



UT VLSI Seminar:

OpenAccess: The Team, The Technology and Value Proposition

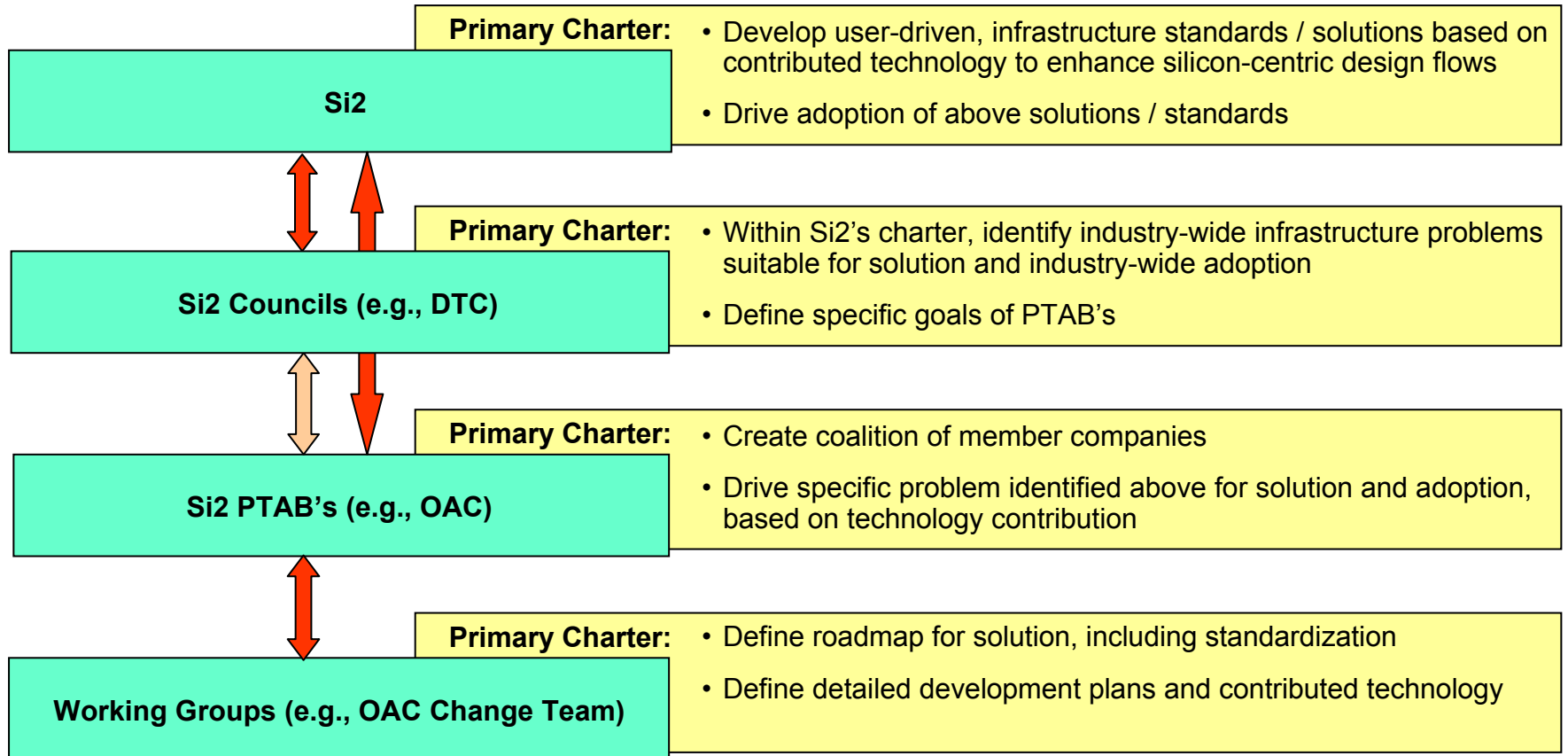
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- **Si2 / OpenAccess Organization and Goals**
- OpenAccess Technology
- OpenAccess Proliferation and Progress
- OpenAccess Value Proposition
- Call for Action



First, Some Simple Q&A

- **Who / what is Si2?**
 - ◆ Silicon Integration Initiative is an EDA/electronics industry consortium focused on **infrastructure standards** based on **community contributions** to enhance chip design flows
- **What is OpenAccess?**
 - ◆ An open, industry-standard API, and a reference implementation, to enable plug-and-play connectivity of best-in-class EDA tools to create customized design flows
 - ◆ Based on technology contribution from Cadence Design Systems
- **Who drives OpenAccess?**
 - ◆ Si2's OpenAccess Coalition, which consists of members from leading EDA and end-user companies



