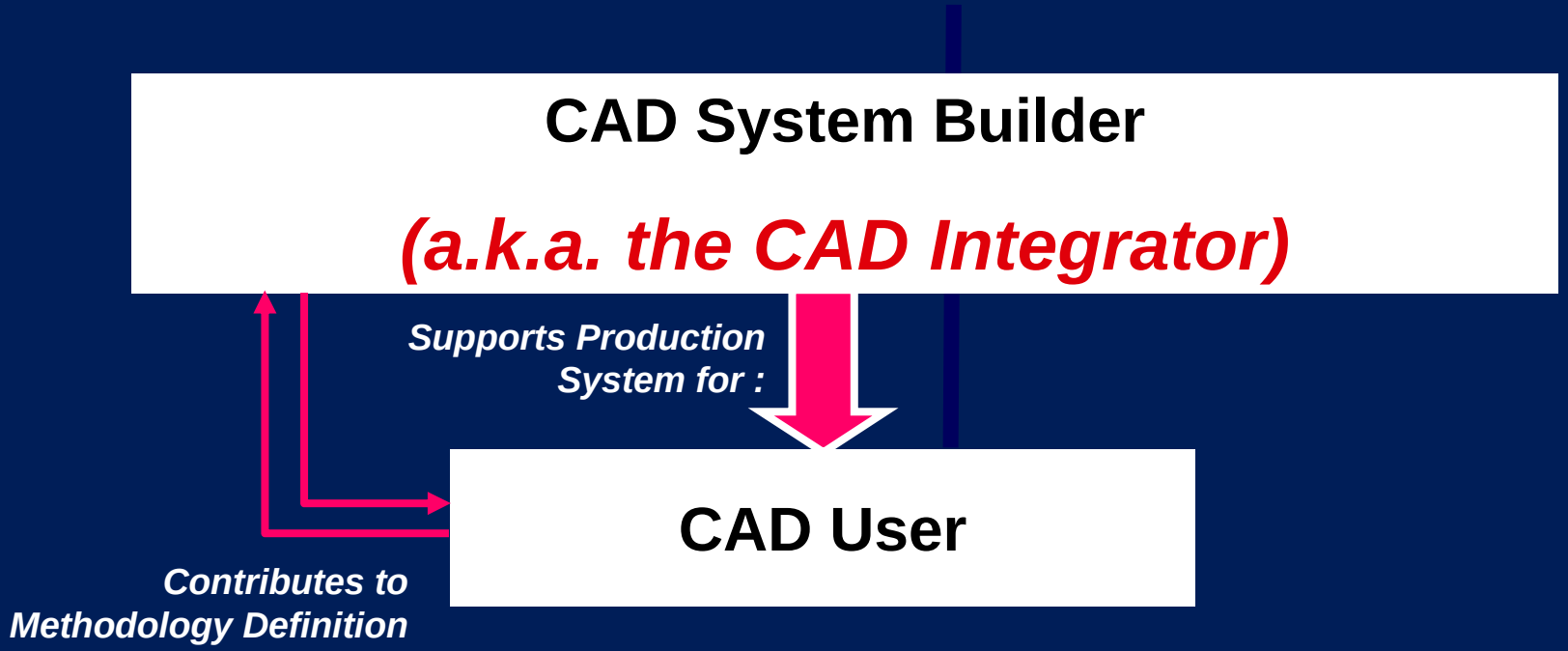
API Emulation Layer Architecture



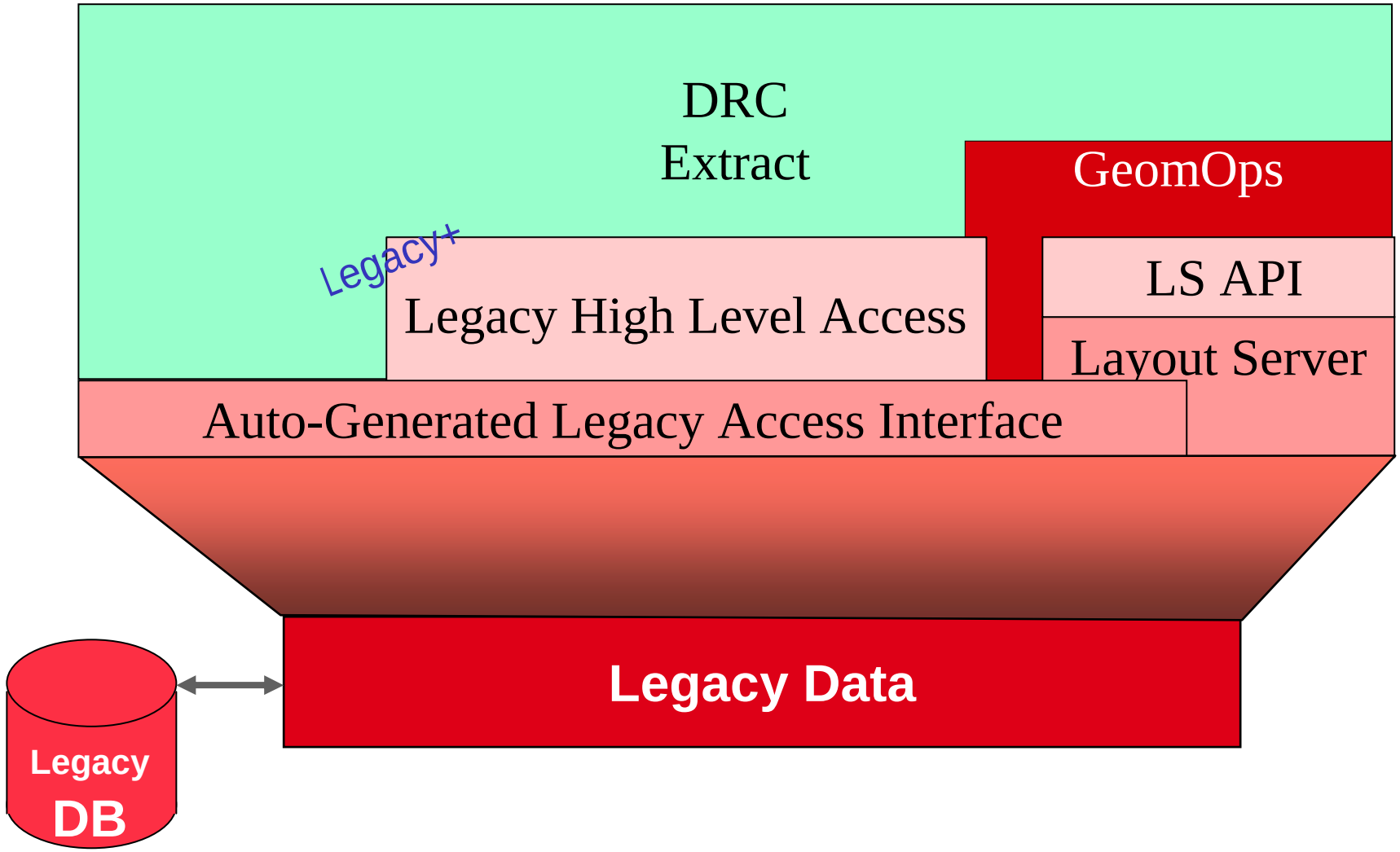
EDA Lab Support for Design Community

Stability

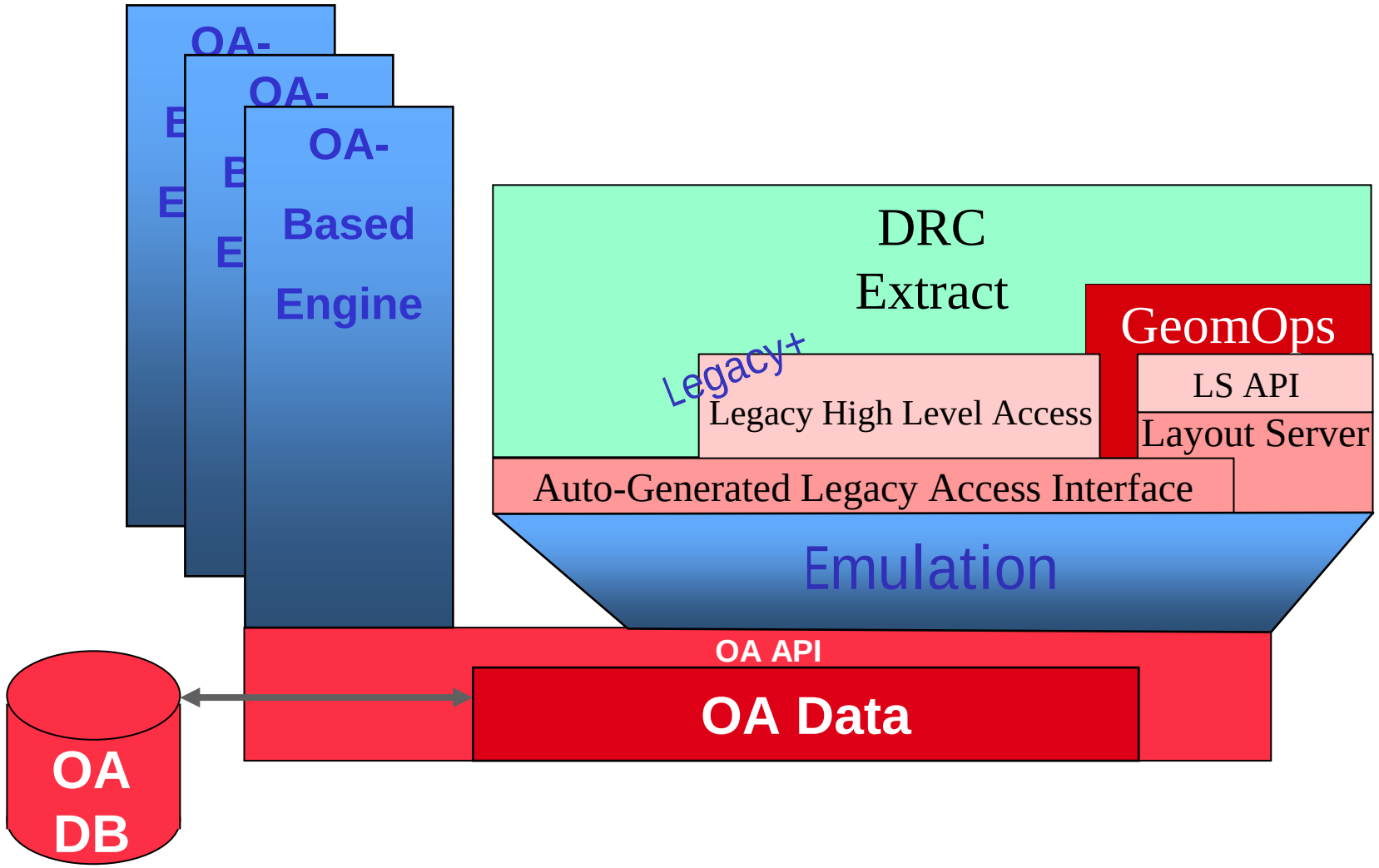
Is Pretty Darned Important Too



Leveraged Verification Available Throughout Development Phase



Evolution of HP CAD System on OA



Summary

- *HP's First OpenAccess Deployment*

- What we have achieved
  - More rapid OA adoption via commitment to real flow on real data
  - Significantly greater understanding and appreciation of OpenAccess technology
- Benefits to HP
  - Enables tighter integration between HP and third-party solutions
  - Redirect our internal investment to higher value-add infrastructure, applications, and methodologies
- Potential benefits to EDA vendors
  - Reduce investment in proprietary infrastructure
  - Easier path to demonstrate customer benefit
  - Lower cost to integrate new and acquired technologies
  - High potential for visionary suppliers of OA-based components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