

# MATLAB EXPO

October 13.11.2024 | Online

## The Software Factory Approach: Model-Based Design for Safety-Critical Application

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*TBU | Model Based Design*



# Agenda

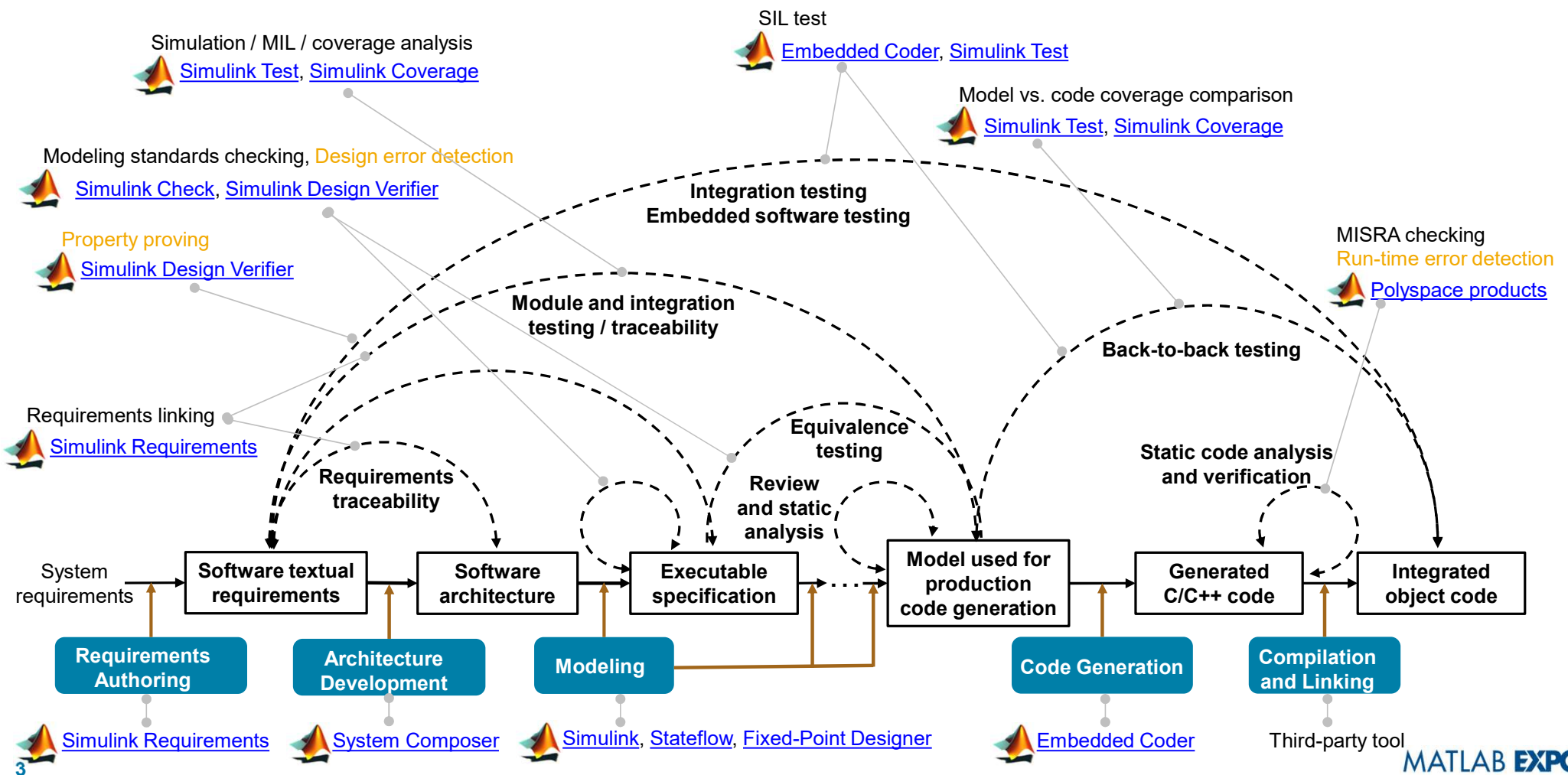
- Introduction
- Tata Elxsi – Challenges with Traditional MBD Workflow
- Software Factory Approach in MBD
- Workflow – MBD Process on CI/CD
- Outcomes
- Future Scopes

# Adoption of Model Based Design in Tata Elxsi

## **Scopes:**

- Software development
- Verification and Validation for various components

# Safety Critical Process



## Slide 4

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**KKO**

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.

