Integrated Communications Systems Modeling
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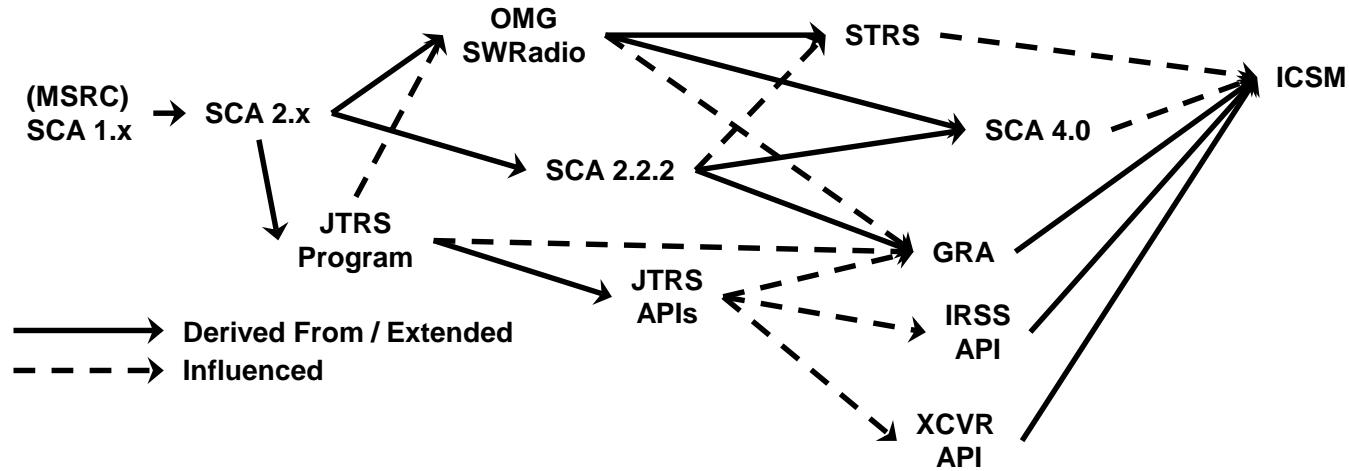
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Objectives

- **Focus on the integration of hardware and software architecture specification for communications systems.**

- **Leverage prior work in SDR standards and systems to:**
  - Develop an Open Modular Radio Architecture using industry standard modeling languages and tools.
  - Promote the re/use of the architecture through model extensions and specialization.
  - Provide a reference architecture in the form of a SysML/UML model.

