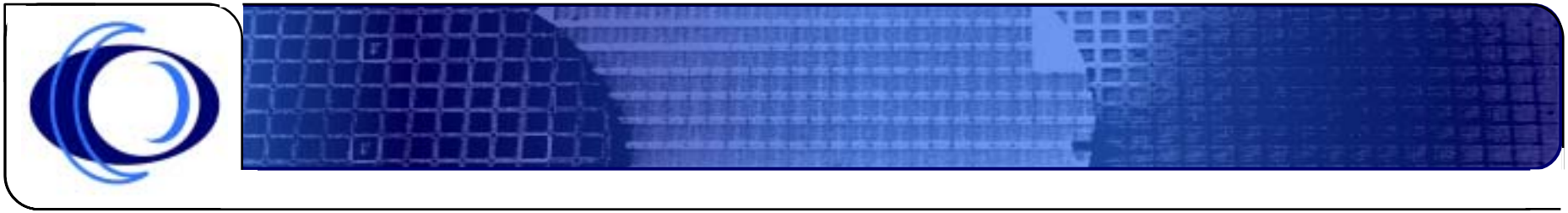

OpenAccess:

Goals and Status

DAC, 2003

Outline

- OpenAccess Goals
- OpenAccess Coalition (OAC) Structure, Process and Participation
- OpenAccess Technology
- OA Proliferation and Progress
- OpenAccess Status/Summary

Openness Requires...!

- **Accessible by all parties:**
  - Anyone can use, change, embed, or redistribute according to clearly established terms
- **Reasonable cost:**
  - Established prices (if any) are based on service value and do not present an undue barrier to any company, regardless of size
- **Managed migration by stakeholders:**
  - Controlled evolution of the technology by an elected Change Team

OpenAccess meets these criteria

OpenAccess Goals

- **Provide an IC design tool infrastructure that yields**
  - **Integrated** systems rather than sequential flows
  - **Choice** of design tools and provider
  - **Technology transfer** of innovative research
  - **Collaborative design** capability for ICs
- **Promote an open standard for IC design data access**
- **Gain adoption of the standard within the EDA industry and university research programs**

OpenAccess Benefits: End-users

- **Saves investment (people and dollars) in proprietary API/data model/database solution**
- **Enhances interoperability with vendor tools**
  - Saves investment to develop/maintain translators
  - Plug-and-play access to new tools reduces integration costs
  - Reduces/eliminates performance impact of translators on design flows
- **Allows focus on core competencies, i.e., developing value-added internal tools and customized flows**
- **Leverage collective knowledge base and contributions of OA community, including academia**

OpenAccess Benefits: EDA Companies

- **Large EDA companies:**
  - **Easier access to customers**
    - Simpler integration into their flows
  - **Less interfacing effort**
    - Focus on tool development
  - **Easier to integrate tools when purchasing small vendors**

- **Small EDA companies:**
  - **Reduces barrier to entry, i.e., quicker “startups”, faster ROI**
    - Less infrastructure to develop
    - Custom infrastructure may be barrier to acceptance
    - Focus on tool development
  - **Less interfacing effort**
    - Quickly sell to a larger market

OpenAccess Benefits: Universities

- Access to commercial database and its users
- Ability to influence standard
- Access to industry benchmark examples
- Potential for research on tightly-coupled applications and flows
- Ability to streamline technology transfer

EDA Interoperability Genealogy

Process level integration

Design to Manufacturing Data Sharing

Multi-vendor integrated systems

Open Data API

01/2003

Single vendor integrated systems

Proprietary Data APIs

Loosely coupled systems

Open File Formats

Tool-Data Binding

Proprietary File Formats

Outline

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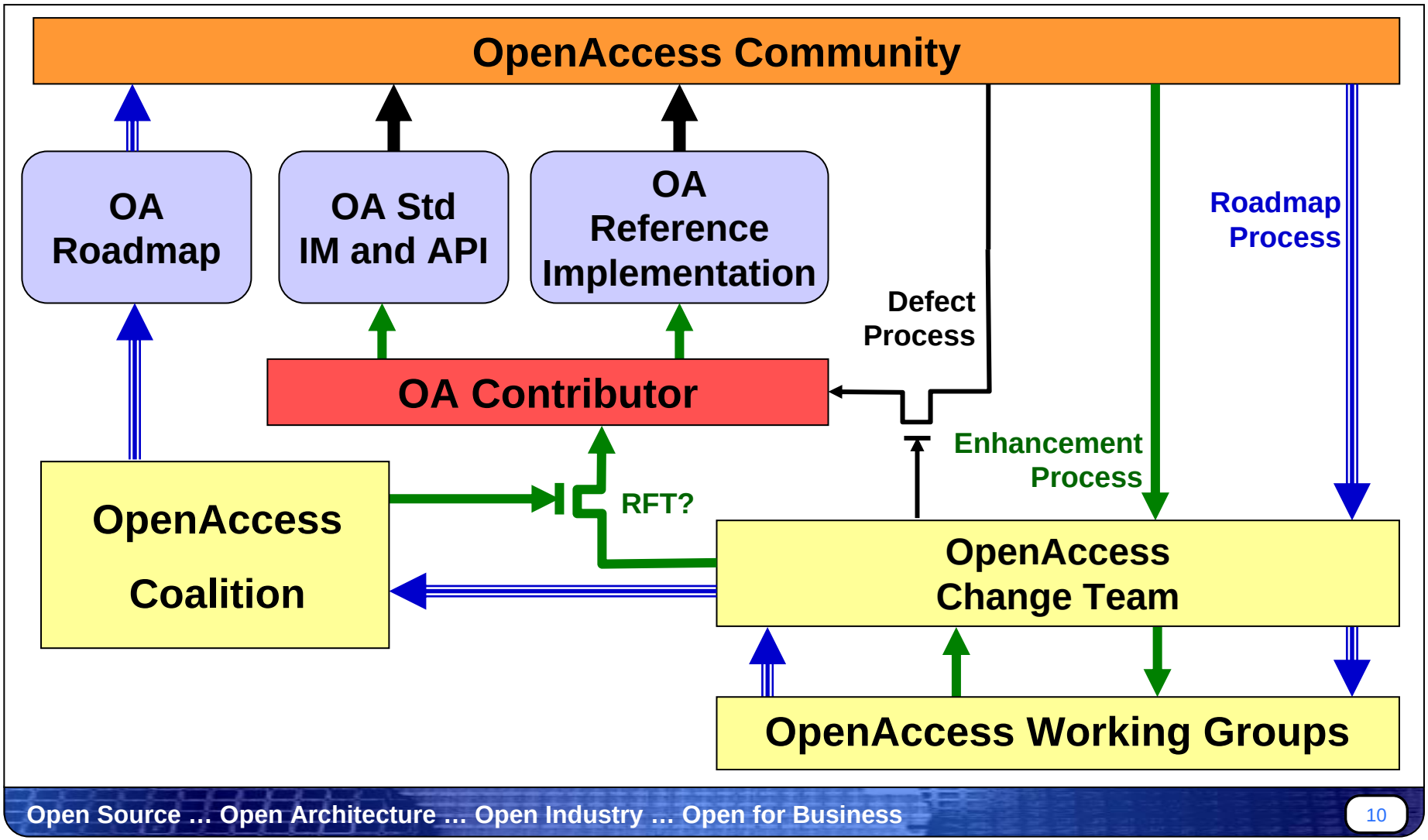
OpenAccess Process



