# Institute for Software Integrated Systems

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# Embedded Systems Modeling Language and End-to-End Development Tool Chain

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# Outline

- Introduction to ESML
  - Interfaces
  - Event types
  - Component types
  - Interactions
  - Configurations
- End-to-end system development tool chain

# What is ESML ?

- Domain-specific graphical modeling language developed for modeling Real-Time Mission Computing Embedded Avionics applications

- Designed using the MIC approach

- ESML describes event-driven component based system through the following aspects:
  - Interfaces
  - Events
  - Components
  - Interactions
  - Configurations

# Interfaces

- The interface aspect allows specification of various interface types implemented by the components in the system

# Event Types

- The event aspect allows specification of event types. The *EventType* class, stereotyped as a model, captures an event.



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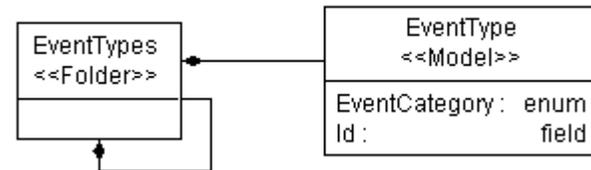
# Components

- The components specify component types.

- Component types are instantiated to create the configuration of a specific application.

- Components are modeled in terms of:
  - composition interface (facets/receptacles/publish/subscribe ports)
  - configurable elements (persistence/concurrency/distribution/parameter)
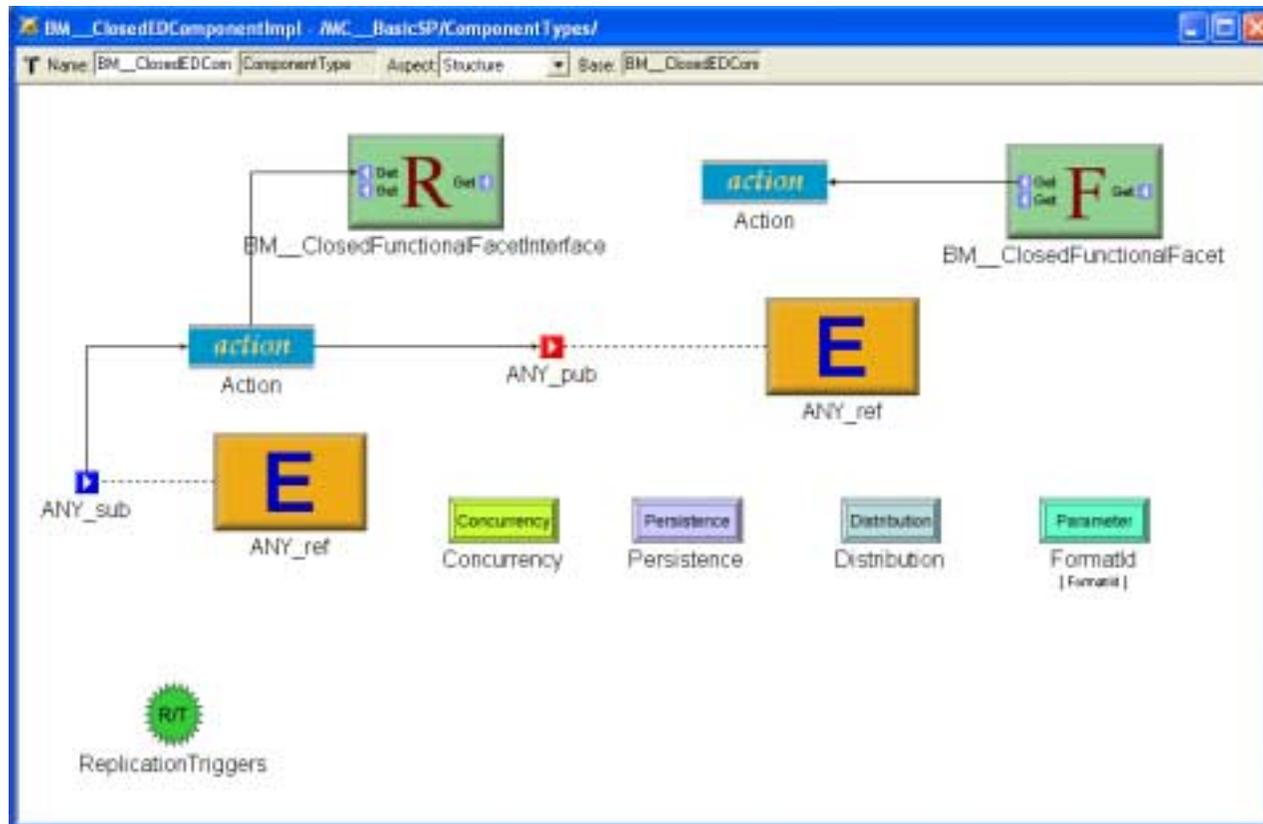  - QoS  requirements
  - modal behavior