- **Provide 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**

Growing and Evolving OpenAccess Coalition



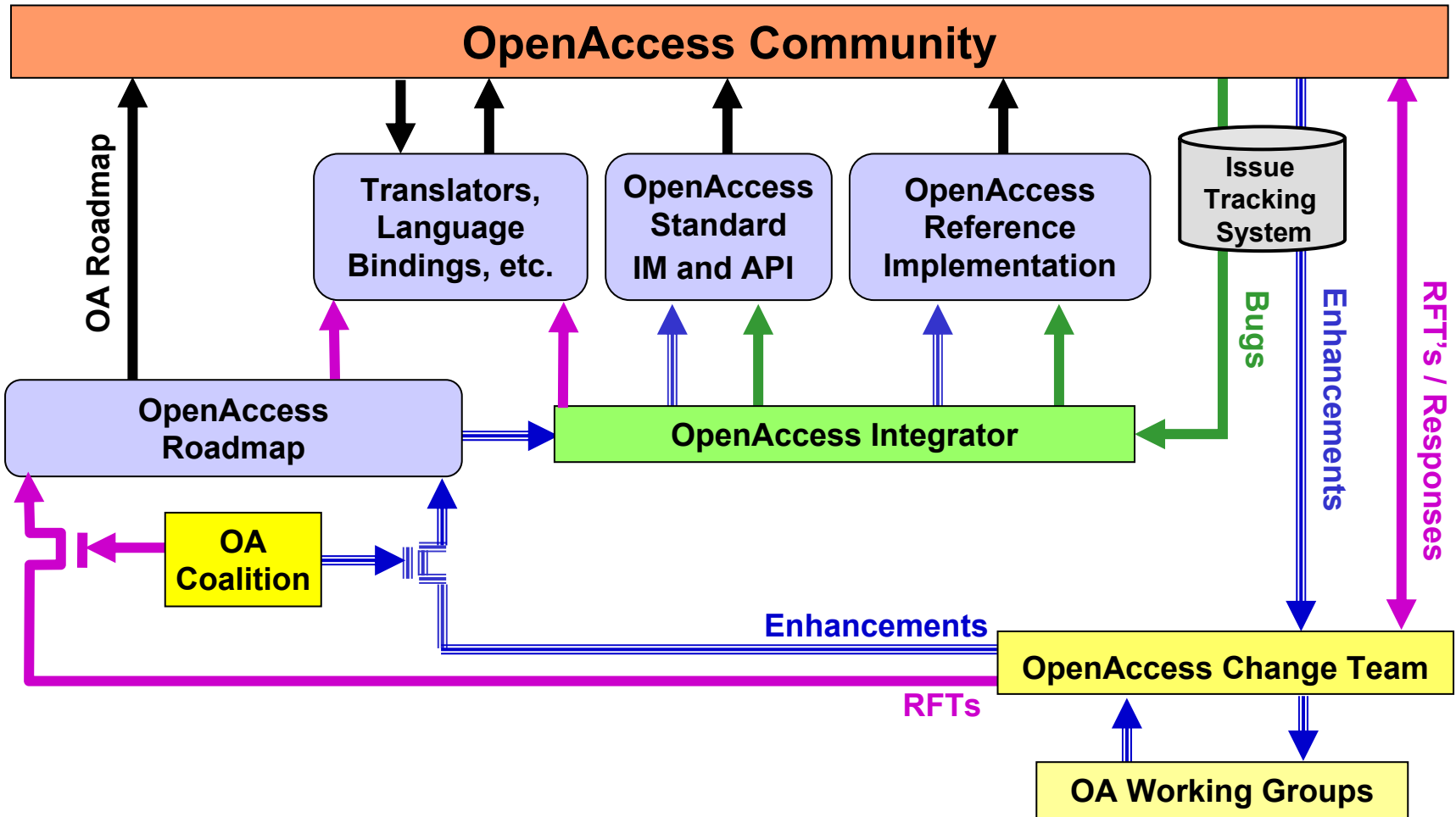
2004 Membership

- Single tier membership for end-user companies, 3-tier membership for EDA companies to promote proliferation
- Current membership: 24 companies and growing