OpenAccess Coalition

- **Coalition members have specific rights and responsibilities**
  - Share in funding
  - Operate to open, unbiased decision-making policy
  - Abide by OpenAccess Participation agreement terms, and joint funding for development and facilitation
  - Guide future of API and Reference Code
  - Elect Change Team to manage revisions
- **Coalition member benefits**
  - Early access to planned/future releases of reference database code
  - Participate in Change Team and Working Groups
  - Set direction and vote on development priorities
  - All things equal, higher priority for member requests
  - Discounted training, support and access to Si2

OpenAccess Change Team

- **Makeup**
  - 12 annually-elected Coalition company representatives
    - 1 representative per company, 1 vote per company
    - Max of 5 EDA companies (4 plus Cadence)
  - Chaired by 2 architects who must be CT members (Cadence and 1 elected non- EDA company)
  - Approval of change requires 9 “Yes” votes
- **Responsibilities**
  - Approving body for API & Reference DB changes
  - Specifies changes to code integrator
  - Caretakers for OA Technical Roadmap
  - Charters working groups to analyze/solve key problems
  - Change Team may collectively agree to delegate vote to architects in which case both must agree to approve the change
  - If Change Team has less than 12 members and a proposed change receives 75% approval, then architects (by unanimous vote) make up missing votes

OpenAccess Working Groups

- **Chartered to analyze specific problems and recommend solutions to Change Team**
- **Current working groups:**
  - **Tech:** Solve problem of representing technical manufacturing constraints and rules, considering current applications for SIPPS standards.
  - **DDM:** Analyze and solve problem for library directory structure optimization. Activity targeted for Rel. 2.2.
  - **Golden Gate:** Analyze bridging between Milky Way and OA. Initial effort focused on creating mapping document to show mapping between OA and Milky Way and roadmap for 2003 & 2004. Bridging software to be based on mapping document.
- **Completed working groups:**
  - **Occurrence and L/P:** Defined approach for occurrence model and means to represent both logical and physical hierarchies in design in unified manner (Embedded Module Hierarchy). Results will be in Rel. 2.1 (07/2003)
  - **Extensibility:** Develop requirements and specs for capability to extend common model and associated functions with new elements, attributes and relationships without requiring change to OA API standard
  - **Parasitics:** Define means to efficiently/comprehensively represent RLC parasitic data in OA model. Currently dormant.

OpenAccess Structure/Membership

Cadence	Philips
HP	Sagantec
IBM	ST Microelectronics
Intel	Sun
LSI Logic	Synchronicity
Mitsubishi	Synplicity
Motorola	Tektronix
Nassda	Artisan*

