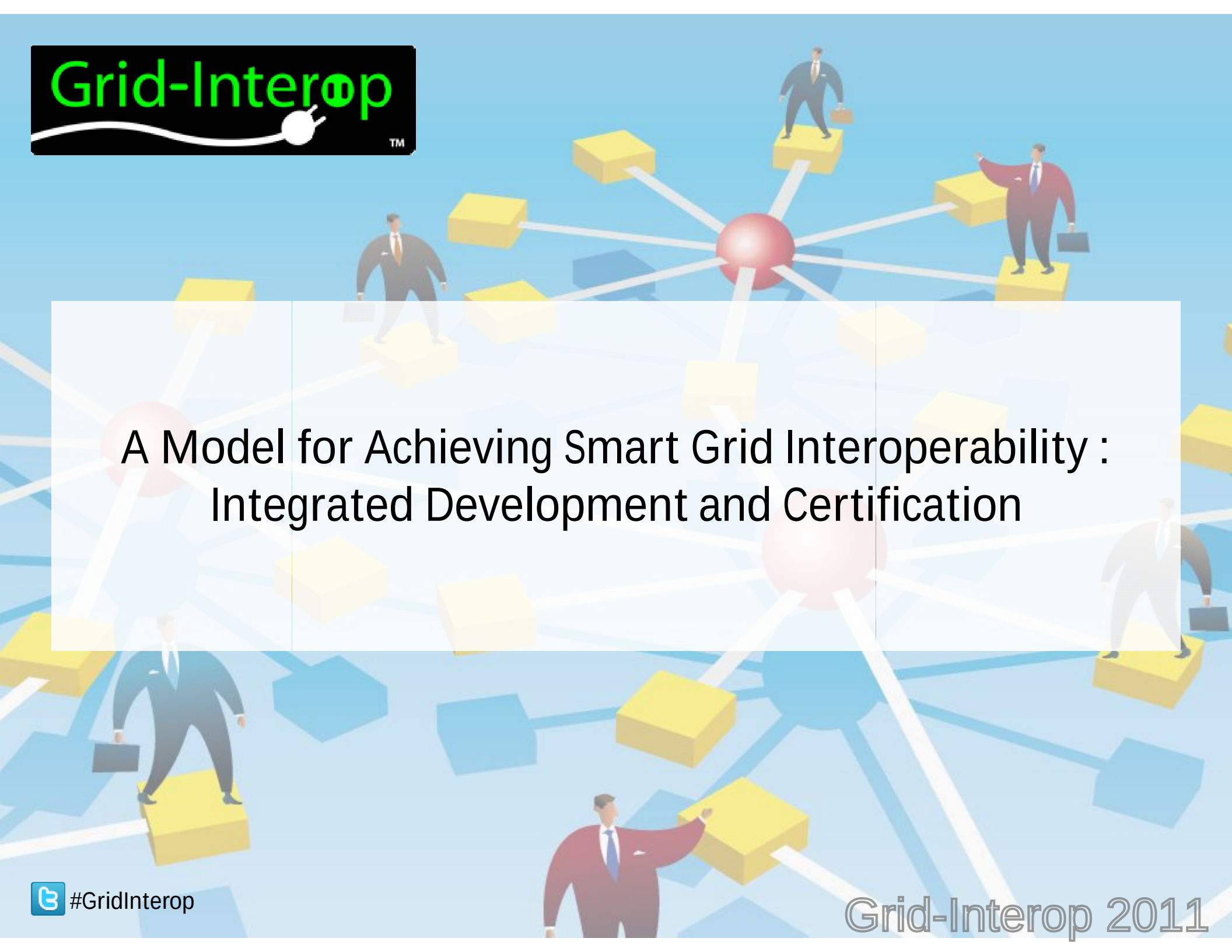
The SGIMM and Integrated Development, Test and Certification

Grid-Interop 2011

Agenda

- Smart Grid Product Interoperability
  - Achieving Interoperability
  - One Standard: One Set of Tests
- Integrated Development and Certification Model
  - Development Test Tools
  - Development and Certification
- Who Pays?
  - Models
  - Example Scenario
- Achieving Interoperability: Conclusions and Recommendations
- The SGIMM and Testing



A Model for Achieving Smart Grid Interoperability : Integrated Development and Certification

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Achieving Interoperability Between Products Requires…

- Customers who demand standard, interoperable products
- Technical Specification with minimal options and ambiguities
- Standard Conformance AND Interoperability Engineering tests
- Certifications that are integrated with development and test process

Customers Who…

- Do not assume that “certified” means products will integrate seamlessly together
- Are specific in RFPs on conformance and interoperability requirements
- Plan for independent assessment of conformance and interoperability of proposed products
- Monitor relevant standards to understand the state of the standards and certifications

