Engineering Process for Systems Testability Analysis.

Presentation of an Integrated Process

Contents

- The goal
- The problems encountered
- A Solution
- The implementation
- Synthesis - Conclusion

Contents

- The goal
- The problems encountered
- A Solution
- The implementation

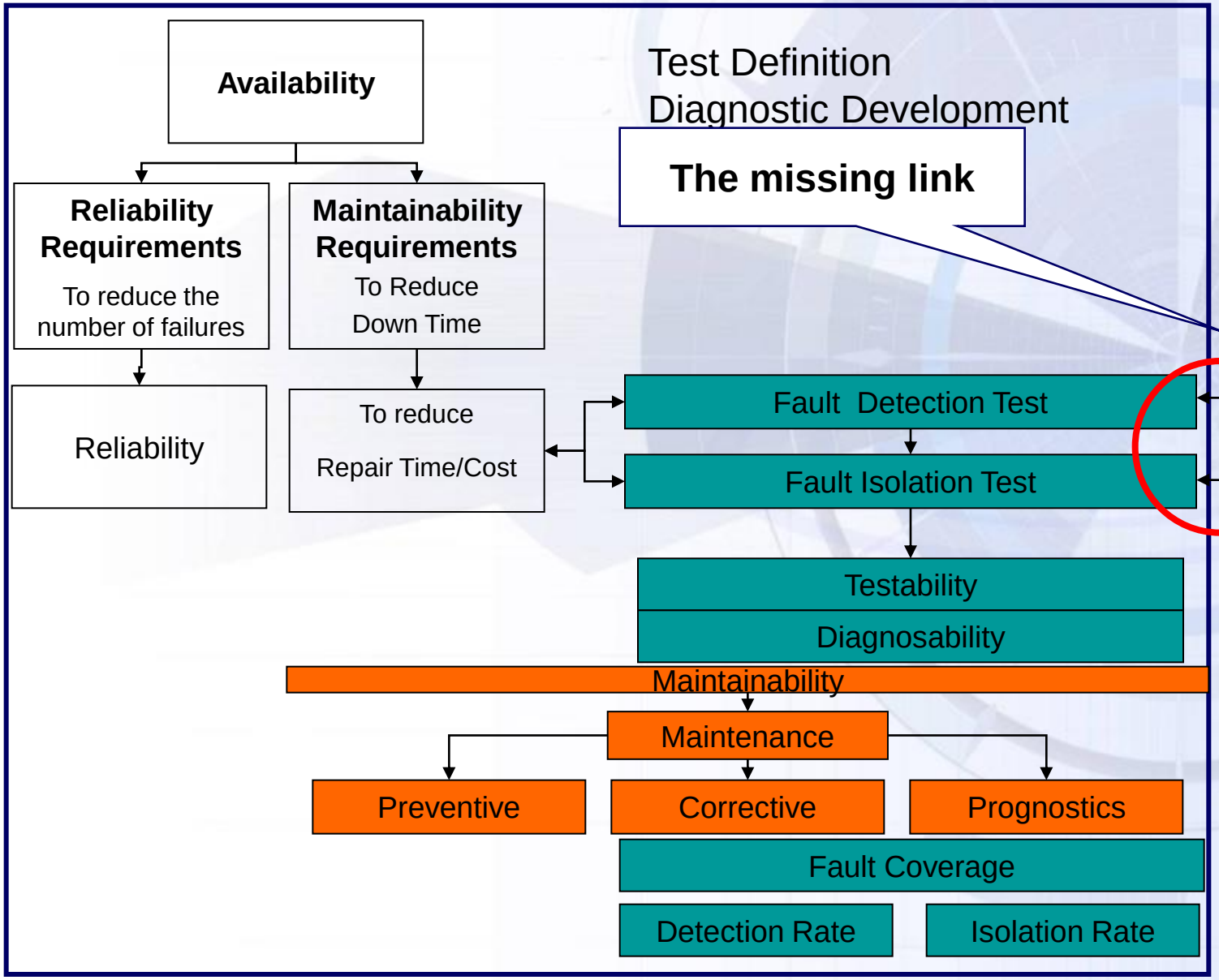
What we want to achieve

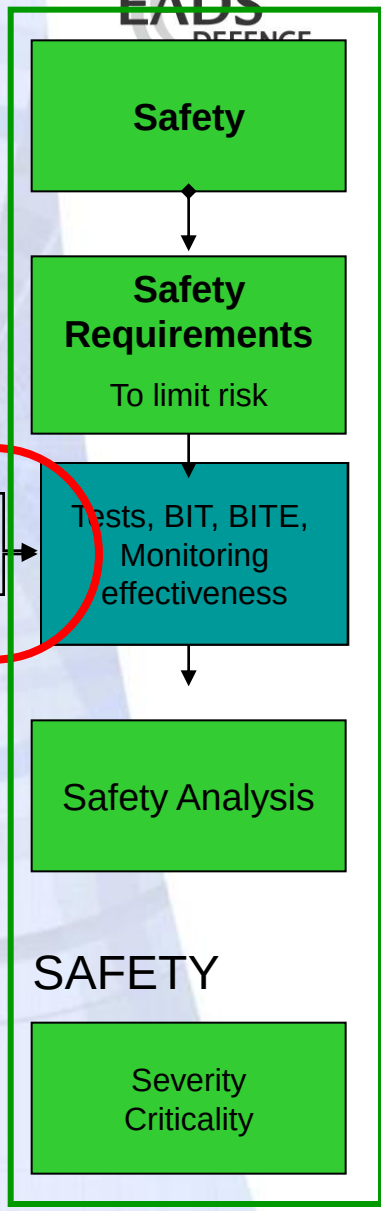
- An Enhanced Testability & Diagnostics Modeling Process to:
  - Improved Fault Detection Confidence (FD)
  - Improved Fault Isolation to Optimum Repair Level (FI)
  - Reduced False Alarms / False Removals (FA)
  - Lower Mean Time To Isolate (MTTI)
  - Improved Safety Through Critical Fault Analysis (FMECA)
  - Improved System Availability
  - Reduced Cost of Ownership

