



Aurora

Model-based code generation
for space embedded systems

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Requirement Gathering

Analysis of current trends in component-based software architectures

- - **core Flight System.**
- - **AUTOSAR.**
- SAVOIR.
- Other open source and **message driven solutions:** RabbitMQ, REST.

Requirements for the design of the component model

Detailed analysis of cFS and AUTOSAR for the generation of a **component model.**

Platform agnostic requirements.

Special attention to the **communication system.**

UI Integration

Requirements designed with the objective of their **integration in a Graphical User Interface** for the representation of modelling systems.

Requirements



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101004291



Requirements

N to M
Asynchronous
Communication

Events

Data Store

Component
Management

Fault Detection

General Requirements



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Code generation and integration



AADL+
ASN.1
models

Code
generation

TASTE
runtime

Generic
platform



AADL(cFS)+
ASN.1
models

cFS App
generation

cFS runtime

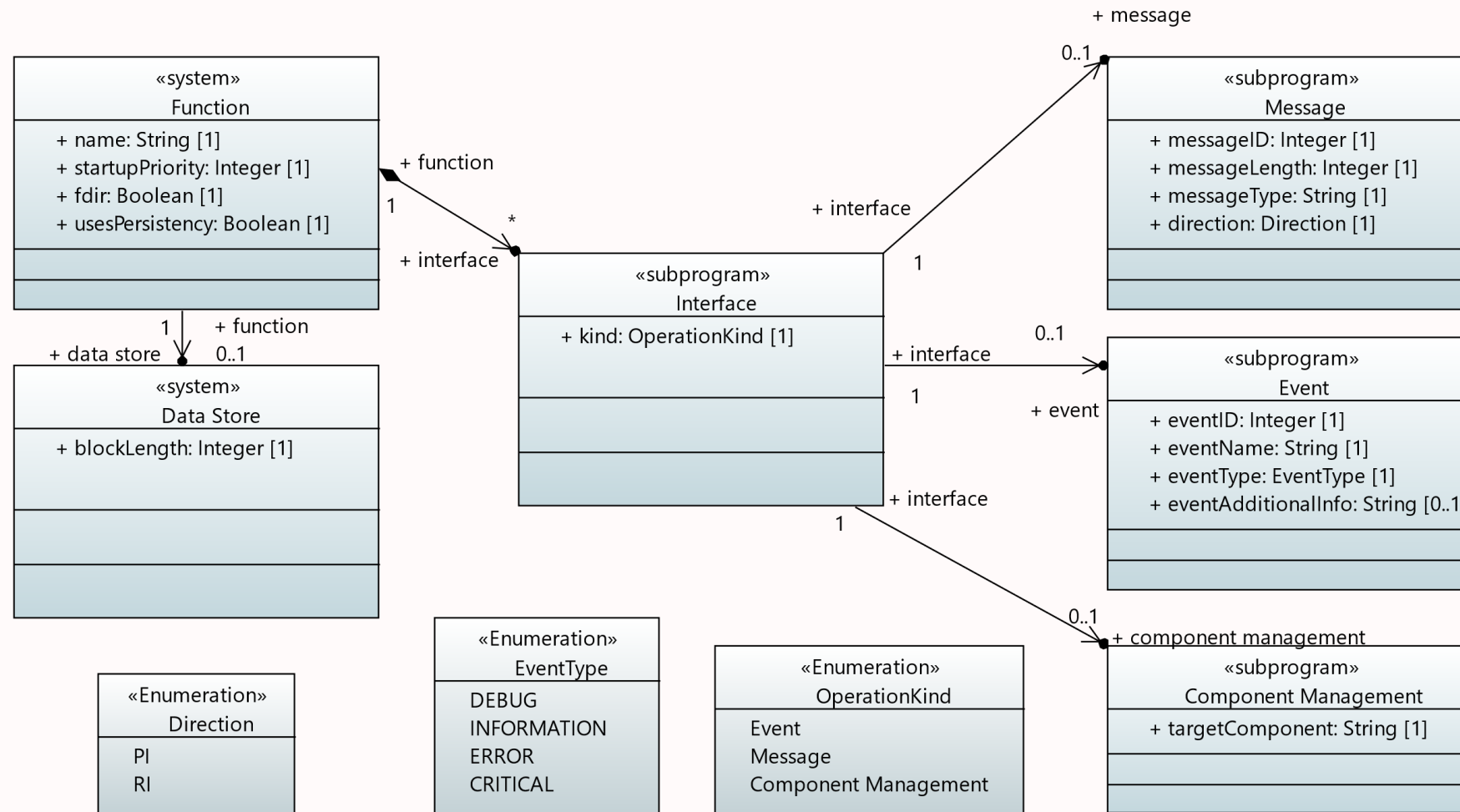
cFS-RTEMS-
LEON3
Platform



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Conceptual Model



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Excerpt cFS property set

-- *Message properties*

MessageContent: **aadlstring applies to (subprogram);**

MessageID: **aadlinteger applies to (subprogram);**

MessageSize: **aadlinteger applies to (subprogram);**

MessageType: **aadlstring applies to (subprogram);**

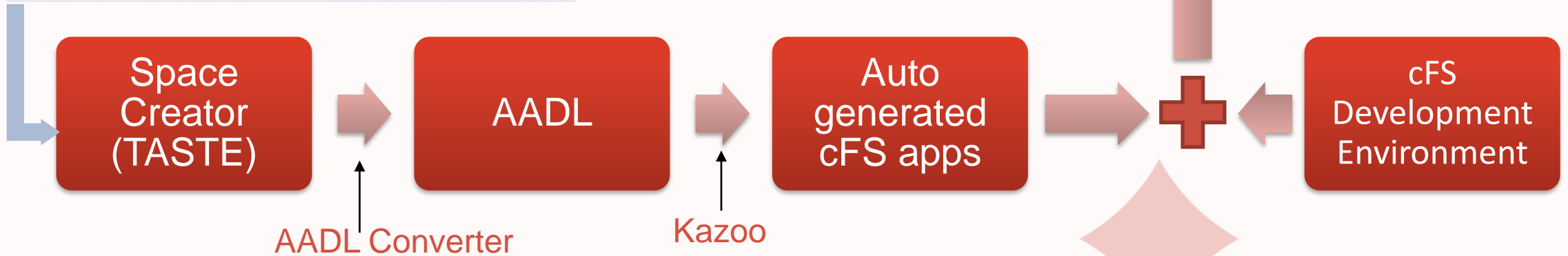
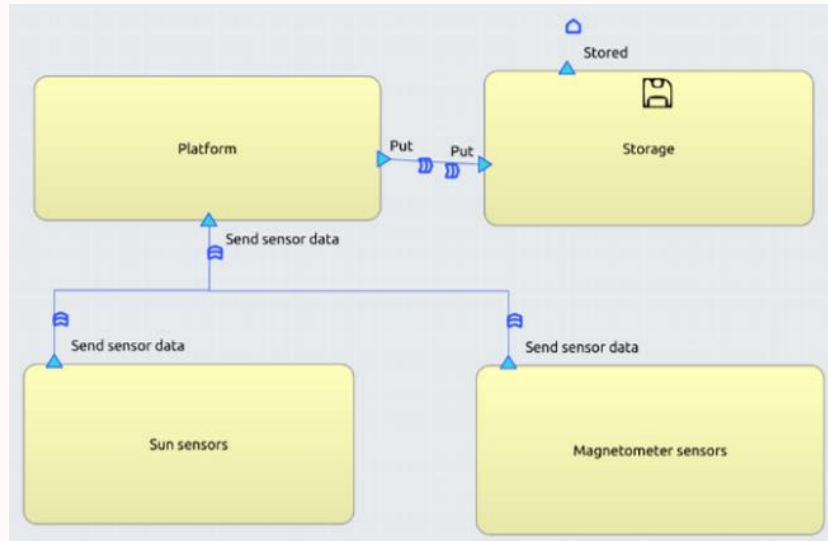
MessageDirection: **enumeration (PUB,SUB) applies to (subprogram),**



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Toolchain modifications for code generation