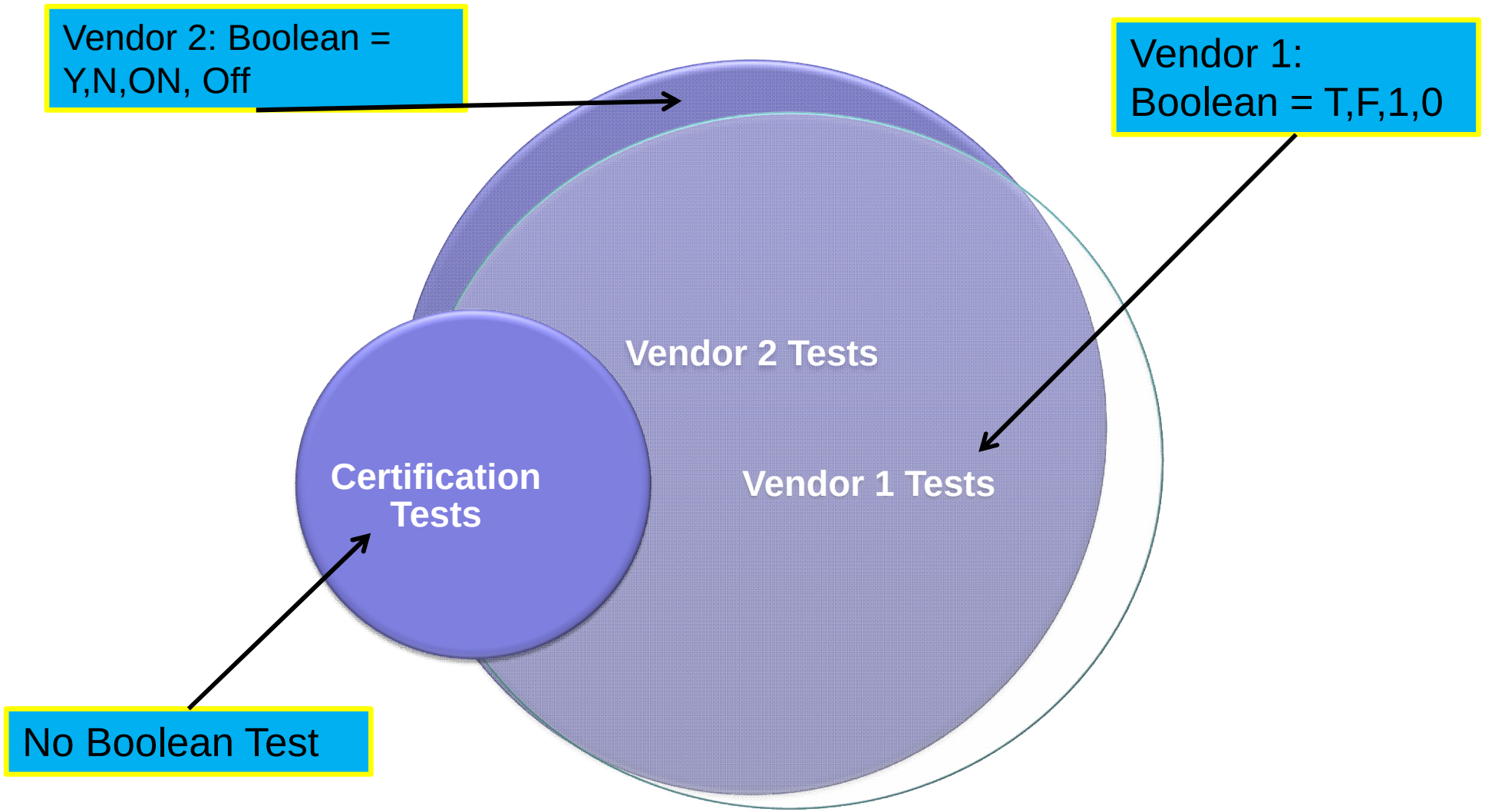
Unambiguous Specifications

- Ambiguities and options increase risks to interoperability, for instance:
- *Boolean values are initialized to be values representing True or False. However, IEC 61850-6 is mute on the actual value that should be used. This means that values consisting of: T, F, Yes, No, Y, N, On, Off, and other permutations could all be argued to be valid.*
- Different vendors can implement in conformant but differing ways

One Spec: One Test

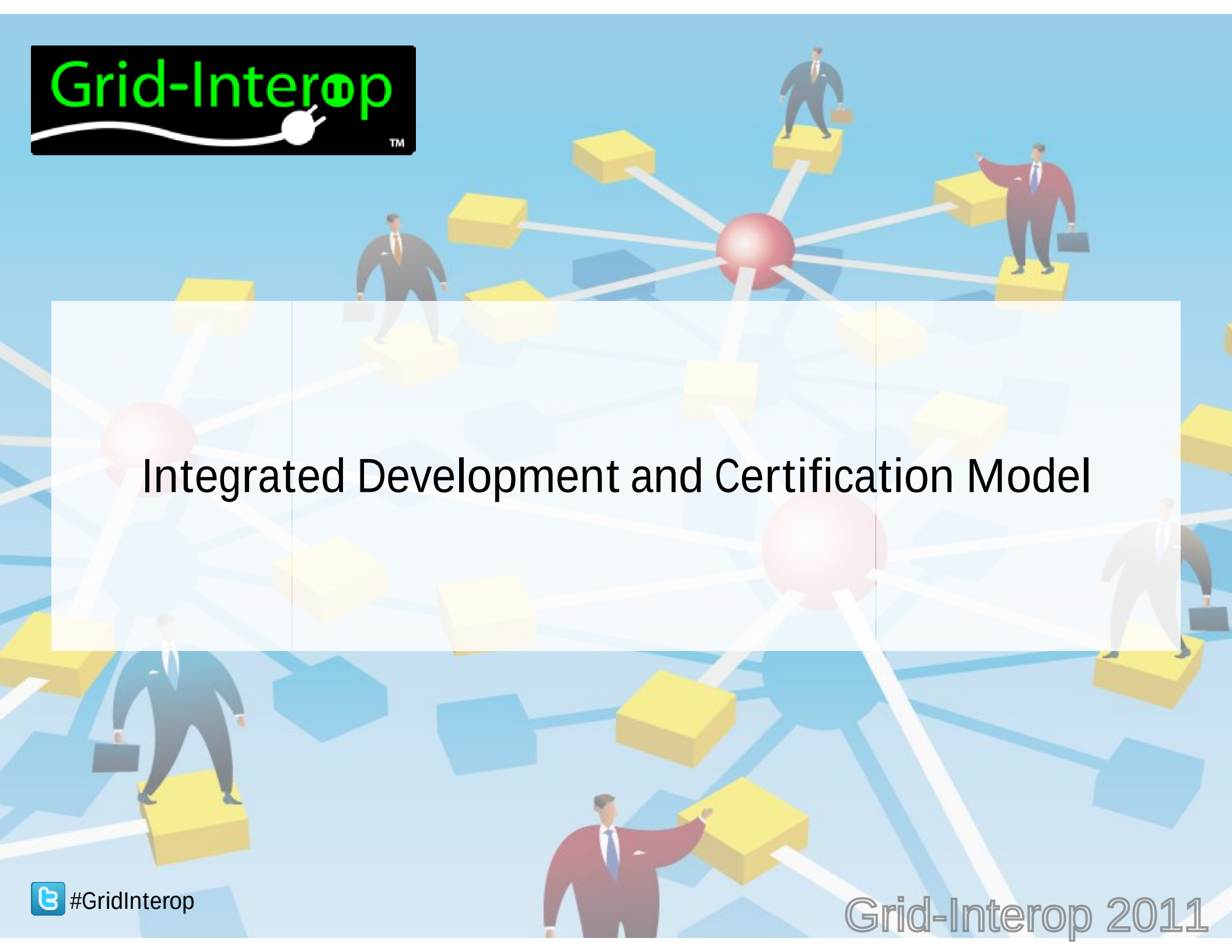
- For each feature/function defined in a Standard Technical Specification…
- There should be a single set of “official” conformance tests
- Without such a model (one spec: one test) interoperability risks increase greatly