Contents

- The goal
- The problems encountered
- A Solution
- The implementation

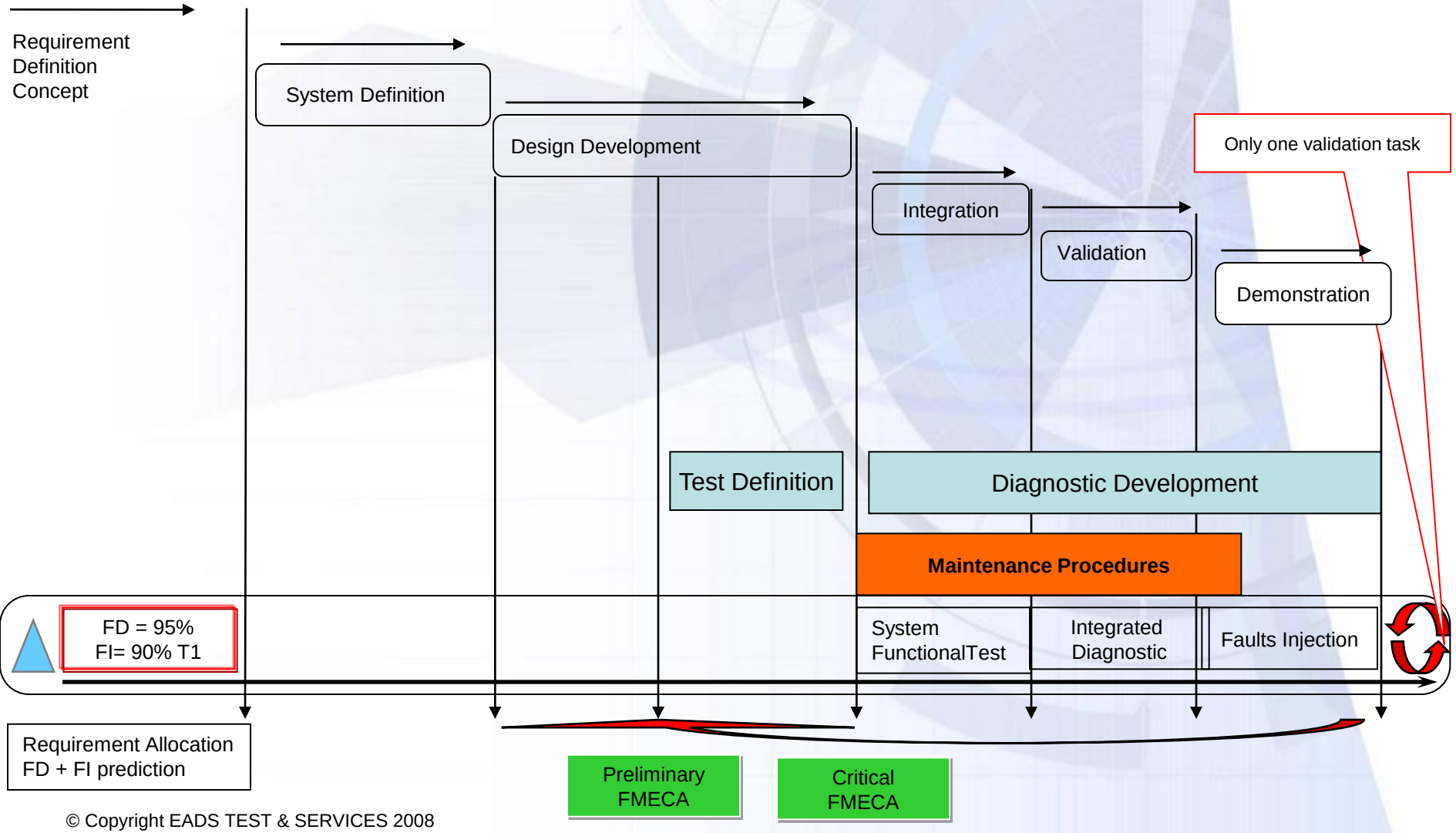
Test and Safety Process





Engineering process without eXpress

No testability milestone and the missing link.