# ComponentType meta model
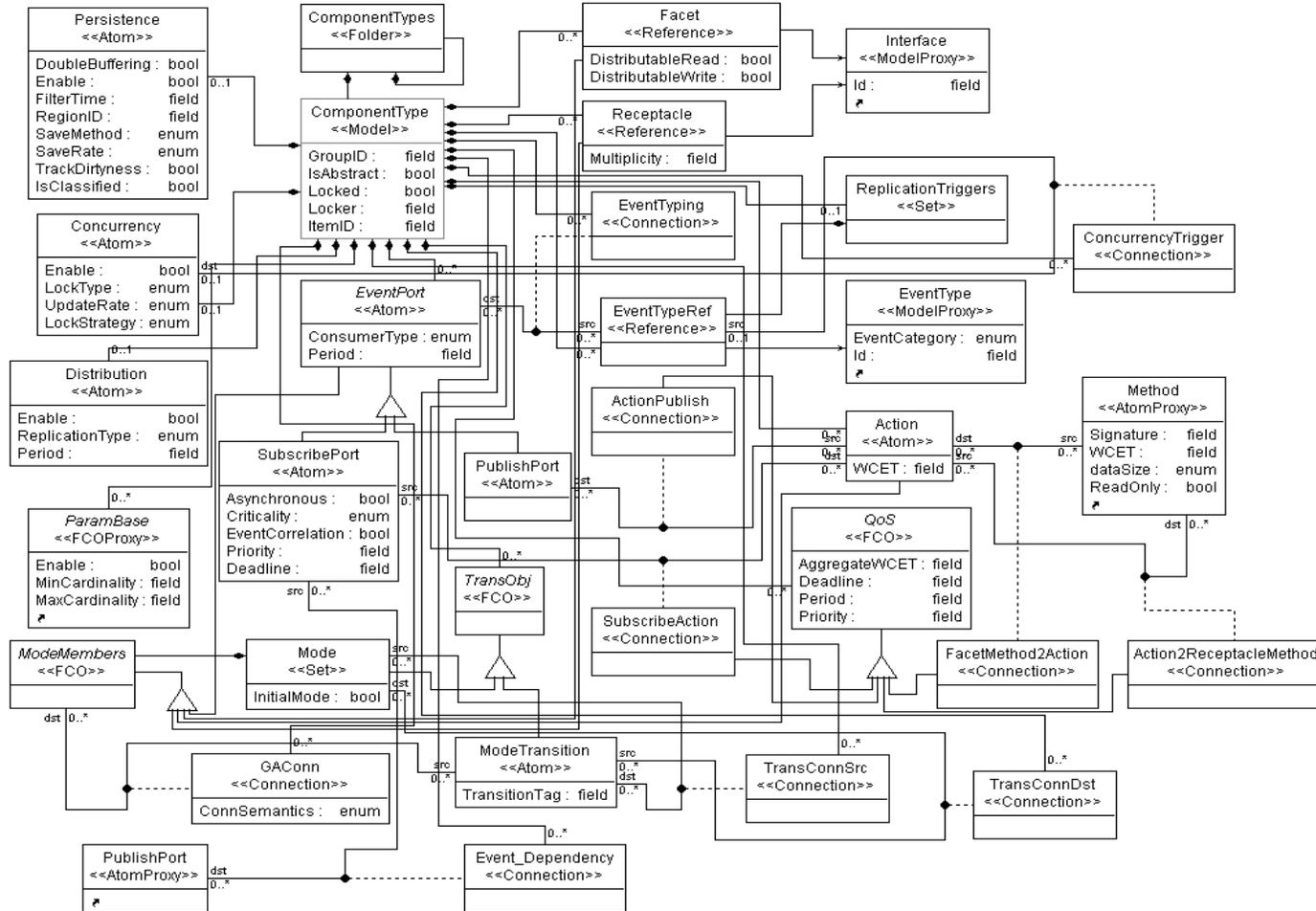
# Component Type model

# Interactions

- InteractionModel captures component interactions in terms of:
  - instantiated component types, or references to those
