



Real-Time and Embedded Systems Workshop

DARPA Sponsor Presentation

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Credits: John Bay, Joe Cross, Doug Schmidt



DARPA Software Programs



Applications

DASADA (IPTO - Salasin)

- Self-adaptive software applications

Domain-Specific Services

MoBIES (IXO - Bay)

- Design technology & software CAD

Common Services

SEC (IXO - Bay)

- Hybrid system control & computation

Distribution Middleware

ARMS (IXO - Cross)

- Adaptive & reflective middleware

Quorum (ITO - Koob)

- Quality-of-service & translucent layers

Infrastructure Middleware

PCES (IXO - Cross)

- Composable embedded systems

Operating Systems & Protocols

NEST (IXO - Raghavan)

- Deeply networked embedded systems

Hardware

PCA (IPTO - Graybill)

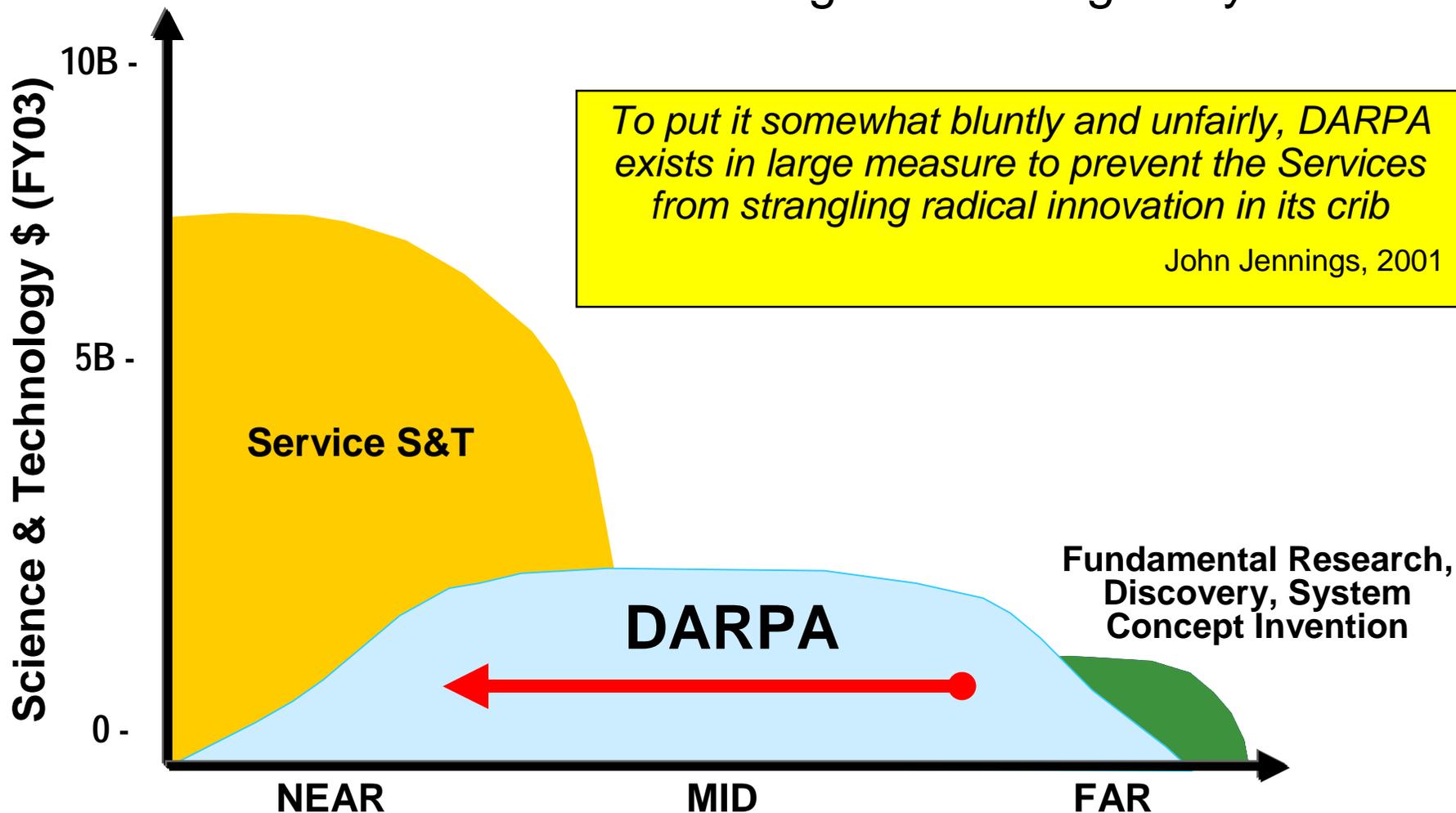