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Graphical extension

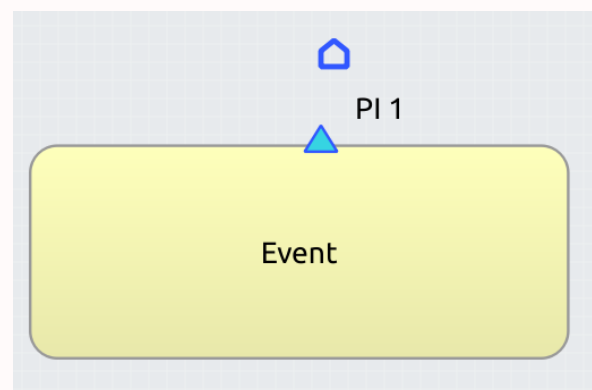
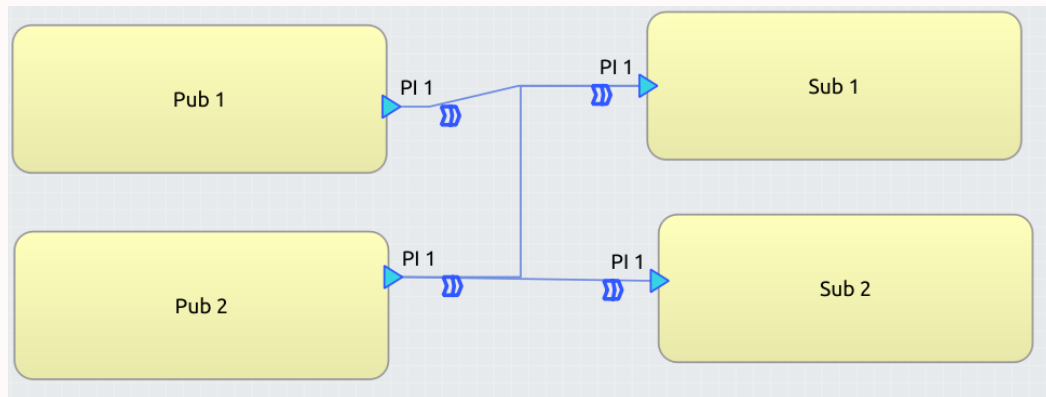
- No impact on code generation
- Explicitly represent new elements supported to improve end-user experience
- Messages and events representation based on SAVOIR



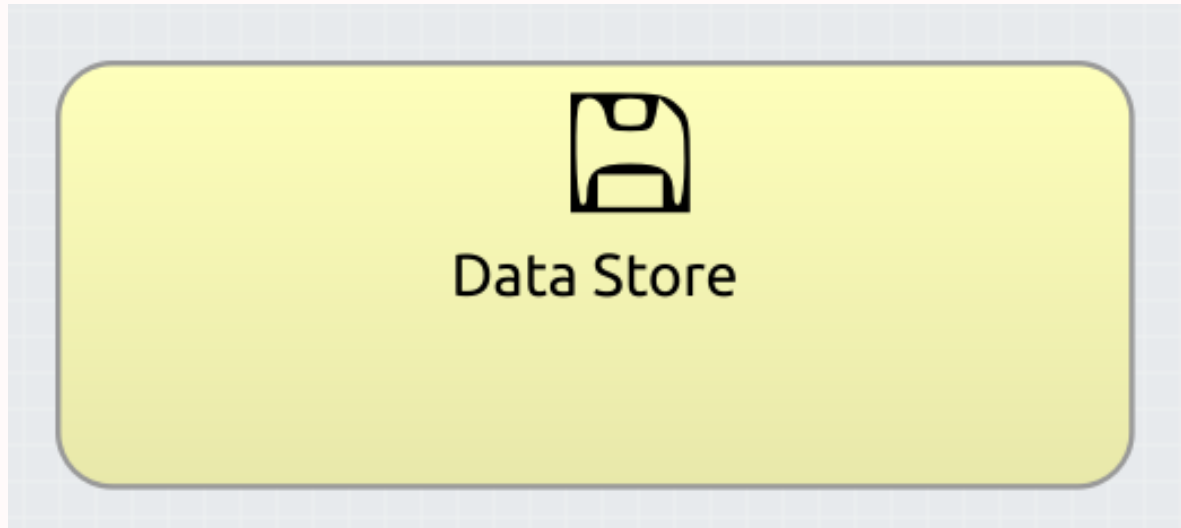
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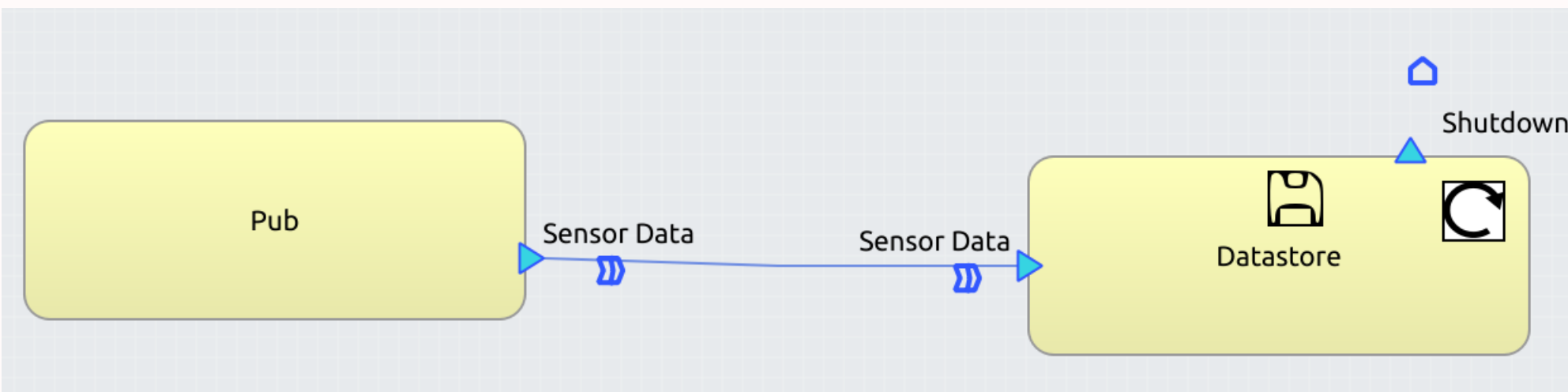
Graphical representation: Messages, Events and Component Management



