Automated Test and Re-Test (ATRT)

Model-Based Testing (MBT) of Integrated Aviation Mission Systems

"Develop a software tool that will check instrumentation data collected from an integrated mission system to see if the observed system behaviors of an integrated mission system conform to required and allowed behaviors defined in an Architectural Analysis and Design Language (AADL) model of the integrated aviation software and hardware mission system."

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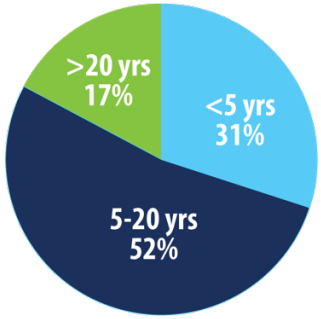
Agenda

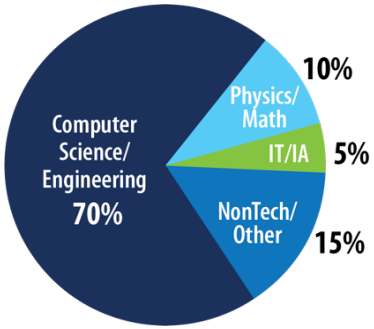
- Background
  - IDT / Automated Test and Re-Test (ATRT)
- Technology Overview
  - Leveraged from ATRT SysML MBSE approach (TRL 8/9)
  - Currently being extended into AADL via A17-006 SBIR
  - AADL to ATRT interface
- Demonstration
  - AADL to ATRT feature list and accomplishments
  - Automated analysis from AADL model demonstration