- Polymorphous computing architecture



DARPA's View of Itself

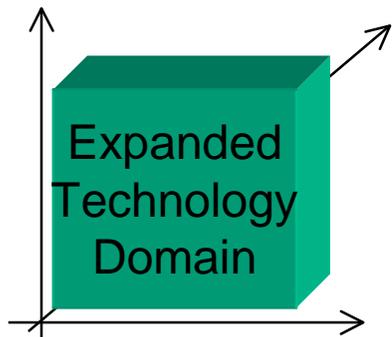


- High Risks/ High Payoff





Technology Transition Process *After DARPA Exits*



Stakeholder	Role
DoD Services	Additional R&D as needed
Defense Industry	Market for created COTS
Commercial Industry	Incentive to generate COTS
DARPA Leave-behinds	Open repositories & reference solutions

DoD Programs

Commercial Applications

DoD Agencies

Defense Industry

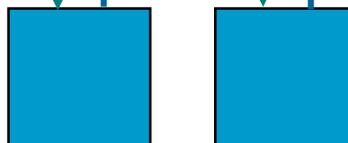
Non-Defense Industry

Standards & Certification Bodies

SELF-SUSTAINING COMMERCIAL MARKET

DARPA Leave-Behinds

National Experimental Platforms



Technology Developers



COTS tools

Large vendors
Small companies/
Startups
Universities

- Reference Solutions
- Open Tool Integration Framework
- Open Code Bases & Repository
- Open Tool Repository



