

Software Development Applying MBD Process & Tools at Ford



MathWorks Fall Automotive Engineering Conference
October 28, 2020

Presented by:

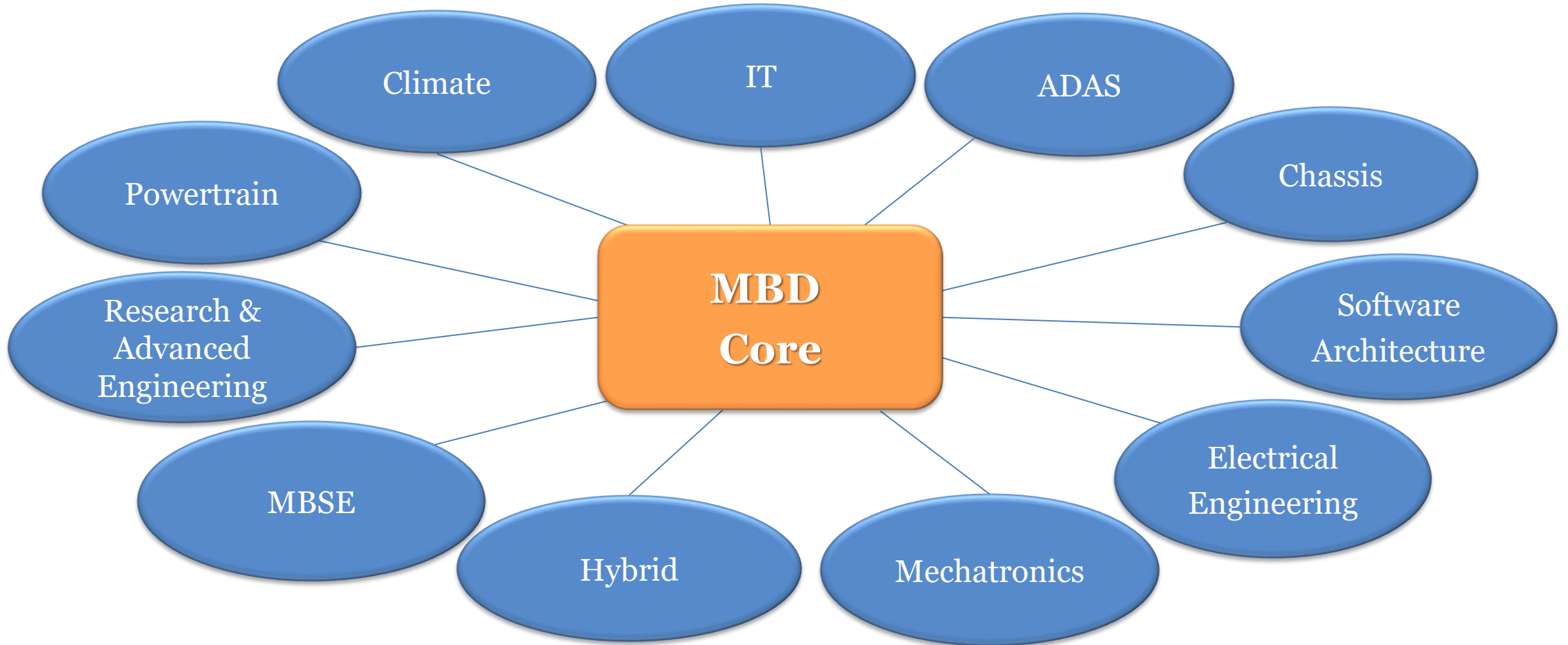
Kim Murphy
Ford MBD Technical Specialist



- MBD (Model Based Design) is a Common set of Processes, Tools and Methods for developing control/requirement models for simulation and/or code generation.
- MBD is designed to integrate with and enhance the current strategy/software development process used for production and research code development.
- MBD is a methodology used to design embedded software based on graphical models typically applied to control systems.



MBD Core Team & Stakeholders



MBD Core Team is a centralized team that develops and deploys MBD Processes, Methods, and Tools for Ford globally.



Evolution of MBD at Ford

Teams applying MBD for Requirements Capture

Hand-code

1990's

2005-2008

Early MBD Adopters

Teams piloting MBD for Embedded Code Generation

Ad-hoc MBD practiced across company

MBD Core Team Established

2012

2015

Production Ready MBD Process / Tools

MBD Roll-out for Key Production Stakeholders

Proven MBD Process; Drive for Commonality

Common MBD Deployment

2017

2018

MBSE Core Team Established

New MBD Stakeholders

Recognition of Growth & Benefits using MBD, as well as diverging MBD practices, created value proposition for establishing MBD Core Team.