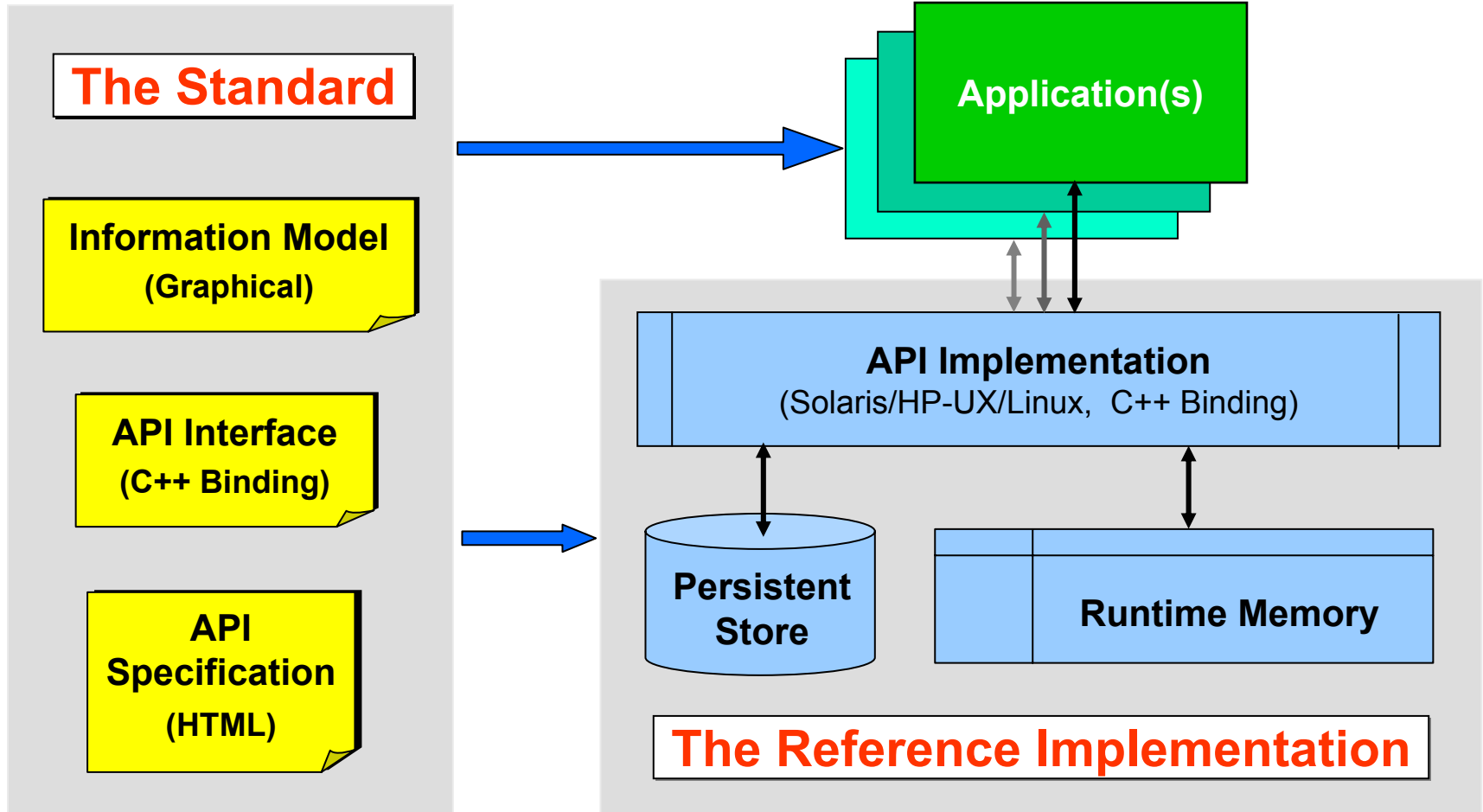
2003 Membership

- Single-tier membership
- Members: 16 companies

- Artisan
- Cadence
- CiraNova
- ClioSoft
- HP
- IBM
- IC-Manage
- Intel
- LogicVision
- LSI Logic
- Mentor Graphics
- Motorola (Freescale)
- PDF Solutions
- Philips
- Renesas
- Sagantec
- Silicon Canvas
- Silicon Navigator
- ST Microelectronics
- Sun
- Synchronicity
- Synplicity
- Tektronix
- Verisity



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• Design Data

- ◆ Hierarchical connectivity
- ◆ Floorplan objects and attributes
- ◆ Physical layout
- ◆ Standardized Route and Via semantics
- ◆ Shapes
- ◆ Parasitics (detailed and reduced)
- ◆ Scan chains
- ◆ **Extension objects (app.-defined objects, attributes, groups and properties)**
- ◆ **Occurrence model and EMH**
- ◆ Timing (using extension objects now, will be added as part of design data after definition of timing constraint specs)

• Technology Data

- ◆ All technology features and constraints, such as, wire width/spacing, via spacing, stacked via limits, pad position/spacing, etc...

• Library Management

- ◆ Light-weight support for handling:
 - Design hierarchy
 - Access control
- ◆ DDM WG defining robust API extension to plug in DDM solutions

Life in the Slow and Easy Lane!

