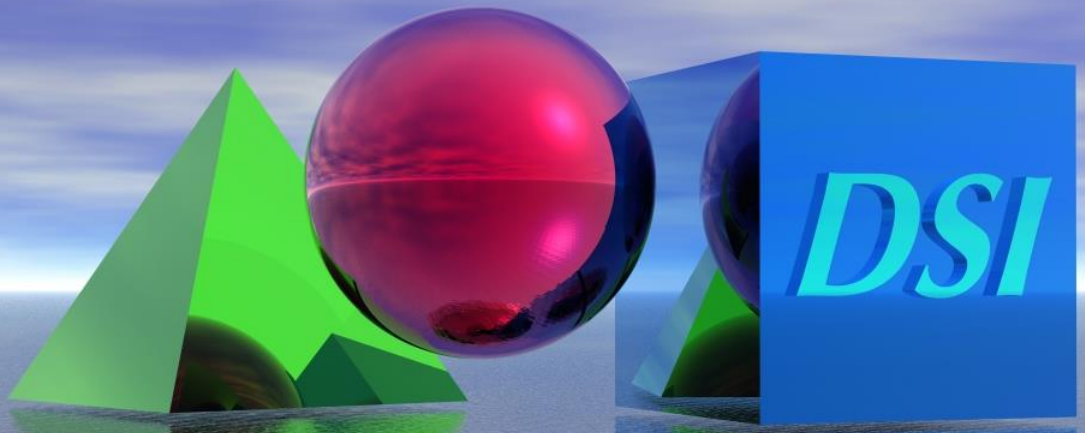
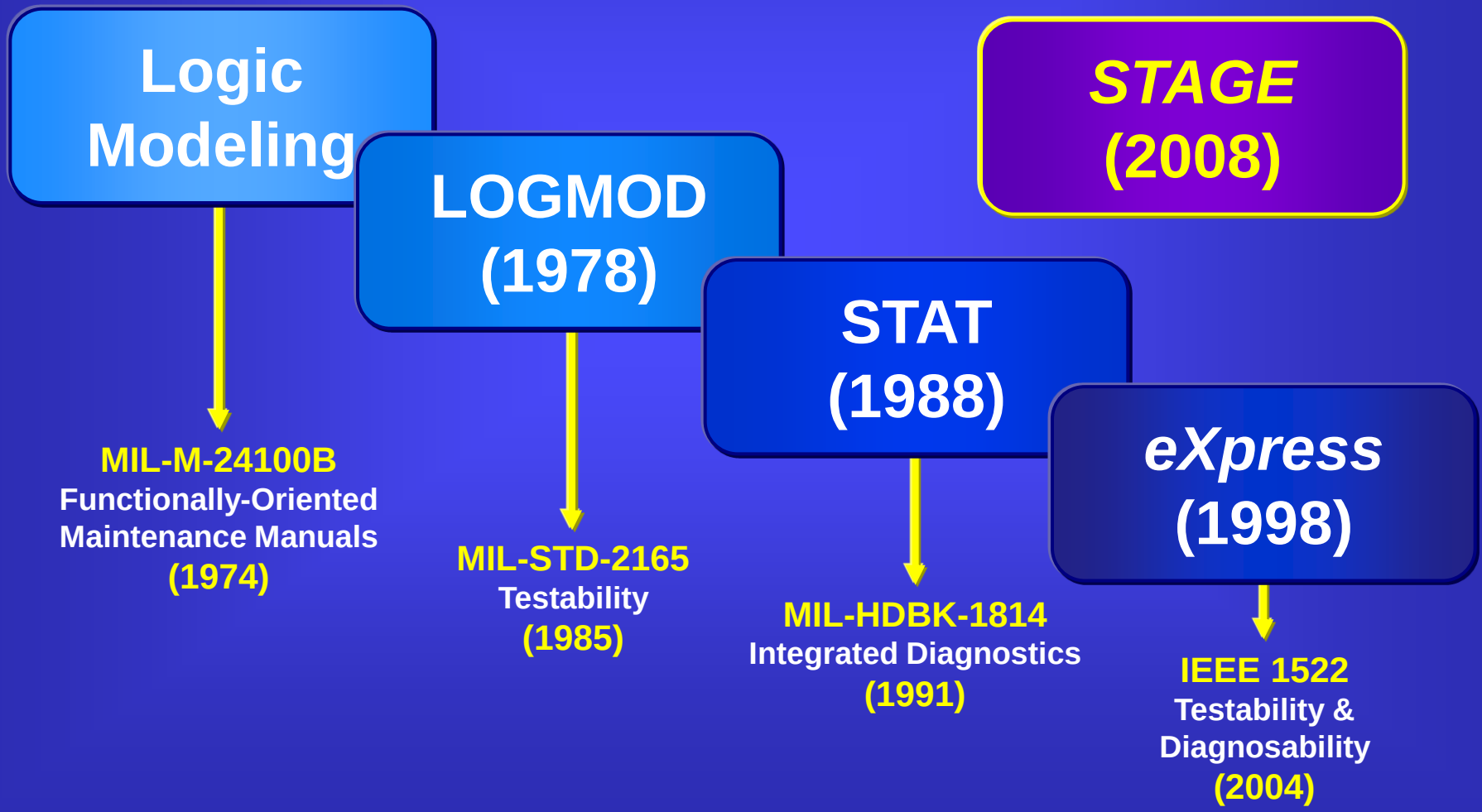
An Introduction to DSI and our Products



