Enterprise Infrastructure for Model-Based Design

Good to Great

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Opportunities of Enterprise-level Model-Based Design

- Enabling scalability
  - Inter-team collaboration
  - Multi-component simulation

- Empowering reuse
  - Designing for reuse
  - Publishing

- Expanding simulations and analysis
  - Parallel
  - Distributed
Agenda

- Managing MBD for scalability
- Sharing reusable tools and models
- Enterprise level simulations
Managing Model-Based Design for Scalability

- Key to scalability is careful management
  - Model reference
  - Interface definition (buses, ARXML import)
  - Simulink Data Dictionaries
  - Simulink Projects
  - Configuration Management integration
Simulink Projects for teams: Collaborate, automate, integrate

- Find and group files
- Standardize tasks
- Promote commonality with templates
- Label items for workflow support
- Share with SCM tools
- Project referencing for scalability
Source Control Management example: Git

- Common SCM features
  - Shared location
  - All versions stored
  - Branches, labels, tags

- Git difference
  - Designed for distributed development
  - Favors branch & merge over fetch/lock/update

- For models, data dictionaries, .mat files this is tricky
Scalable component management strategy

- Align logical views of the system
  - Model components
  - Simulink Projects
  - Git modules
  - Data
Managing for reuse

- Challenges to reuse
  - Location
  - Clarity
  - Status
  - Awareness
  - Interoperability
  - Trust

- Simulink Projects, design templates, SCM integration

- Can we go further for sharing than just SCM?
Challenge of discovery

- Discovering what?
  - Your own apps
  - Engineering data
  - Models
  - Automation tools
  - Templates

- MATLAB Minimart add-on
  - Package and publish
  - Download and install
  - Versioning
  - Compatibility
Socializing this idea ➔ MATLAB App Store

- Search/filter
- Scope
- Approval workflow
- Component interdependencies
- Ownership
- Download tracking
- Notifications
- User ratings
- Comments
- Recommendations

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After 18 months
- 100 internally authored apps and toolboxes
- downloaded 6000 times
- almost 1000 users

- Reduce duplication
- Encourage and recognize sharing
- Engineering productivity increased
Challenge of growth of simulations and analysis

- **Scope**
  - component – subsystem – vehicle – fleet

- **Types of tasks**
  - Design of experiments
  - Controller/system optimization
  - Parameter sensitivity analysis
  - Training machine learning algorithms
  - System validation
MathWorks solutions

- Parallel Computing Toolbox
  - Multiprocessor/Multicore
  - GPU
- MATLAB Distributed Computing Server
Conclusion

- Optimize your adoption for enterprise
  - Scalability
  - Sharing
  - Speed

- Companies are improving in some dimensions

- Tackling all will lead to a world-class state
For further information

- Large scale modeling
  https://www.mathworks.com/help/simulink/large-scale-modeling.html
- Git integration
- Jaguar Land Rover User Story
- MATLAB Distributed Computing Server
  https://www.mathworks.com/products/distriben.html
- Amazon EC2 early adopter program