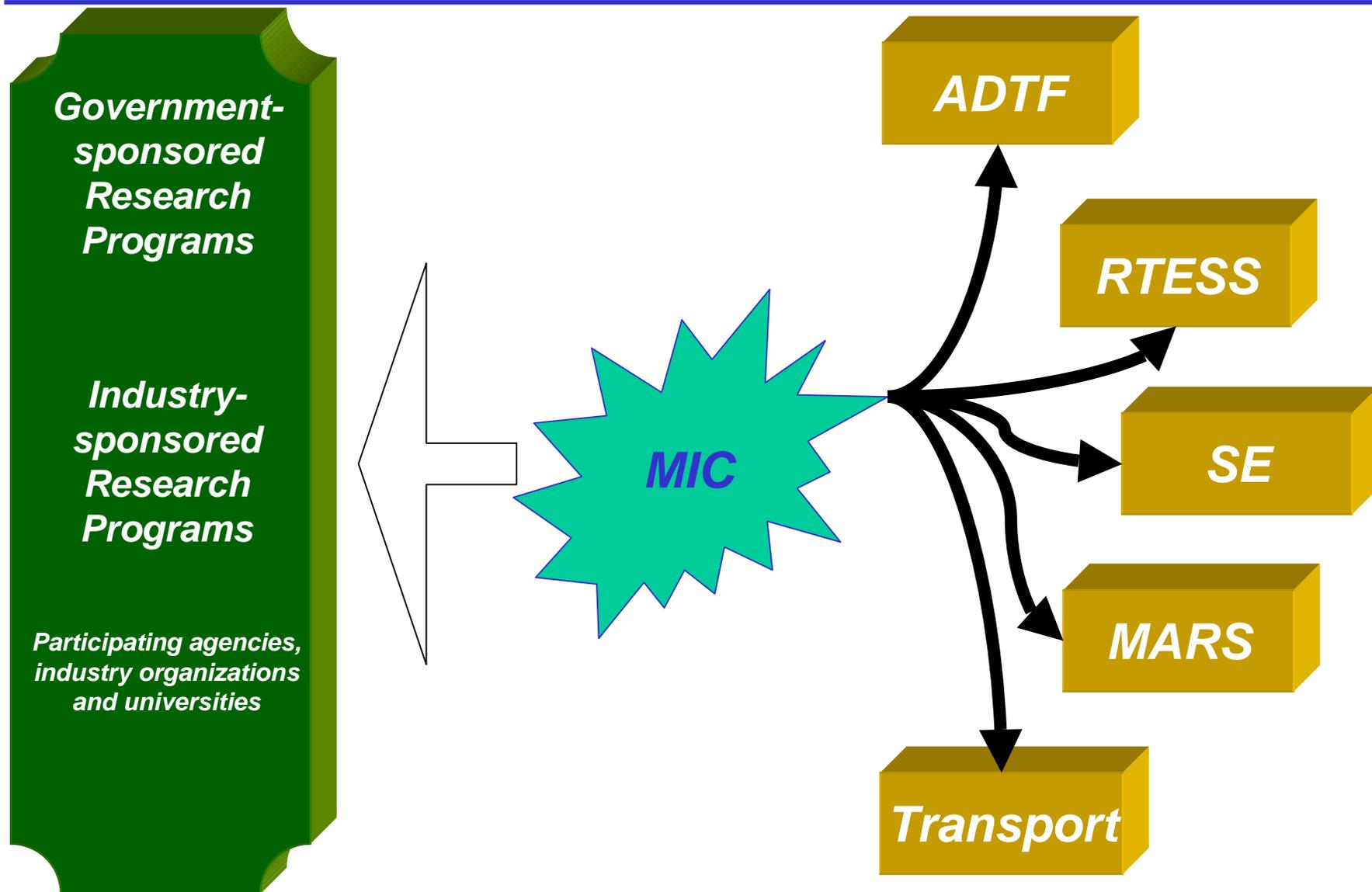
Model Integrated Computing PSIG Charter



- Advocate standardization of the products of government- and industry-sponsored research and development programs for Model Integrated Computing (MIC) through the OMG process.
- Encourage researchers engaged in MIC to participate in OMG activities.
- Promote model-based design, analysis and generation for resource constrained systems.
- Promote tool integration standards for design, analysis and generation tools for resource constrained systems.



MIC PSIG Activity





MIC Areas of Interest



- Meta-level specification
 - Specification of Domain Specific Languages (DSL)
 - Para-functional aspects of DSL
 - Not necessarily OO
- Meta-programmable tools (meta language for tool specification)
- Model Translation
 - Code Synthesis
 - Configuration
 - Analysis (Temporal, Resource loading, Quality of Service)
- Composing Embedded Software
 - Models of computation
 - Platform-based system design
- Composing Domain Specific Tool Chains
 - Tool Integration Frameworks
 - Verifiable tool chains
 - x by wire, DO-178, etc.
 - Model Interchange
 - Analysis
 - extracting para-functional information from models
 - Instrumentation
 - Simulation
- Semantic backbone
 - e.g. - HSIF - hybrid system models
 - Semantic issues from the representation languages to the tools that can handle it