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## Tata Elxsi – Challenges with Traditional MBD Workflow



Team communication



Ignorance of activity



Reports gathering



Difficulty in defects handling

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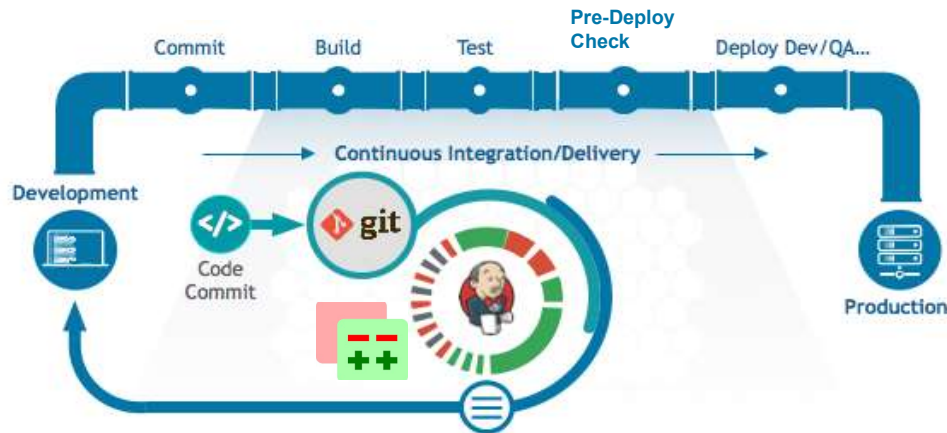
What is the Solution?

**SOFTWARE FACTORY  
APPROACH**

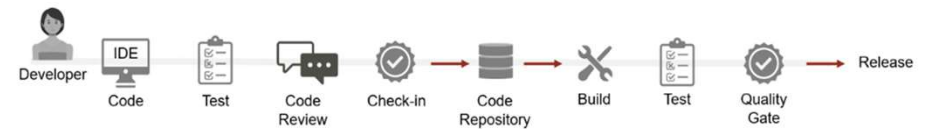
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# What is Software Factory?

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



## Process Flow



### 1. Repeatability

Find errors and verify coding standards consistently

### 2. Faster delivery

Find defects early  
Reduce testing  
Upskill Developers

### 3. Higher Quality

Quality gates  
Including the absence of critical runtime errors!