  - instances of EventType objects, or references to those
  - Publish/Subscribe/Invoke interactions
  - component distribution between master and proxy components
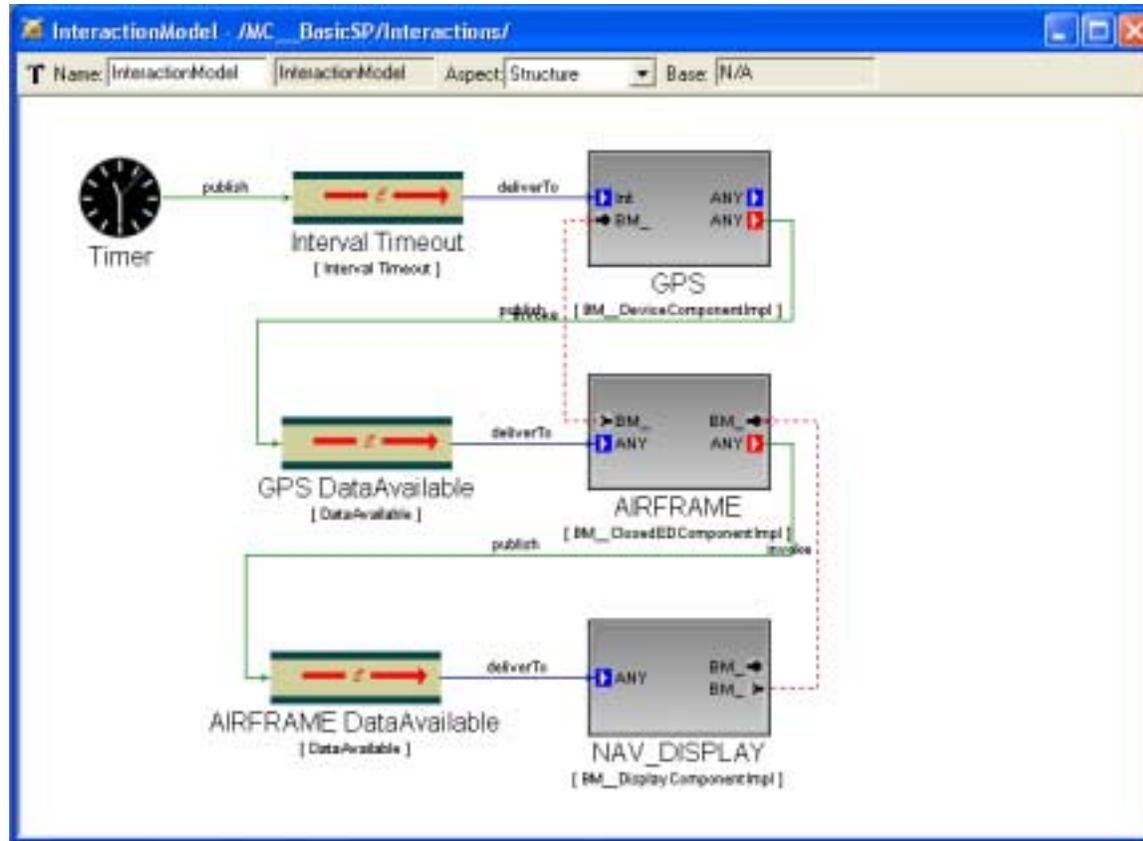  - synchronous proxy group and shared lock specification