MBD Core Team Mission Statement

TO DELIVER BEST IN INDUSTRY STANDARD MODEL BASED DESIGN PROCESS, TOOLS, METHODS, TRAINING AND USER SUPPORT AND TO BE THE VOICE OF THE CUSTOMER WITH PRODUCT VENDORS

To that end, the MBD team is leveraging agile methodology and continuous integration platform

Increase Test Automation

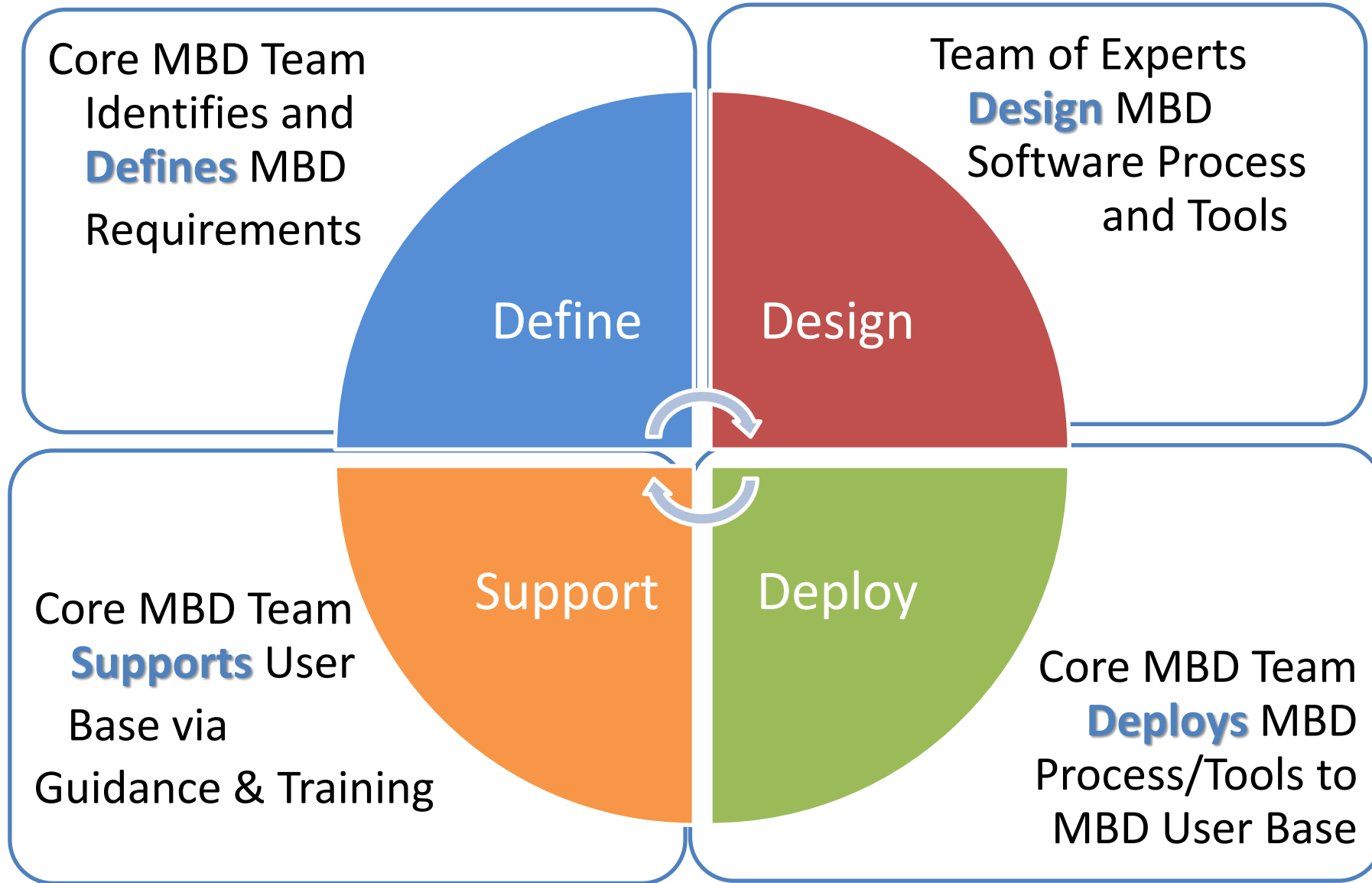
Efficient Process

Early Error Detection

Higher
Quality
MBD Tools

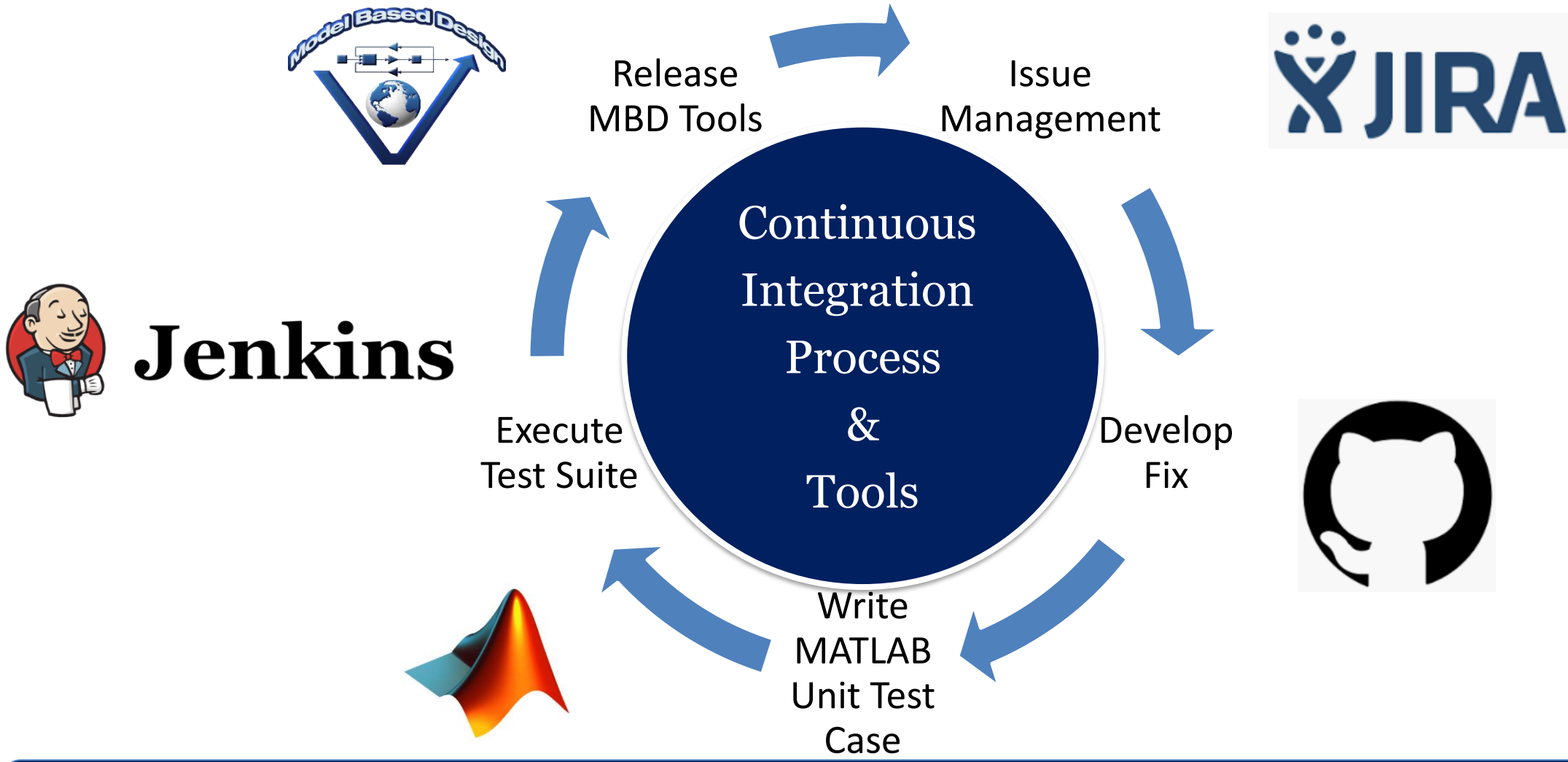


Key Roles of Ford MBD Core Team





Continuous Integration & Agile MBD Workflow



Increased Efficiency, Higher Quality MBD Tools

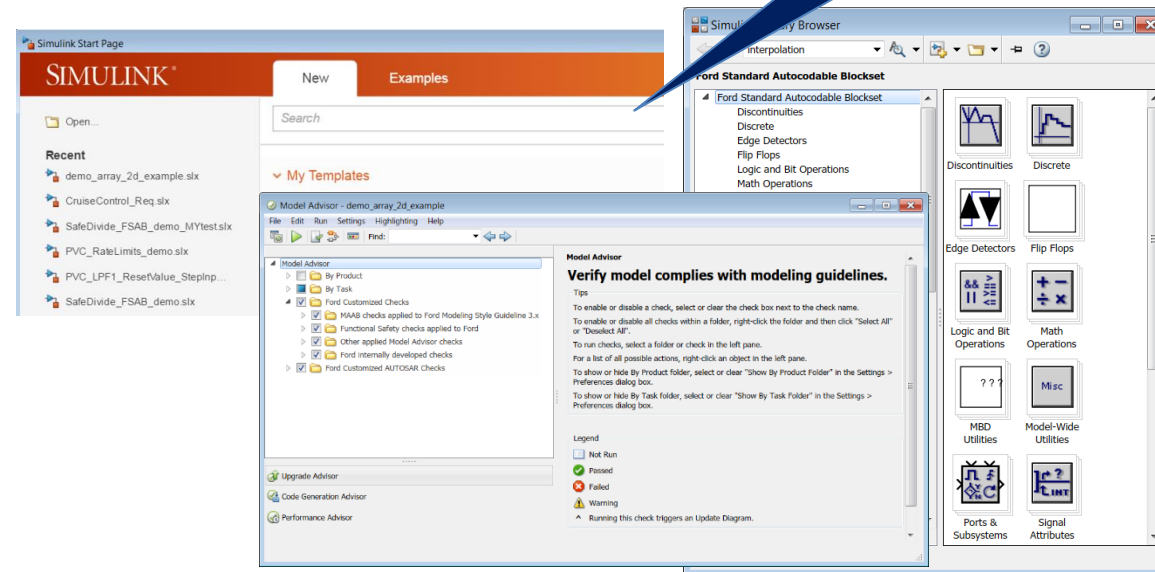


What are Ford MBD Process/Tools?

Each step of Ford MBD Process applies MathWorks Tools at the foundation.

Customizations are applied to base tools, however, to support Ford MBD Workflow.