IDT at a Glance

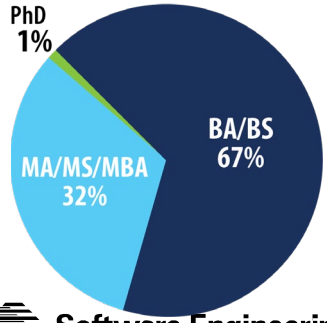
Relevant Experience

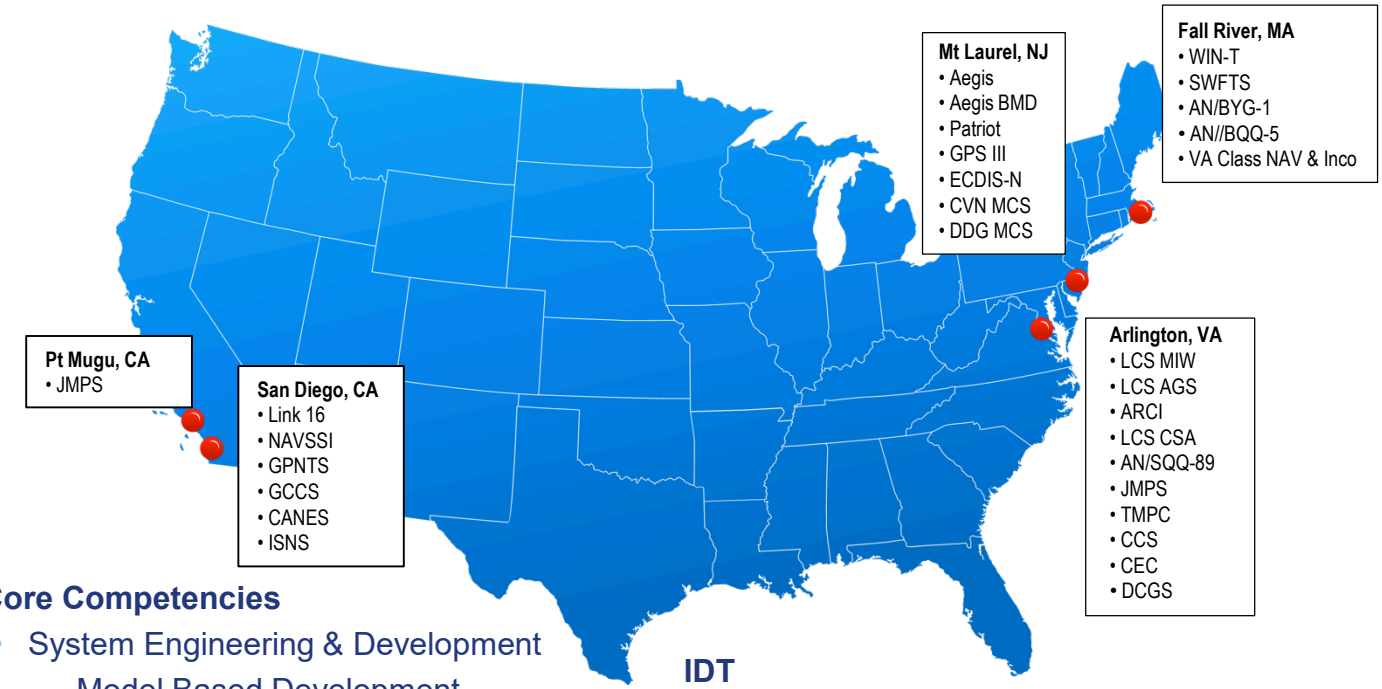


Degrees



Advanced Degree





Core Competencies

- System Engineering & Development
  - Model Based Development
  - Automated Analysis/Assessment
  - Continuous Integration
  - Virtualization
  - SoS Interoperability
- Software Re-Engineering
  - Automated SW Re-Architecture
- Test & Integration
  - Automated Test & Analysis
- Cyber Hardening, Threat Detection & Recovery

IDT

- CMMI Level 3
- Recognition
  - Contractor of the Year (Small & Emerging Contractor Advisory Forum—SECAF)
  - 50 Fastest Growing Businesses (Washington Business Journal)
  - 20 Most Promising Solution Providers (CIO Defense Technology Review)

Automated Test and Re-Test (ATRT)

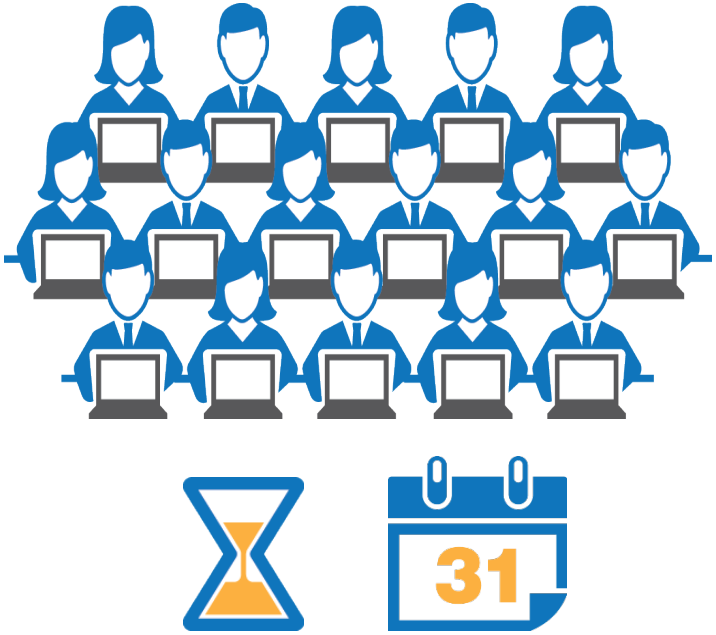
ATRT is a TRL 8/9 technology developed under the SBIR program to achieve the following goals:

- Provide a methodology and capabilities able to used across an Enterprise and throughout the lifecycle
- Significantly reduce the time and manpower required for testing and in particular regression testing
- Support the efficient characterization of a system's performance envelope
- Provide significant objective quality evidence across the development and test lifecycle for system certification
- Provide collaborative test strategy capability for test planning, test status, and test reporting across distributed test resources