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# Interactions meta model
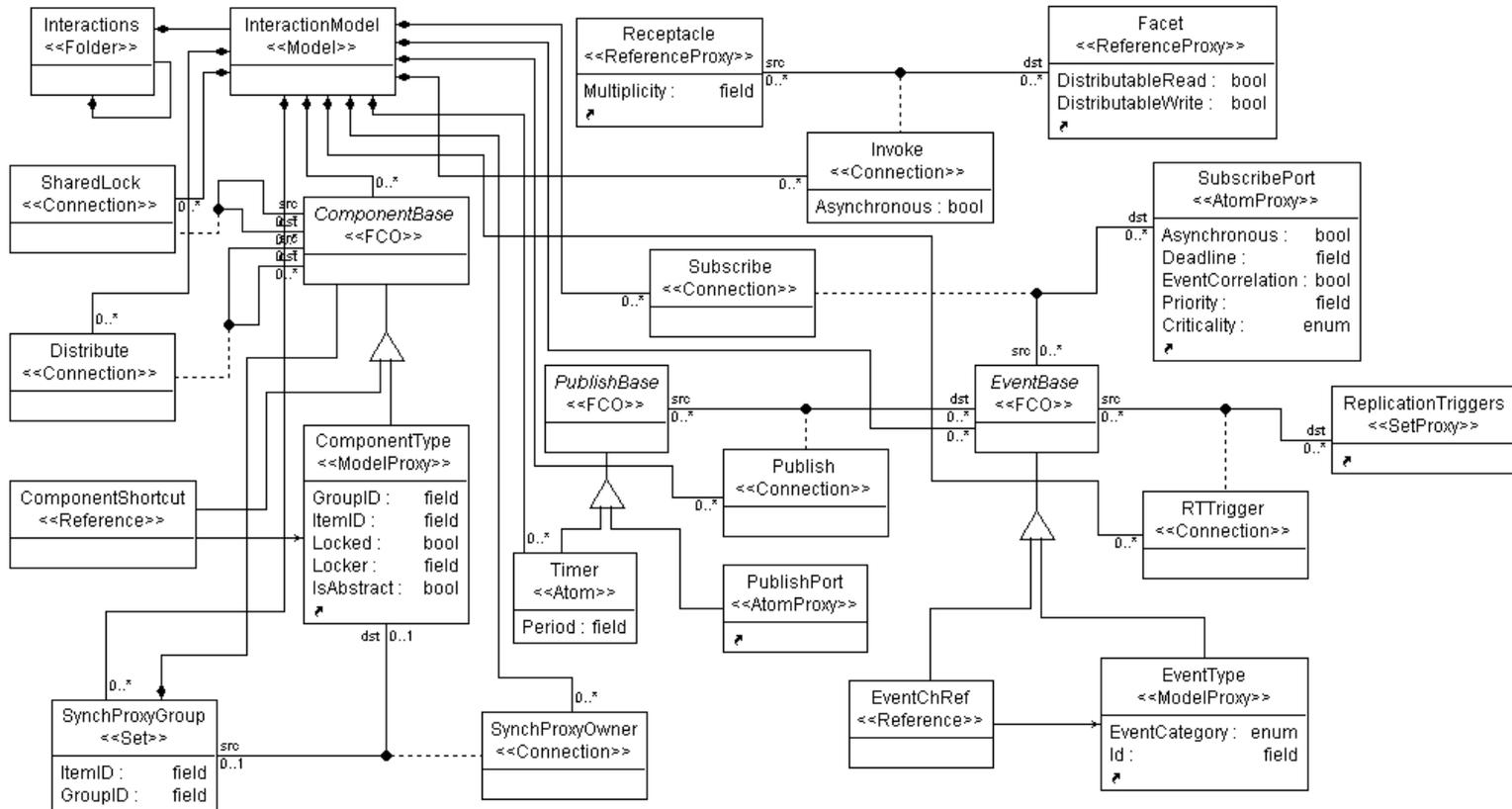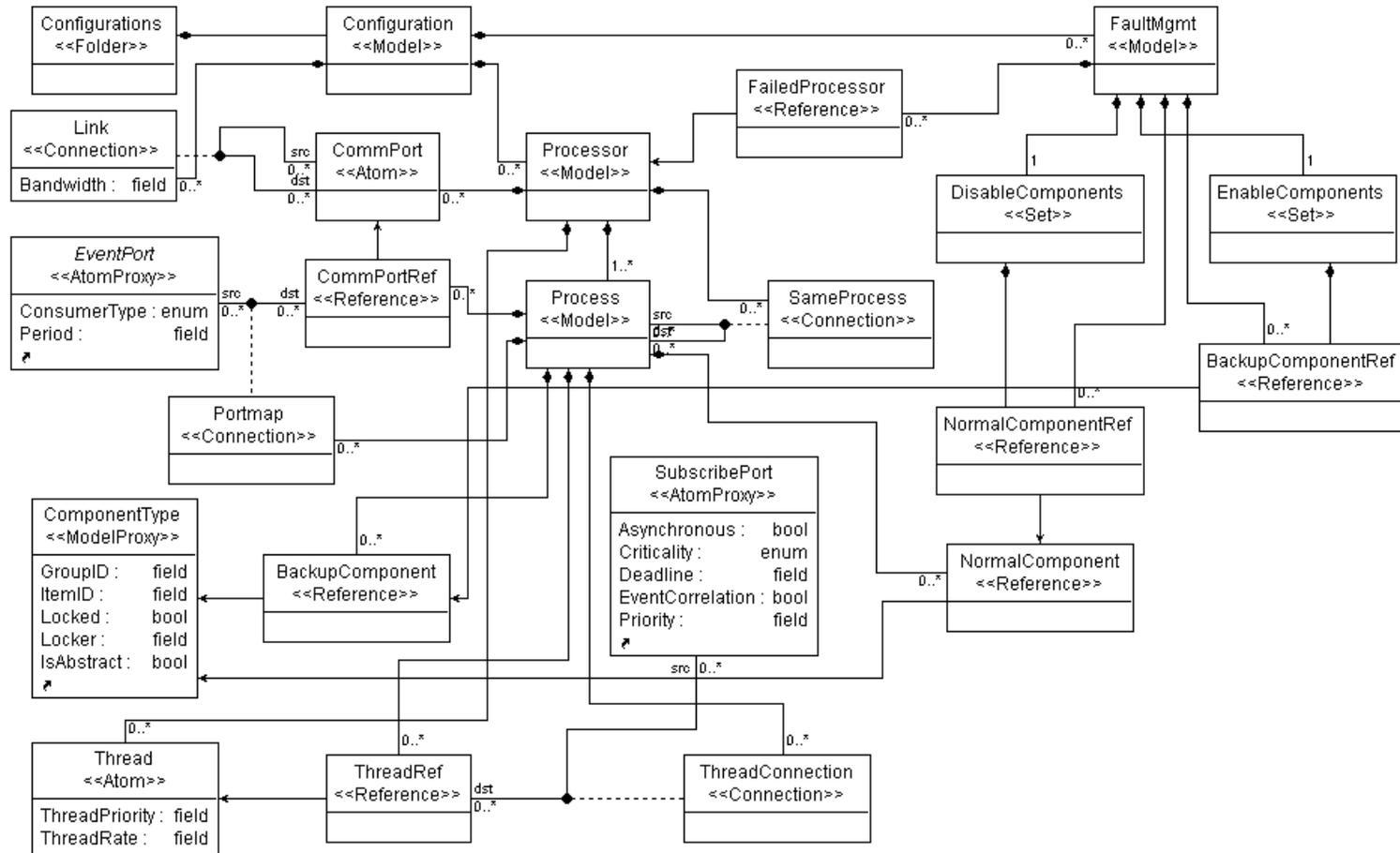
# Interaction Diagram