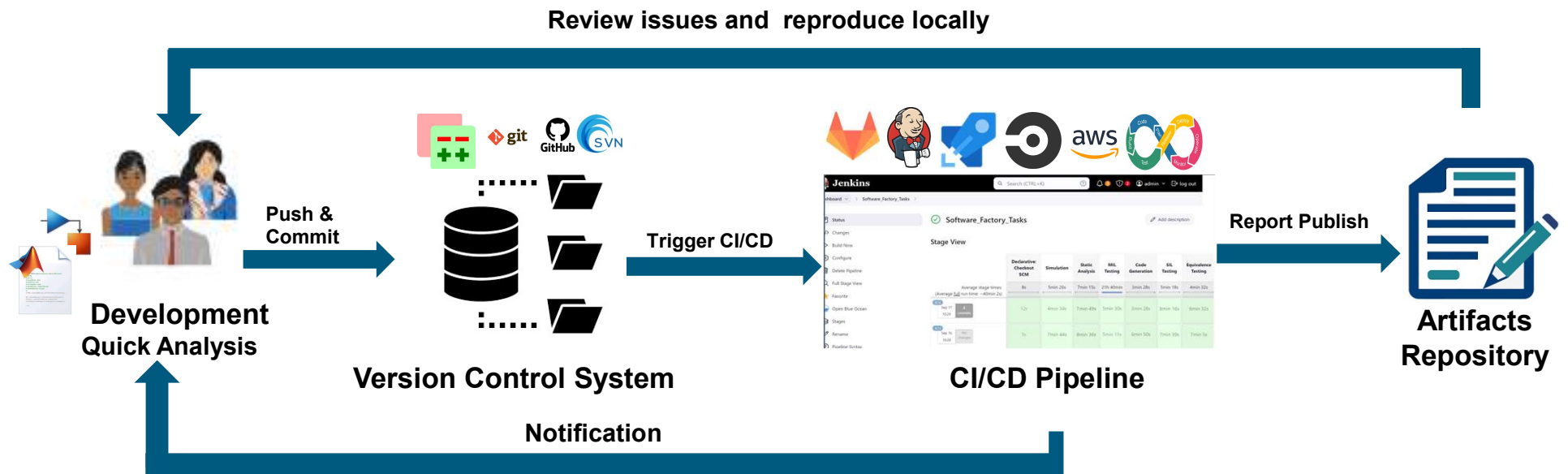


# Software Factory Approach

- ❑ 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.