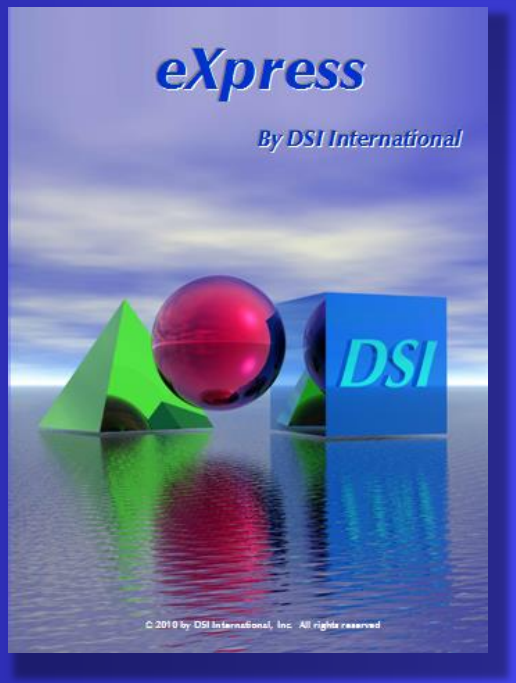
Eric Gould
December, 2010

DSI International

36 years of diagnostic engineering

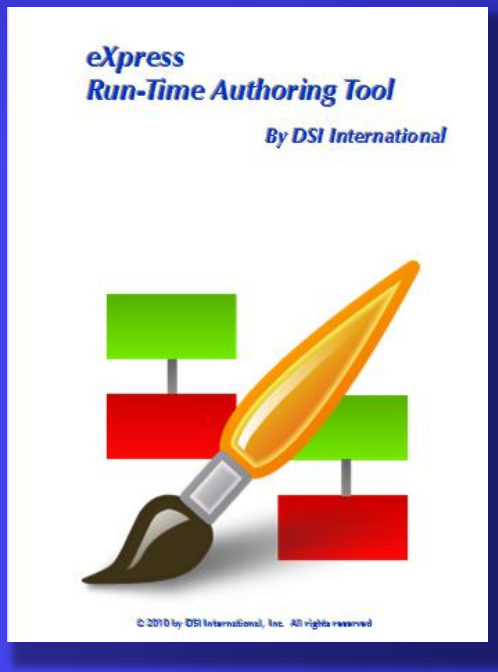


DSI's products



eXpress
(1998)

STAGE
(2008)



eXpress Run-Time
Authoring Tool
(2010)

