Microsoft® Research
Faculty Summit 2010

# Making a Open Ecosystem

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# Microsoft Open Protocols


http://www.microsoft.com/protocols

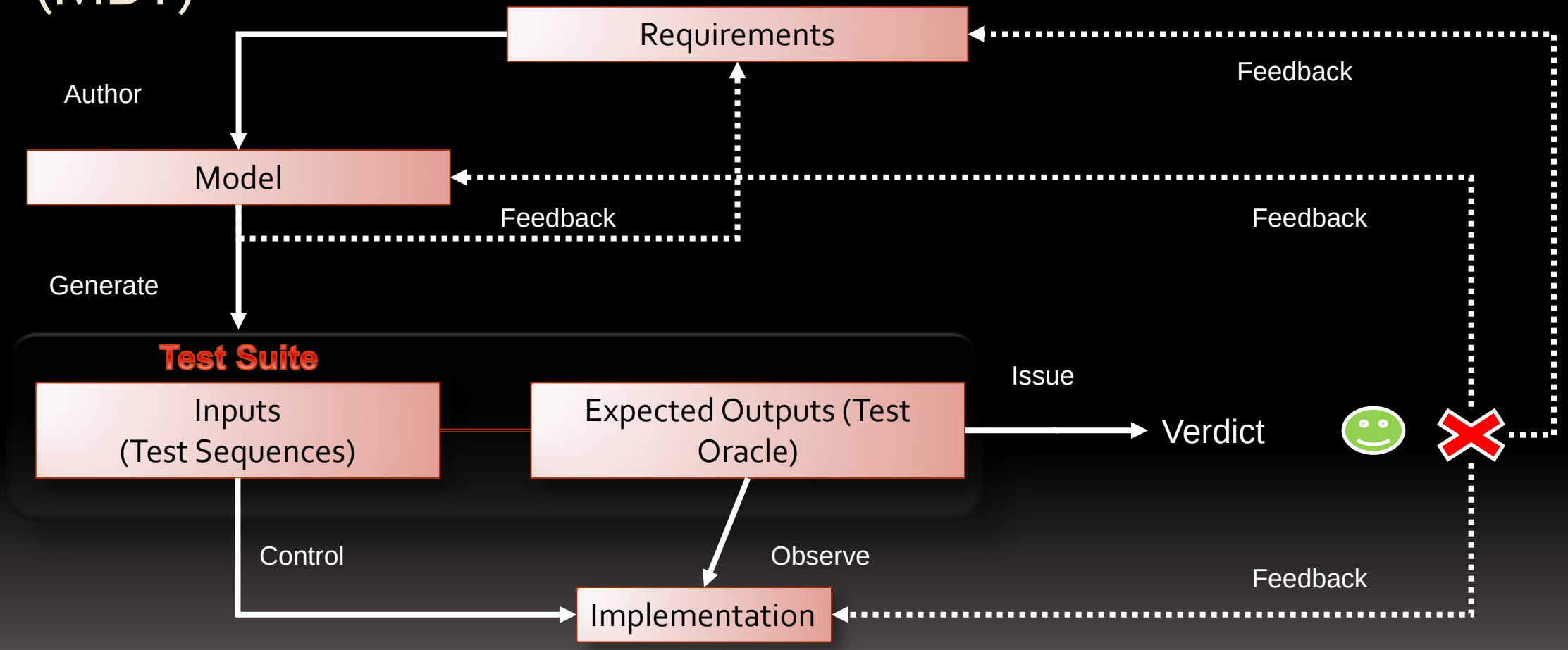
# "BlueLine" Technical Document Testing Program of Windows (as of 03/09)

- 222 protocols/technical documents tested
- 22,847 pages studied and converted into requirements
- 36,875 testable requirements identified and converted into test assertions
  - 69% tested using model-based testing with Spec Explorer
  - 31% tested using traditional test automation
- 66,962 person days (250+ years)
  - Hyderabad: 250 test engineers
  - Beijing: 100 test engineers