Enable Capability to be Delivered Faster and More Efficiently to the Warfighter

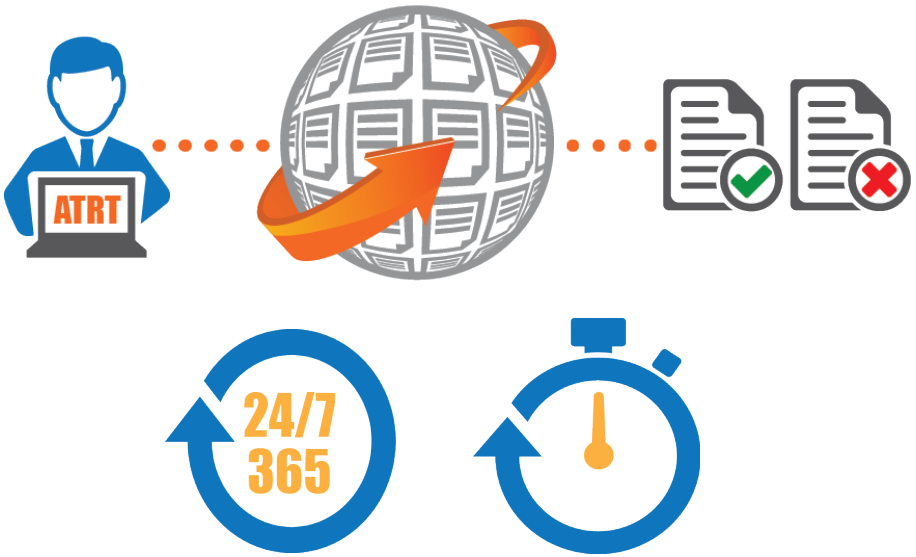
What is Different With ATRT ?

Historical Testing Approach



- Repetitive human labor intensive testing
- Time constrained
- Limited permutation testing
- Evaluation of test results requires days or weeks