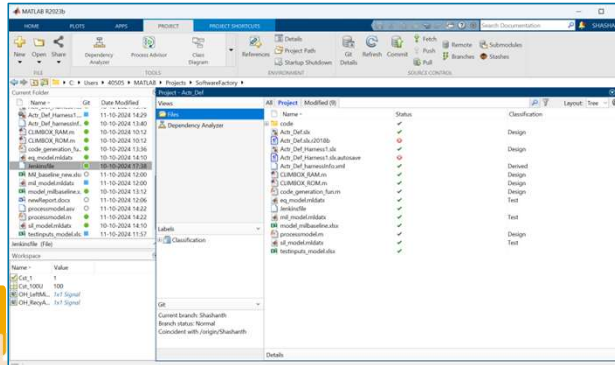
# Workflow – MBD Process on CI/CD



- Automation
- Validation and Verification
- Traceability
- Collaboration

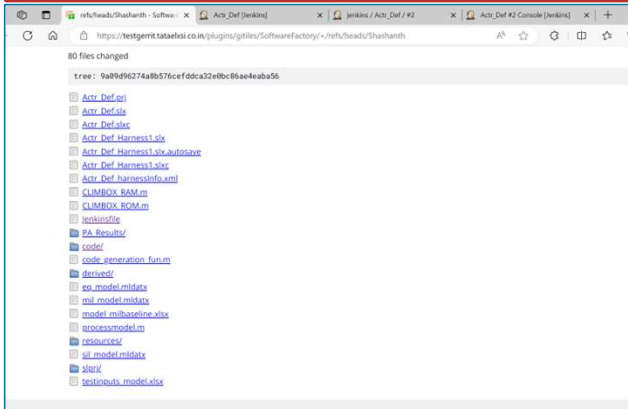
# Software Interface

- Interface MATLAB with Gerrit

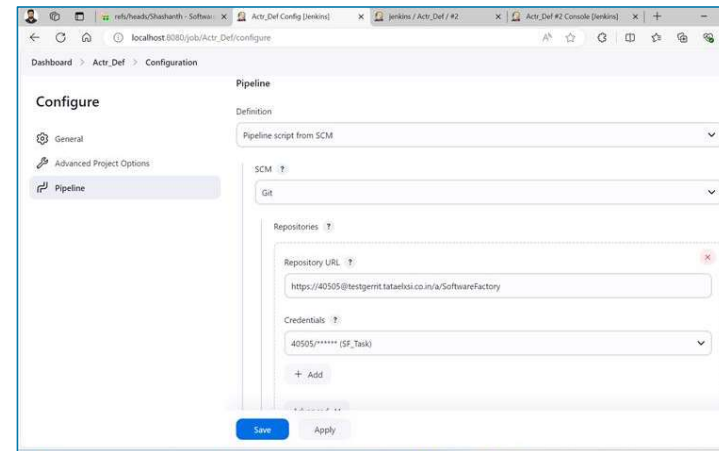


Create a new project and add files to Gerrit

Commit your changes and push files to Gerrit



- Interface Gerrit with Jenkins



# Process Advisor



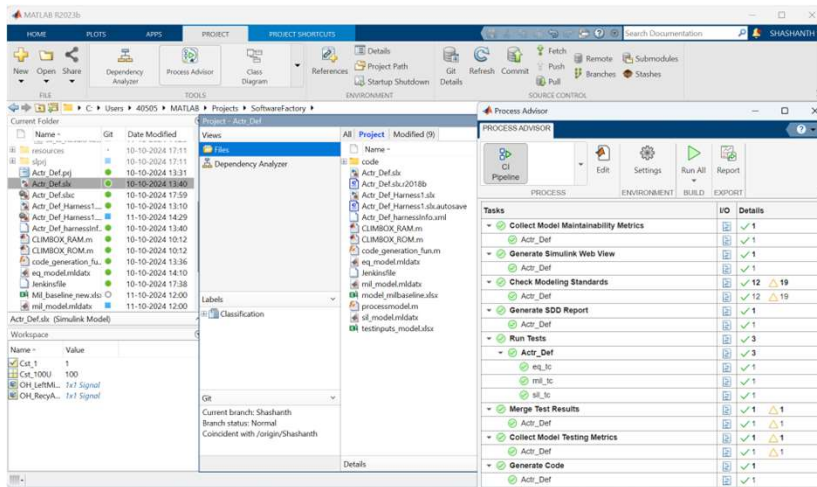
How do I define and deploy an MBD workflow?



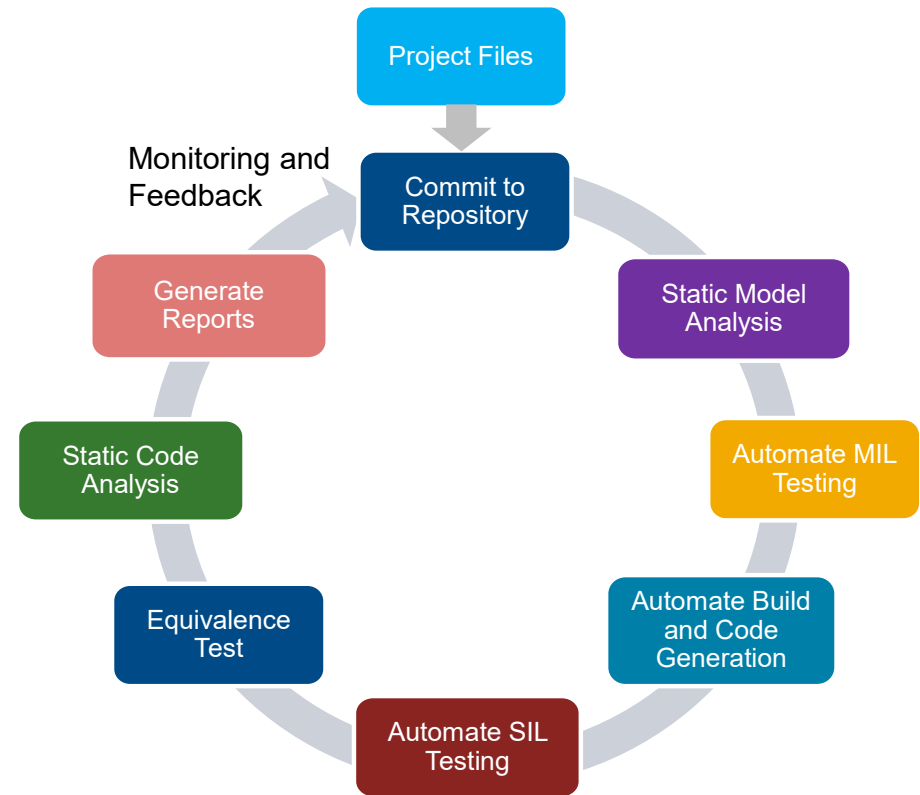
Prequalify locally to reduce build failure