Governing Coalition

OpenAccess Community

12 Member Change Team

Working Groups

Two Architects

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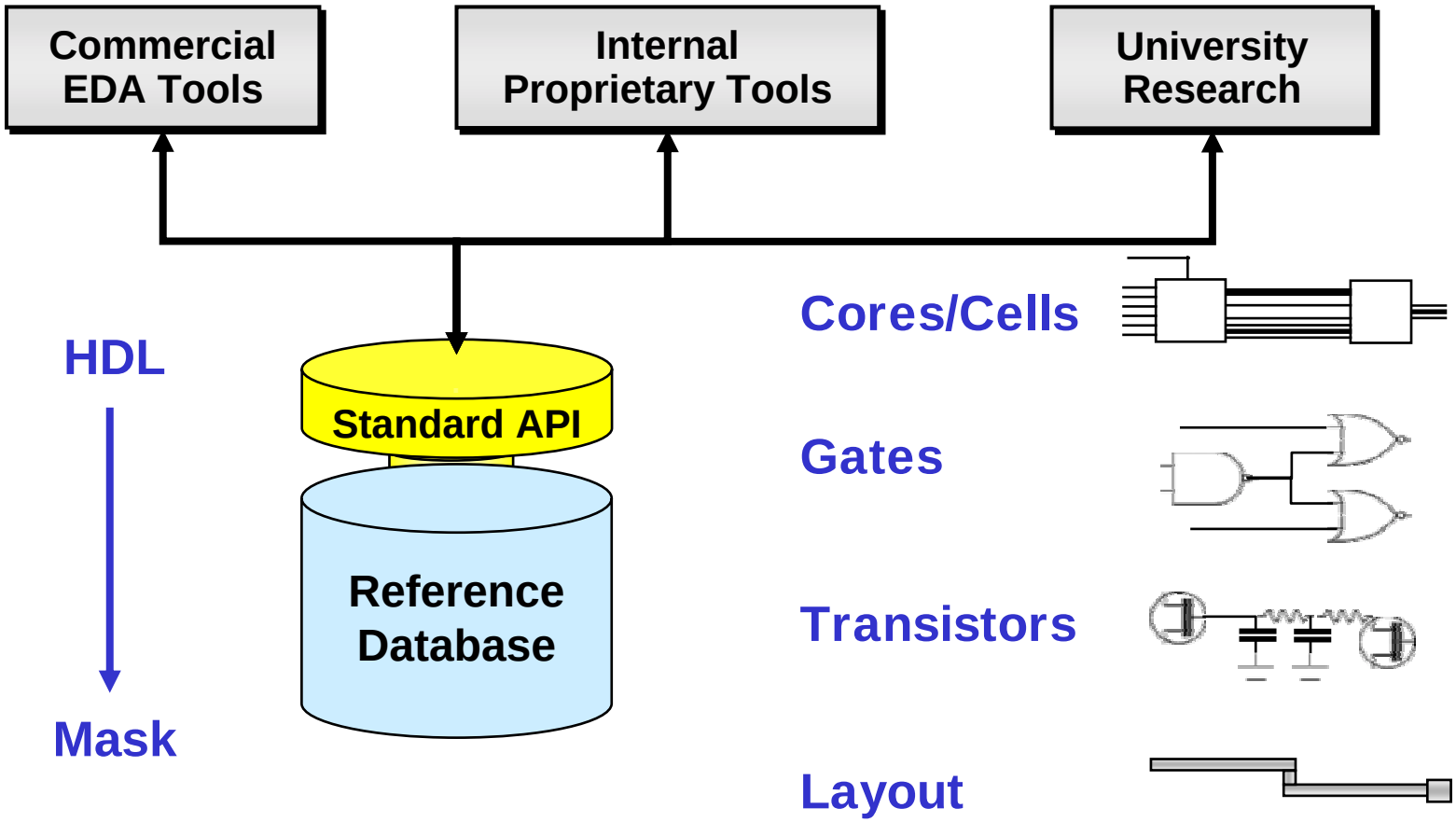
What is OpenAccess?



Founded on a Technology Transfer from Cadence Design Systems

Scope of Applications

- Synthesized RTL to Silicon
- Digital and Analog
- Std. Cell and Custom
- Macro cells to Transistors
- Logical and Physical
- Batch or Interactive

OpenAccess Technology

OA features:

- **Standard information model for IC design data**
- **Standard C++ interface (API) to access, manipulate and store data**
- **Reference, commercial-grade database compliant with API**
- **Translators to industry-standard formats**
- **Development support aids**

OA provides:

- **Greater design productivity**
  - Standard Model & API provide for choice & tighter design flows
- **Reduced development and support cost**
  - Reference DB provides solution for IC designers and EDA developers right out of the box
- **Better interoperability**
  - Reference Database provides “golden behavior” for development & test, & for interoperability issue resolution

API Features

- **Strongly typed**
  - Less chance of errors
- **Data representation independent of machine width**
  - 32 bit, 64 bit support
- **Multi-platform support**
  - Automatic byte-swapping
- **Thread-safe (07/2003)**
  - Support parallel processing