ATRT Testing Approach

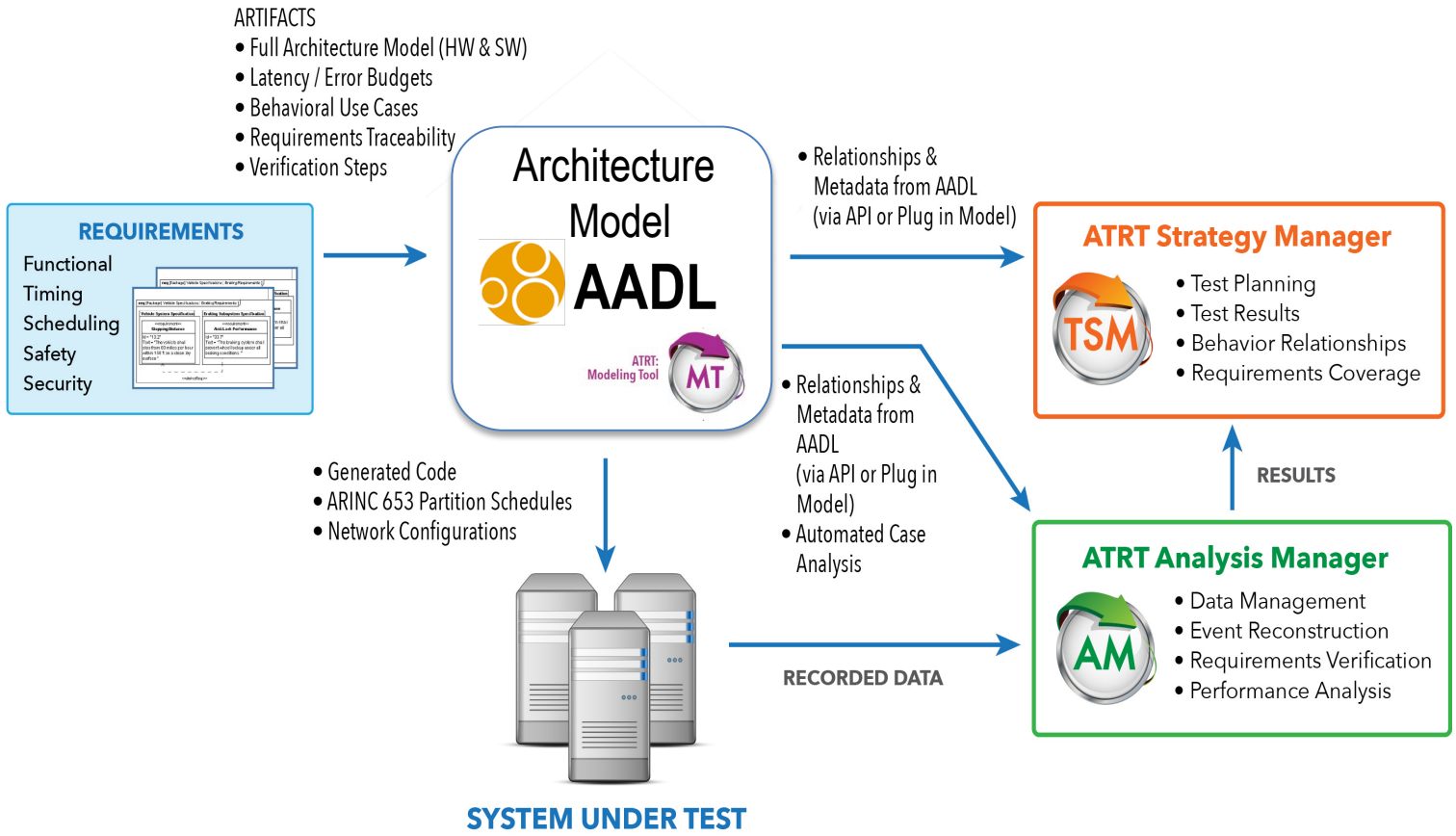


- Automated computer based testing
- 24/7/365 testing
- Expansive permutation testing
- Test results available in minutes