# Comparison MBT vs Traditional


- In % of *total* effort per requirement, normalizing individual vendor performance
- Vendor 2 modeled 85% of all test suites, performing relatively much better than Vendor 1

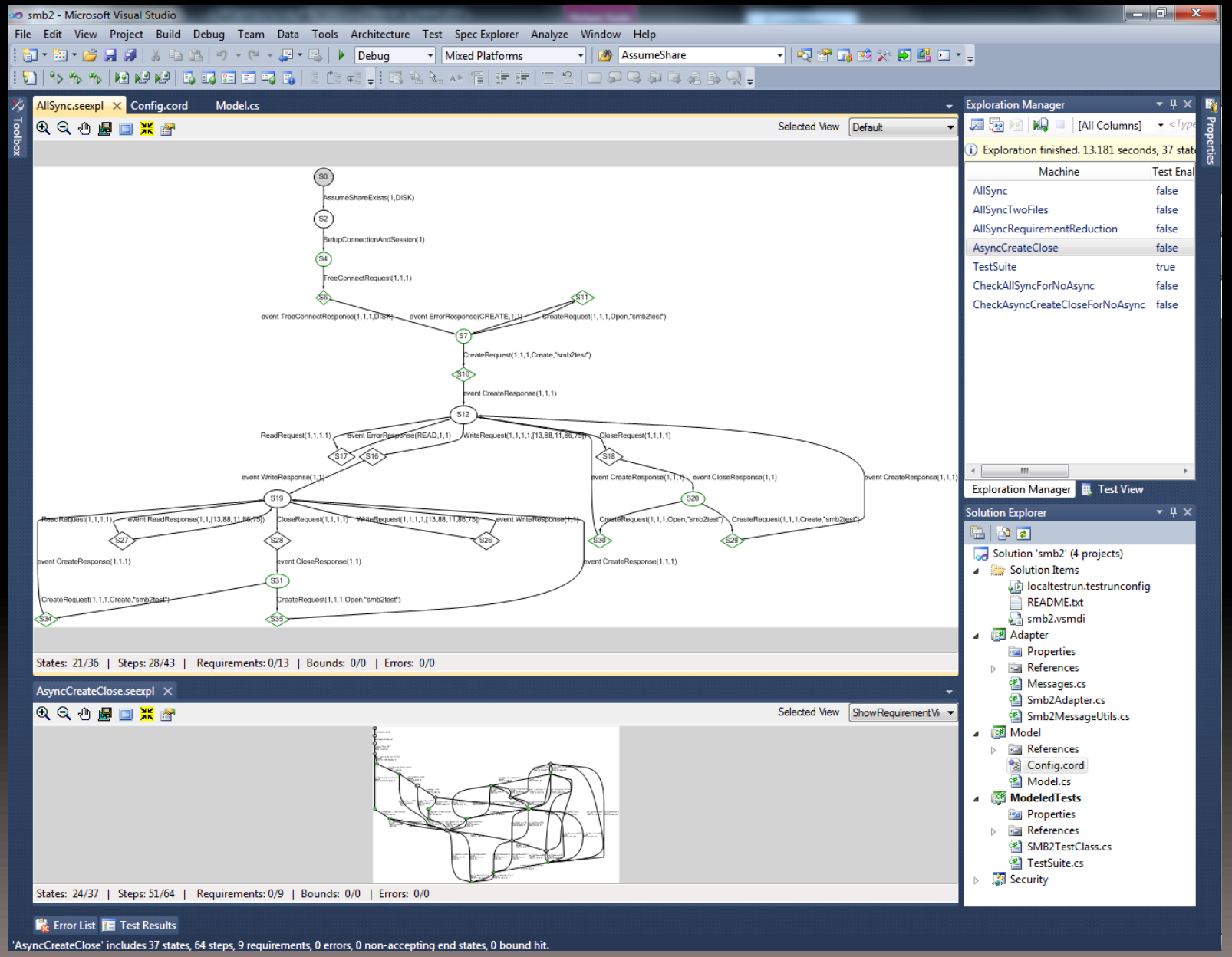
# Model-Based Testing in a Nutshell (MBT)