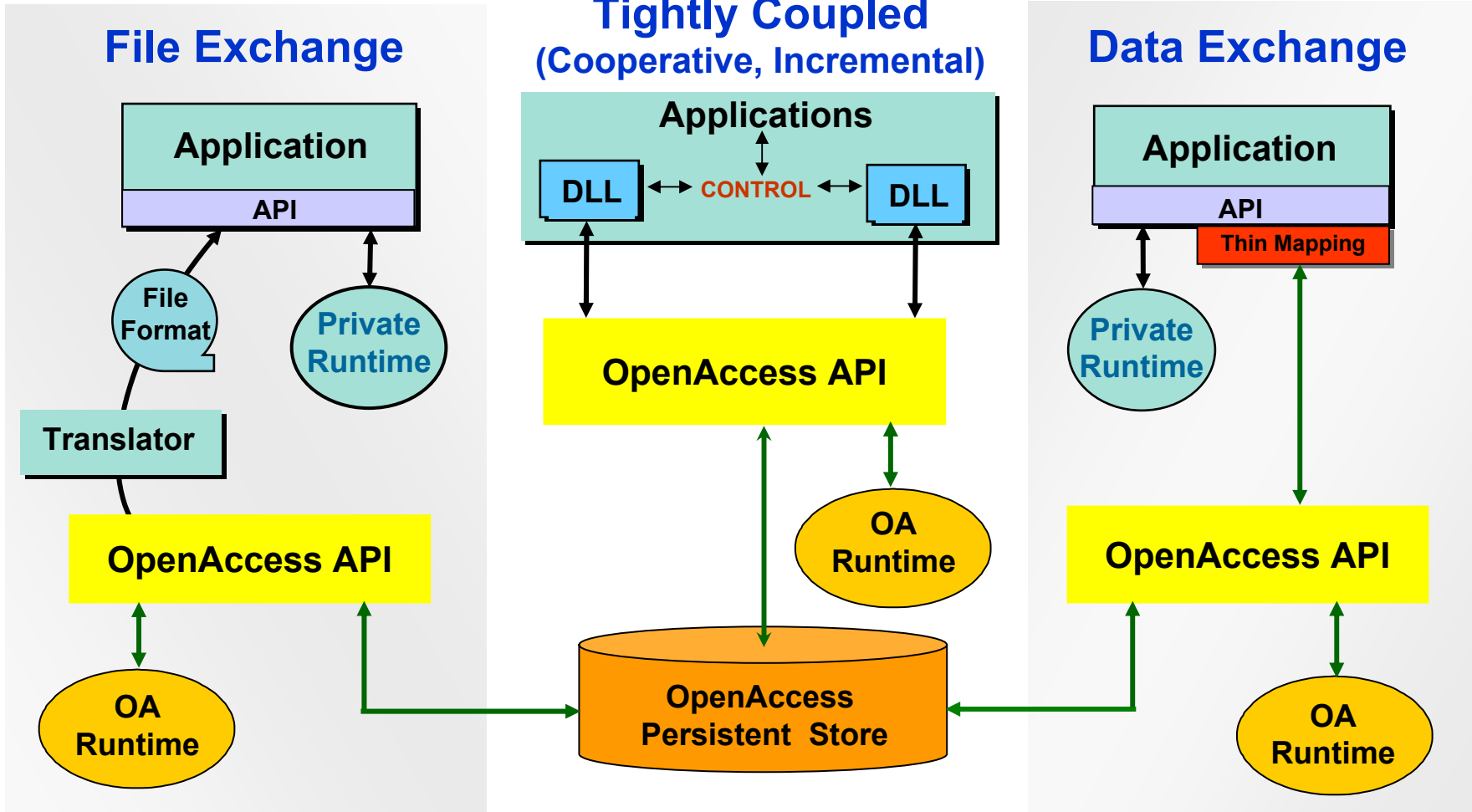


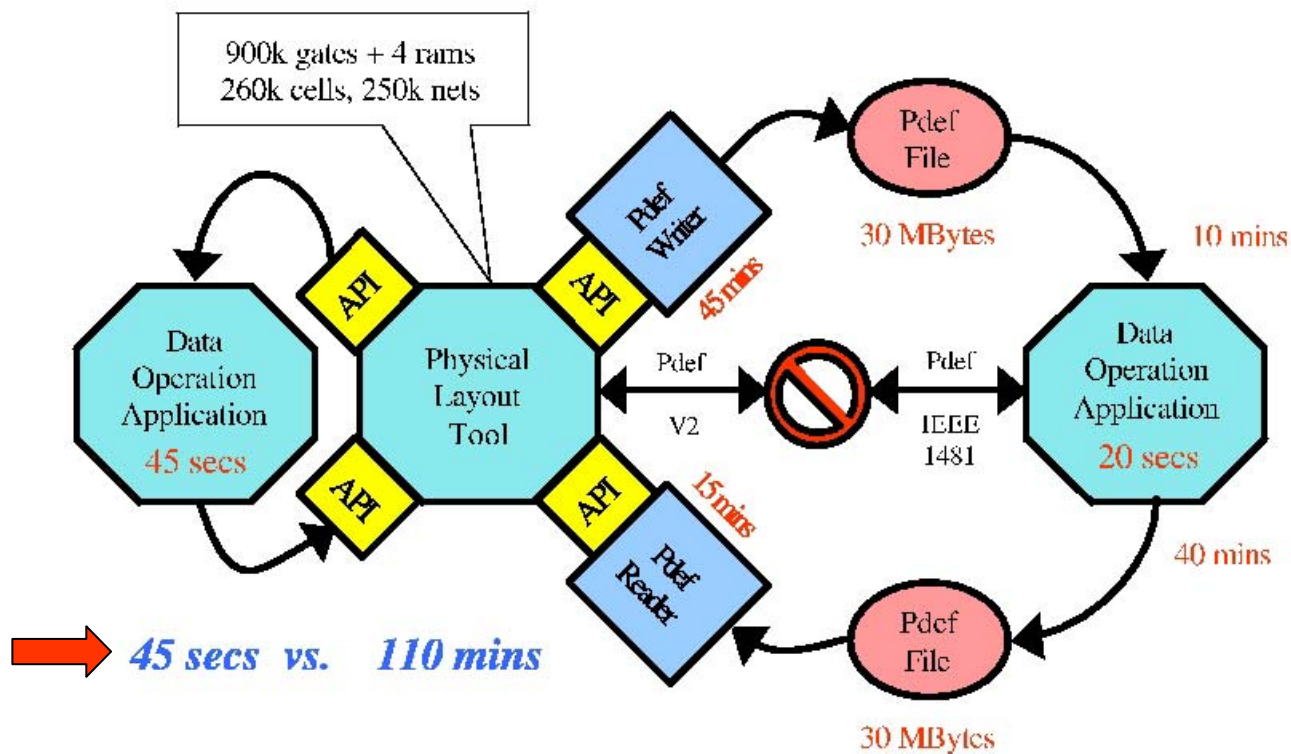
Writing translators:

- Compelling job description for a PhD? Or, how to drive him/her to your competition!
- Cost of developing and maintaining above flow 3-5X that of tool cost
- Problems in translation:
 - ◆ At any **instant of time**, what App(i) delivers is not what App(i+1) expects (syntax/semantics)
 - ◆ Over **period of time**, App(i) evolves differently from App(i+1), so translator between App(i) and App(i+1) must evolve

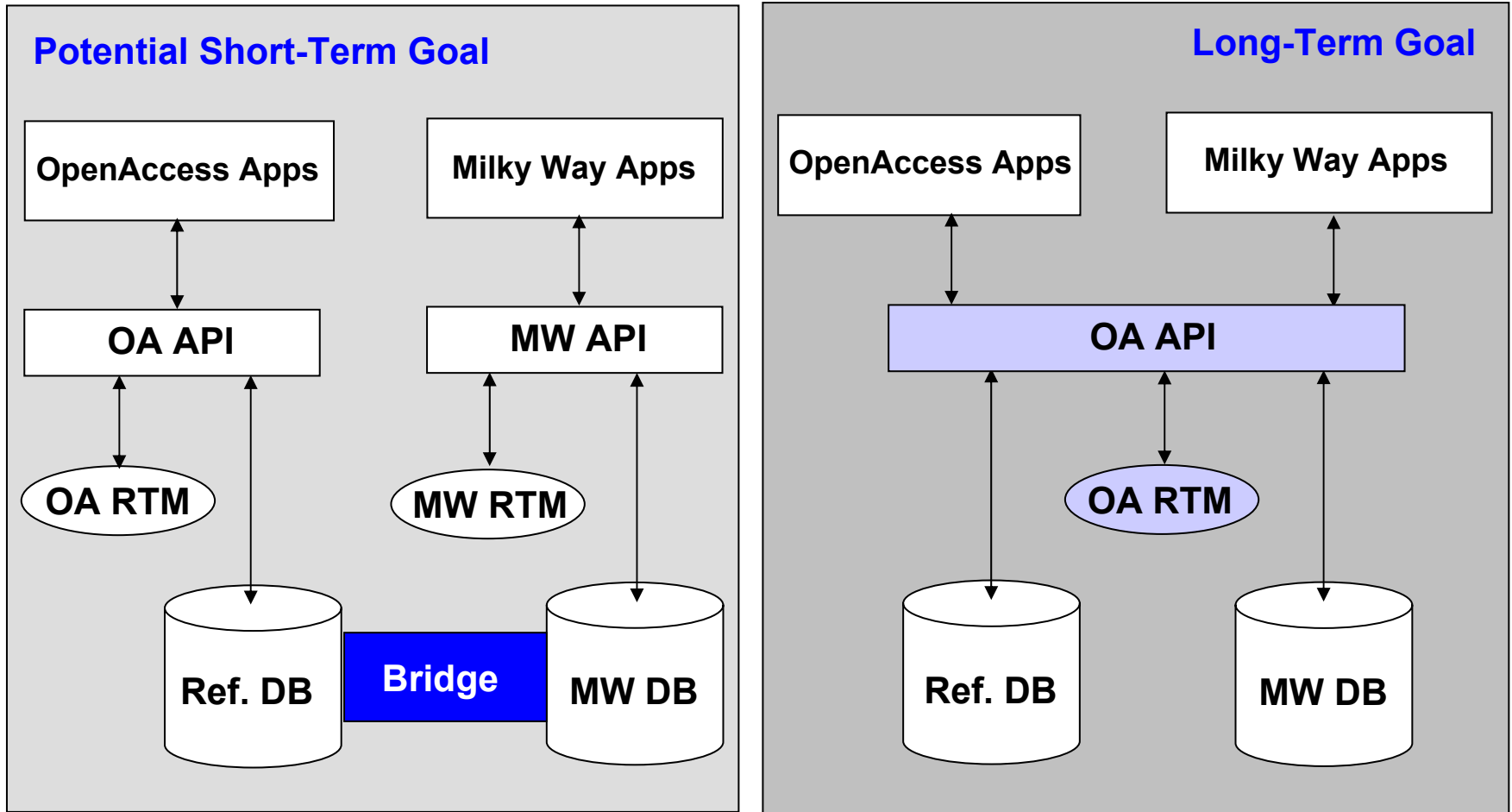


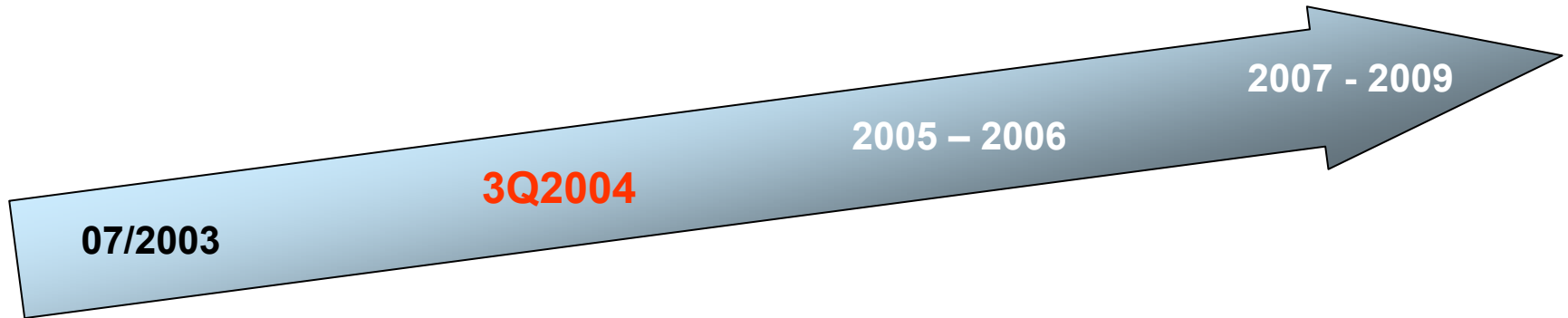
Streamlined Design Flows for 90nm & Beyond!





Courtesy of: LSI LOGIC





Key items:

- EMH