- Model Templates
- Model Configuration
- Modeling Style Guidelines
- Blocksets (FSAB, PCCN, ...)
- Example Models
- Requirement Traceability
- Parameter Management

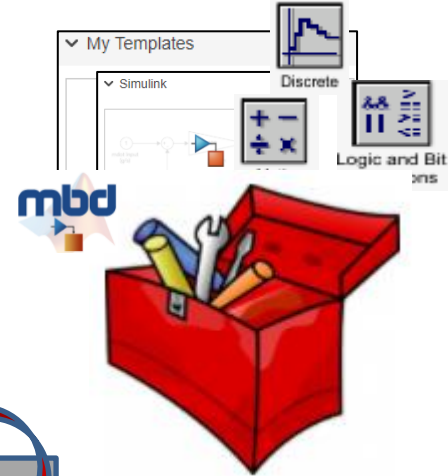


- Model Utility Tools
- Model Checking Tools
- Code Generation Tools
- Documentation Tools
- Static Analysis Tools
- Design Verification

Global MBD Processes/Methods/Tools that allow engineer to follow Ford Recommended MBD Workflow



Ford MBD Tools Release Process

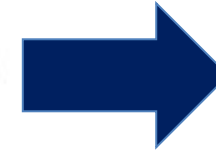


MBD Core Team delivers enhancements and fixes to existing MBD Tools on a Quarterly basis, supporting Production Users



- Powertrain
- Chassis
- Body
- Climate
- ADAS
-

MBD Core Team



- Prioritize Ford Requests
- "Top 10"
- Provide Clarification on Requests
- Track Progress



Single MBD Tools Release Package Supports:

- Latest 3 MATLAB “b” versions
 - Users encouraged to migrate every 3 years, at minimum
- Multiple Model Architectures
 - AUTOSAR, Export-function, Rate-Based
- Compliance to Model Industry Standards
 - MAAB Guidelines
 - MISRA
 - Functional Safety
 - AUTOSAR Style Guidelines



Some degree of flexibility required in MBD Tools to support multiple architectures, production timing, and model requirements.

- MathWorks Industry Model Testing (IMT) Process
- Early Product Testing (Pre-Releases)
- Evaluate new tools for alignment with Ford MBD workflow
- Identify & Fix issues prior to reaching Ford MBD end-users



MBD Core Team is responsible for testing new MATLAB releases and ensuring compatibility with Internal Ford MBD Tools.