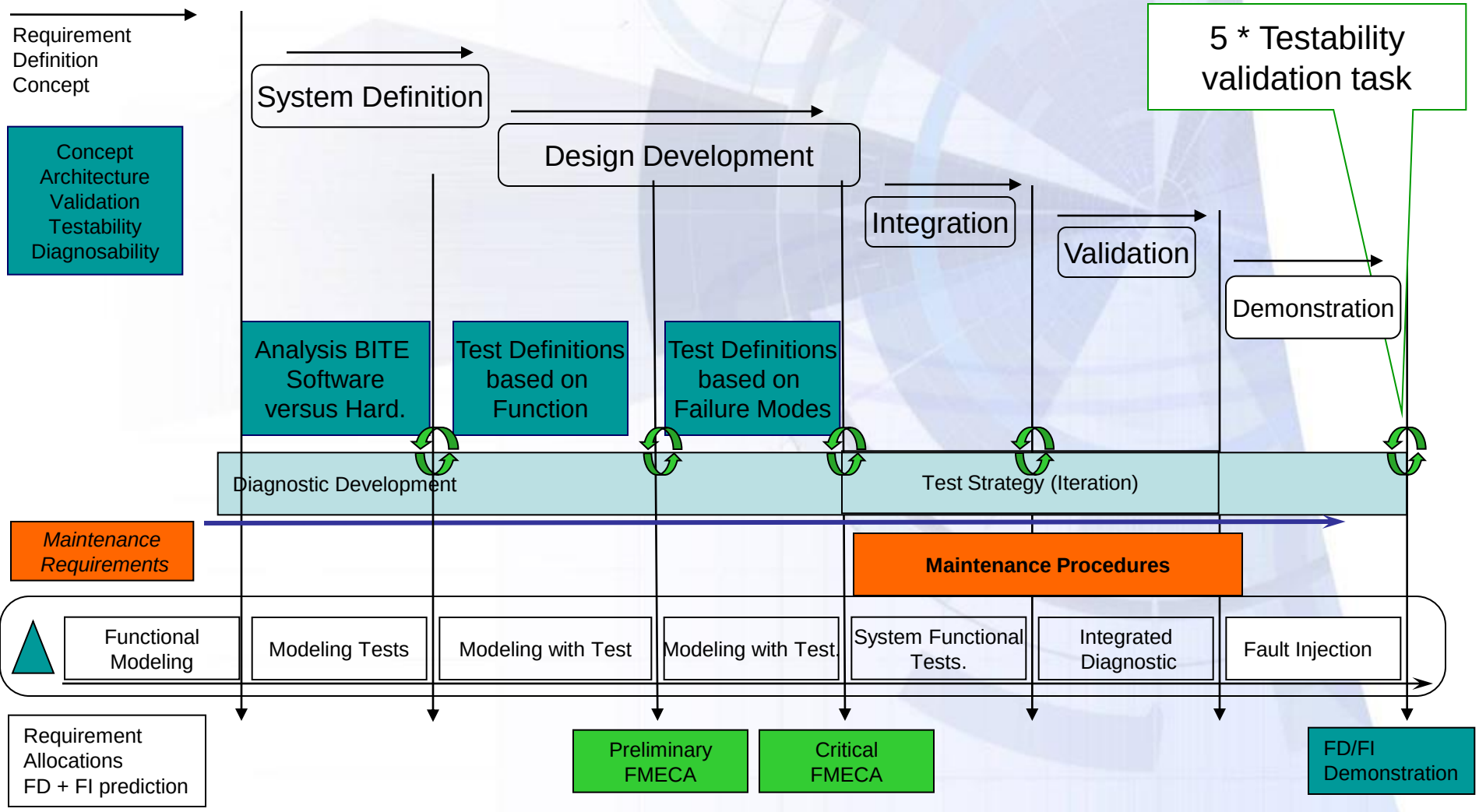


Contents

- The goal
- The problems encountered
- **A Solution**
- The implementation

Model driven Engineering process

Testability & Safety processes integrated

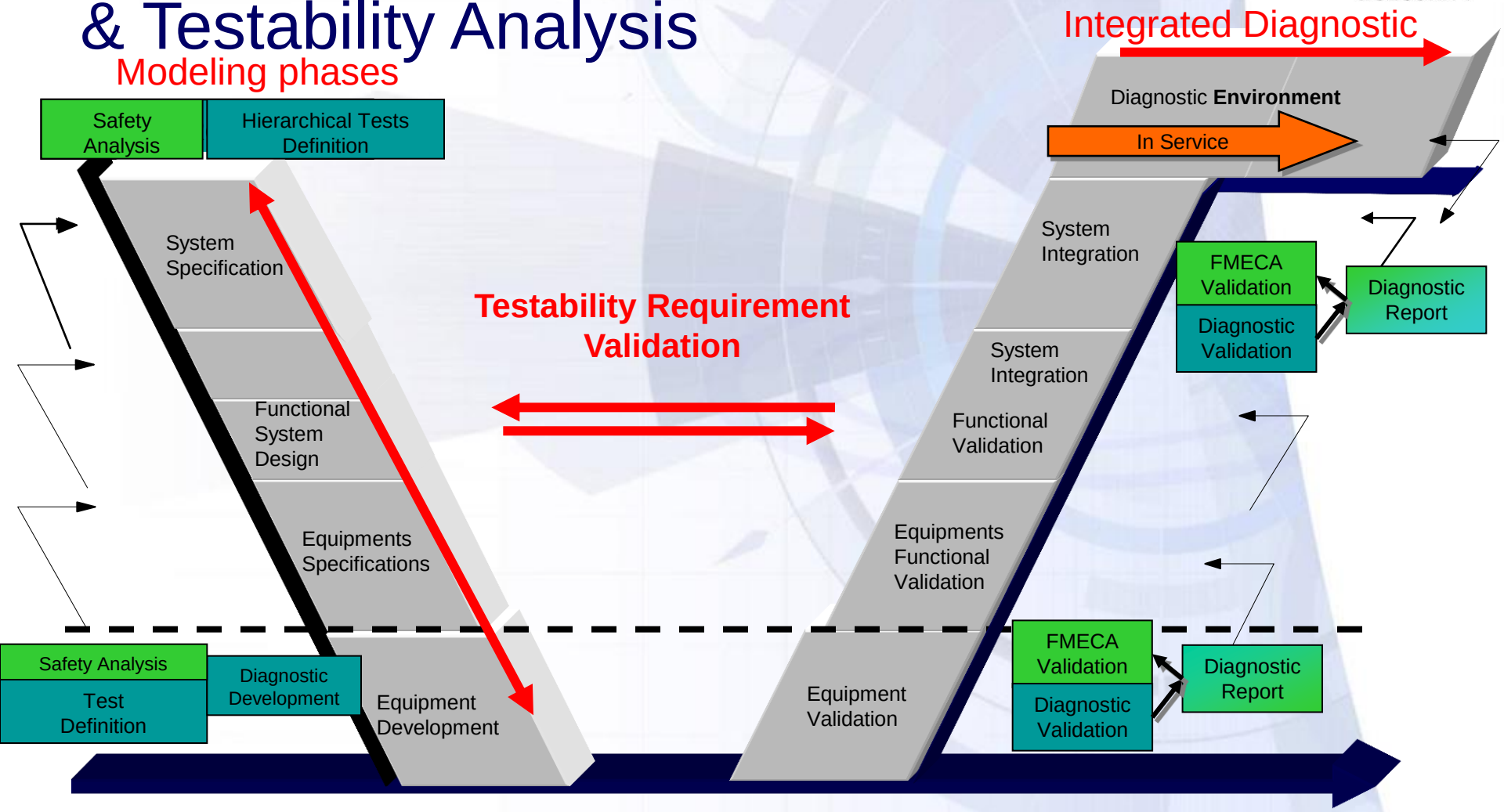


The Integrated process between Safety & Test

- **Safety: Building the Faults Catalog through the entire process, combining Top-Down and Bottom Up approaches**
  - Top Down: From the early requirements down to the equipment definition
  - Bottom Up: From initial Validation up to Servicing the System
    - All new failure Modes found are integrated from each Test level.

- **Testability: Using the Faults Catalog through the entire process, combining Top-Down and Bottom Up approaches**
  - Top Down: From the early requirements down to the equipment definition
  - Bottom Up: The hierarchical Tests (BIT) roll-up to the highest level definition and the Tests are Updated to the latest Fault Catalog.

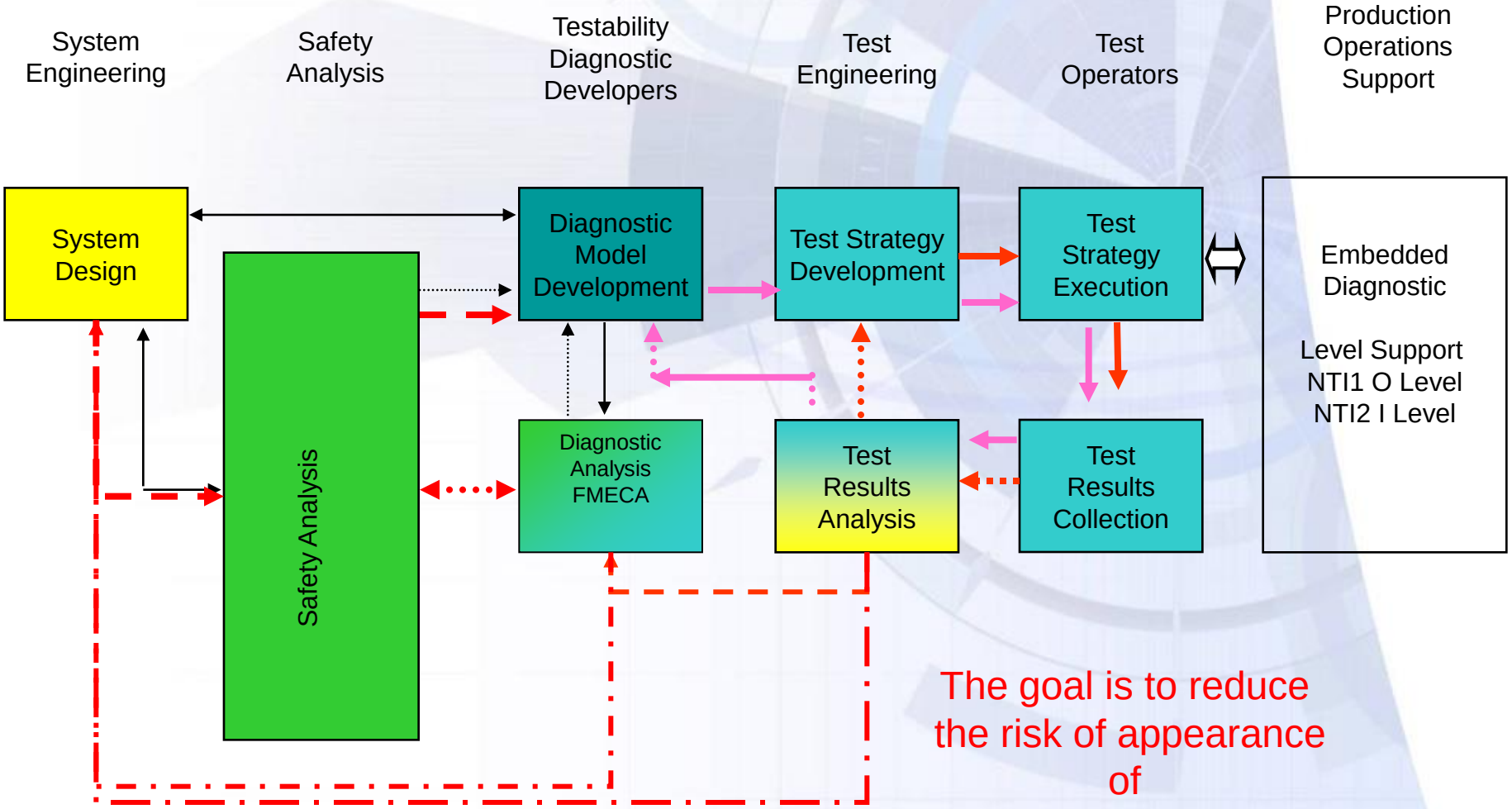
The Integrated process between Safety & Testability Analysis