DSI is the world's leading provider of diagnostic engineering software

Current U.S. Customers

Major Companies

BAE Systems
Boeing
General Atomics
General Electric
General Dynamics
Honeywell
Lockheed Martin
Northrop Grumman
Raytheon
Sikorsky

Government

U.S. Army
U.S. Navy
U.S. Postal Service

Universities

North Carolina A&T
Alabama A&M

over 200 licenses sold within the United States

DSI is the world's leading provider of diagnostic engineering software

International Customers

Europe

EADS (European Union)
Eurocopter (France)
MBDA (France)
MBDA (U.K.)
Nexter / GIAT (France)
Sagem (France)
THALES (France)

Asia

Aviation Technologies (China)
Dongfanghong Aircraft (China)
Ishikawajima HI (Japan)
Kingswell Enterprises (China)
Mitsubishi HI (Japan)
Shiji Electronics (China)
Tianwei Industry (China)
Xi'an Industries (China)
Yuntong Technology (China)

DSI has extensive experience on major programs

2nd Gen RLV

Future Combat Systems

Joint Strike Fighter

TSAT Satellites

CVN-76 Nimitz-Class Supercarrier

Comanche Helicopter

AIM-9X Evolved Sidewinder Missile

X-33 VentureStar

New Evolution Locomotive

Eurofighter

Space Operations Vehicle (SOV)

Crusader Self-Propelled Howitzer

Fire Scout UAV

Some current programs using eXpress

JLENS (Raytheon)

CH-53K (Sikorsky)

Predator – MSTS (Raytheon)

GCV (Boeing)

JASSM (Lockheed)

X-Band Radar (Raytheon)

CVN-21 – EMALS/AAG (General Atomics)

Standard Missile (Raytheon)

Four main goals of diagnostic engineering

Subsidiary benefits of diagnostic engineering

Availability

Cost of Ownership

Effective Isolation to Optimum Repair Level

Lower MTTI / MTTR

Improved MTBF

Reduced False Removals

Lower Maintenance Costs

Improved Fault Detection

Reduced False Alarms

Reduced System/Mission Aborts

FMECA/Critical Fault Analysis

Risk Priority Analysis

Unique Isolation of Critical Failures

Mission Success

Safety

Contracted diagnostic requirements

Availability

Cost of Ownership

Effective Isolation to Optimum Repair Level

Improved Fault Detection

Unique Isolation of Critical Failures

Mission Success

Safety

The Challenge: How to use FD/FI requirements to achieve diagnostic goals

Availability

Cost of Ownership

Effective Isolation to Optimum Repair Level

Improved Fault Detection

Unique Isolation of Critical Failures

Mission Success

Safety

The benefits of Integrated System Diagnostic Development (ISDD)

- Reduce and Manage Risk
- Reduce Program Costs
- Provide Compliant Design
- Submit Winning Proposals