 - ◆ Logical / Physical hierarchy
 - ◆ Occurrence Model
- Multi-threading
- And many more

Key items:

- X-routing support
- Plug-in for custom region query
- Constraint modeling
- Major release API compatibility
- Version-independent on-disk storage
- Library & design data management
- MW-to-OpenAccess translator
- And many more

Potential Key items:

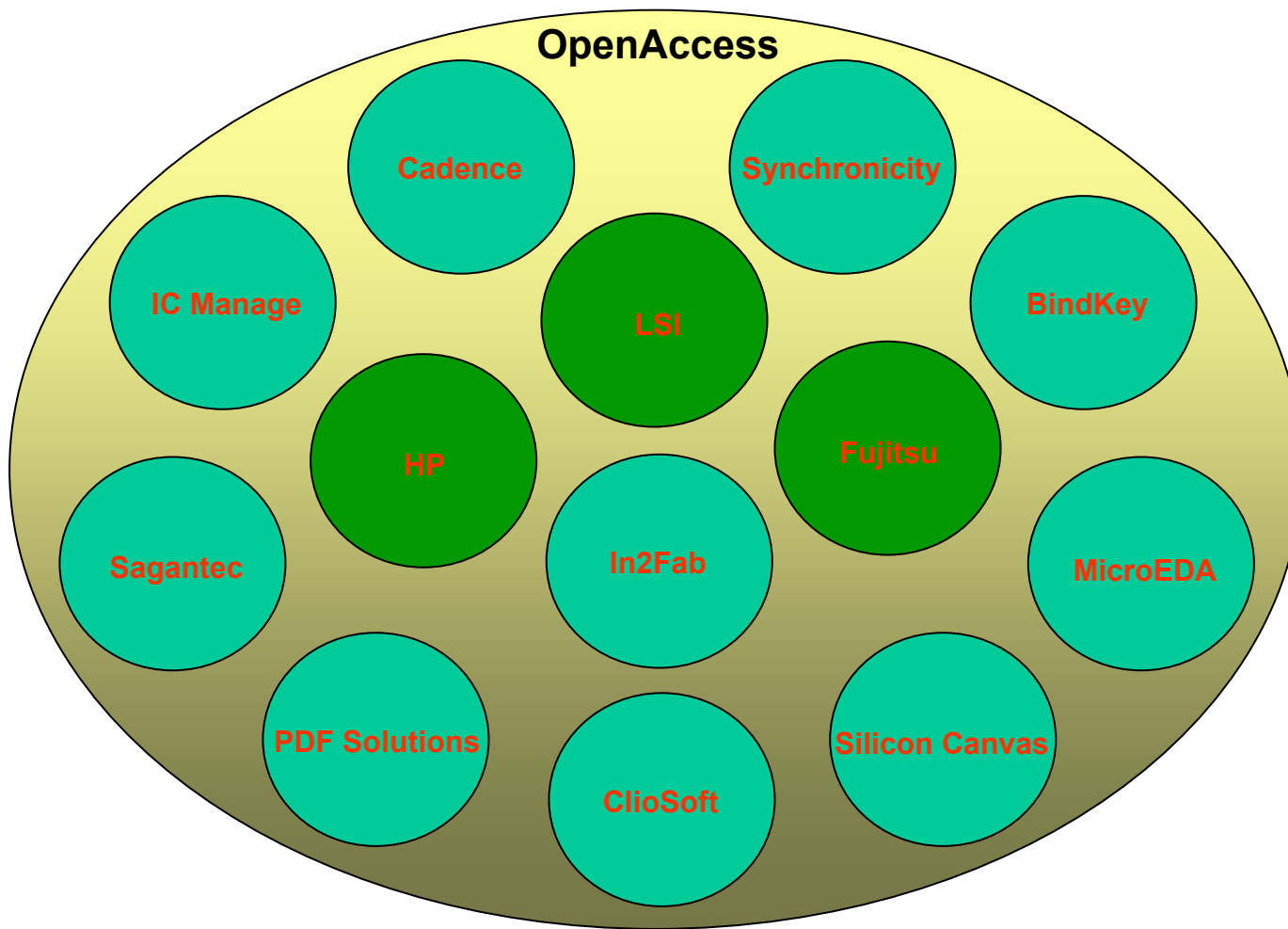
- Support design-to-manufacturing
- Timing/delay constraints
- Library modeling
- System-in-package
- Manufacturing test
- IP security
- Control-level tool communication API
- And many more