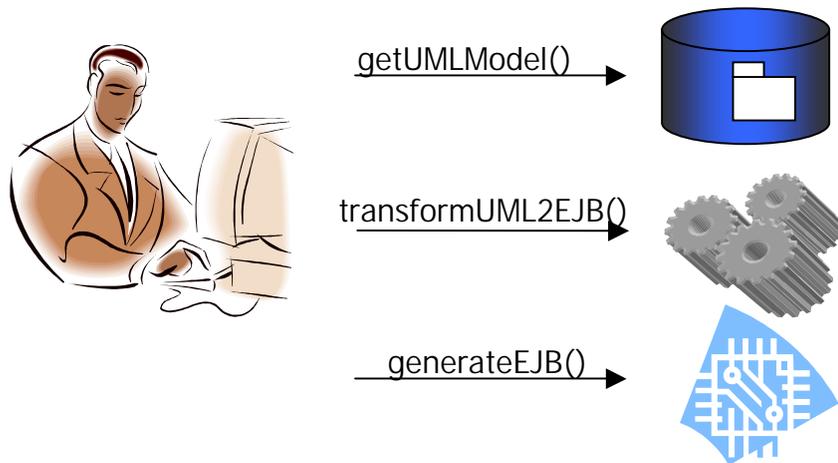
MIC PSIG Activities



- MIC PSIG meets at each OMG Technical Conference (five per year)
- MIC has sponsored four Special Focus Days in the last year
 - Model Integrated Computing
 - Coordination with European researchers
 - Ptolemy II – Models of Computation
 - GME Tutorial
- Planning another Special Focus on Aspects
- Planning a Model Integrated Computing Workshop
 - October 11 – 15, Washington, D.C.
 - Call for Participation is on the table outside