Contents

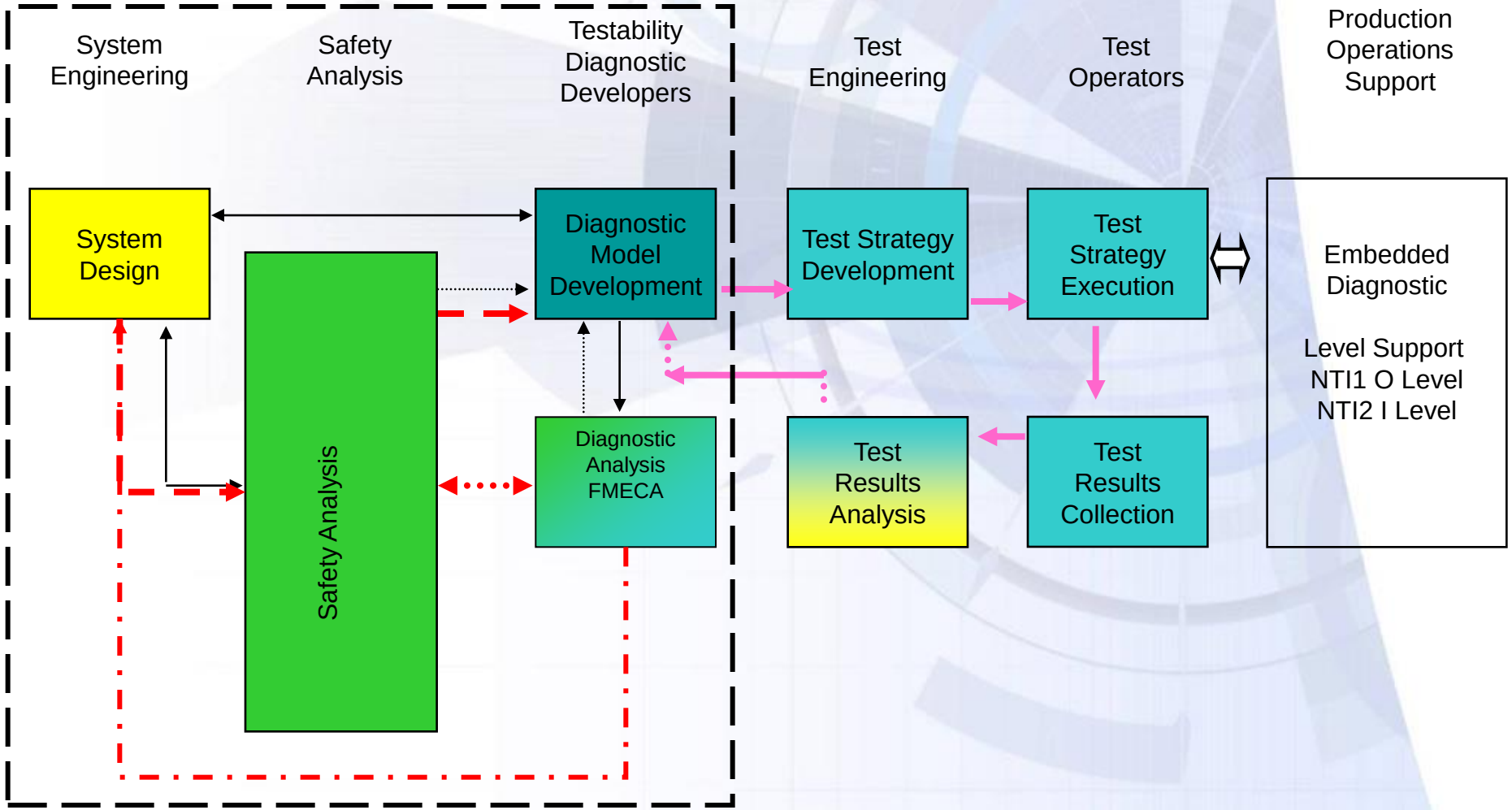
- The goal
- The problems encountered
- A Solution
- The implementation