Why do Interoperability Problems Exist?



Implications

- If each vendor develops conformance tests for a standards-based product…
- Very likely to have different interpretations of ambiguous specifications
- Leading to interoperability problems
- PART of the SOLUTION
  - ***One official (industry-accepted) comprehensive set of conformance tests!***

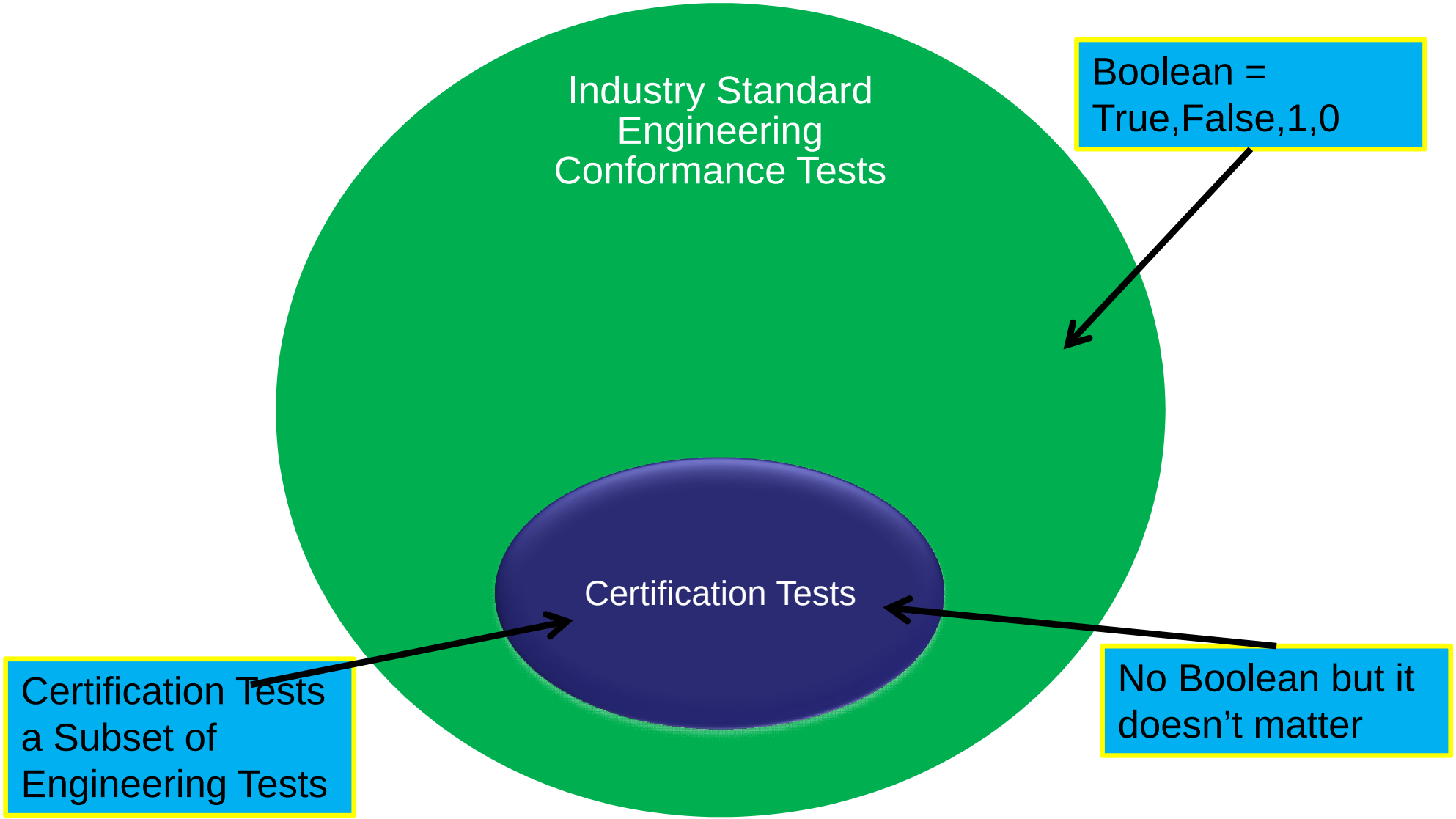


Integrated Development and Certification Model

Integrated Development/Certification Model

- Historic certification model
  - Vendors develop engineering tests independent of certification tests
  - Certification tests a subset of possible tests
  - No comprehensive “standard” test suite for all of the specification
- Integrated engineering and certification testing model
  - Comprehensive standard conformance tests – covers all features, functions and options
  - Developed by Alliance or independent 3rd Party
  - Certification tests are subsets of engineering conformance tests
  - Certifications integrated with development cycle