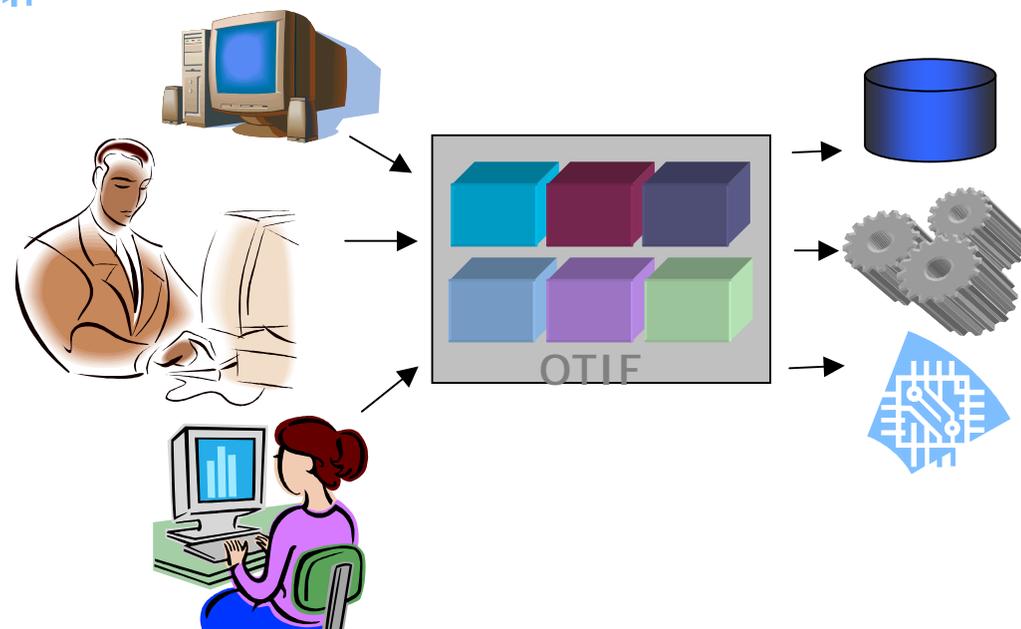


Open Tool Integration Framework



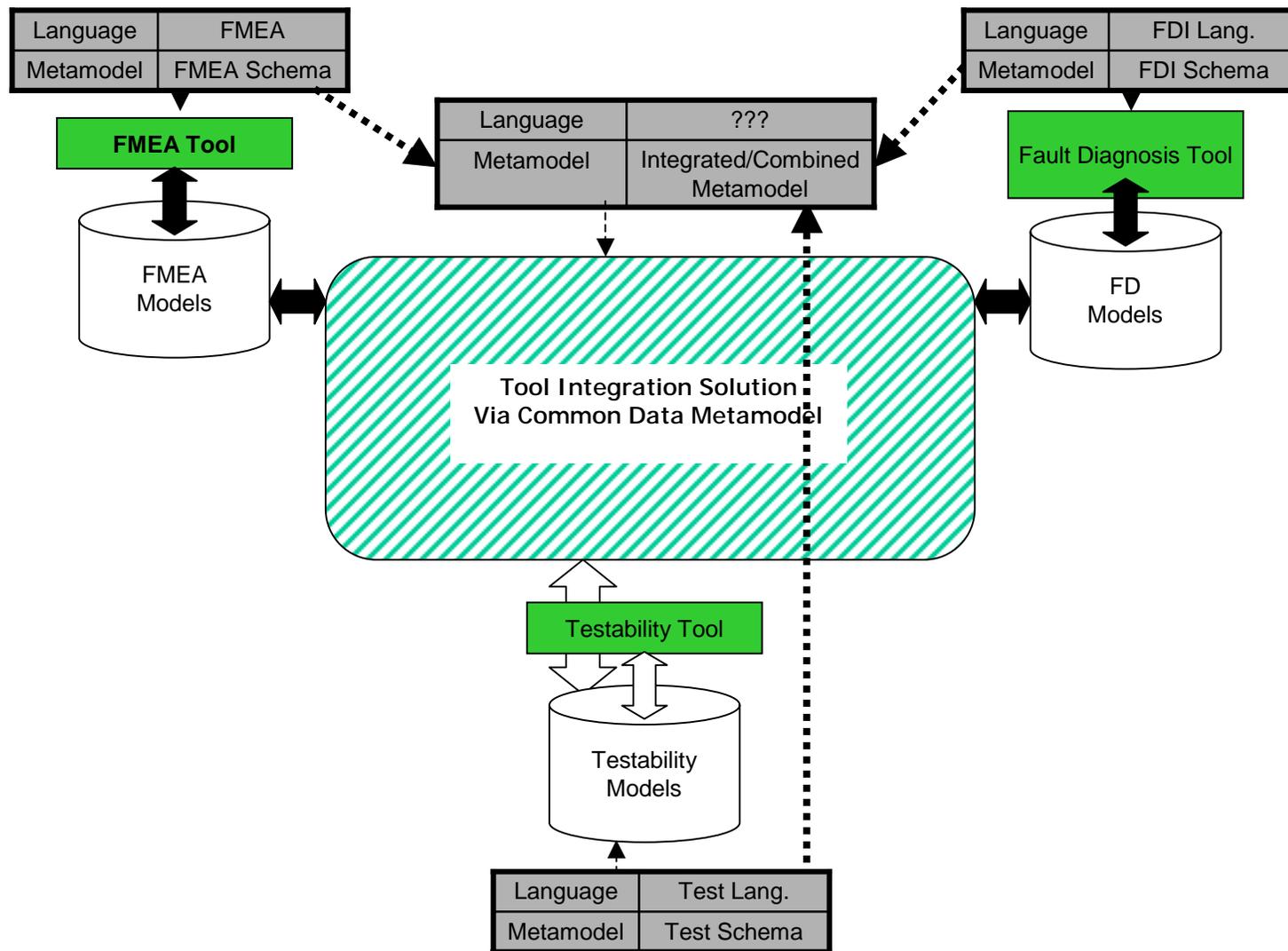
Current Situation