The Integrated Process View toward a Software Framework

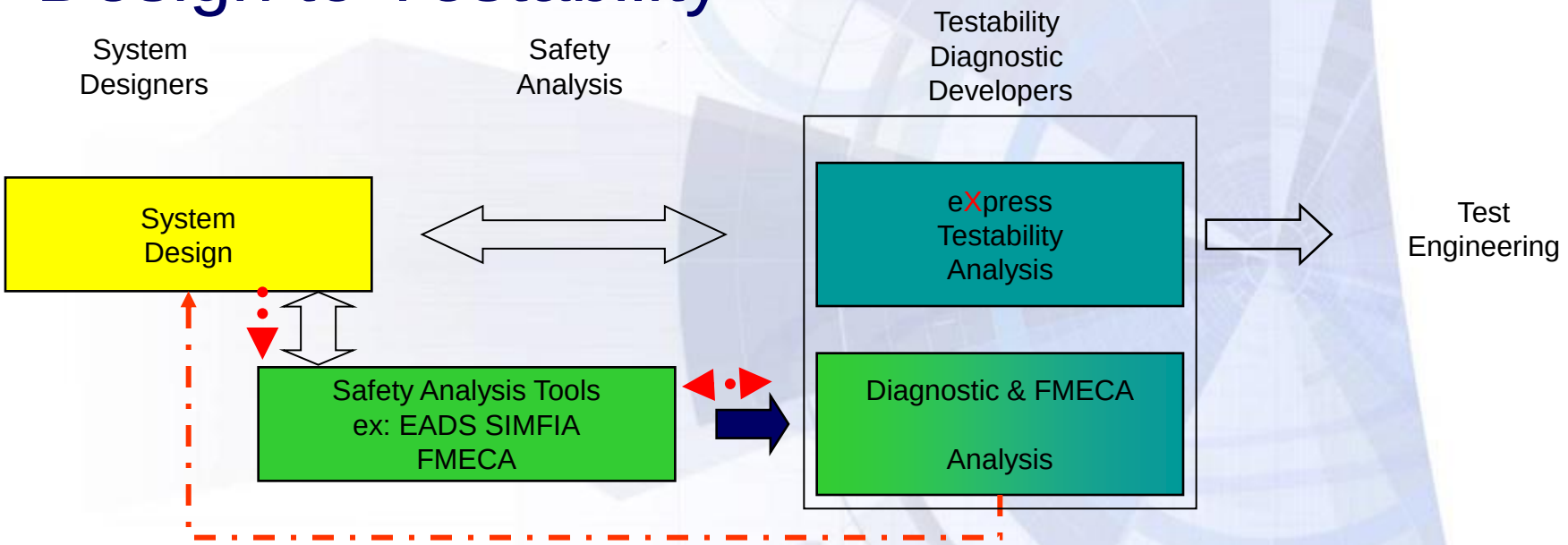


The goal is to reduce the risk of appearance of the critical loops

Software Framework from Design to Testability



Software Framework from Design to Testability

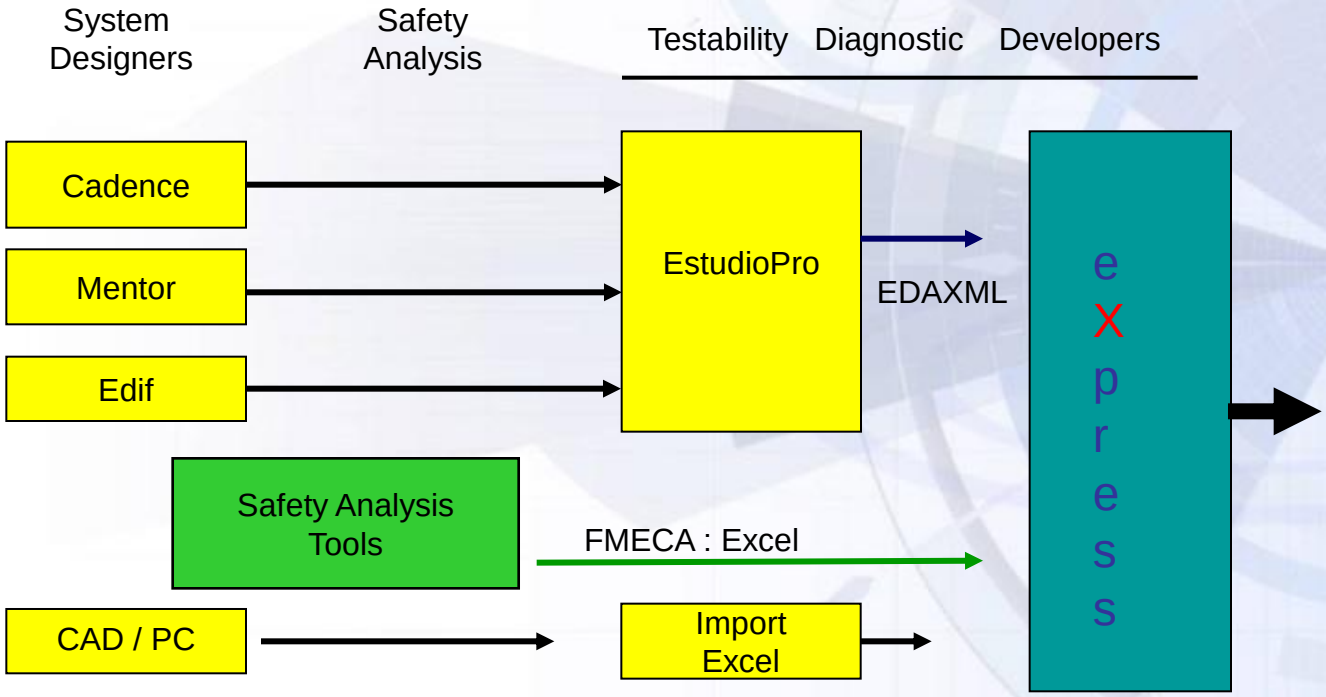


Safety Analysis Tool as SIMFIA can feed the Testability tool with:

- the safety dependency model and the reliability data's
- the Failure Modes and Hierarchical Effects
- the Severity

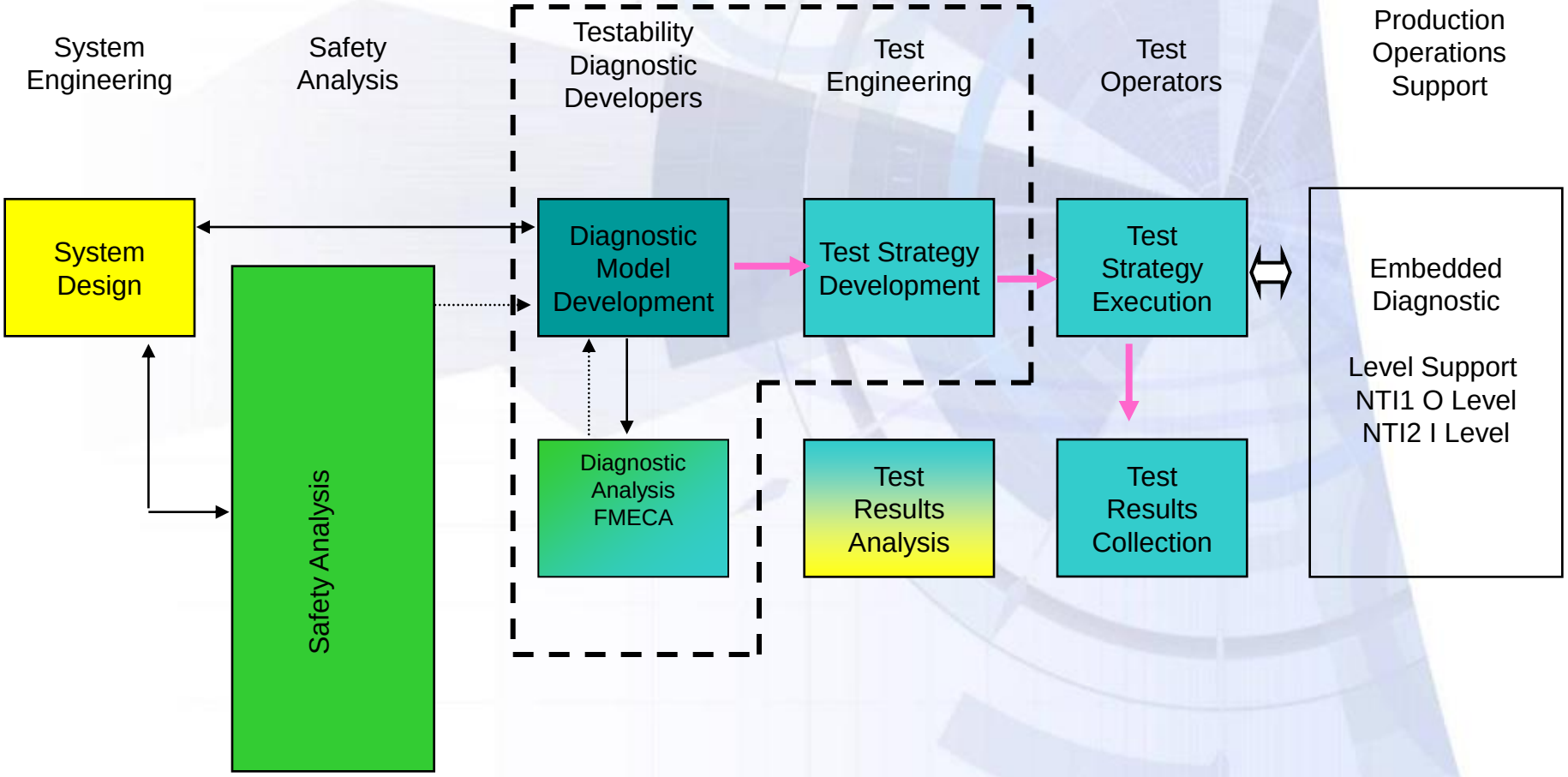
at the end of the Preliminary & critical FMECA

Software Framework from Design to Testability : Gateways

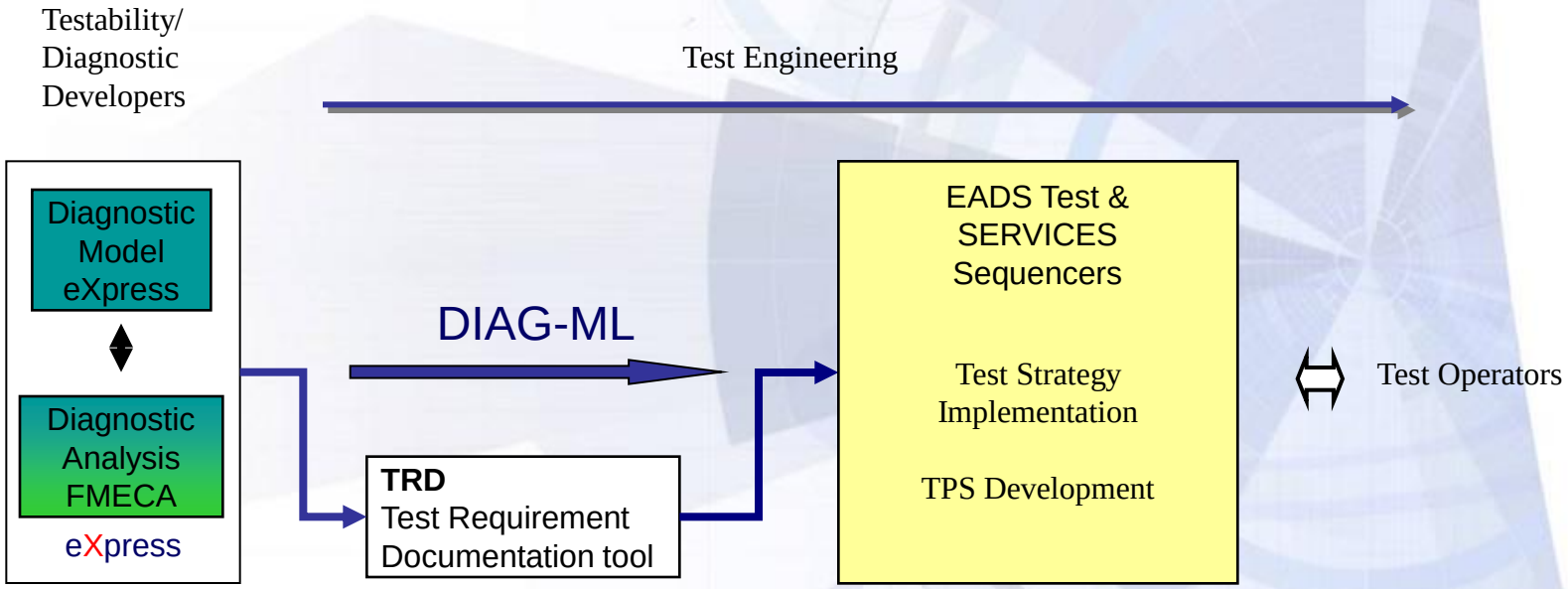


- The CAD multi-schemas are merged through Estudio Pro and imported in eXpress as one Design. *Igor Luvishis [igor@elgris.com]*
- The Safety Analysis Tools as Relex, Item Software, RAMS are feeding the Testability tool through Tabular FMECA