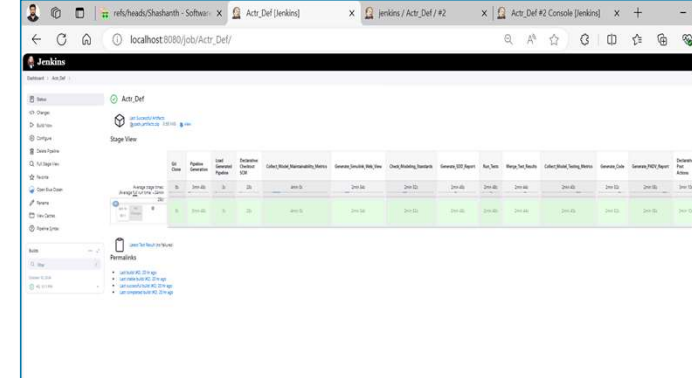
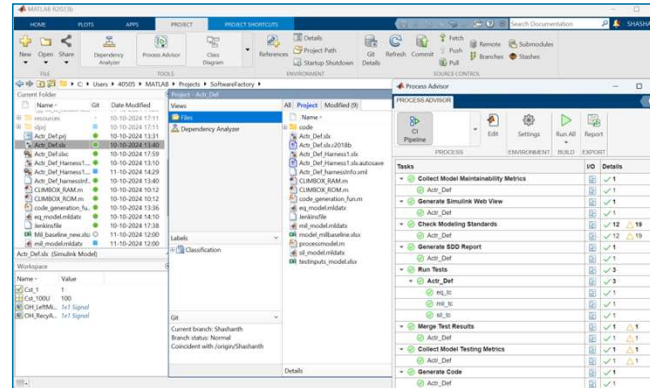
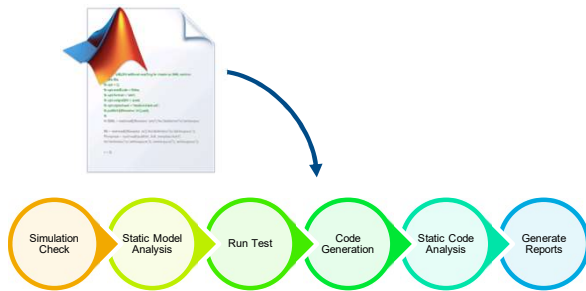
Reproduce & debug build failures



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



# CI/CD Automation Process Flow



## Simple Setup

- Prebuilt MBD Pipeline
- Built in MBD Tools Support

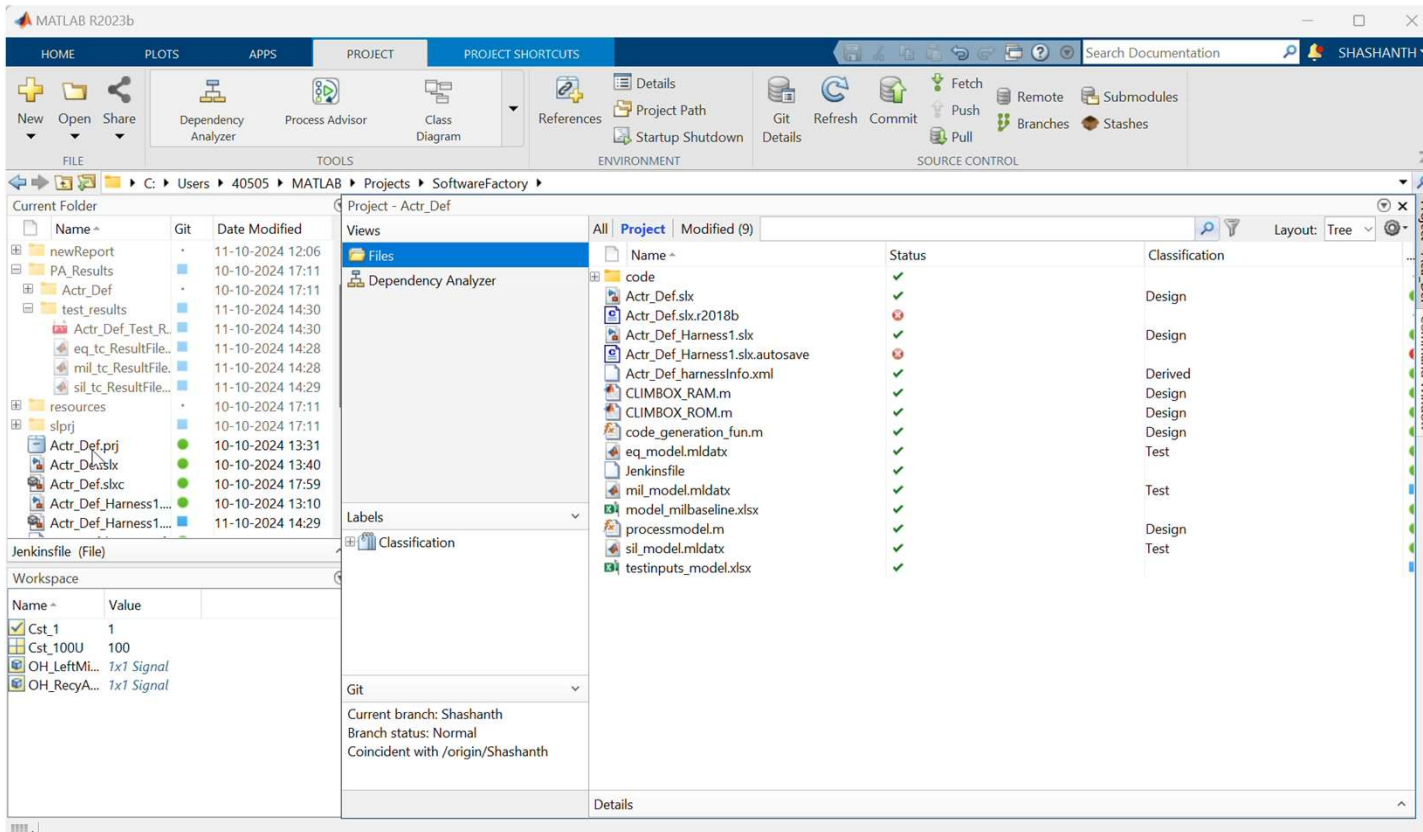
## Desktop Integration with Process Advisor App