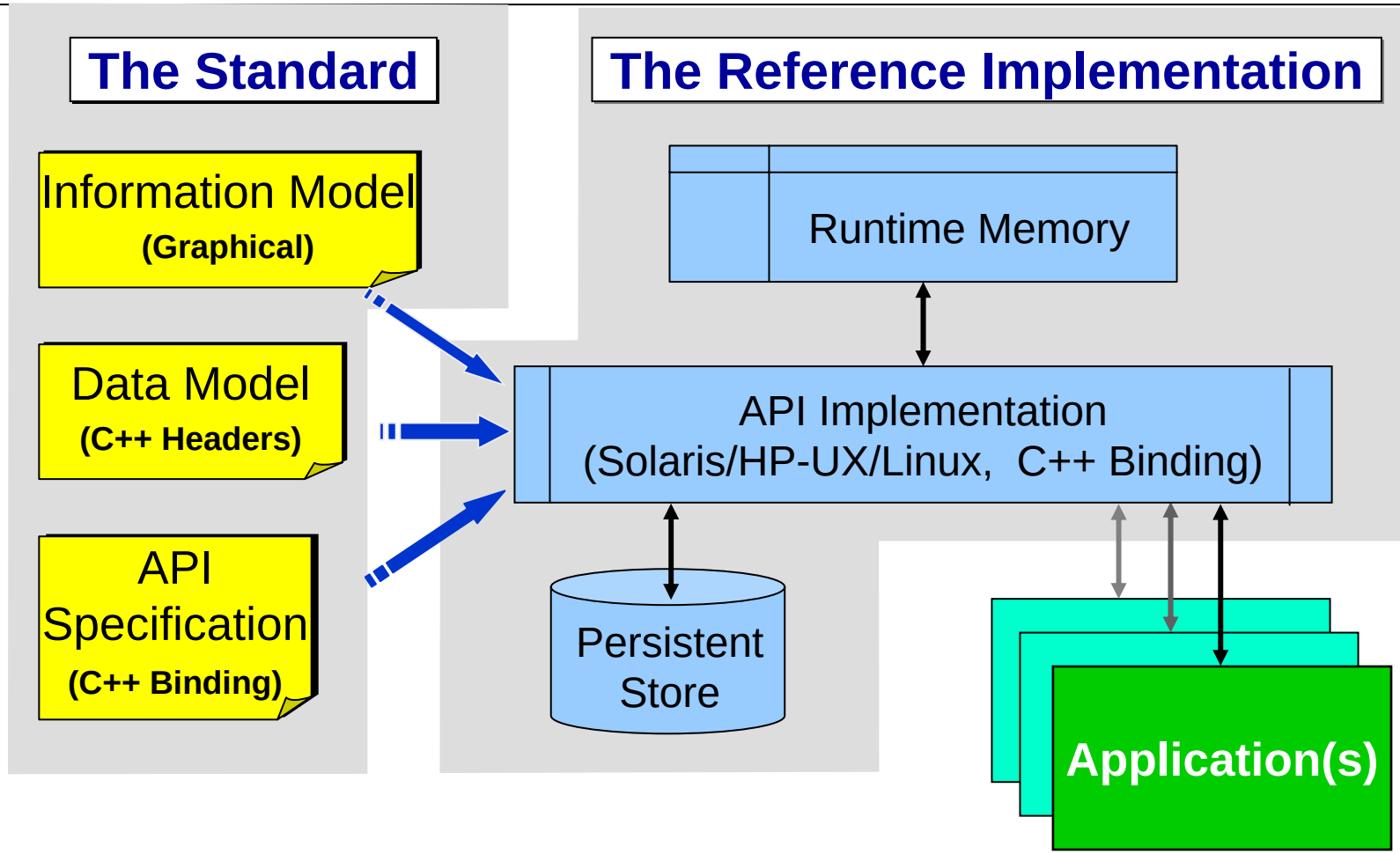
Information Model Scope

- **Design Data**
  - Hierarchical connectivity
  - Floorplan information
  - Physical layout
  - Special routing types
  - Shapes
  - Pins and vias
  - Parasitics (detailed and reduced)
  - Scan chains
  - Extension objects (groups, properties, etc)
  - Timing (through extensibility feature now, will be added as part of design data after definition of timing data specs)
  - Occurrence model and EMH (07/2003)

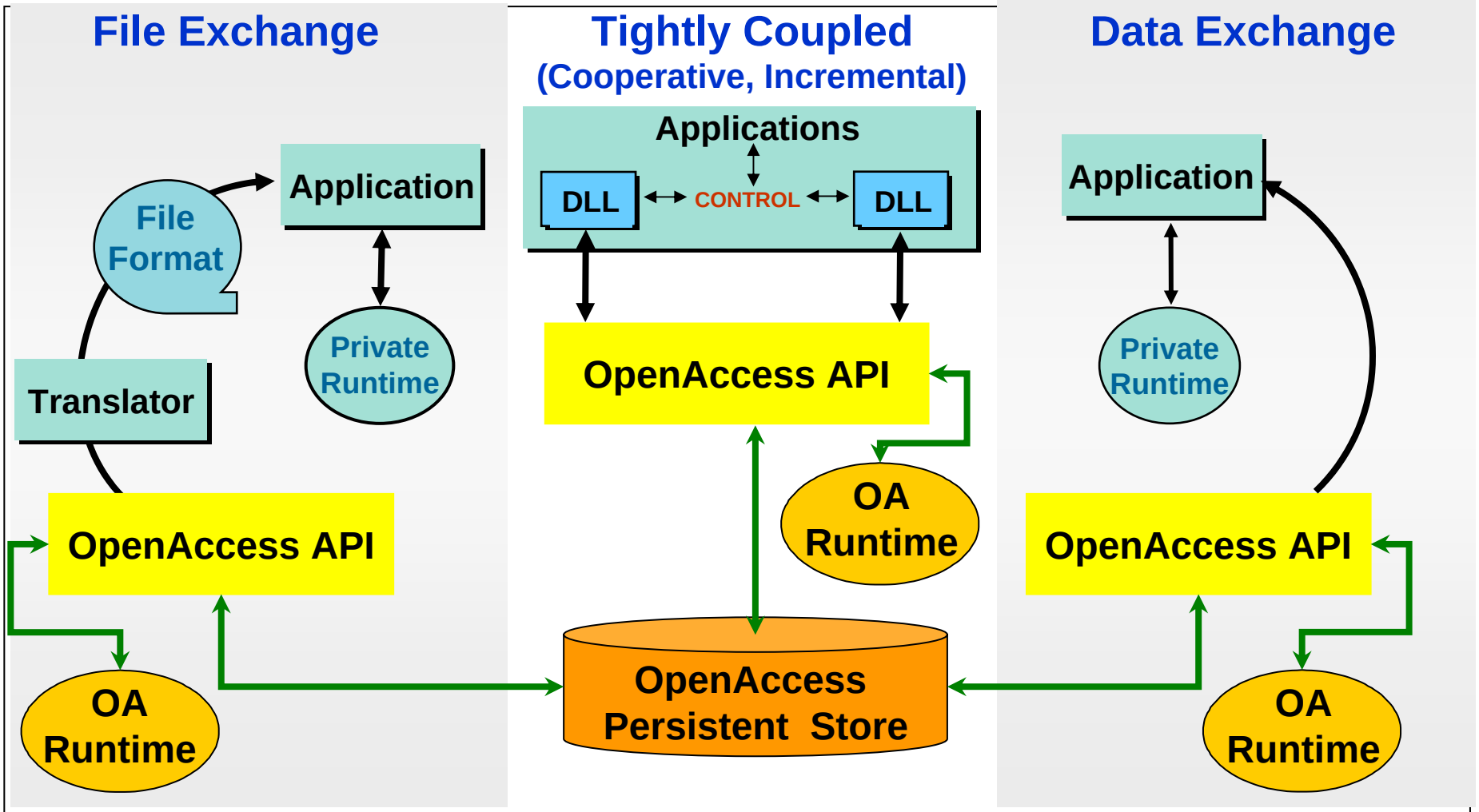
- **Technology Data**
  - Layer constraints
  - Technology characteristics
  - Technology constraints