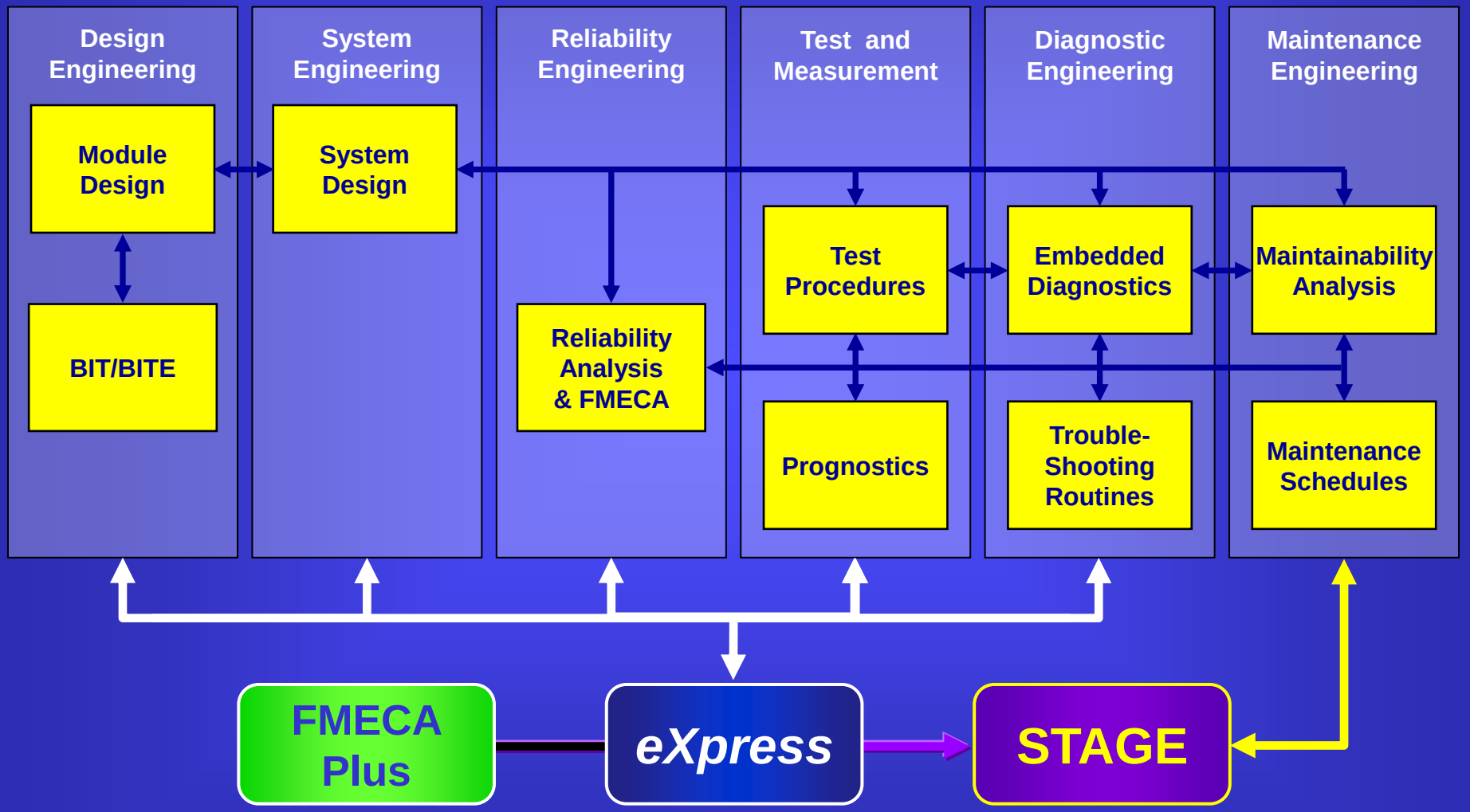
ISDD encompasses all aspects of diagnostic engineering