Management of MBD Portfolio (MBD Vendor Tools)



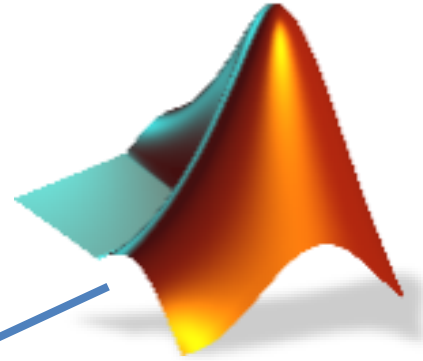
- Manage Deployment of MBD Portfolio Tools, including MATLAB, for all Ford users
- Manage MBD Vendor Toolbox Usage
- Manage Enterprise Licensing Needs

Management of MBD Portfolio allows us to better take Advantage of Latest Tools to Support Desired MBD Workflow



Strong Working Relationship

Early Product Evaluation & Feedback



Setting Direction Together

Collaboration with a Purpose

Win-Win Solutions



Workflow Development

CREATING TOMORROW TOGETHER



Challenges Along Way:

MBD Process/Tools Maturity

Gaining Commonality

- Migrating Pre-established Processes

Culture

- Shift in Mindset

Overcoming Silos



Common
MBD

Strong Relationship with vendors

Engagement with Functional Teams

Centralized MBD team driving & advancing MBD

Functional Team Alignment

Enterprise-Wide Alignment to MBD Strategy



Key Learnings to Overcome Challenges

**MBD
Process / Tools
Maturity**

Agile
Methodology
that allows
support for
Latest Emerging
Technology

**Gaining
Commonality**

Dedicating time
for hands-on
user support &
engagement

**Culture
Shift**

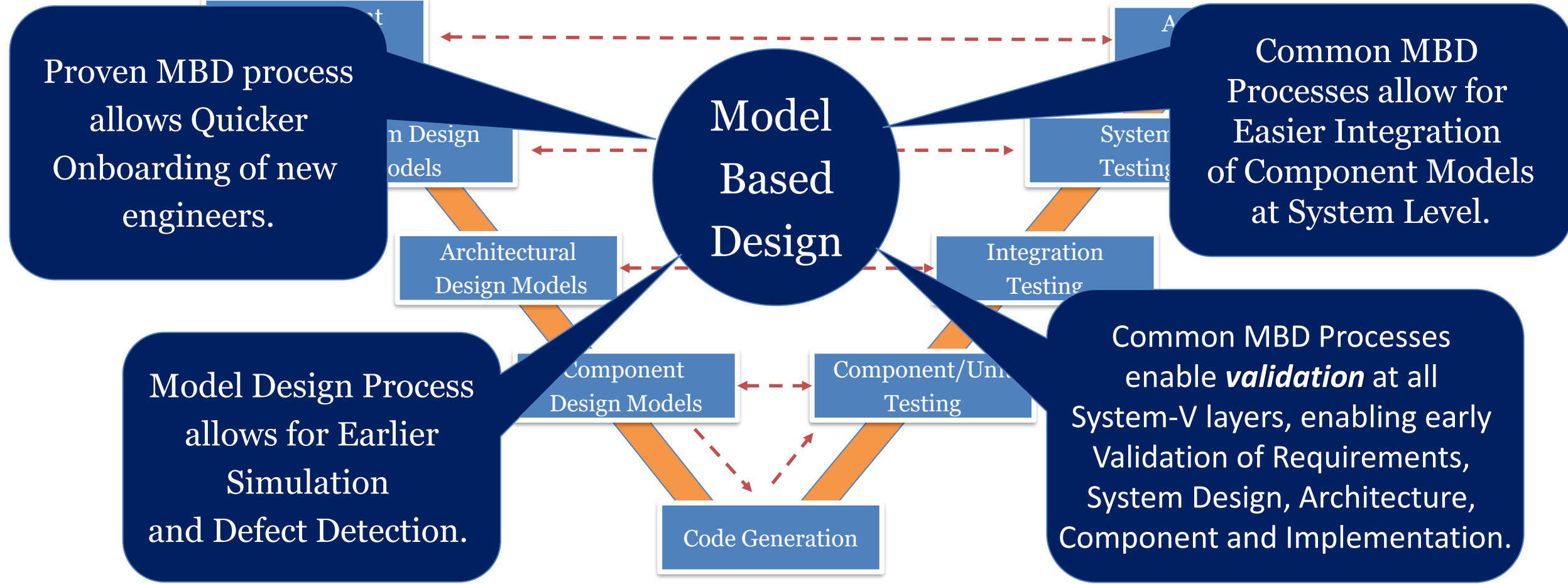
High-Level
Champion to
drive MBD
globally

**Overcoming
Silos**

Cross-functional
Governance /
Steering Team
Forums to steer
Functional MBD
Alignment



Model Based Design at the Core



Common MBD Processes & Tools Not Only Benefit the Engineer, but the Entire Enterprise.



Thank You!