# Spec Explorer Features

- Visual Studio add-in
- Multiple modeling styles and languages
  - Programs, patterns, diagrams
- Asynchronous & non-deterministic systems
- State machine extraction from model program
- Test code generation from state machine
- Model composition

# Model Exploration



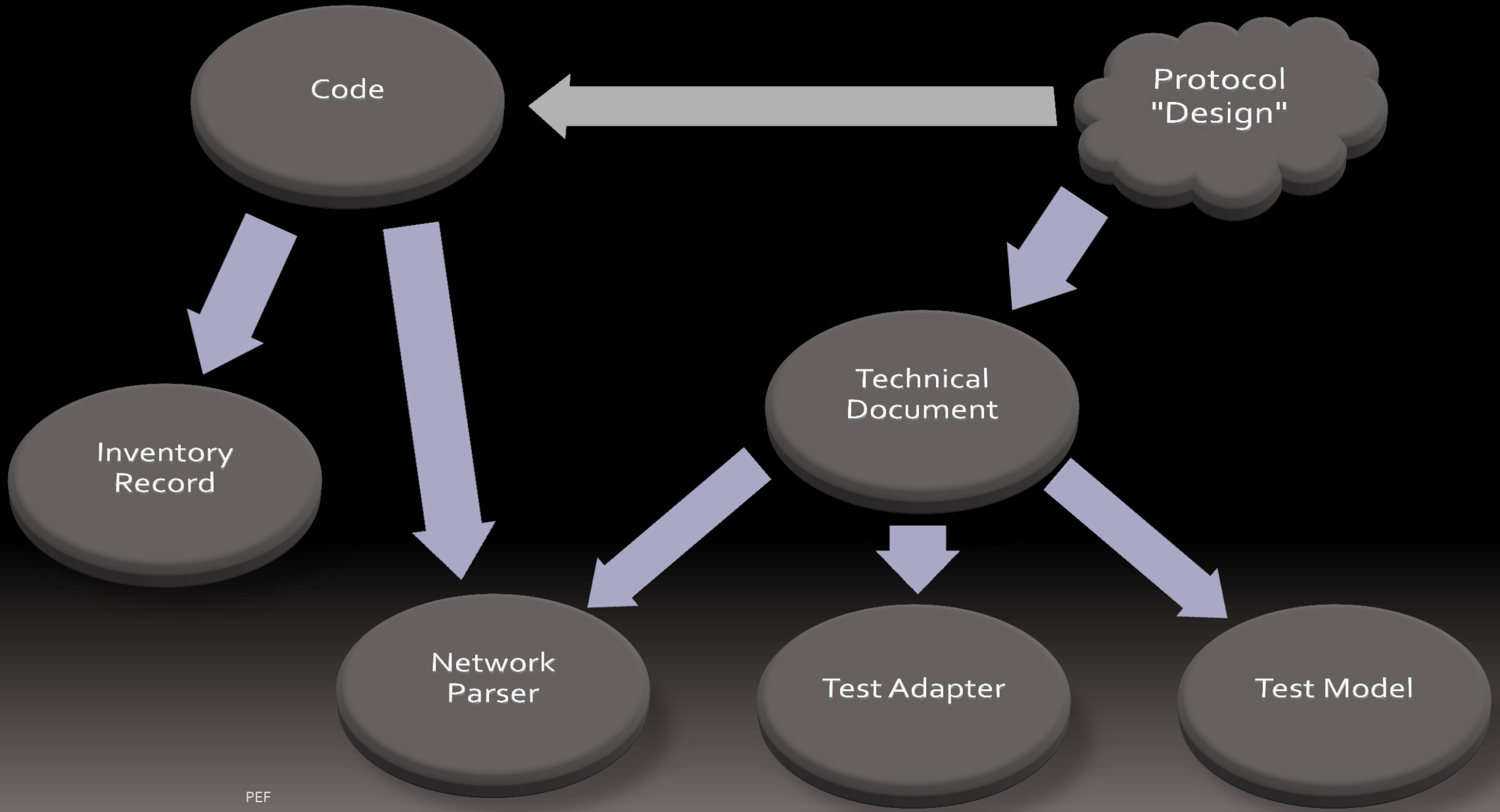
# Give it a try…

- Microsoft offers Spec Explorer 2010 as preview technology free of charge via MSDN DevLabs: http://msdn.microsoft.com/devlabs
- Licensing allows for commercial use
- Academic institutions can join MSDN Academic Alliance for access to Visual Studio 2010