Software Framework from Testability to Test Engineering



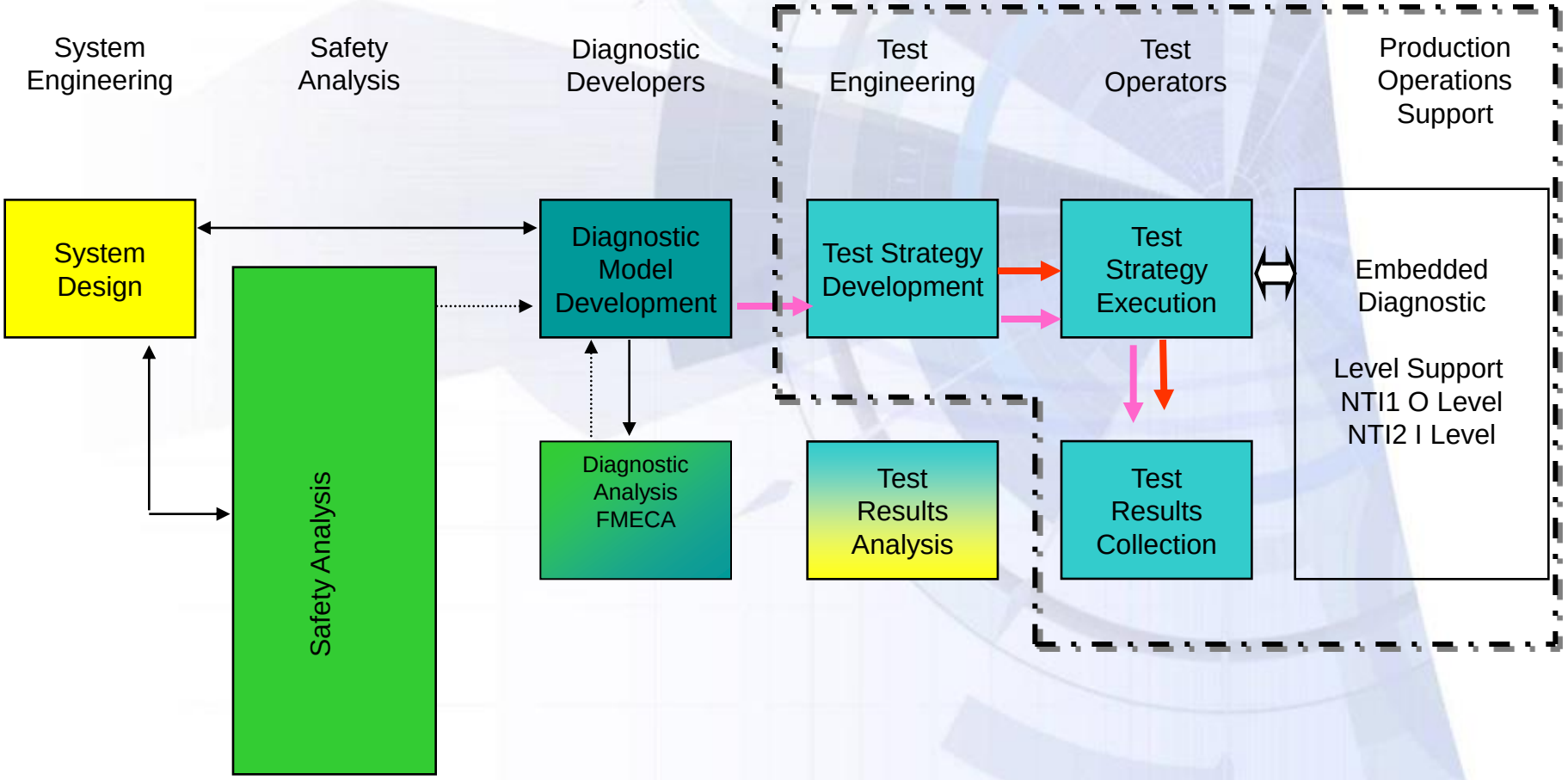
Software Framework from Testability to Test Engineering



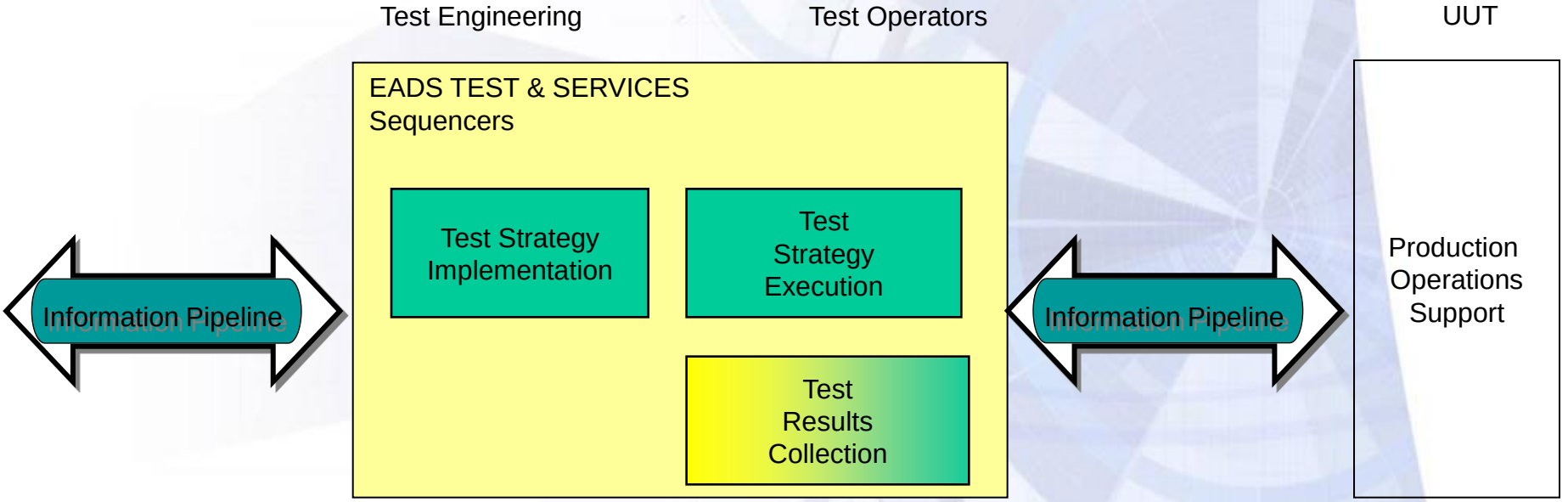
A Testability tool as eXpress is forwarding to the Test Sequencer efficient Test Strategies, for the target System, exporting:

- the UUT Description (hierarchical)
- the Diagnostic Flow Diagram (Detection and Isolation)
- the Test Attributes which can be enhanced with a tool like TRD
- the global Diagnostic Information (Faults Group data).