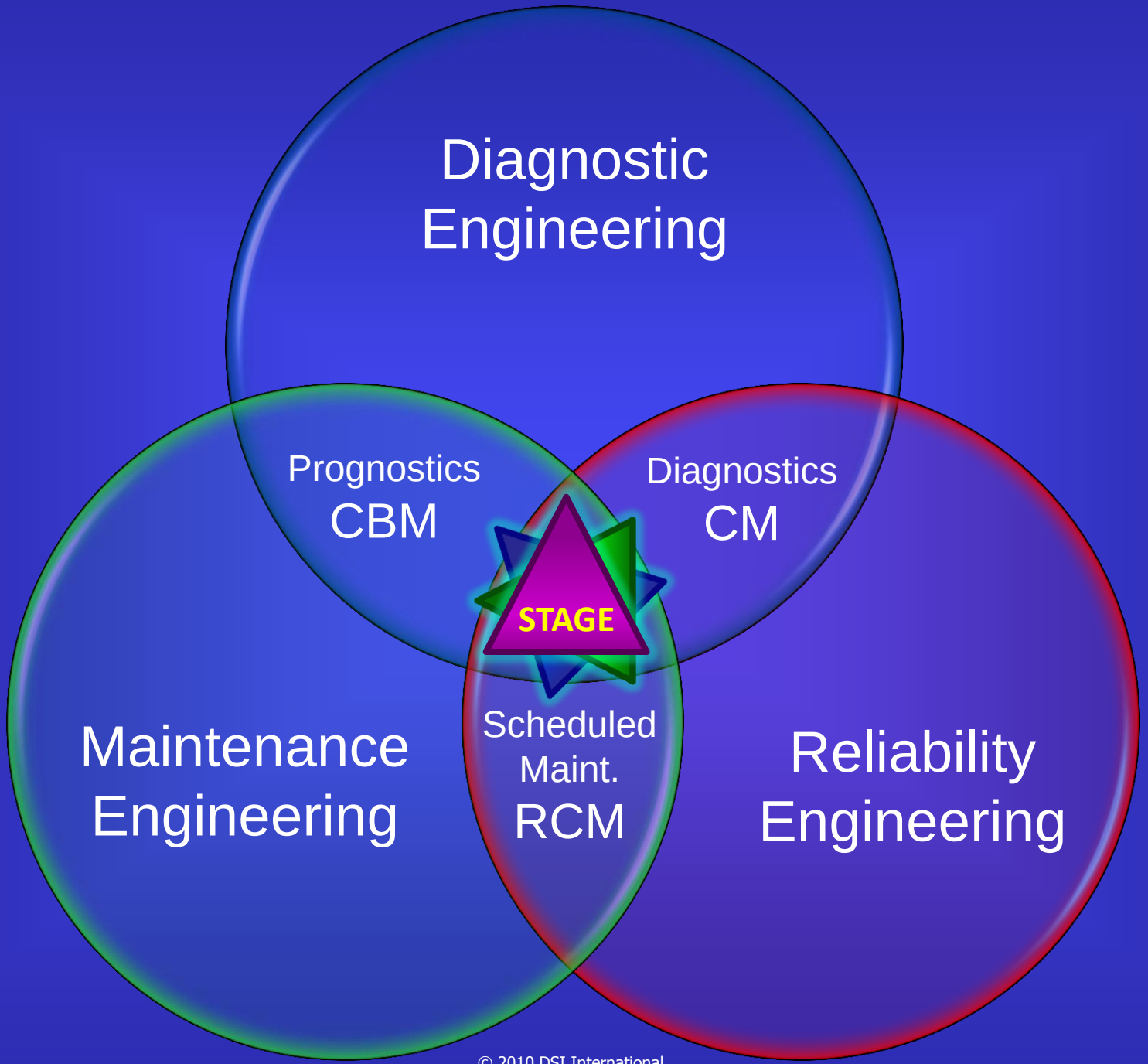
- Requirements Derivation
- Requirements Flow-down
- Design Development
- Test Point Enhancement
- Design & Diagnostic Optimization
- Prognostic & Reasoner Development
- Embedded Systems Integration
- Life Cycle Support

Advantages of ISDD using *eXpress*

- Addresses All Aspects of Diagnostic Design
- Integrates Logistics with Design
- Facilitates Collaboration & Integration
- Unifies Diagnostic Engineering Practices