- Local Prequalification
- Local Debugging

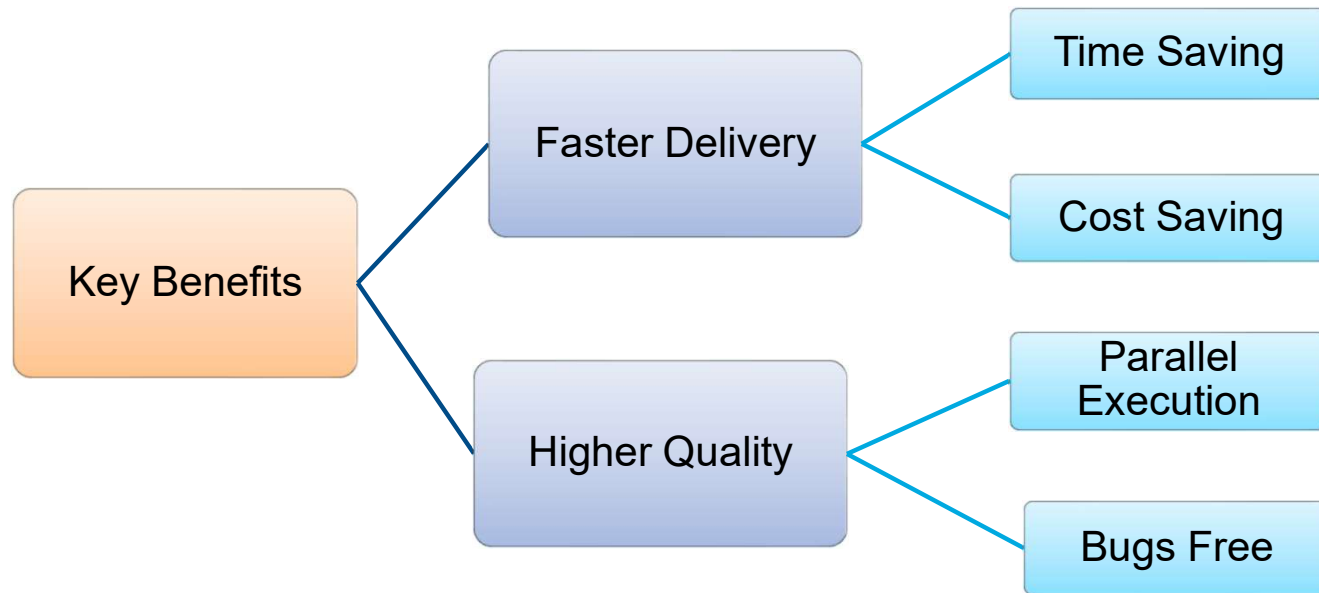
## 3<sup>rd</sup> Party CI Integration

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

# Video: CI Process Flow



# Outcomes



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## 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.





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**THANK YOU**