ATRT Automation Technology

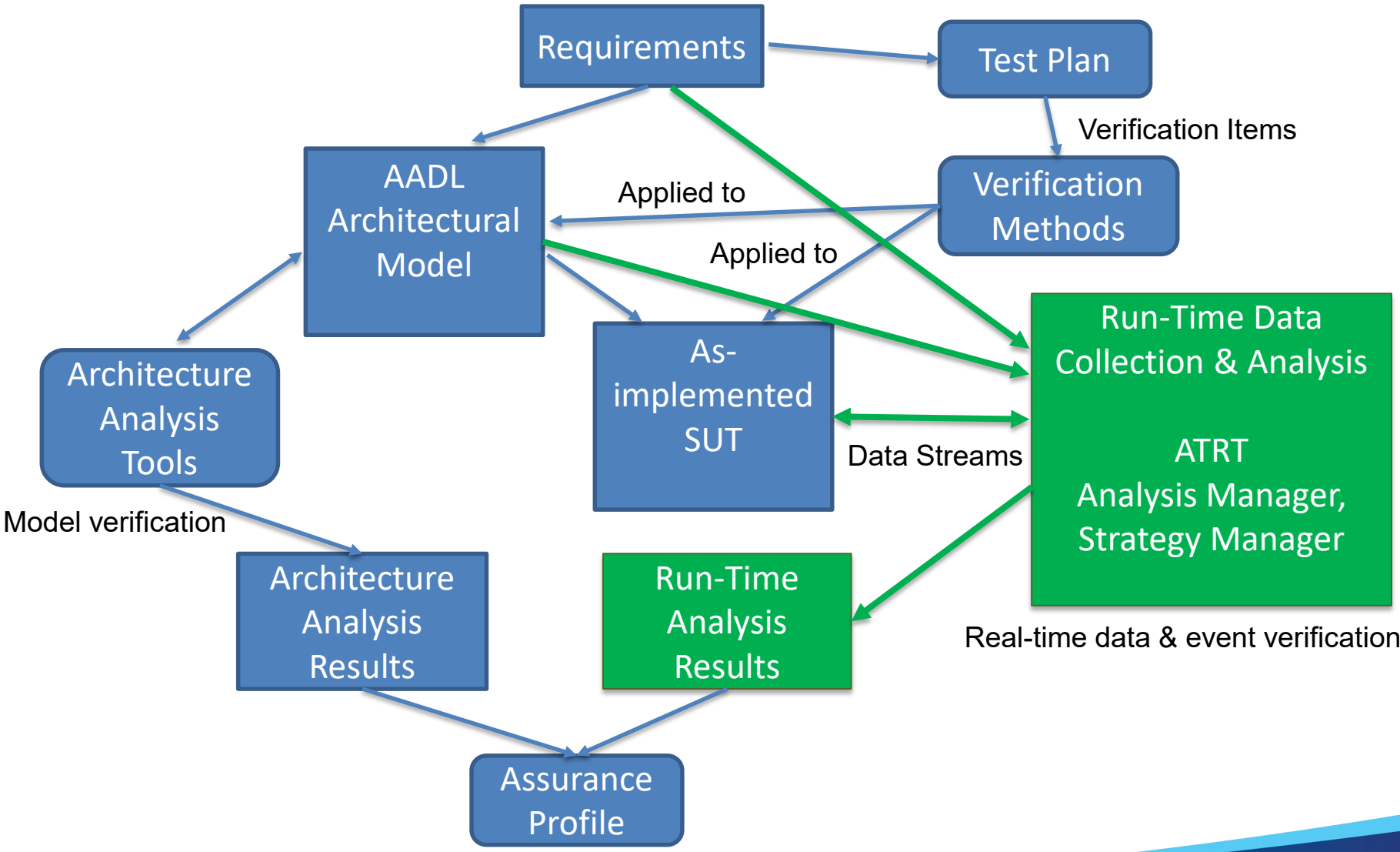
- ATRT is non-intrusive to system under test
- ATRT technologies can be applied independently or in an integrated fashion
- ATRT technologies can be applied to both tactical/production systems and systems in a development environment