Integrated Conformance Testing & Certifications

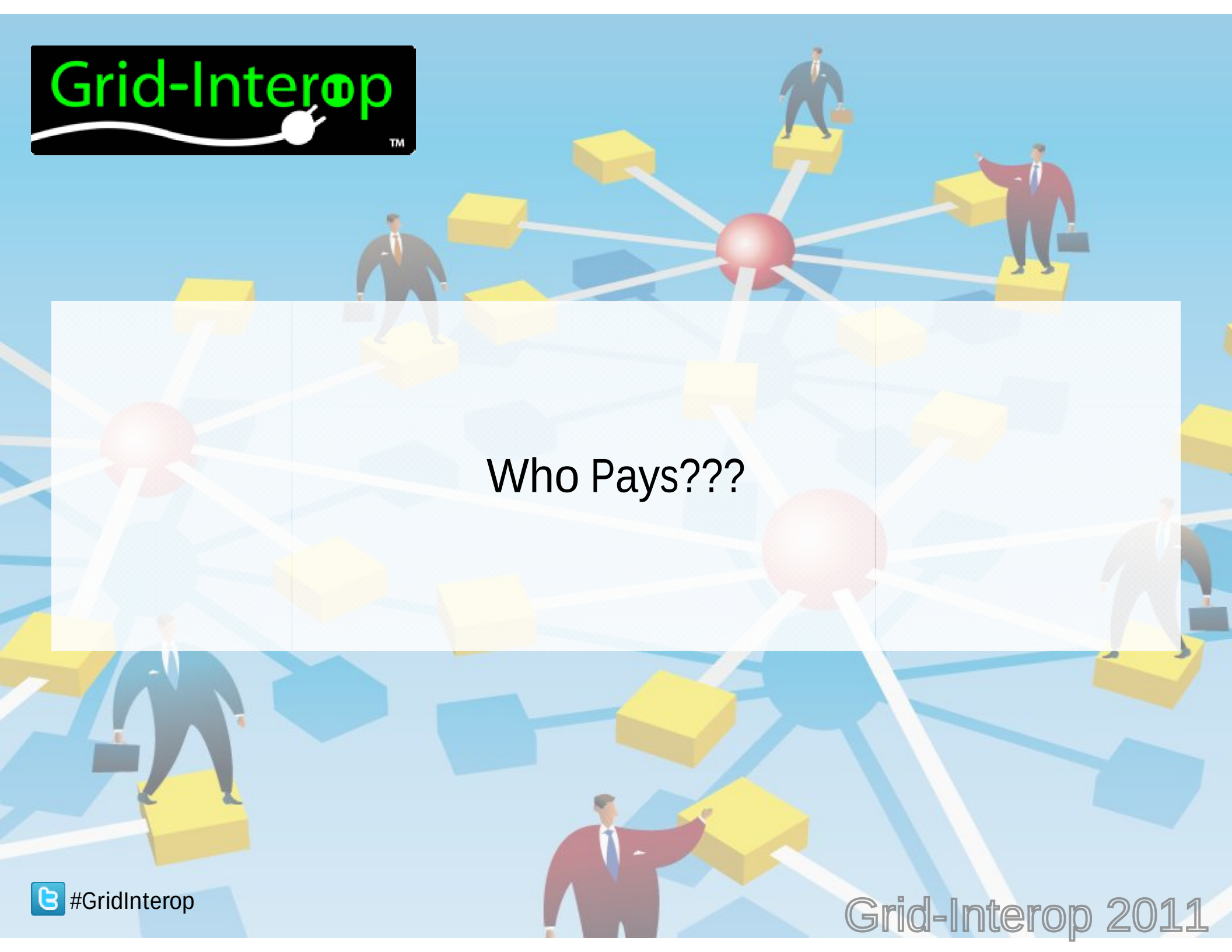


Benefits of Integrated Model

Improved efficiency and effectiveness of industry interoperability:

- Preparation for certification embedded in development process
- Streamline the certification process for vendors using standard conformance development test tools
  - Self-certification (with independent audit)
  - Preferential, accelerated certification
- Engineering feedback on certification tests will be earlier and broader, improving the certification tests rapidly