- **Library Management**
  - Design hierarchy
  - Access control

Open Access Deliverables



Application Integration



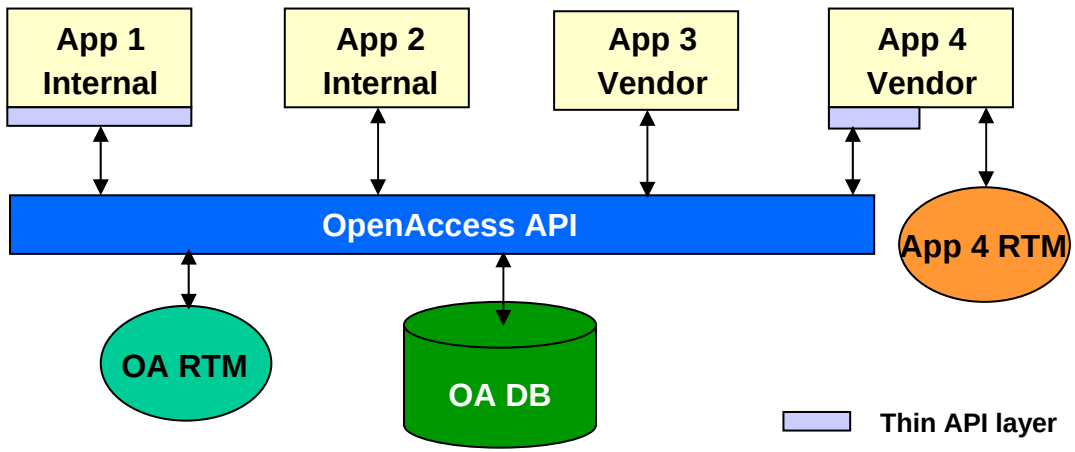
Streamlined Design Flows

Life in the Slow Lane:

Writing translators: Compelling job description for a PhD?

Or, how to drive him/her to your competition!

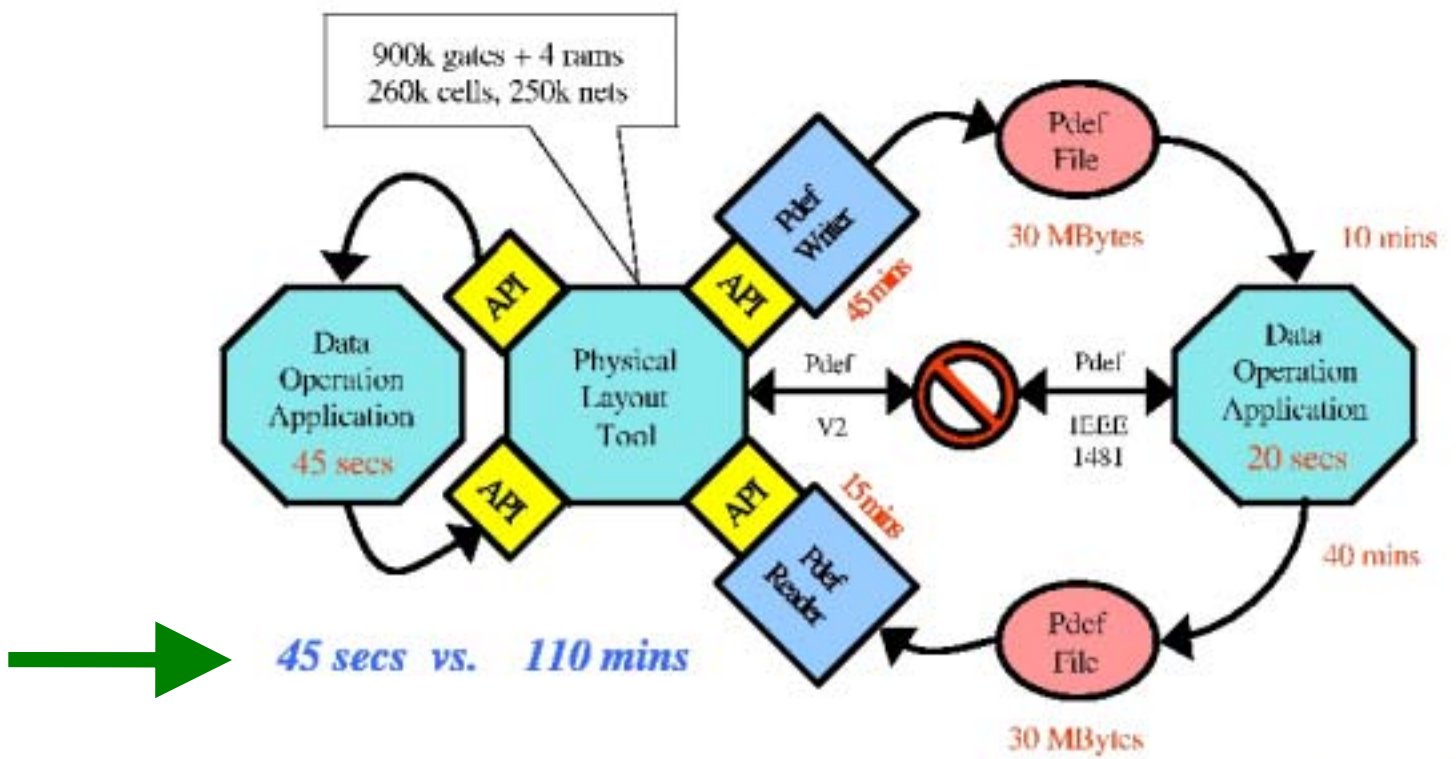
Life in the Fast Lane:



By design, OA:

- Enables tool interoperability
- Reduces need for translators
- Creates common syntax and semantics even in non-ideal case
- RTM is context-sensitive and memory-efficient
- Private RTM may be application specific and can be considered, case-by-case, as temp. solution

Example of API Benefits



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Connecting With EDA Industry & Users

- **DAC, 2003: OpenAccess adoption is reality!**
  - **Compelling base** of OA functionality available from OpenEDA website
  - **Strong leadership** from EDA/end-user companies to drive standard
  - OpenAccess evolving with greater capabilities – **Roadmap defined!**
  - **Multiple EDA/end-user companies** creating/porting tools to OA
    - **7 showing products at booth**
  - **Downloads** from OpenEDA website rising daily
    - **744 downloads/month, 800 licenses issued in 2003!**