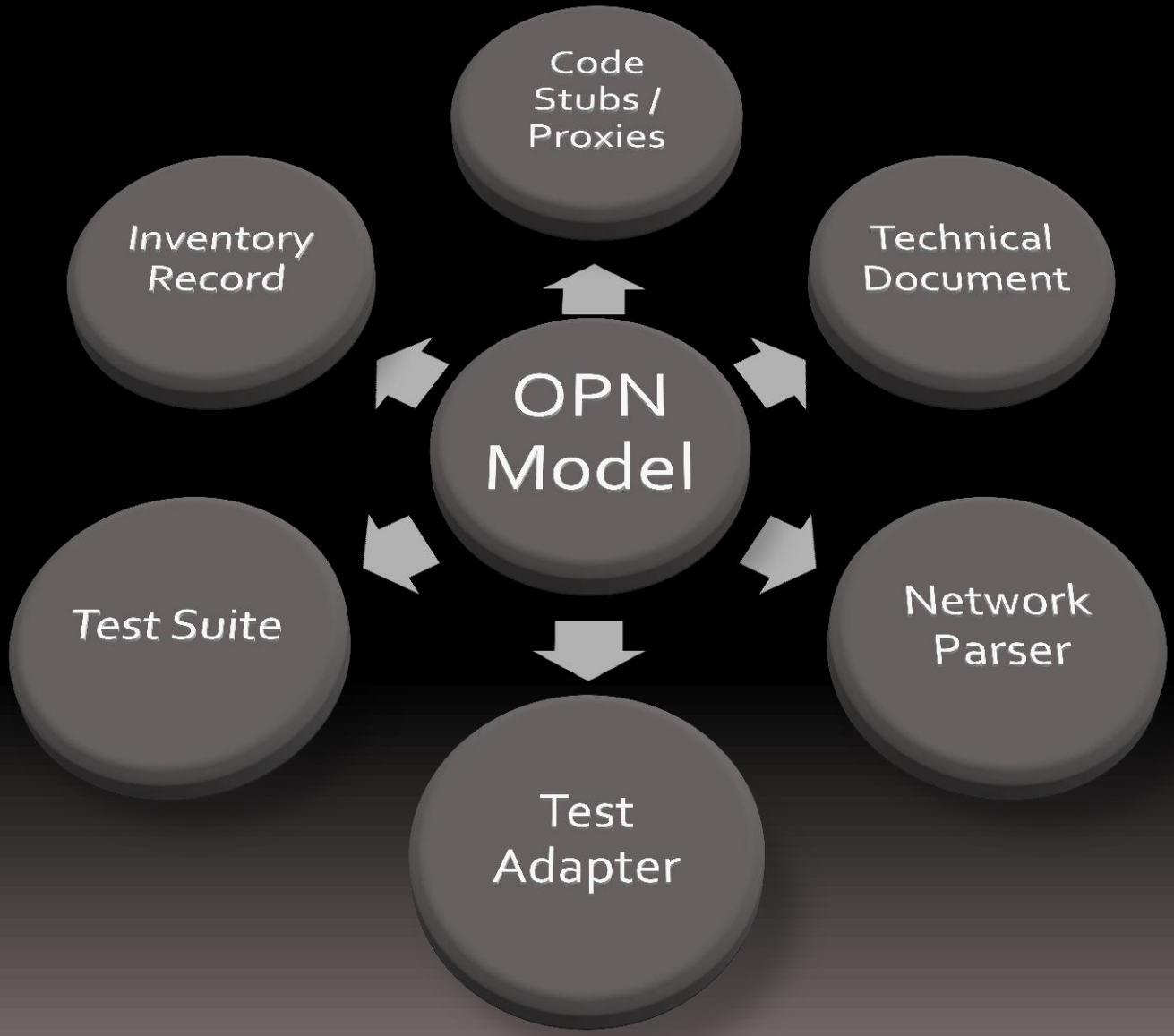
# Moving Forward: The Challenges

- Multiple masters
  - Specs, Code, Parsers, Models, Test Suites, Inventory
  - Efficiency and accuracy of creation / maintenance hard
- Verification
  - Need to improve efficiency
  - Need to reduce subjectivity