The ISDD process

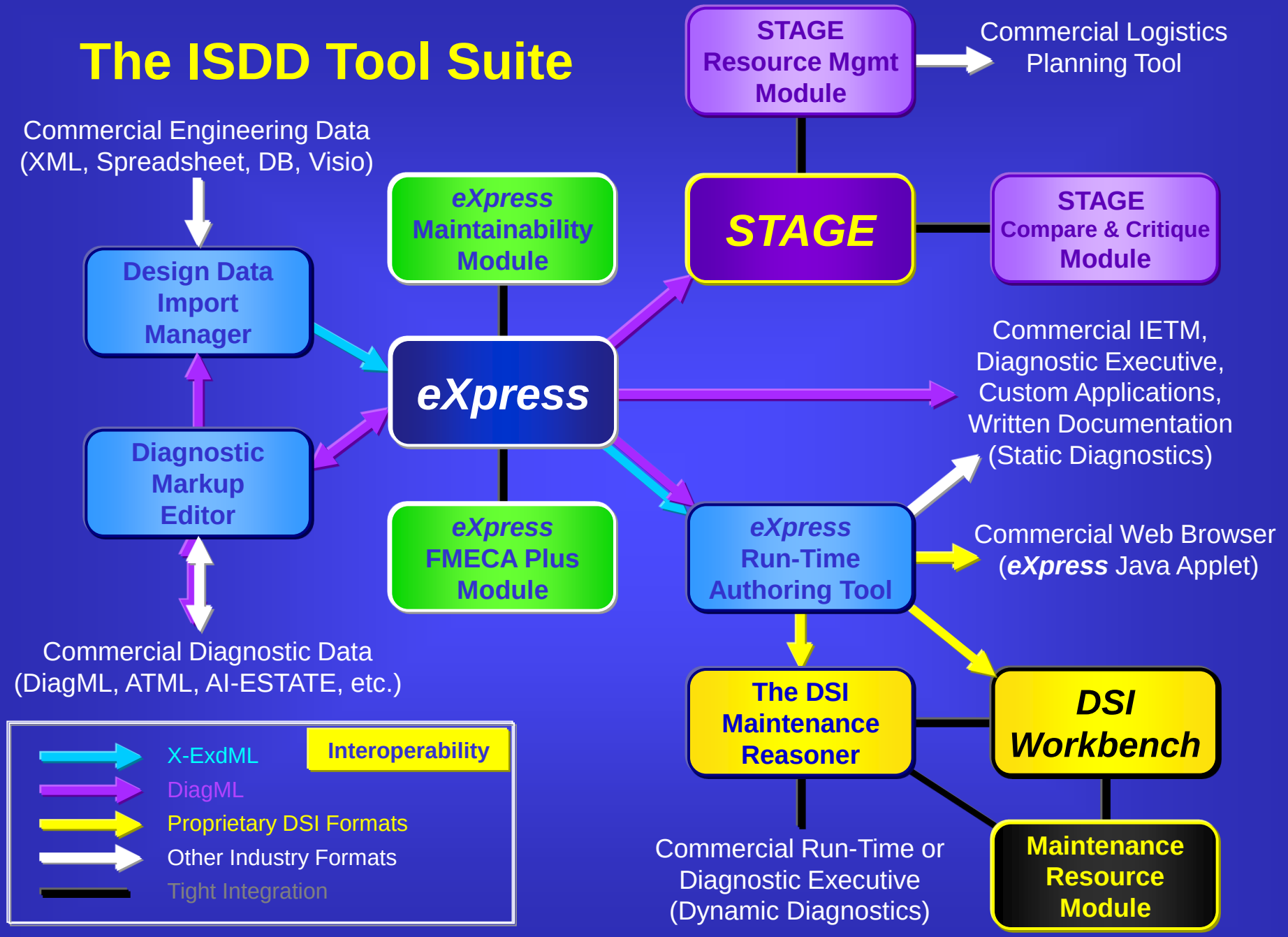




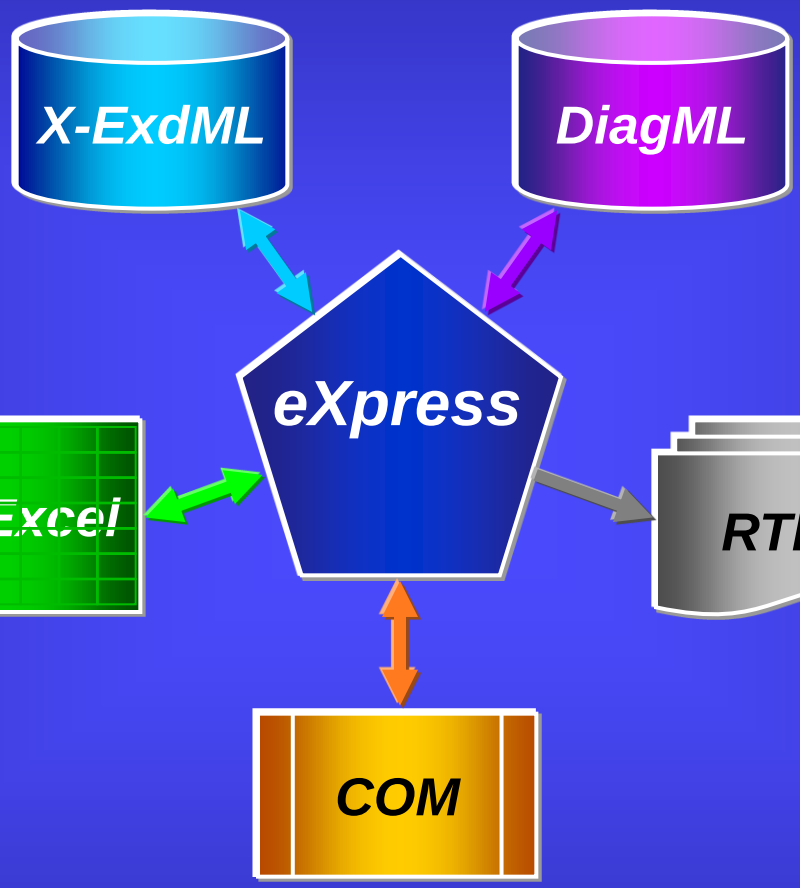
Requirement Improvements

- Greater Stratification
- Fewer Catch-All Calculations
- Prioritization of Requirements
- Requirements tied to performance
- Requirements that cross disciplinary boundaries

The ISDD Tool Suite



eXpress interoperability



Design Topology
Model Appearance
Test Definitions
FMECA Data
Attribute Values

Static Diagnostics
Model Appearance
Test Definitions
Attribute Values

Design Topology
Model Appearance
Test Definitions
FMECA Data
Attribute Values
Analysis Results

Test Definitions
FMECA Data
Attribute Values
Analysis Results

Symbol Graphics
Model Graphics
Diagnostic Graphics

Design Topology
Model Appearance
FMECA Data
Attribute Values

XML Reports
MS-Excel Reports
MS-Word Reports
Adobe PDF Reports

STAGE Roadmap

STAGE, Act I

Failure, Diagnosis
& Replacement
Prognosis / Maintenance

STAGE, Act II

Phases
NRE Costs
Logistics Planning

STAGE, Act III

Reconfiguration
Redundancy
Mission Success

STAGE, Act IV

Resource Management
Supply Chain Modeling

Prognostics Requirements

A typical prognostics requirement has four components:

Scope:	a set of failures for which prognosis is desired
Coverage:	the percentage of failures in the scope that must be prognosed