cadence

LSI LOGIC

Synchronicity

sagantec

MicroEDA Corporation

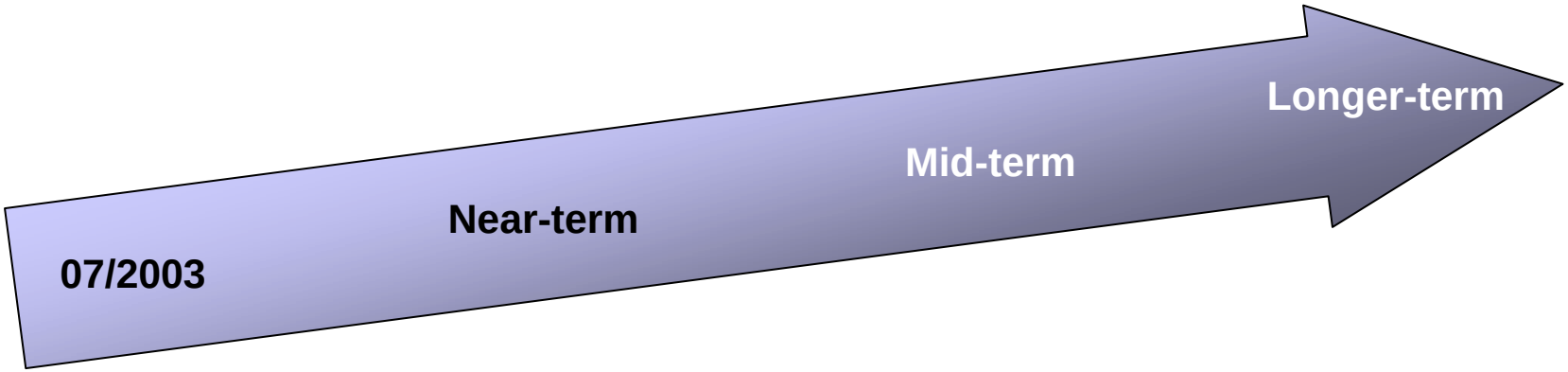
IN2FAB

Silicon Canvas

Academic Interest/Participation

- **Focus on US Universities**
  - NCSU
    - Rhett Davis teaching OA-based course
    - Submitted research proposals to SRC for OA-based flow research
  - U. of Michigan
    - Student trained to apply OA to GSRC P&R algorithm research
  - UC, Santa Cruz
    - Student trained and starting to apply OA to algorithm research
    - **Has ported OA 2.0 to Linux and donated to Si2**
  - Others
    - Students from UCLA and UC, San Diego trained in OA
    - UT, Austin planning to download OA for training & evaluation
- **Focus on European Universities**
  - Meetings held during DATE week to begin engagement
  - Discussions underway with universities/organizations in Germany:
    - U. of Hannover (Barke)
    - U. of Bonn (Korte)
    - Edacentrum (Haase)
  - Universities/organizations in France:
    - U. PMC has signed OA source license agreement to download, evaluate and use for research

Moving Forward: OA Roadmap!

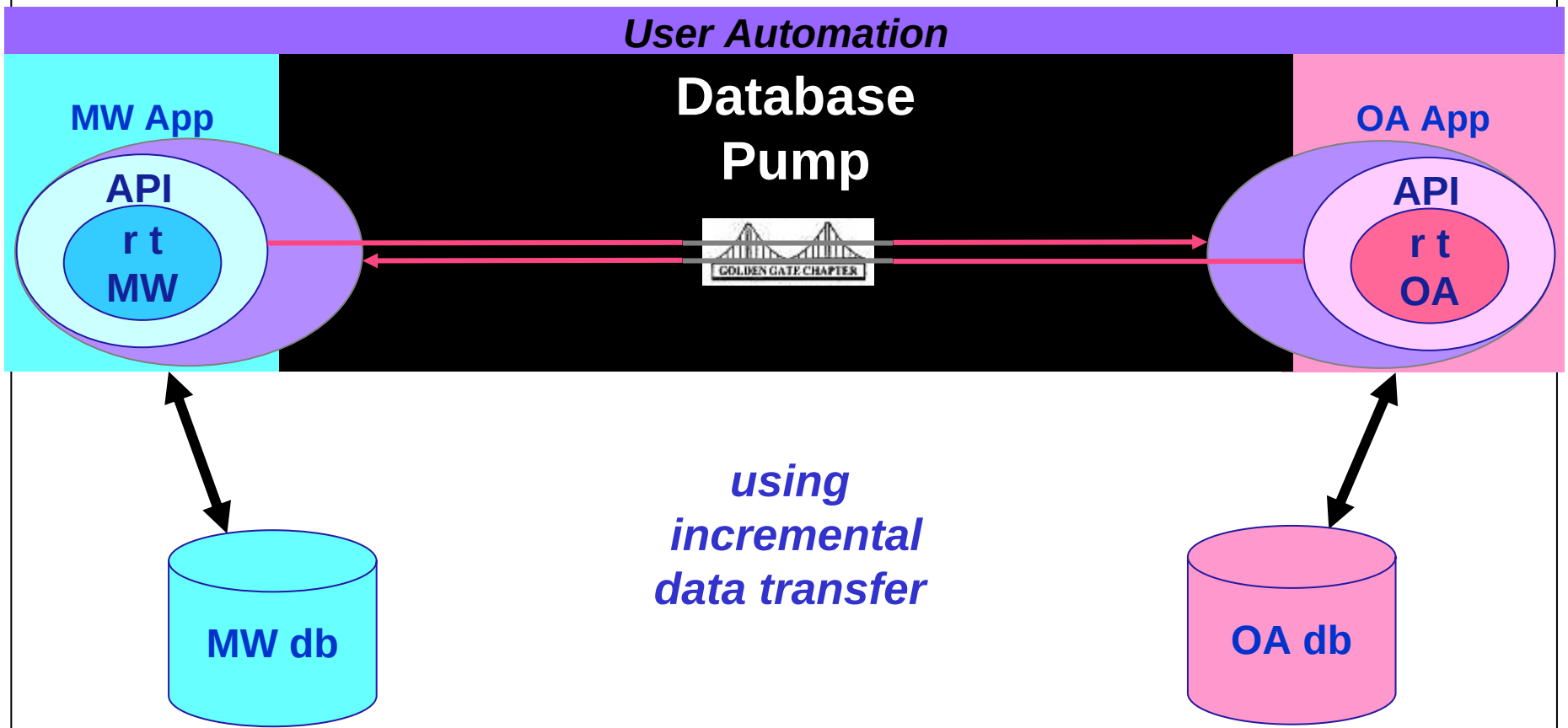


- **Key items for OA 2.1:**
  - Occurrence Model / EMH
  - Multi-threading
  - Plug-in for custom region query
  - Data loading by LPP
  - ,……..
- **Key items:**
  - Support timing/electrical constraints
  - X-routing support
  - Standardized process modeling for RLC extr.
  - Functional model support.
  - Enhanced tech. data support (for OPC/PSM & package-level analysis)
  - Additional translators for industry-standard formats,…..
- **Key items:**
  - Support design-to-manufacturing
  - Library modeling
  - System-in-package
  - Library & design data management
  - Manufacturing test
  - IP security
  - Control-level tool communication APIs,….
- **Key items:**
  - Formal transistor-level modeling support
  - Support behavioral-level data models
  - Support architectural-level data models,….