Technical Approach

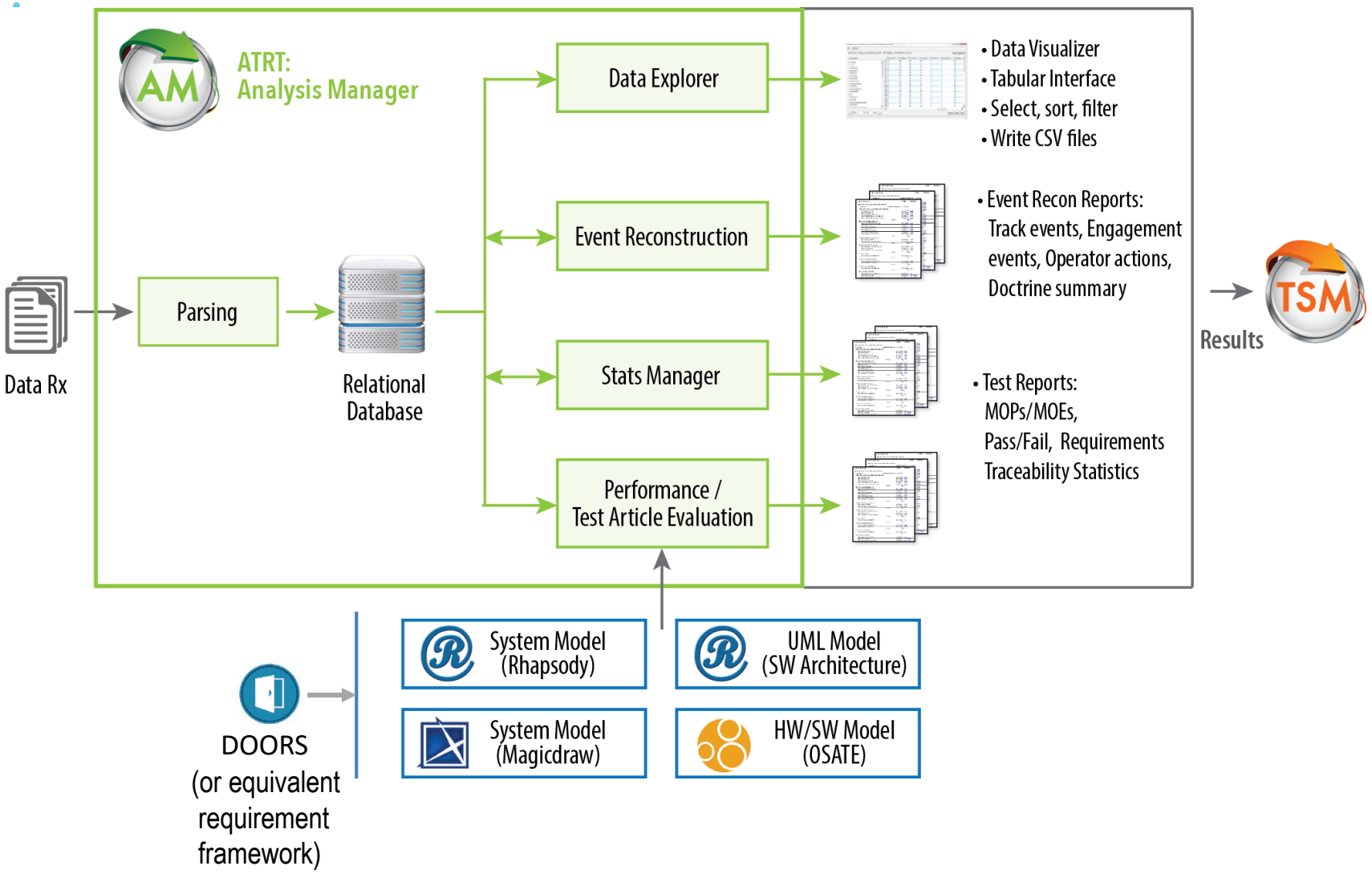


ATRT/AADL Model-Based Testing (MBT)