- Difficulty capturing messages
  - High bandwidth
  - Compression, encryption, and fragmentation
  - Virtualization, network stack offloading

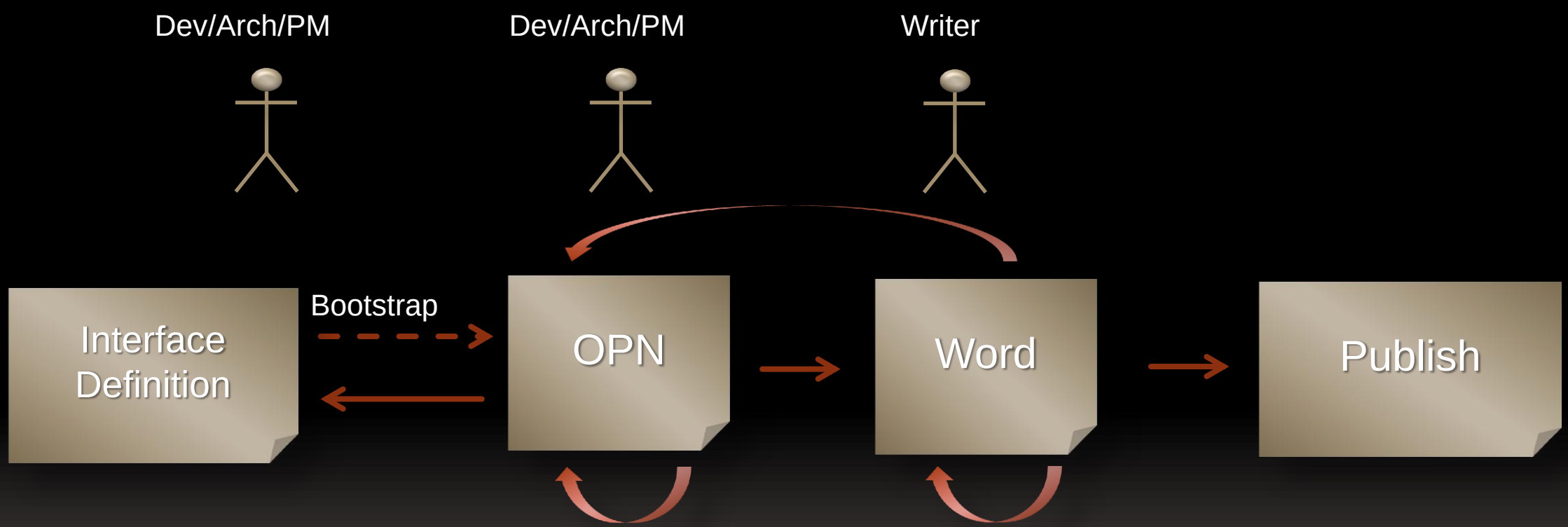
# Present


Code
Protocol "Design"
Inventory Record
Technical Document
Network Parser
Test Adapter
Test Model