Software Framework from Test Engineering to Test



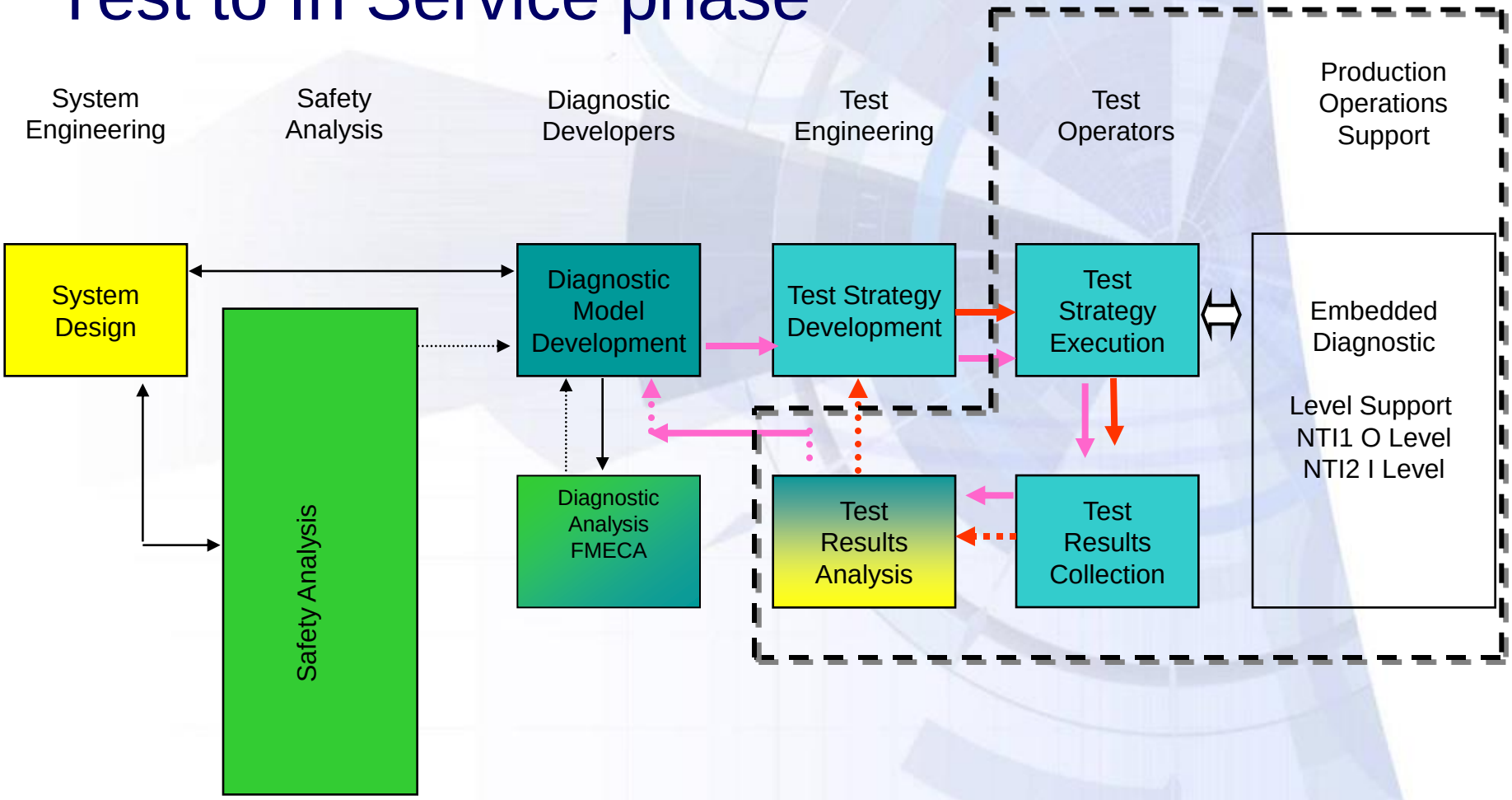
Software Framework from Test Engineering to Test



A Framework integrating an ATML compatible Information Pipeline

- which goal is to reduce development time and maintenance costs by facilitating information exchange
- based on XML Schemas description for information about
  - Test Station, Instrument, Test adaptor, Tests , Test results, UUT
  - Diagnostic, Maintenance Information Collection and Analysis

Software Framework from Test to In Service phase



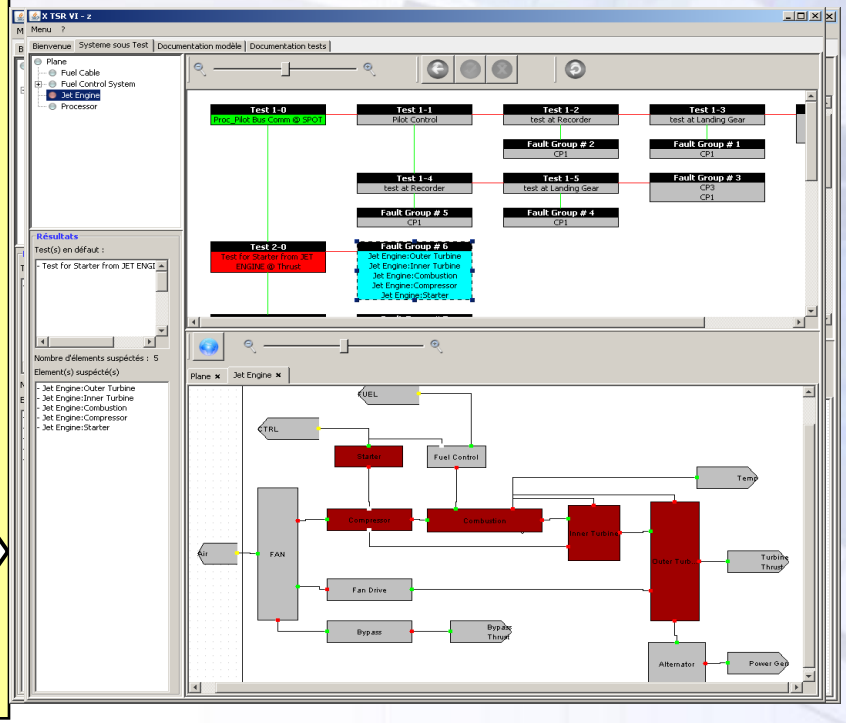
Software Framework from Test to In Service phase