- **Promote the adoption and use of the Open Modular Architecture within the forum and industry.**
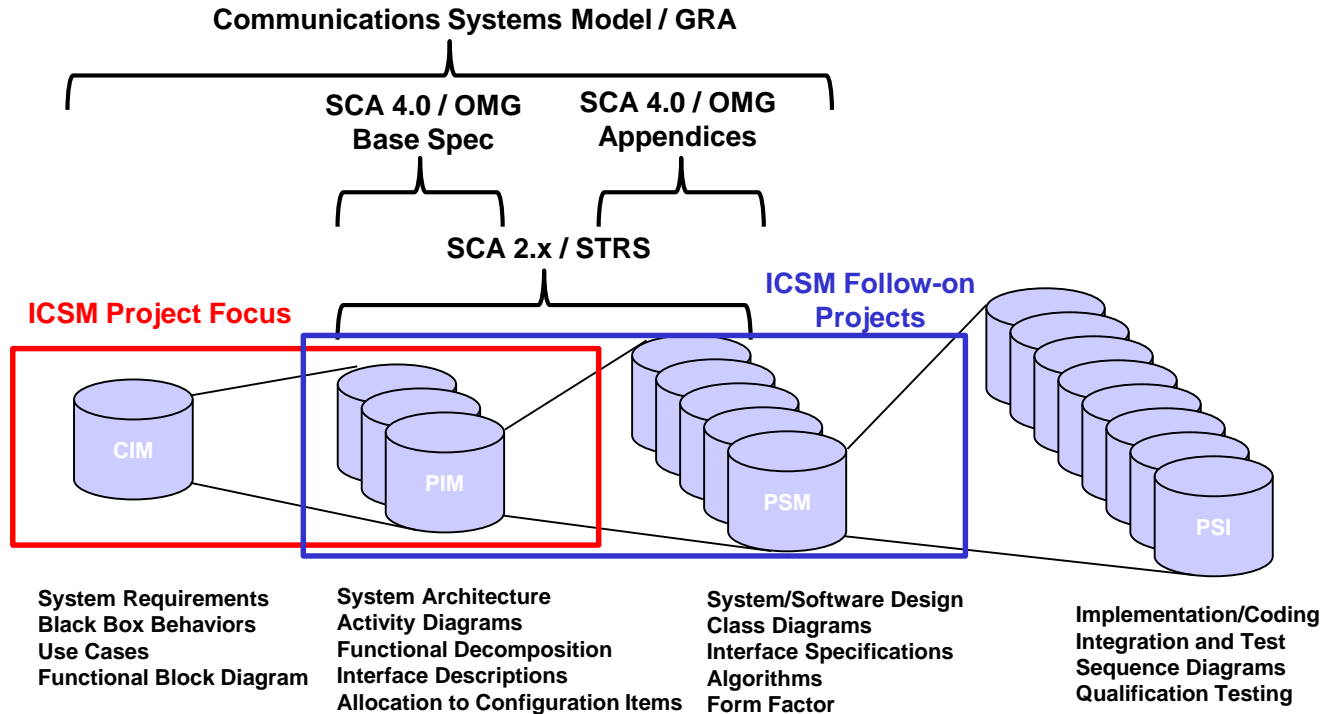
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Rationale

- **Standardization to date in SDR systems has primarily focused on a particular aspect of the system, e.g the software infrastructure.**

- **The hardware architecture has been traditionally performed as a semi-independent process.**

- **This approach may lead to integration and performance issues.**

- **This WInnF project was initiated to focus on developing an extensible, integrated systems model.**

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Evolution of Standards and Specifications
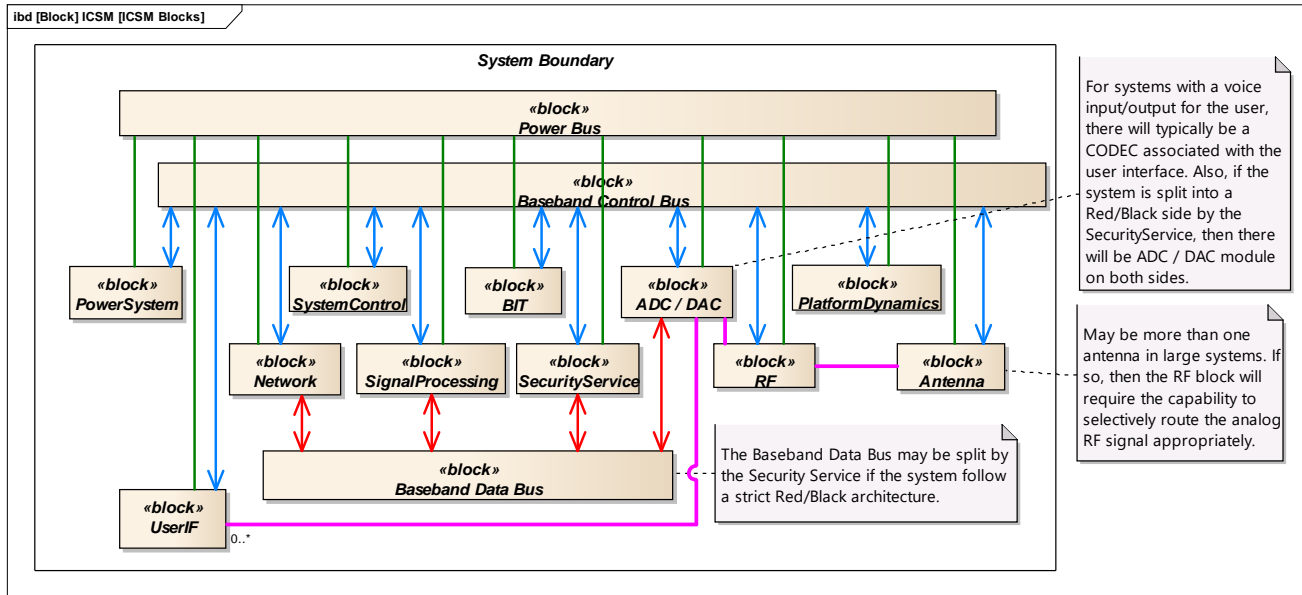