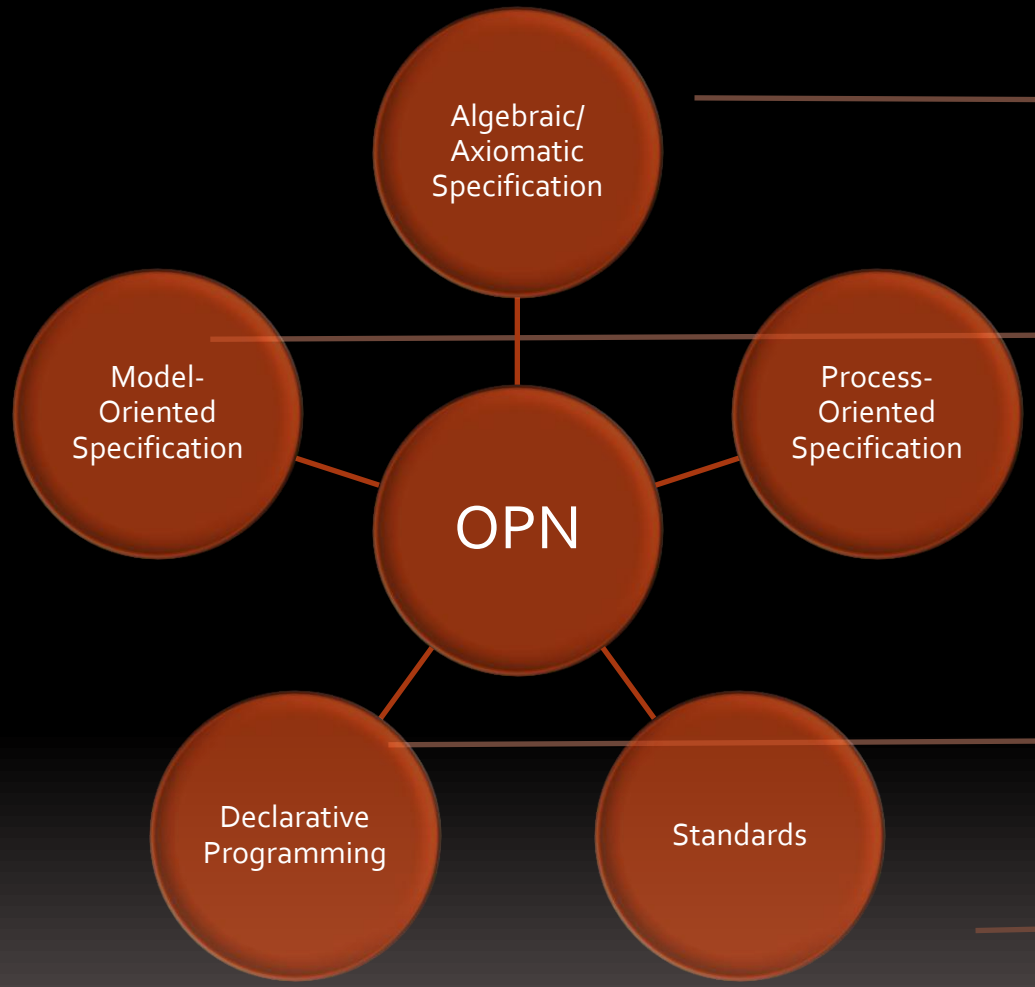
# Future – Open Protocol Notation (OPN)



