

# Astrium Activities around Gene-Auto in 2009

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# Outline

- Context
- Case Study
- Status
- Conclusion

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# Context (1/2)

## ■ OBSYS EADS Demonstrator

### ■ Objectives

- Increase system and software engineering technologies maturity for a faster integration in each BU On-Board Systems business
- Focus on development process optimization and future architectures framework analysis
- Sharing EADS best practices, methods and tools in software-intensive embedded systems
- Build and develop a common EADS On-Board Systems demonstration platform

### ■ Use Cases

- Topics of common interest in several Business Units
- Gene-Auto related use cases performed by Airbus and Astrium SAT, feedback of interest for other BUs (e.g., Astrium ST)

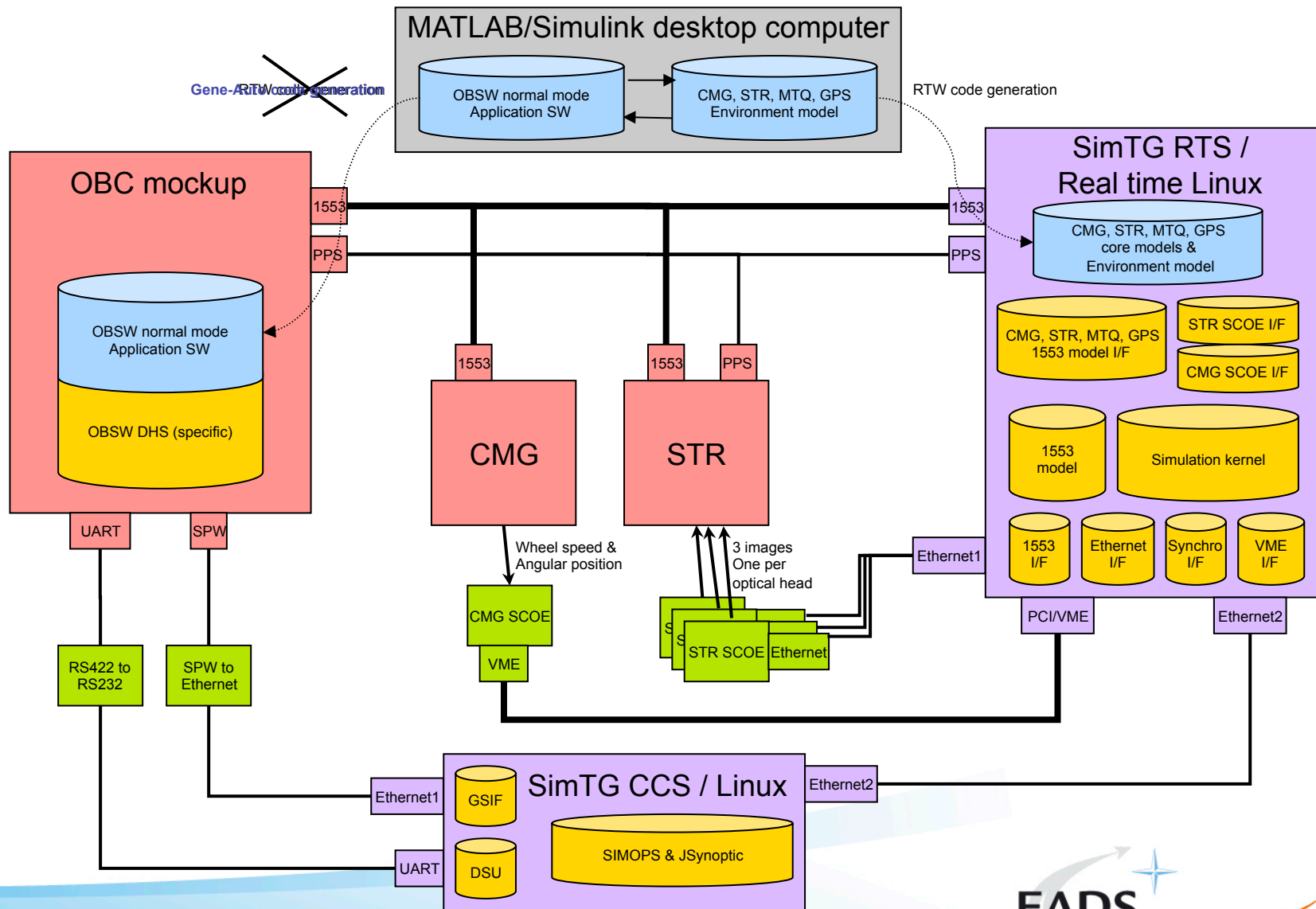
# Context (2/2)

- Gene-Auto maintenance contract
  - Stakeholders
    - Users: Airbus, Astrium
    - Providers: Alyotech, IBKrates
  - Purposes
    - Bug fixes
    - User support (e.g., on backend development and usage of Gene-Auto toolset)
    - Documentation update
  - Usage of common tool for support requests
  - Periodic CCBs gathering all stakeholders
    - Prioritization of the actions wrt available budget
    - Distribution of charges among the users
    - Decisions about new releases

# Case Study – DIVAS Demonstrator

- Demonstrator of new avionics features of AstroSat 250 platform (LEO missions)
- AstroSat 250 features
  - LEON3-based computer
  - New generation of actuators (i.e., star tracker)
  - Gyroless AOCS mode based on star tracker and on control moment gyro actuators
  - Single rate (16Hz)
- Demonstrator characteristics
  - Strict separation between Simulink models of FSW and of the rest of the World
  - Model compliant with RTW autocoding constraints

# Test Bench Overview



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# OBSW Model Characteristics

- Size
  - 3186 blocks
  - 10 hierarchical levels
- ~2000 constant initializations in .m file (originally the init was done through the workspace, i.e., a .mat file)
  - Many structures
  - Usage of Matlab functions (e.g., trigonometric)
- One S-function
- Many Embedded Matlab blocks for the core algorithms

# Status (1/2)

- **Necessity of model adaptation**
  - Creation of .m file from the .mat file
    - artisanal method (automatic extraction for scalars, manual extraction for structures)
  - Creation of 2 (simple) mode automata in Stateflow (as replacement to two Embedded Matlab blocks encoding automata)
    - Data ports, states, transitions, junctions
  - Removal of Matlab expressions in constant blocks
  - Replacement of unsupported blocks by equivalent sets of supported blocks wherever possible
  - Replacement of Embedded Matlab blocks by S-functions generated with RTW
    - Practical integration problems (necessity of wrapping, naming problem as RTW generates functions and files with the same names from different blocks)
    - Not a nominal usage of Gene-Auto
- **Necessity to add blocks in the library of supported blocks**
  - ~ 15 blocks identified (mostly blocks from the Simulink library, e.g., matrix operations, transfer functions)



# Status (2/2)

- The identified bugs were reported and fixed
- Code generation achieved on parts of the model (including stateflow charts)
- To do
  - Develop the necessary backends
  - Continue integration of code generated by RTW from the Embedded Matlab blocks
  - Generate code from the entire OBSW model and perform functional validation in closed loop as S-function integrated in the Simulink model

# Conclusion

- **The current maintenance organization**
  - Seems effective, allows federating efforts both on user and provider sides
  - Preliminary experimentation wrt OPEES
  
- **Foreseen Gene-Auto enhancements by Astrium**
  - Enrich the block library
  - Support for Embedded Matlab

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