Test Operators

Production Operations Support

EADS TEST & SERVICES Sequencer

- Test Strategy Execution
- Test Results Collection
- Test Results Analysis



Information Pipeline

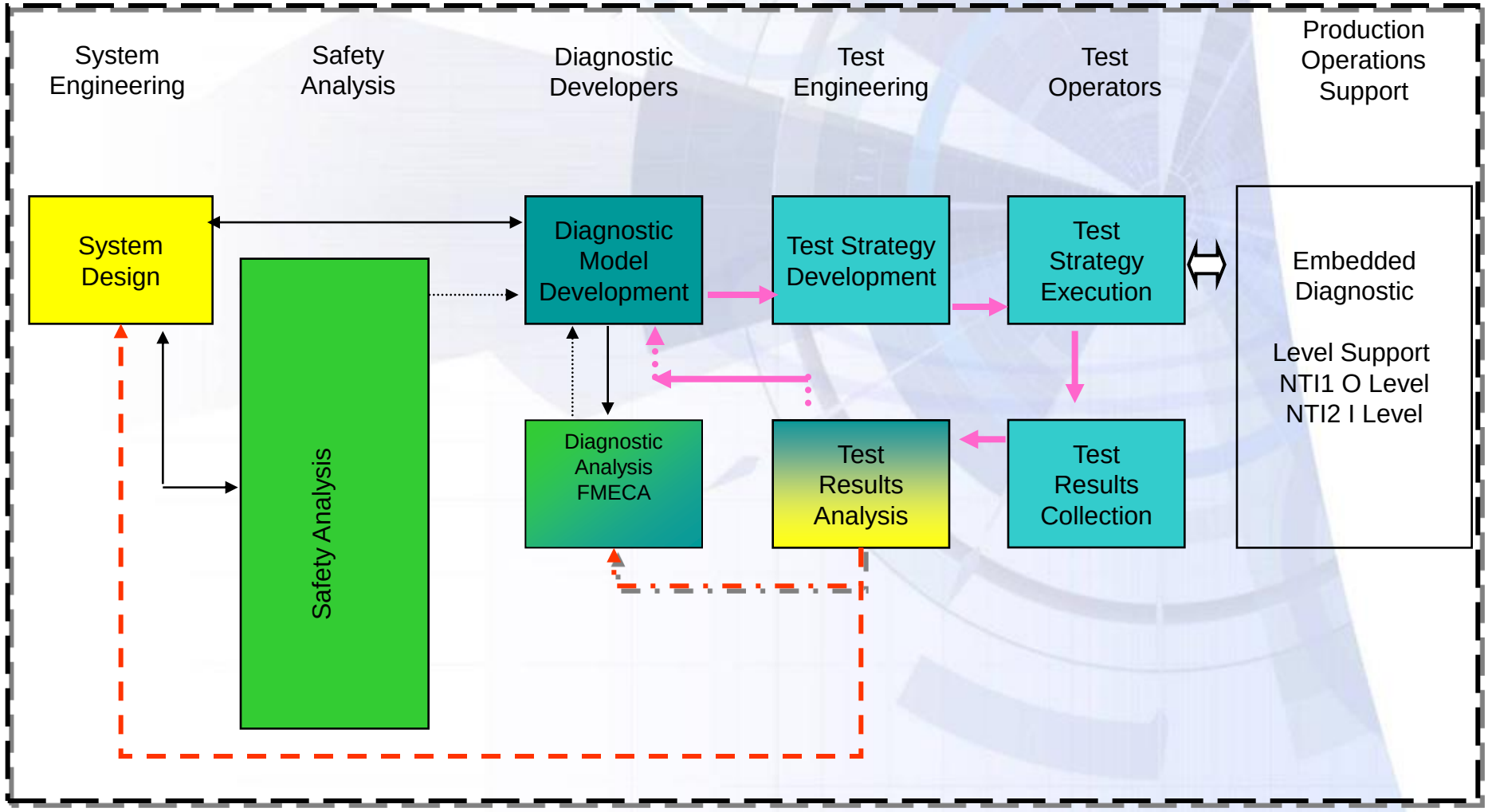
UUT

- Embedded Diagnostic
- Level Support
  - NTI1 O Level
  - NTI2 I Level

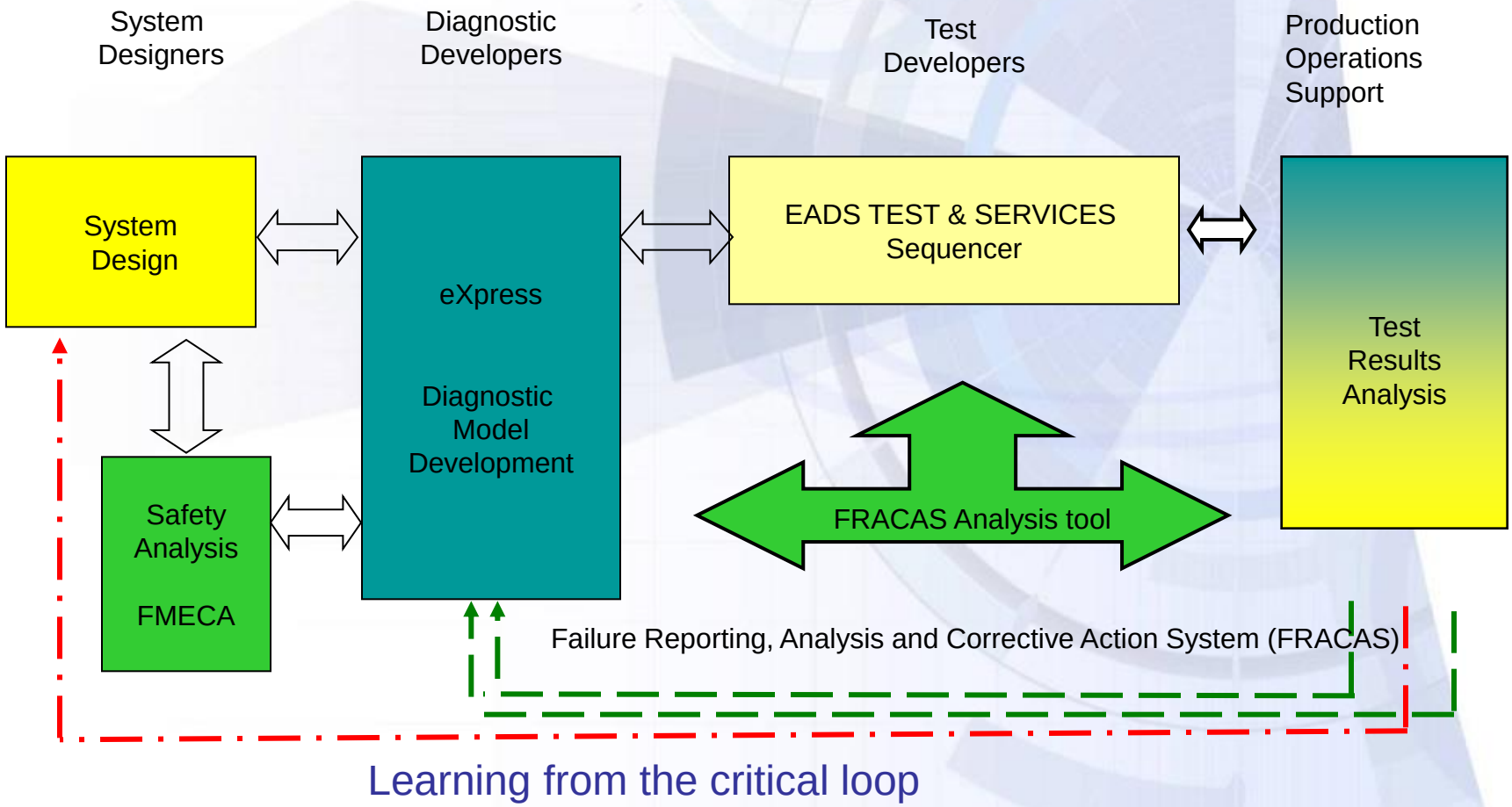
A Visualization Interface

- Hierarchical Level Indicator
- Diagnostic Flow Diagram
- Hierarchical Graphical Models Schema
- Panel displaying Test / Isolation Results

Software Framework
Testability Requirements Validation



Software Framework
Testability Requirements Validation



Learning from the critical loop

Contents

- The goal
- The problems encountered
- A Solution
- The implementation
- Synthesis - Conclusion

Synthesis

- Testability tools allows
  - Development of diagnostic models using CAD/CAEE data
  - Diagnostic Model Development and Diagnostic Analysis with FMECA inputs through the V cycle
  - Evaluation of diagnostic performance
  - Generation of Diagnostic Test Strategies to be exported
- EADS T&S sequencers allow
  - Test Executive and Run-time execution using multiple test environments
  - Import Diagnostic Test Strategies and ATML XML format definition Schemas
- Validation
  - Visualization of the Design and Diagnostic Test Strategies Results, RoEx information's
  - Model Information’s, Diagnostic Test Strategies from an extended DIAG-ML

Conclusion

- The integrated process allows
  - Coherence between Functional Schematics, FMECA, Tests and Diagnostics
  - Reduction of the total cost of ownership of the system
  - Improved traceability and Quality of Test Coverage (Detection/Isolation) and Test Results Analysis
- An integrated process is possible in a software Framework including:
  - eXpress
  - EADS Test & Services tools