Potential Key items:

- Formal transistor-level modeling support
- Support behavioral-level data models
- Support architectural-level data models
- And many more

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Growing Plug-and-Play Ecosystem



YE2003

~~YE2002~~

- **UC, Santa Cruz**
 - ◆ Student conducting OpenAccess-based research, ported and contributed Linux version of OpenAccess
- **NC State**
 - ◆ Design flow course based on OpenAccess, potential future research project based on OpenAccess
- **UC, Berkeley and UC, San Diego**
 - ◆ VLSI course using OpenAccess training materials from Si2
- **U. of Michigan**
 - ◆ Evaluating future research project based on OpenAccess
- **CMU**
 - ◆ Student starting on OpenAccess training materials from Si2 prior to research project
- **SUNY, Binghamton**
 - ◆ Student starting on OpenAccess training materials from Si2 prior to research project
- **U. of Tokyo**
 - ◆ Initial discussions on using OpenAccess as basis for course work and training

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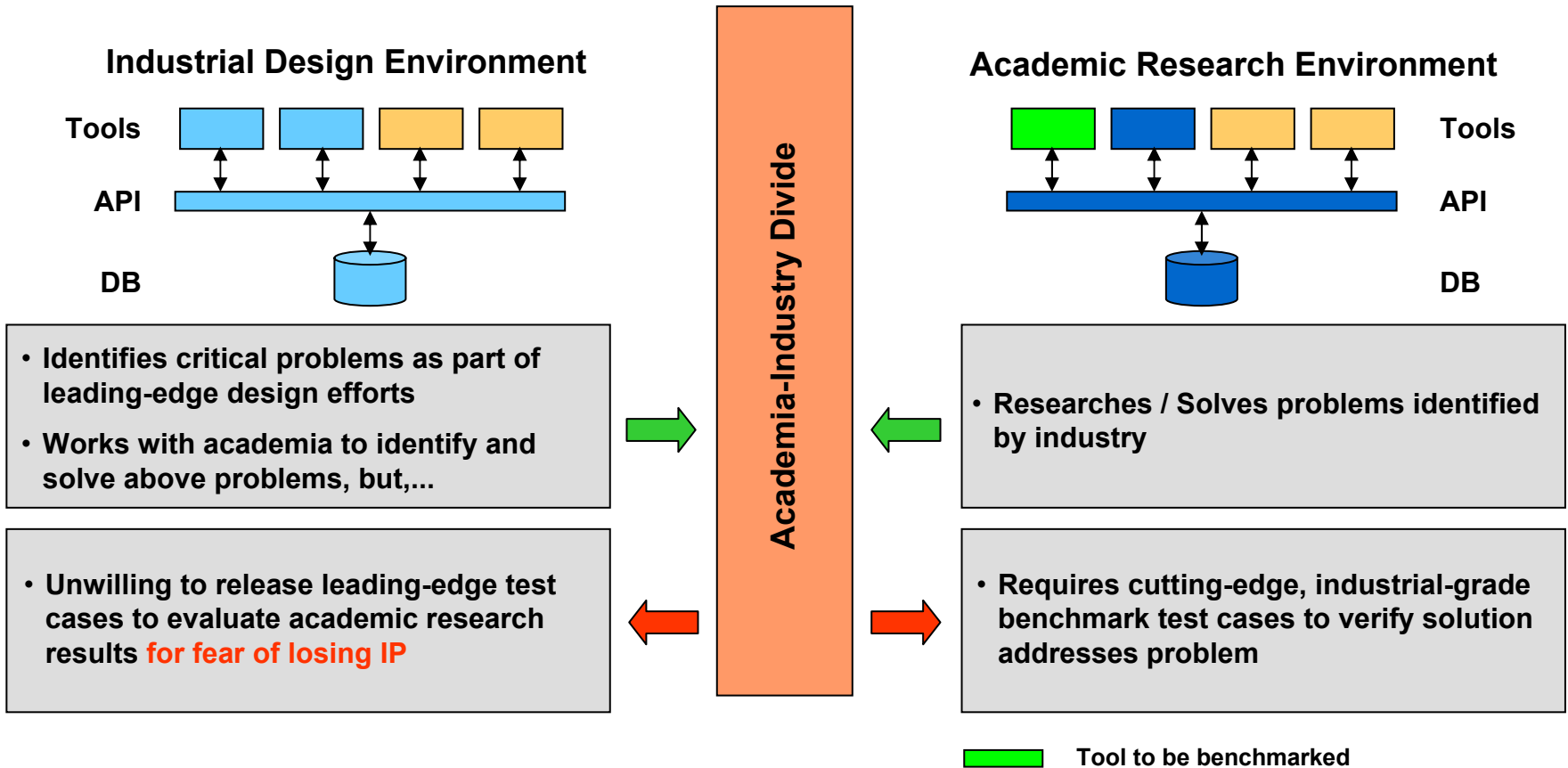
- **Saves investment in proprietary API / data model / database solution**
- **Enhances interoperability with vendor tools**
 - ◆ Reduces/eliminates investment to develop/maintain translators
 - ◆ Plug-and-play access to new tools reduces integration costs
 - ◆ Reduces/eliminates performance impact of 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**