Desired End-State



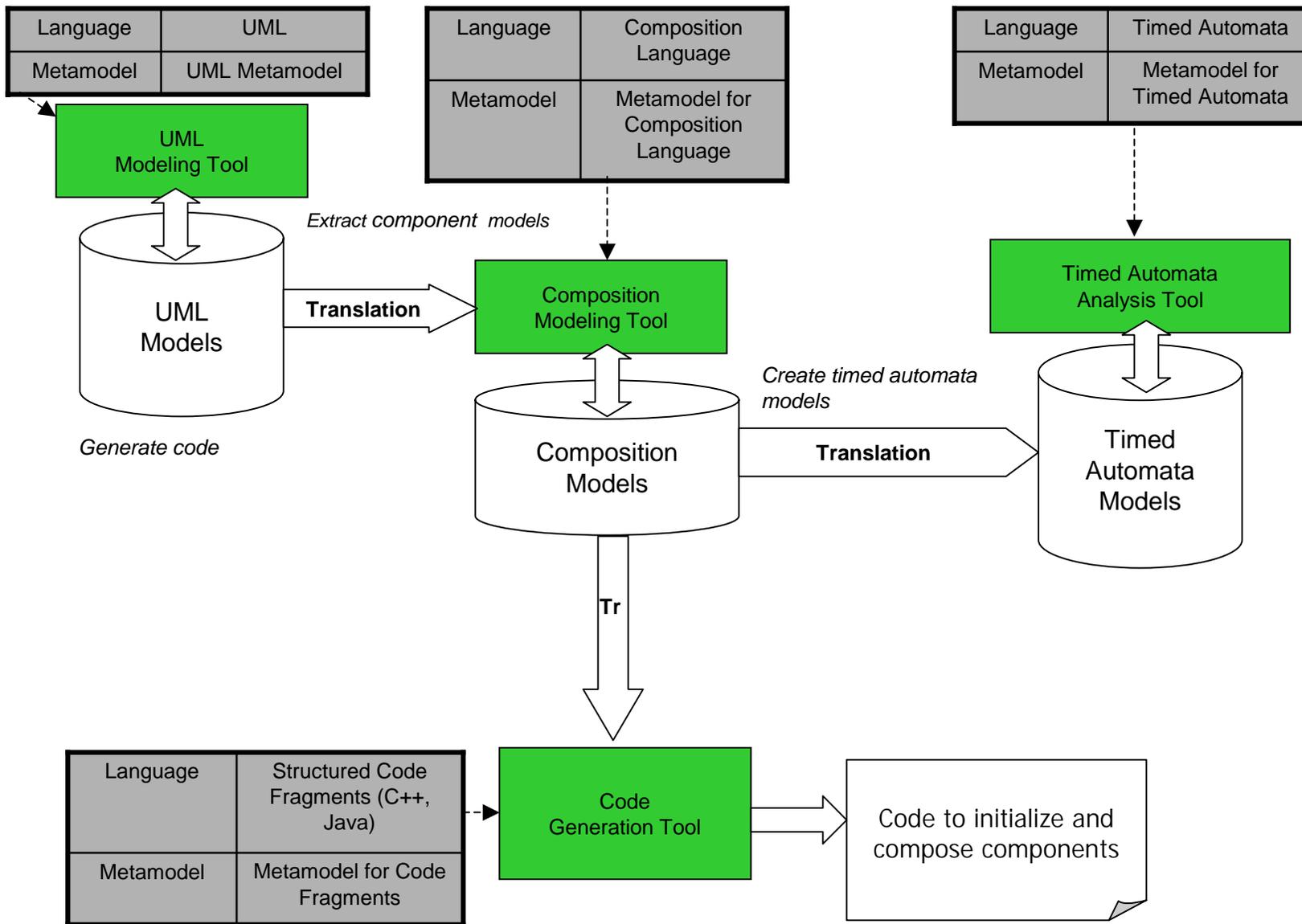


Example 1: Integration via Shared Data





Example 2: Process Flow (Tool-to-Tool)