Combination of standardized engineering tests and certification tests accelerate and best insure interoperability of products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Who Pays???
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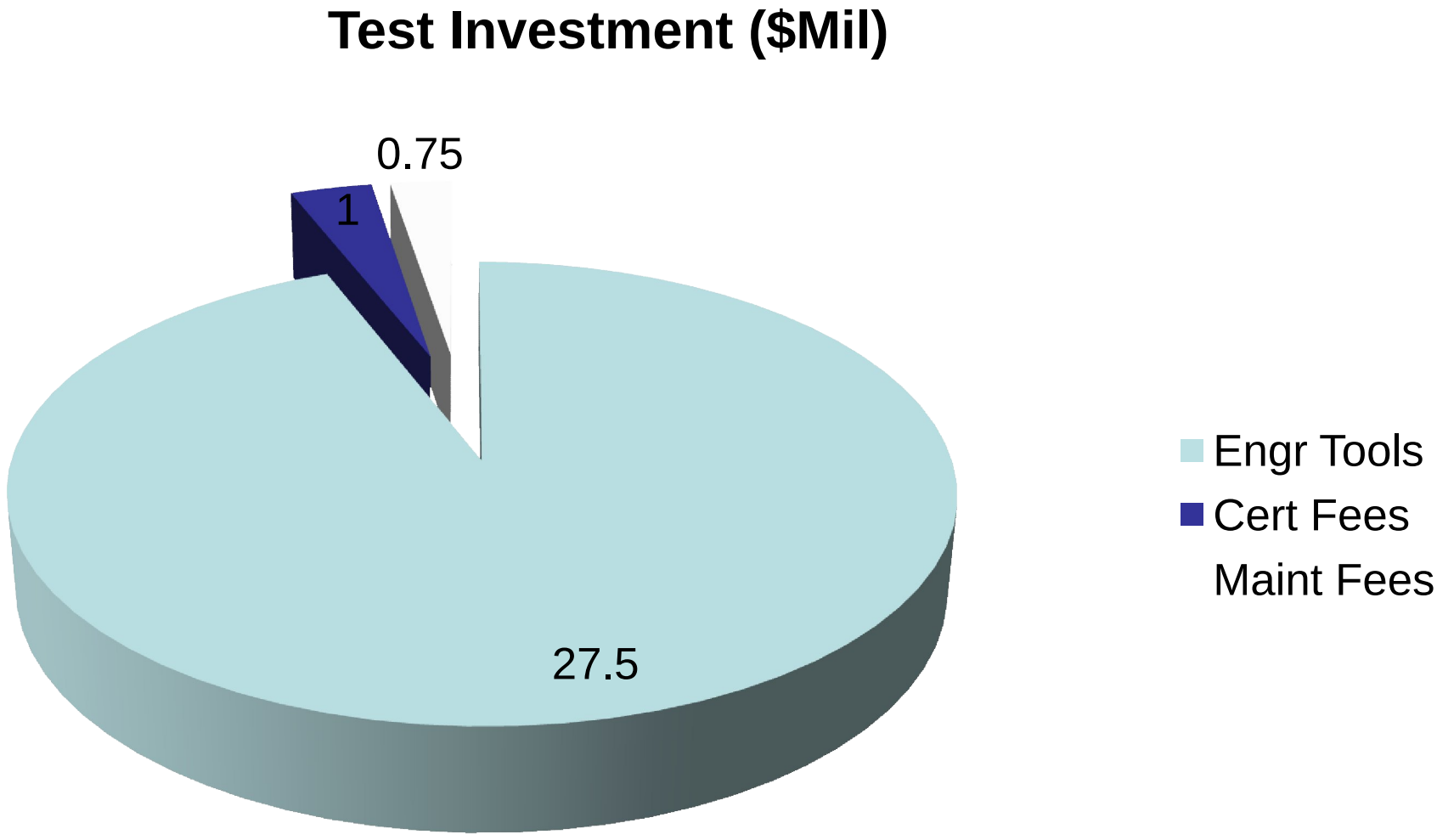
Ecosystem Economics

- Two scenarios
  1) Historic Certification Model
     - Certification tests developed independently
     - Each vendor develops own engineering tests
  2) Integrated Model with “Official” Comprehensive Engineering Test Tools
     - Single set of tools available for sale to vendors
     - Certification tests subset of Engineering Tools
- Fifty Vendors: Tool Investment = $1.1 Mil for commercial quality tools

Ecosystem Economics: Scenario 1

- Assume vendor investment = 50% of commercial cost
- Vendor engineering tool investment = 50 x $550,000 = $27,500,000
- PlugFests and Certifications = $10-20,000/year per vendor = $500,000 - 1,000,000
- Support and Maintenance = $15,000/year per vendor = $750,000/year