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

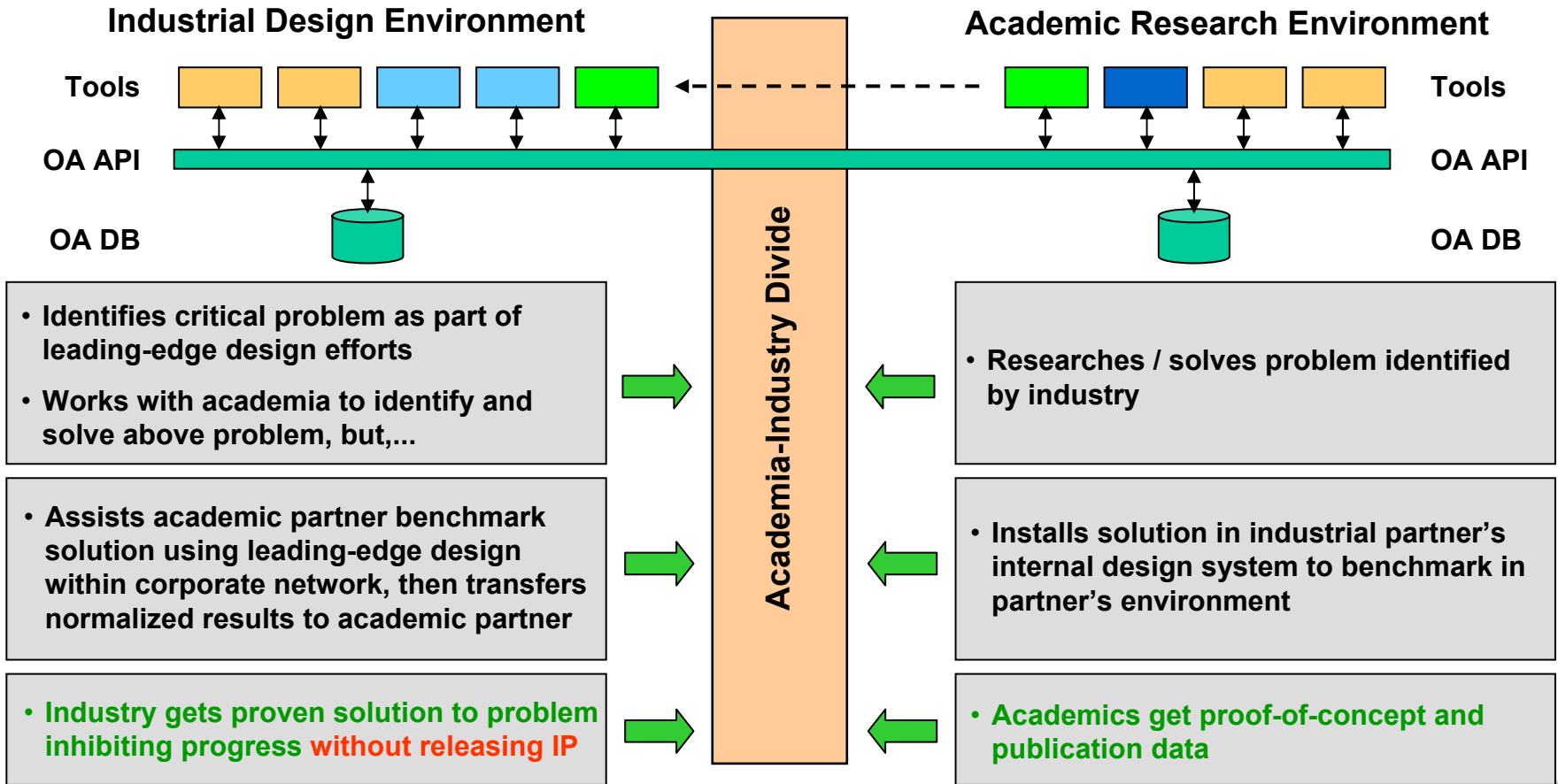
- **Small EDA companies:**
 - ◆ **Reduces barrier to entry, i.e., quicker “startups”, faster ROI**
 - Less infrastructure to develop
 - Custom infrastructure may be barrier to acceptance
 - Focus on tool development
 - ◆ **Less interfacing effort**
 - Quickly sell to a larger market

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

Benchmarking Today:



Benchmarking based on OpenAccess: A Proposal!



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- **Step 1: Initiate what other universities have begun**
 - ◆ Sign up for OpenAccess training
 - ◆ Inject OpenAccess into appropriate courses
- **Step 2: Evaluate / initiate research projects based on OpenAccess**
 - ◆ EDA algorithms
 - ◆ Database issues to enhance capabilities / capacity / performance

- **Si2 web-sites:**

- ◆ www.openeda.si2.org
- ◆ www.si2.org

- **Si2 contacts:**

- ◆ **Bill Bayer:** bayer@si2.org
- ◆ **Bob Carver:** bobc@si2.org
- ◆ **Sumit DasGupta:** dasgupta@si2.org