Graphical representation: Datastore and FDIR



Demo 1 (Events, Datastore, FDIR)

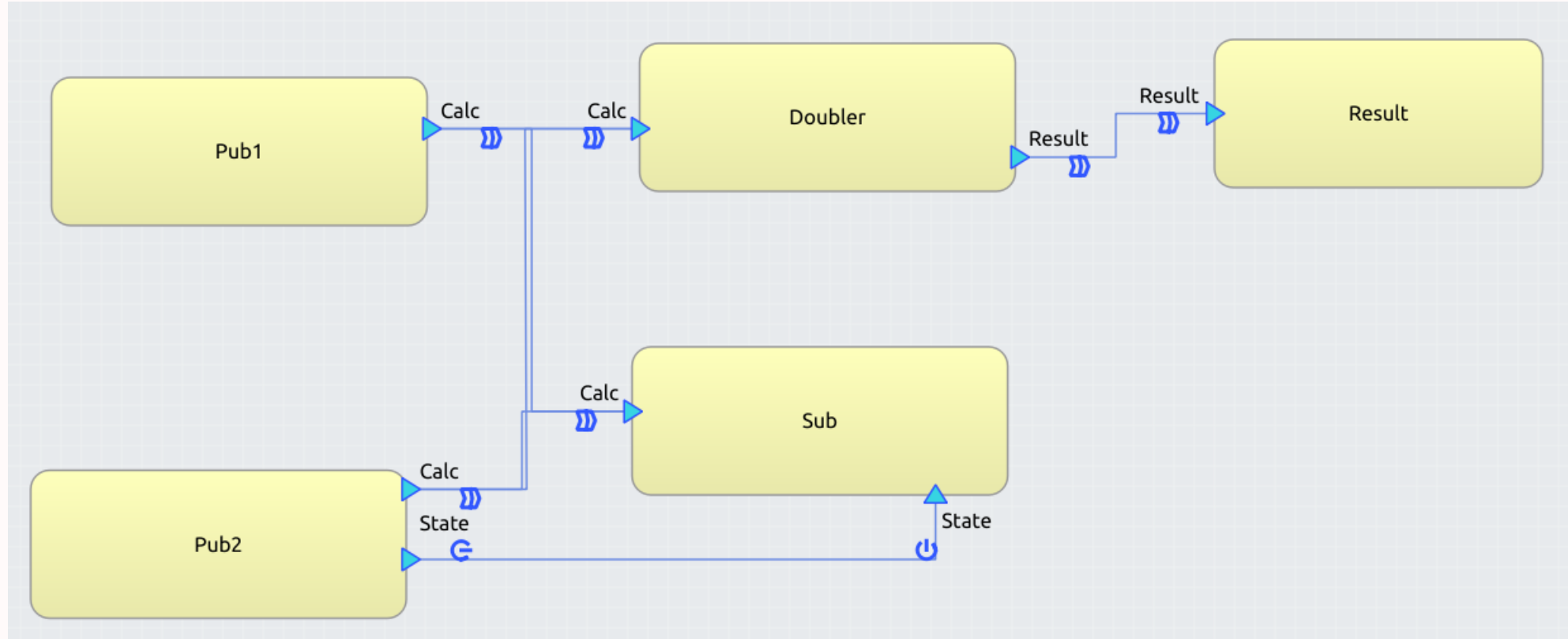


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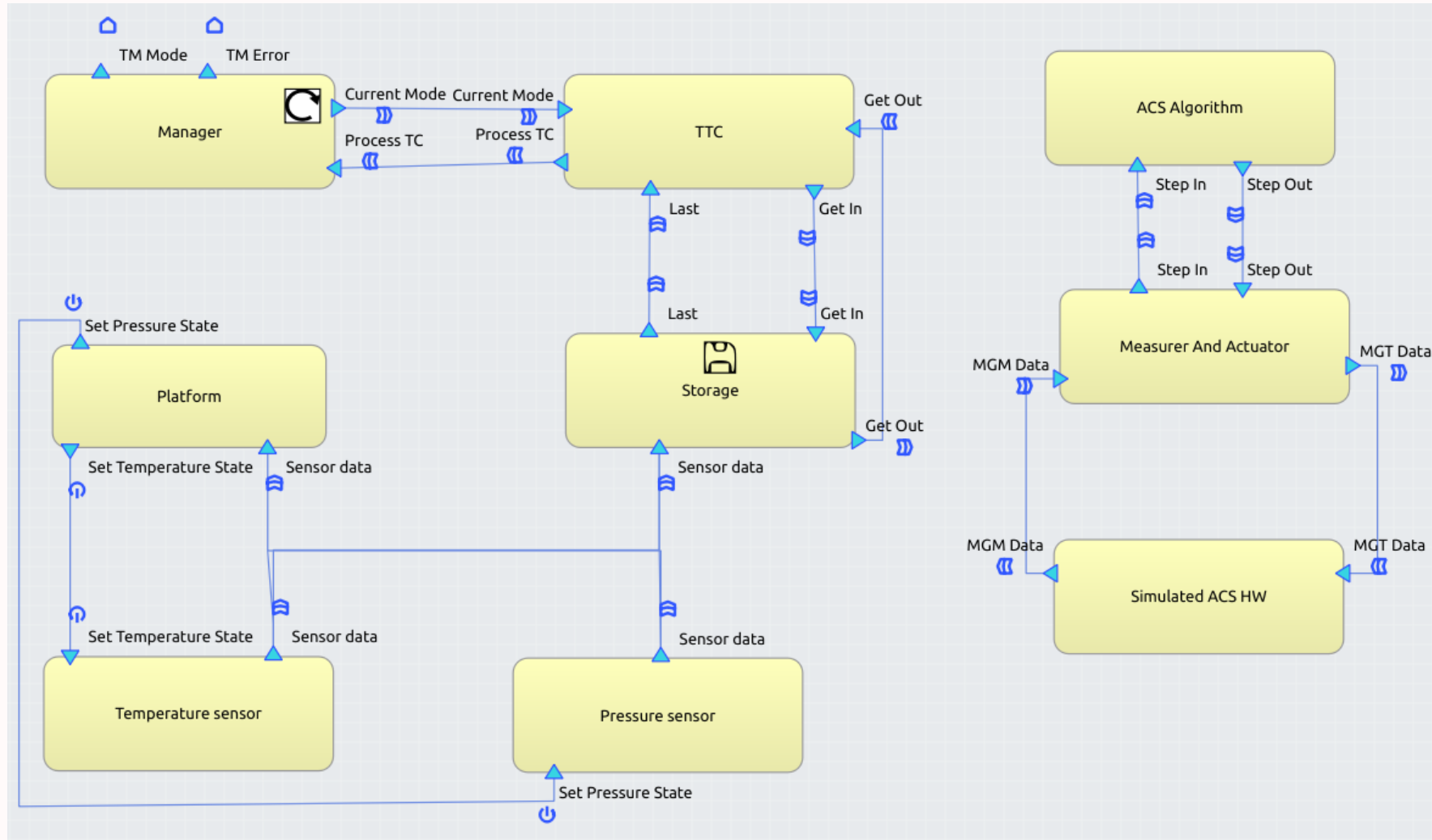


Demo 2

(N-M, QGen, Component Management)



cf-S integration in TASTE – Case study + metrics



Nr components	9
Nr files	137
Total nr lines	16089
LOC	8063
Comments	4595



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Conclusion

- N to M (+ASN.1) ✓
- Events ✓
- Datastore ✓
- Component Management ✓
- Fault Detection ✓
- QGen components ✓
- Full toolset integration ✓



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Aurora

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<https://gitlab.com/aurora-software/cFS-Creator>