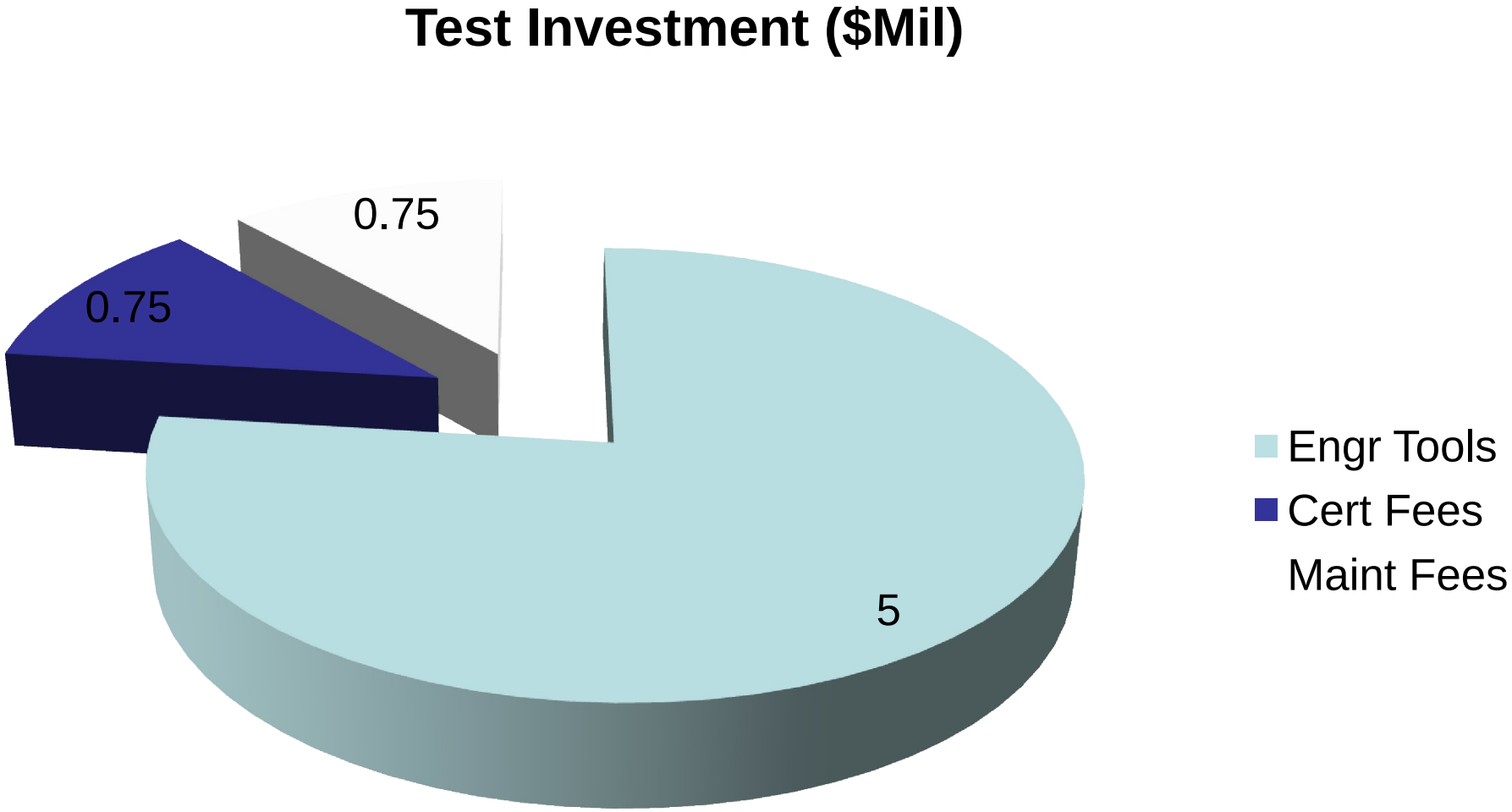
Ecosystem Economics: Scenario 1



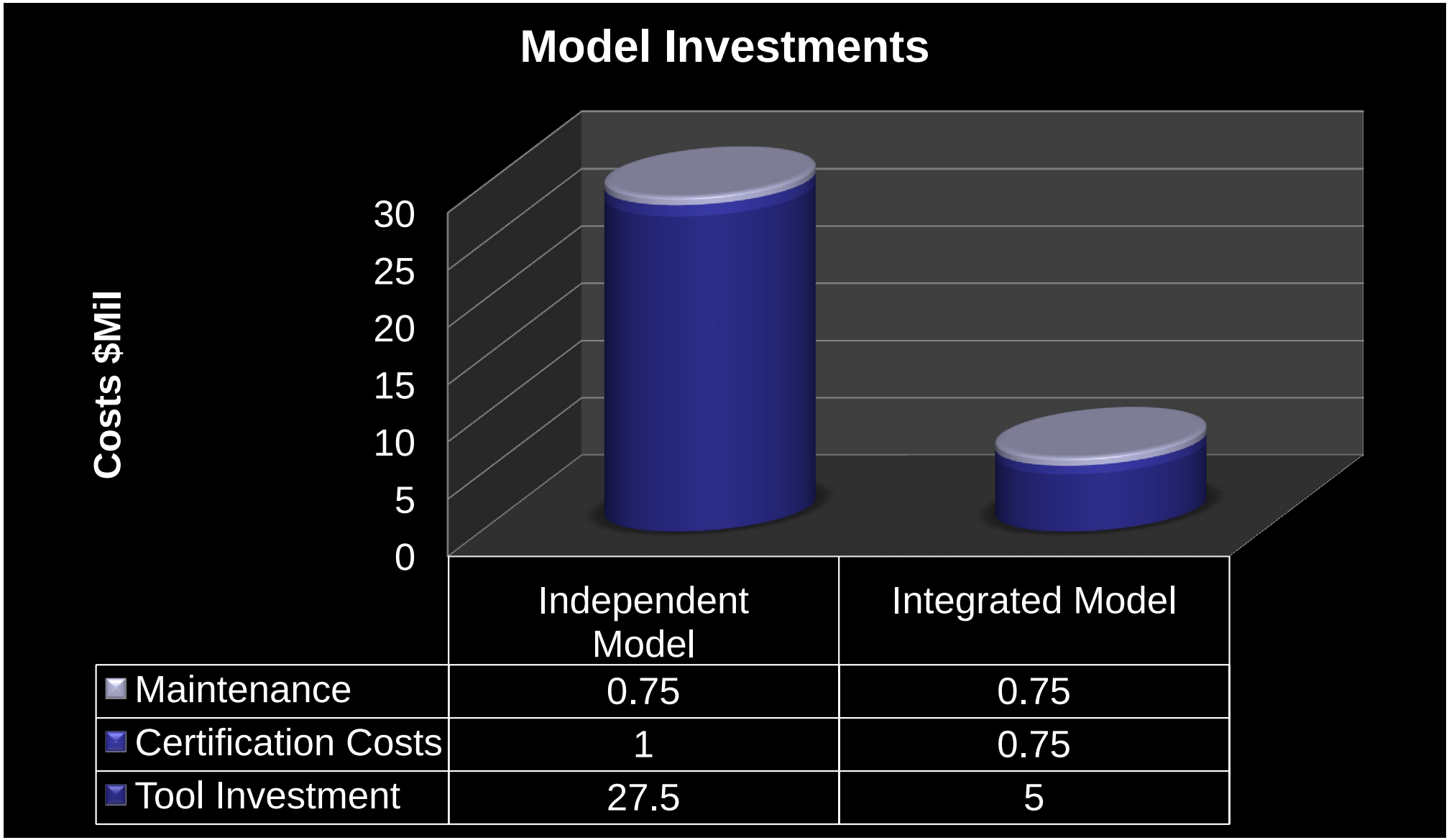
Ecosystem Economics: Scenario 2

- Assume vendor investment = $100,000 purchase of commercial tools
- Vendor engineering tool investment = 50 x $100,000 = $5,000,000
- PlugFests and Certifications = $5-15,000/year per vendor = $250,000 - 750,000
- Support and Maintenance = $15,000/year per vendor = $750,000/year

Ecosystem Economics: Scenario 2

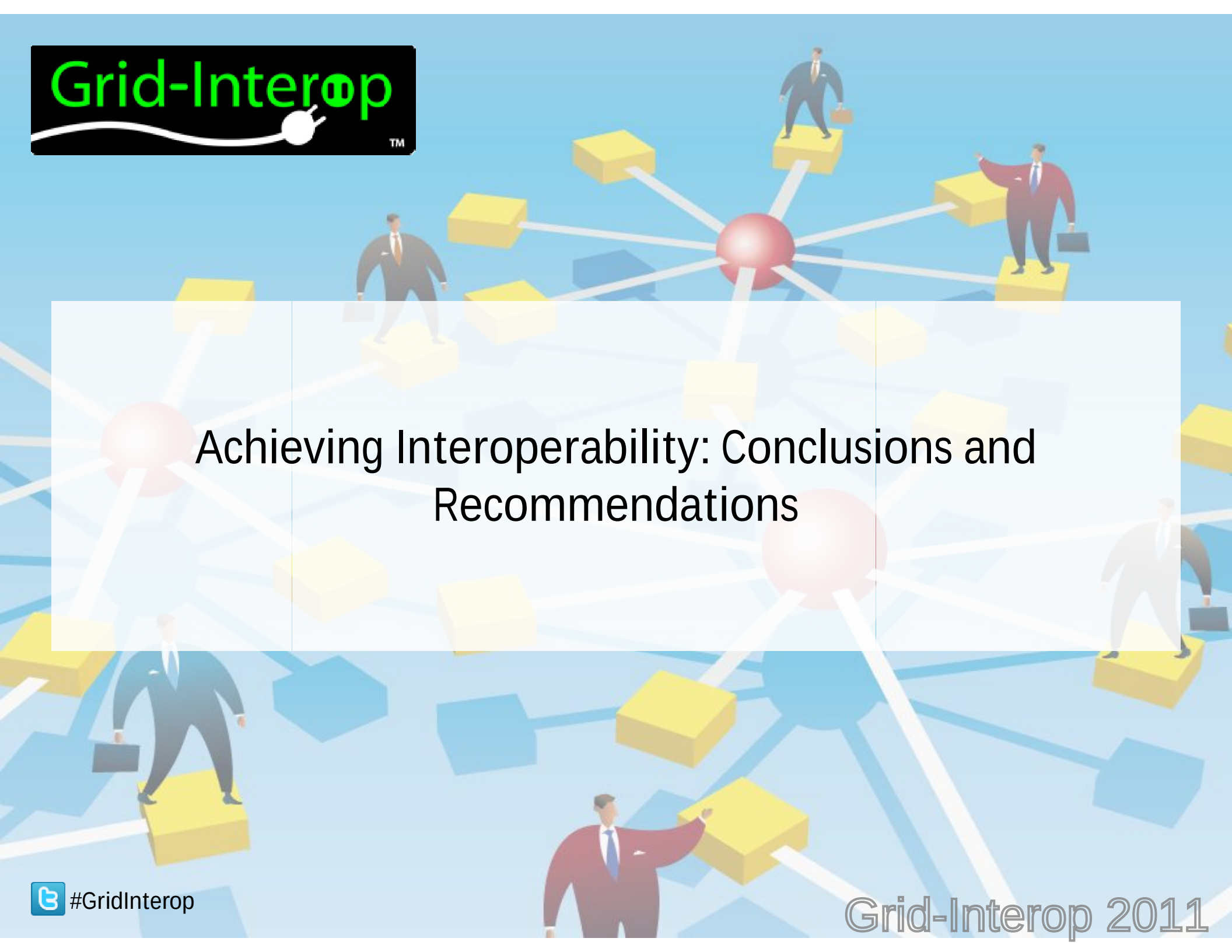


Scenarios Compared



Integrated Process Benefits

- All vendors (hopefully) use the same engineering tests
  - Interoperability easier to achieve than if each vendor develops own test tools
- Vendors save significant investment and engineering time
  - Reduces overall development costs and schedule
- Vendors get supported, maintained, well documented tests
  - Faster than self developed
  - Higher quality tests
  - Accelerated product schedules
- Industry alliance saves cost and time using subset of engineering tests for certification tests
- Certification programs can include reduced fees and schedule for those using the engineering tools