Requirements Verification Flow

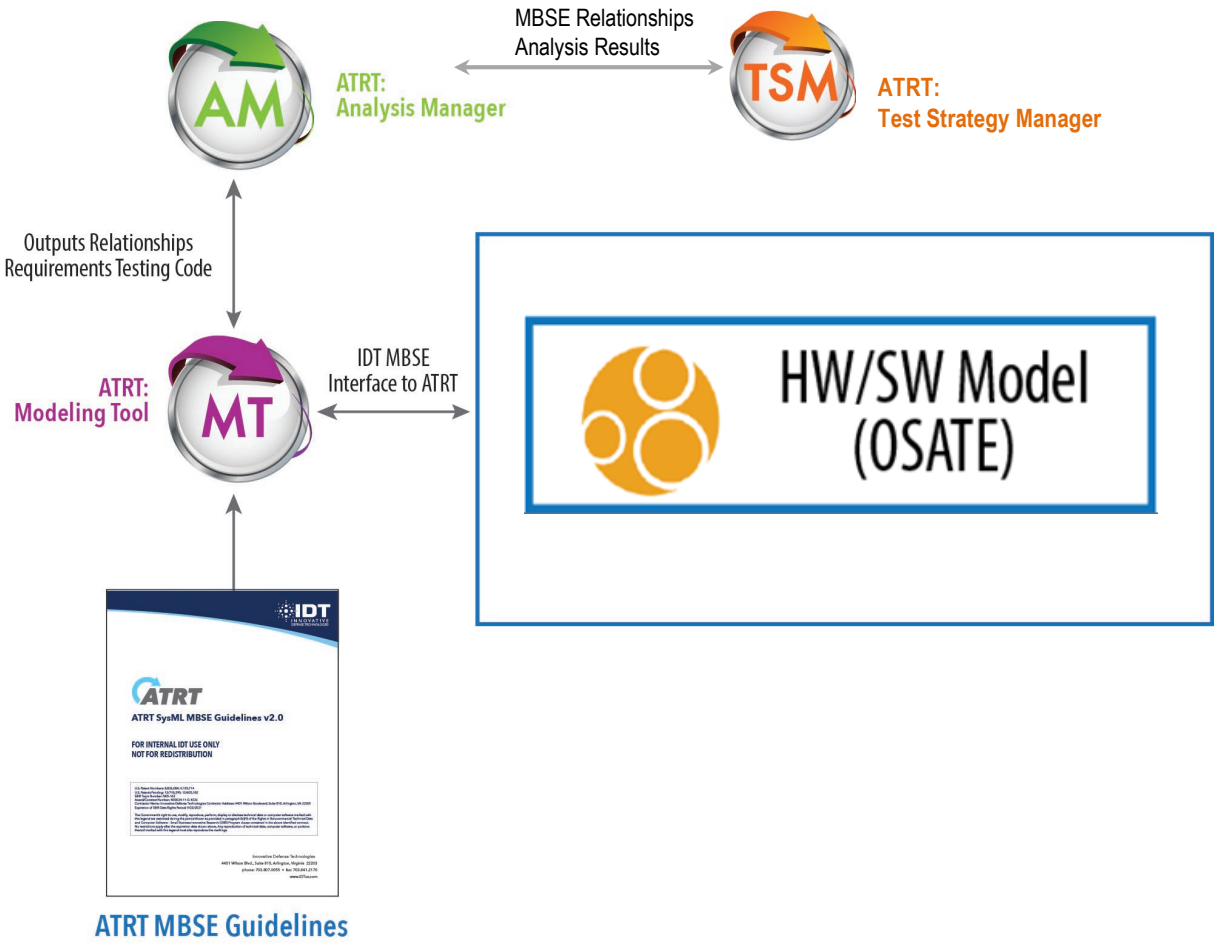


ATRT MBSE Block Diagram



AADL / ATRT Interfaces

- MT plugs into an existing AADL model through OSATE and will traverse the current model in the OSATE workspace
- Walks the Instance Model to pull out information from the flows and the AADL objects contained in each flow
- From the Instance Model information MT automatically generates C++ files and database files AM can consume
- These auto generated files serve as a map for Analysis Manager's analysis engine to perform analysis on the system's recorded data



Technical Status

- Initially identified and developed the following as characteristics that can be leveraged from AADL to ATRT elements:
  a) End to End flow (of data, events, or both)
  b) Latency (between/through logical components, execution of threads)
  c) Modes attached to threads
  d) Communication bus bandwidth (worst case loads, scheduled loads)
  e) Power bus capacity (power)
  f) Resource utilization of bound loads (memory, CPU)
  g) Error flow (ensure error types are handled/mitigated)
  h) Functional hazard analysis
  i) Fault tree analysis

ATRT Demonstration

- Runtime Model
  - Show that modes attached to threads can be mapped into ATRT
  - Simulated data
- Composite model
  - Combine Cruise Control models to create a model to represent all AADL components / views / properties to support analysis
    - Components: Device, Thread, Process, Processor, Bus, Memory
    - Views: Logical, Runtime, Execution Platform, & Deployment
    - Properties: Bandwidth, Latency, MIPS, Power, Execution Time Analysis
  - Simulated data
- Initial investigation ASSA model
  - 60+ End to End Flows,
  - 70+ requirements,
  - Scalability into more complex models