# Document Generation



# Language Concepts




ACT-ONE, OBJ3, CASL, Temporal Logic, ADL, …

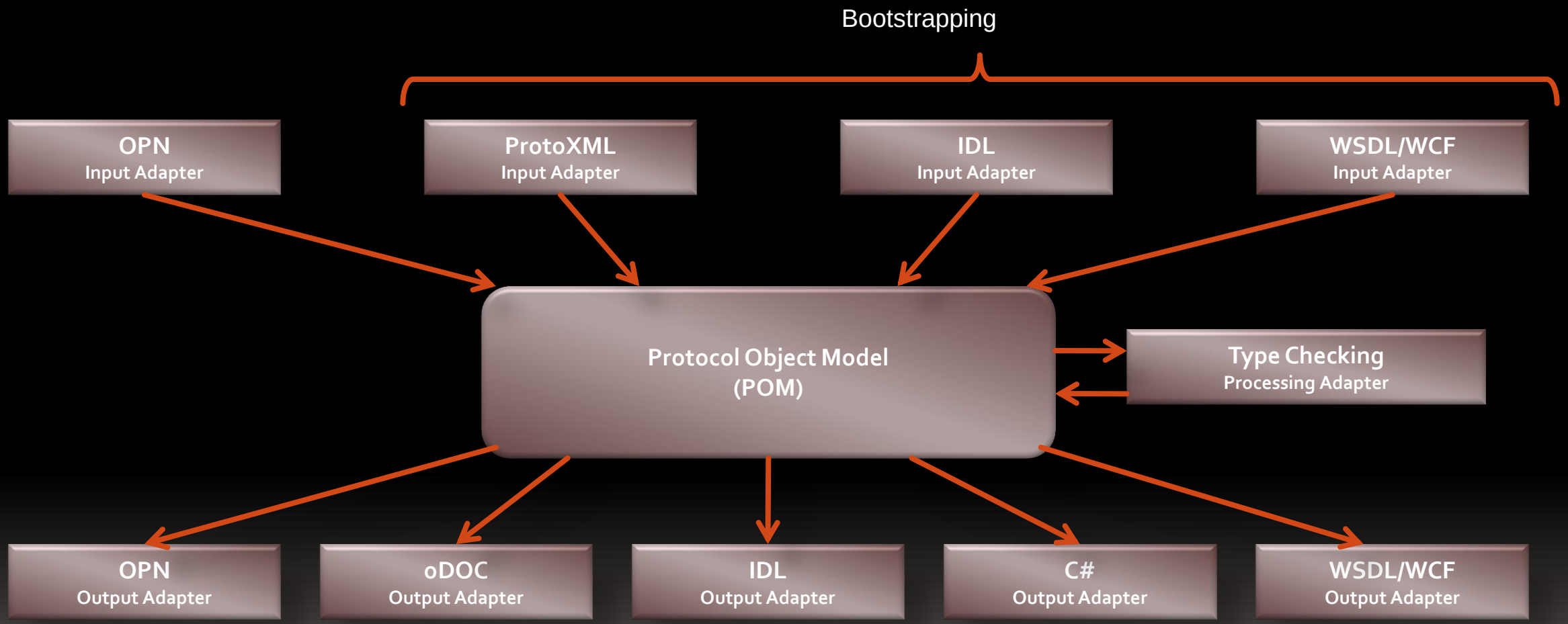
CIP-L. VDM, Z-Notation, B-Method, ASM, TLA, ADLs, …

CSP, CCS, PI-Calculus, …

Functional (ML, Haskell, …),
Logical (Prolog, Curry, …)

LOTOS, SDL, UML,
TTCN-3, ASN.1, …

# The Protocol Object Model (POM)



# Down the road

- Extended Consistency Checking
  - Matching analysis
  - Architecture checking
- Model-Checking and Simulation
  - Symbolic state space exploration (as in Spec Explorer)
- Test generation
  - Traversals on the result of state space exploration
- Architecture exploration
  - Enumeration of valid configurations
- Code-Stub generation and contract injection
  - Get assertions from the model into the code

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