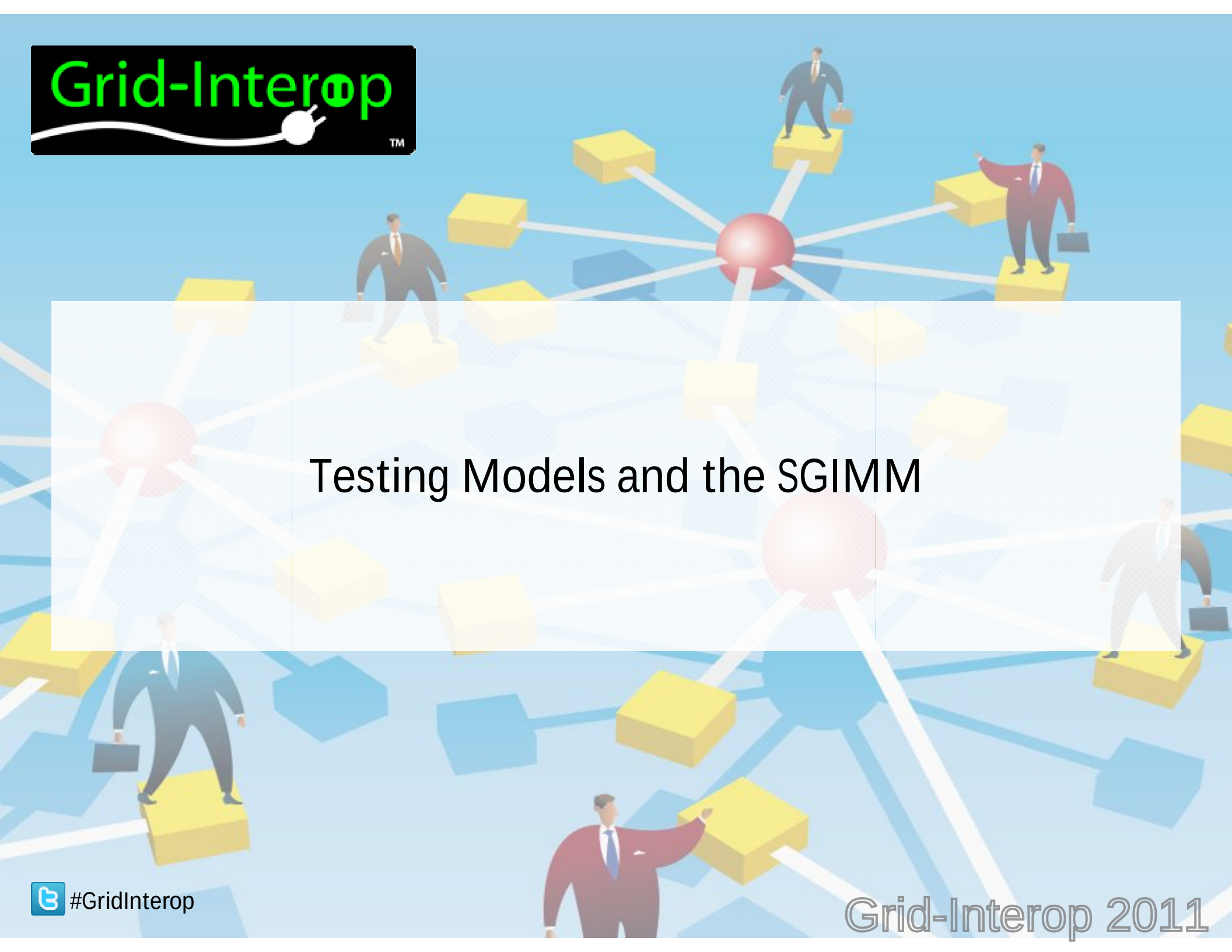
Achieving Interoperability: Conclusions and Recommendations

Conclusions

- Industry certification programs
  - Generally test a subset of functions for conformance
  - Generally developed independent of engineering tests
- To achieve interoperability, there needs to be industry-standard, comprehensive set of engineering tests for conformance
  - Certification tests as a subset
- If industry funded a common set of engineering tests for a standard, it would:
  - Accelerate interoperability significantly
  - Reduce time to market and certification and
  - Significantly reduce engineering investments in engineering test tools

Recommendations

- For each standard, develop a single comprehensive set of engineering tests and test tools that are independent of any one product vendor
  - Alliance investment
  - Consortium of customer and vendors that invest in and own the tests
  - Encourage independent third party test tool developers
- Design certification programs to utilize a sub-set of the engineering tests - integrate product development and certification as a continuous process
- Develop incentives in the certification process to encourage the use of the engineering test tools



Testing Models and the SGIMM

SGIMM and Testing

Maturity Level	Test/ Certification	
Level 1: Initial	Testing is ad hoc	
Level 2: Managed	Tested to plan with results captured	
Level 3: Defined	Tests exist for community with certification	Members claim compliance to standard
Level 4: Quantitatively Managed	Community test processes demonstrate interoperability	Members claim interoperable conformance
Level 5: Optimizing	Test processes are regularly reviewed and improved	

SGIMM Proposed Test and Certification Metrics

SGIMM Testing Assessment Questions

- In demonstrating that community test processes achieve interoperability, which types of tests are in use:
  - Conformance test?
    - Does the Conformance test address all of the functions specified?
    - Is it used by all vendors or participants in integrating the system?
  - Certification test: subset of the conformance test suite?
  - Interoperability testing – e.g., plugfests, simulations, other?
- Are certification conformance tests conducted by an independent third party with documented results?
- Are test cases for conformance and interoperability regularly reviewed and updated?
- Does the community provide test feedback to the ITCA for its standards?

In Summary

- Standards based interoperability can be achieved with an integrated engineering and certification model
- Understanding how to achieve interoperability informs the SGIMM assessment process