# Configurations

- Configuration models capture the complete system configuration which includes:
  - processors
  - components allocation on processors
  - threads within a processor
  - fault management modes
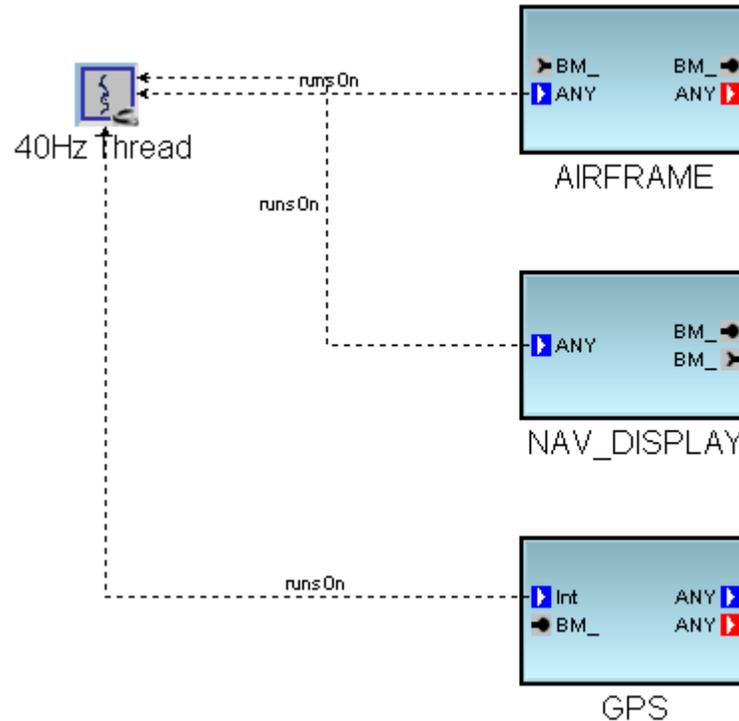  - communication ports and process objects
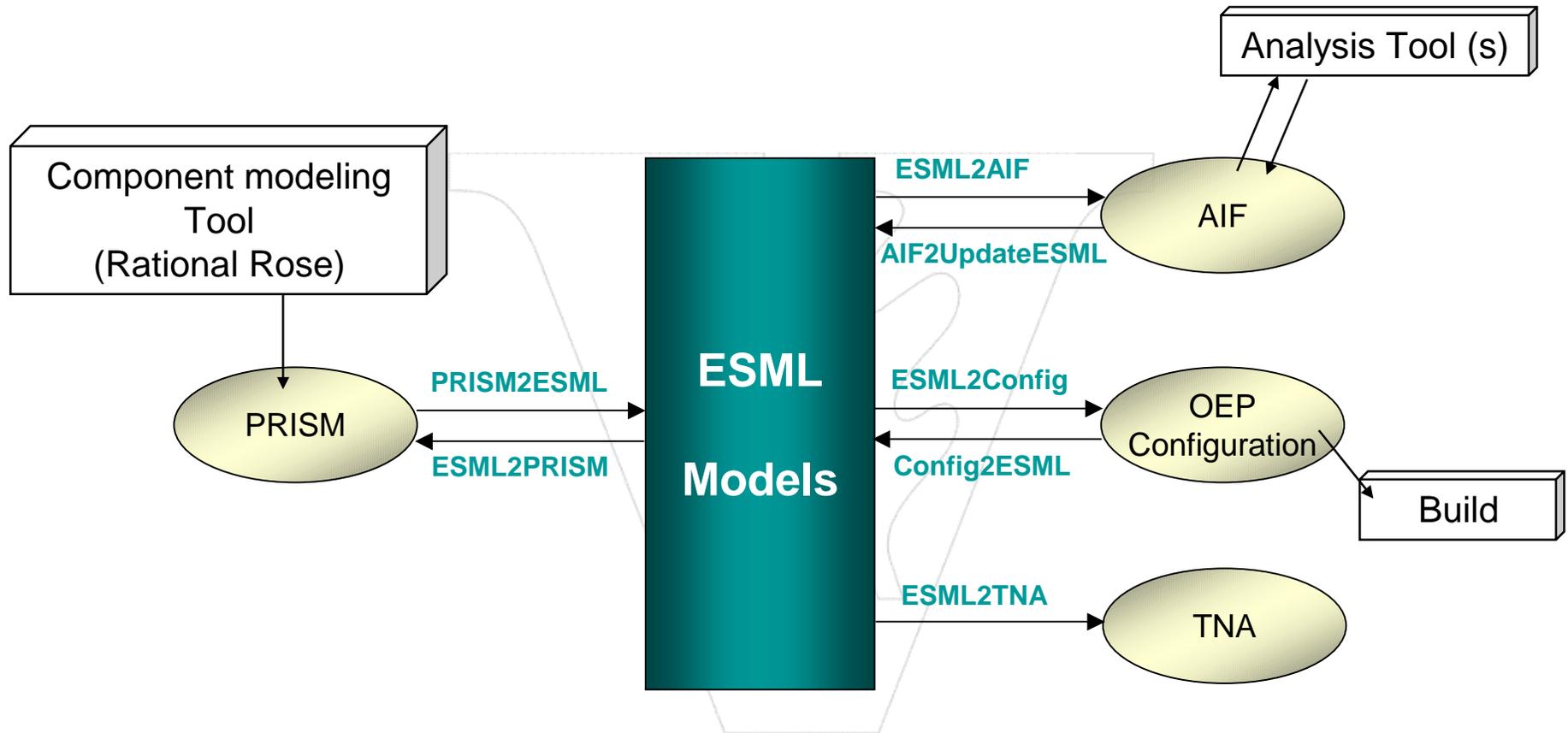
# Configuration meta model

# Components allocation within one Process

# ESML Tool Chain

# Conclusion

- ESML is a domain-specific graphical modeling language designed in MIC approach

- ESML is also designed for use in conjunction with other tools and languages

- An end-to-end tool chain is developed to form an integrated architecture for modeling, synthesizing and analysis processes.