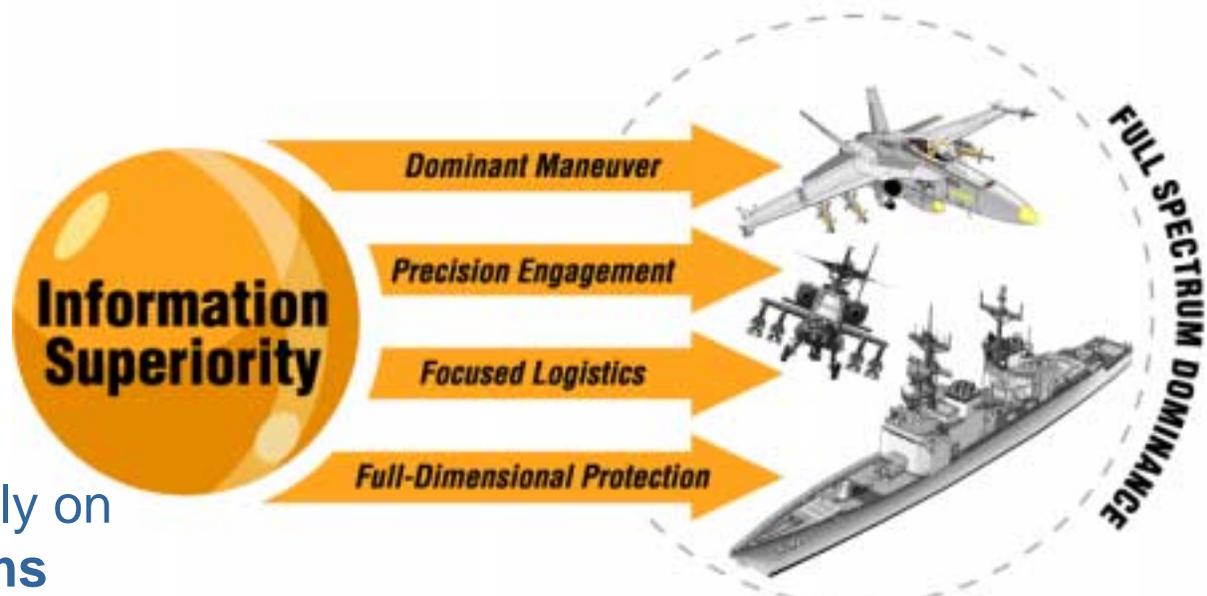


Why DARPA Cares About Embedded Systems



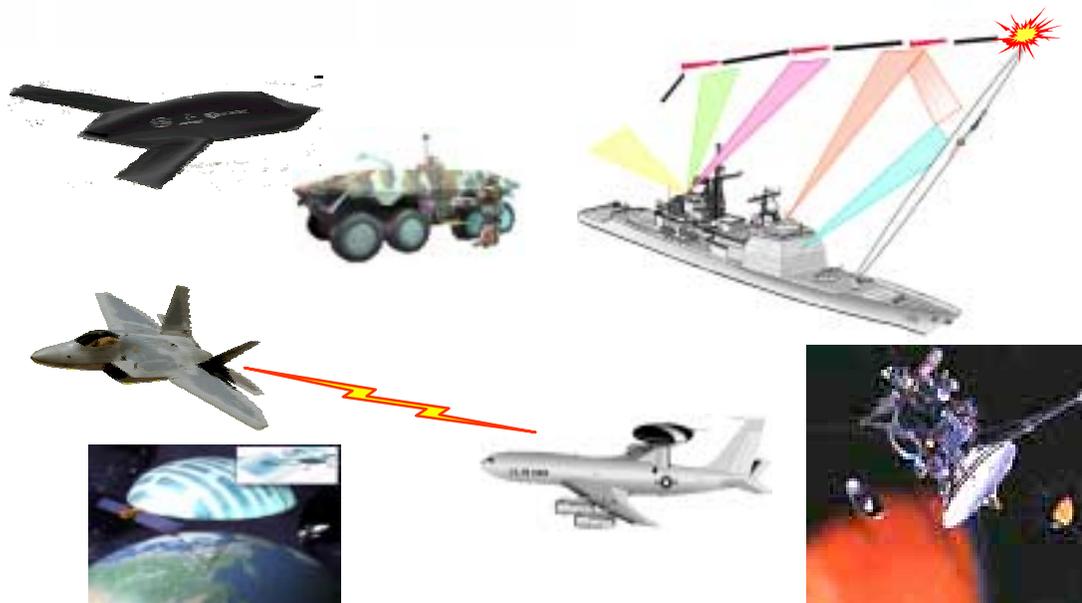
Lessons learned by DoD

- Battles are fought with weapons...
- ...but they are won with information technology



DoD success depends heavily on quality of **embedded systems design, performance, & productivity** for:

- Unmanned combat air vehicles & ground vehicles
- Cruise & ballistic missile defense
- Time-critical target prosecution
- Space systems





There is Plenty of Work Ahead

