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The Software Factory Approach:

Model-Based Design for Safety-Critical Application

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Agenda

- Introduction
- Tata Elxsi Challenges with Traditional MBD Workflow
- Software Factory Approach in MBD
- Workflow MBD Process on CI/CD
- Outcomes
- Future Scopes

Adoption of Model Based Design in Tata Elxsi

Scopes:

- Software development
- Verification and Validation for various components



KK0 1. Requirement may change within one set of code release.

2. Multiple unit models that is going updating day to day depends upon the client's requirement.

3. Since models involved, assigning of the activities like model development, unit testing and other activities will involve multiple engineers that can create challenges in terms of dependent activities. Ex: any signals are coming from model A and it is testing at model B. Let us say model A testing is not done properly (range specific things missed out/ boundary condition) Model B testing is of no use though it is tested very properly inlined to the functional requirements.

3. Here it involved more time with a less efficient process.

4. More manual communication, ticket creation headache, assignee unavailability, moreover it is a challenge to operational aspect of the project.

Kavita Kumari, 2024-09-27T12:10:01.766

Tata Elxsi – Challenges with Traditional MBD Workflow



Team communication



Ignorance of activity



Reports gathering



Difficulty in defects handling

TATA ELXSI

4

What is the Solution?

SOFTWARE FACTORY APPROACH

7

TATA ELXSI

MATLAB EXPO

5

What is Software Factory?

- An organized, structured and systematic approach
- Continuous Integration
- Continuous Delivery



Process Flow



Software Factory Approach

- Saving time by parallel execution in CI.
- Avoid manual efforts and easy to collect all artifacts in Jenkins workspace.
- Able to handle run testing for 1000 number of models and populate the results.
- Due to auto assignments and operational communication, at integration level bugs can be identified and fixed earlier.
- Since auto trigger mechanism during any fail cases on V & V phase it will trigger and generate report. As result software will be defect free.



7 TATA ELXSI

Workflow – MBD Process on CI/CD



Review issues and reproduce locally

TATA ELXSI

8



Process Advisor



- How do I define and deploy an MBD workflow?
- Prequalify locally to reduce build failure



Reproduce & debug build failures



 Plugins: Run MATLAB command, Run MATLAB test and Run MATLAB build

Project Files Monitoring and Commit to Feedback Repository Generate Static Model Reports Analysis Static Code Analysis Automate Build Equivalence and Code Test Generation Automate SIL Testing

10 TATA ELXSI

CI/CD Automation Process Flow



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Simple Setup

- Prebuilt MBD Pipeline
- Built in MBD Tools Support

Desktop Integration with Process Advisor App

- Local Prequalification
- Local Debugging

3rd Party CI Integration

- Jenkins/ Gitlab/ Devps
- Optimise MBD Build
- CI Result Integration

11 TATA ELXSI

Video: CI Process Flow

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12 TATA ELXSI



Outcomes

13 TATA ELXSI

Future Scopes

- Tool Integration: Continuously integrate and update CI/CD tools for improved functionality and efficiency.
- Pipeline Optimization: Regularly optimize CI/CD pipelines to handle increasing complexity and scale.
- □ Customize Process Advisor as per the requirements.
- □ Collaborative refinement with the MathWorks team.

14 TATA ELXSI