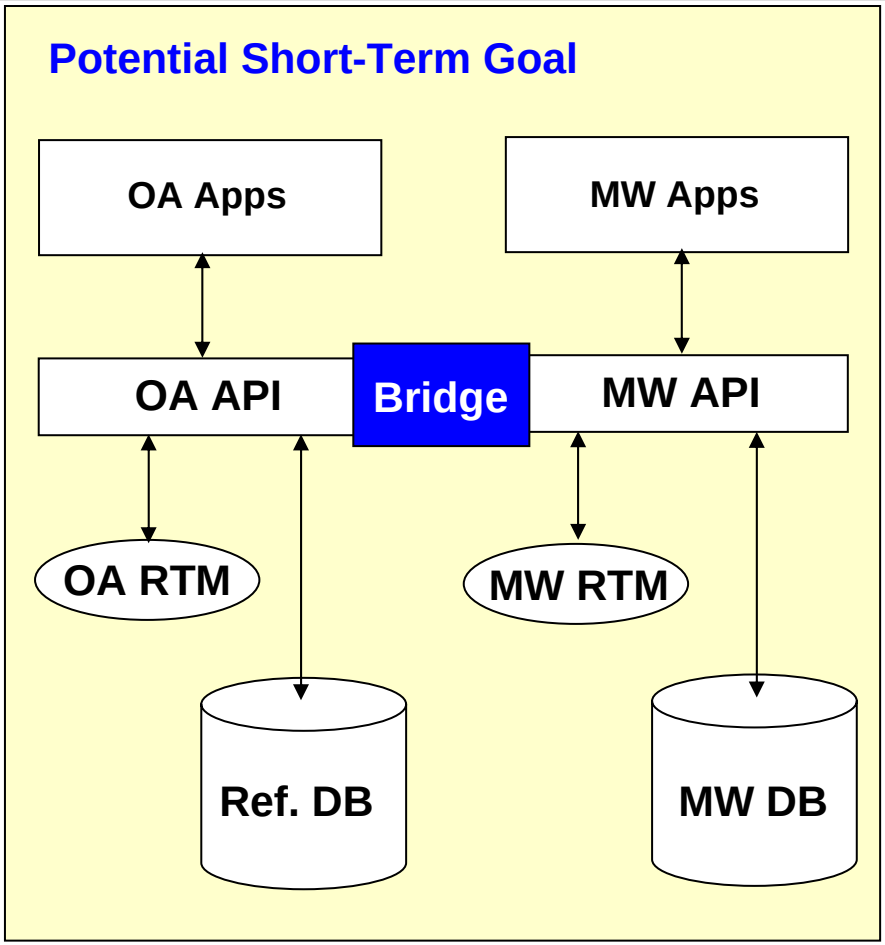
GoldenGate Data Exchange Usage

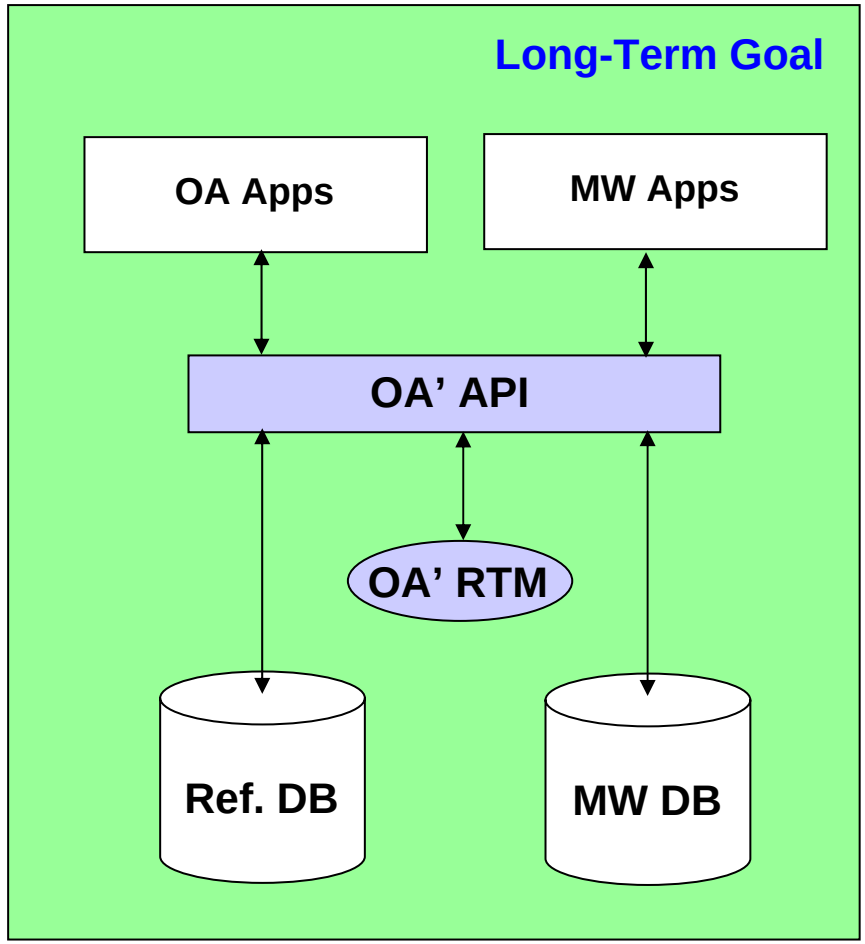
…its implementation

…and its performance benefits



GGWG Goals

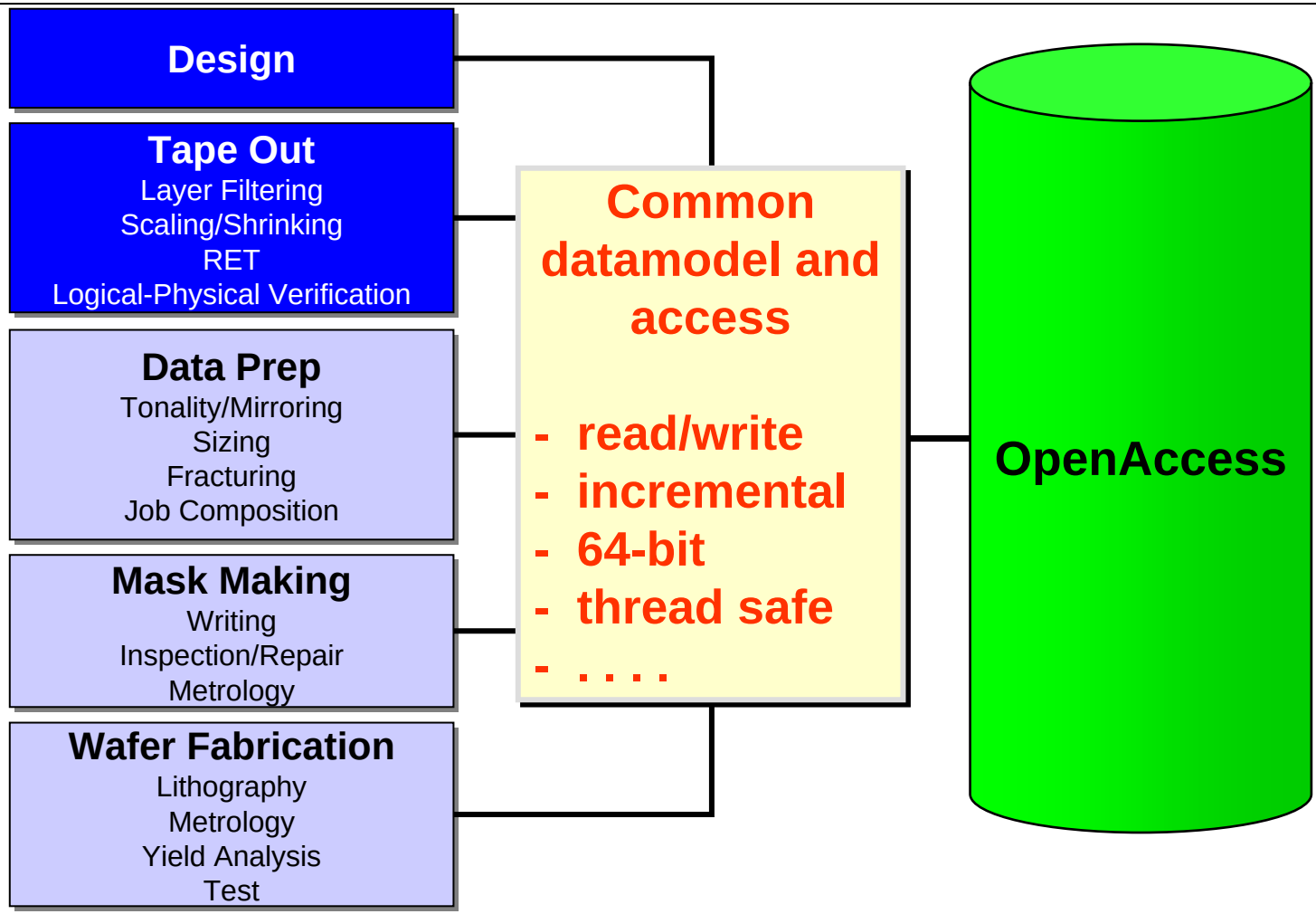

Potential Short-Term Goal
OA Apps
MW Apps
OA API
Bridge
MW API
OA RTM
MW RTM
Ref. DB
MW DB


Long-Term Goal
OA Apps
MW Apps
OA' API
OA' RTM
Ref. DB
MW DB

GGWG Roadmap Targets

- **Preliminary Mapping between OA and MW complete:** **07/2003**
  - Identify Basic Objects for physical, hierarchical connectivity
  - Identify the Correspondence between MW and OA for these objects
  - Identify Basic Operations required on basic objects
  - Initial Mapping Rules
- **Preliminary Development Logistics:** **07/2003**
  - Ownership / Copyright plan from Si2/Synopsys
  - Identified sites and resources for collaborative development
  - Identification of Alpha and Beta customers
- **Prototype software:** **TBD**
  - Write bi-directional emulation layers for subset of basic objects
  - Prepare test data for "round trip" tests
  - Verify emulation layers AND mapping accuracy with Alpha customer data
- **Real Software, Beta Phase:** **TBD**
  - Re-write prototype software, as needed
  - Beta test with customers, verify completeness
  - Begin performance tuning
- **First release of “Bridge” software:** **TBD**

UDM - Common Data Model Concept



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- **Next Steps**

OpenAccess : Call to Action

- **Formulate: Your corporate strategy, re: OA**
  - Download, evaluate (“kick the tires”) the code
  - If end-user, determine your ROI, push your suppliers
  - If EDA company, check what your customers want
  - Buy the book and accelerator kit
  - Sign up for training
- **Get involved: Support the goals of the coalition**
  - Port your code to OA
  - Push your suppliers towards OA
  - Join coalition to guide OA strategy to keep it aligned to your corporate strategy
- **Si2 connections:**
  - Bob Carver: bobc@si2.org
  - Sumit DasGupta: dasgupta@si2.org
  - Bayer: bayer@si2.org