Horizon:	the time before failure that prognosis must occur
Accuracy:	the desired confidence/correctness of the prognosis

Prognostics Requirements: Example 1

"Prognostics shall predict at least 70% (with a 95% goal) of the mission critical failures from 480 hours to 96 hours in advance of occurrence with 80% probability."

Scope:	Mission Critical Failures
Coverage:	70% – 95%
Horizon:	480 + 96 hours
Accuracy:	80%

Prognostics Requirements: Example 2

"[Prognostics] will accurately predict pending critical system failures…that might occur in a 72 hour mission, early enough to allow corrective action before the unit begins the mission. Prognostics will provide coverage for 45% SA and 35% EFF at a 90% accuracy (threshold) 70% SA and 65% EFF at a 99% accuracy rate (objective)."

Scope:	System Aborts	Scope:	Essential Fctn Failures
Coverage:	45% – 70%	Coverage:	35% – 65%
Horizon:	72 hours + CA time	Horizon:	72 hours + CA time
Accuracy:	90% – 99%	Accuracy:	90% – 99%

Prognostics & Diagnostic Effectiveness

There are two ways in which prognostics can be considered during diagnostic analysis:

- Prognosed failures can be included (analysis reflects the performance of both prognostics and diagnostics)
- Prognosed failures can be excluded (analysis reflects the diagnostic performance for non-prognosed failures only)