- **SCA was the foundation specification of the JTRS program**
- **Objective of the OMG effort was to establish SCA as an industry standard**
- **STRS targeted for space deployed systems**
- **GRA originally started as alternative to SCA for A2G systems, e.g. SATCOM, with focus on Systems Model**
- **ICSM will leverage GRA work to provide a reference design model for communications systems**

Focus Area of Standards

Communications Systems Model / GRA

SCA 4.0 / OMG Base Spec

SCA 4.0 / OMG Appendices

SCA 2.x / STRS

ICSM Project Focus

ICSM Follow-on Projects

CIM

PIM

PSM

PSI

System Requirements
Black Box Behaviors
Use Cases
Functional Block Diagram

System Architecture
Activity Diagrams
Functional Decomposition
Interface Descriptions
Allocation to Configuration Items

System/Software Design
Class Diagrams
Interface Specifications
Algorithms
Form Factor

Implementation/Coding
Integration and Test
Sequence Diagrams
Qualification Testing
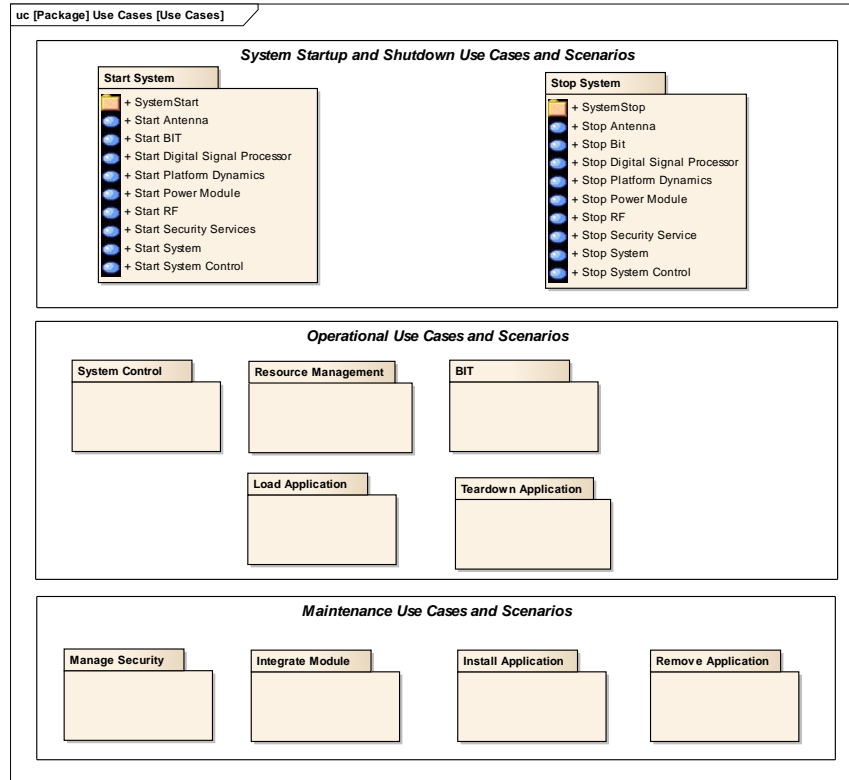
ICSM SysML Functional Model

SysML enables a system engineering view

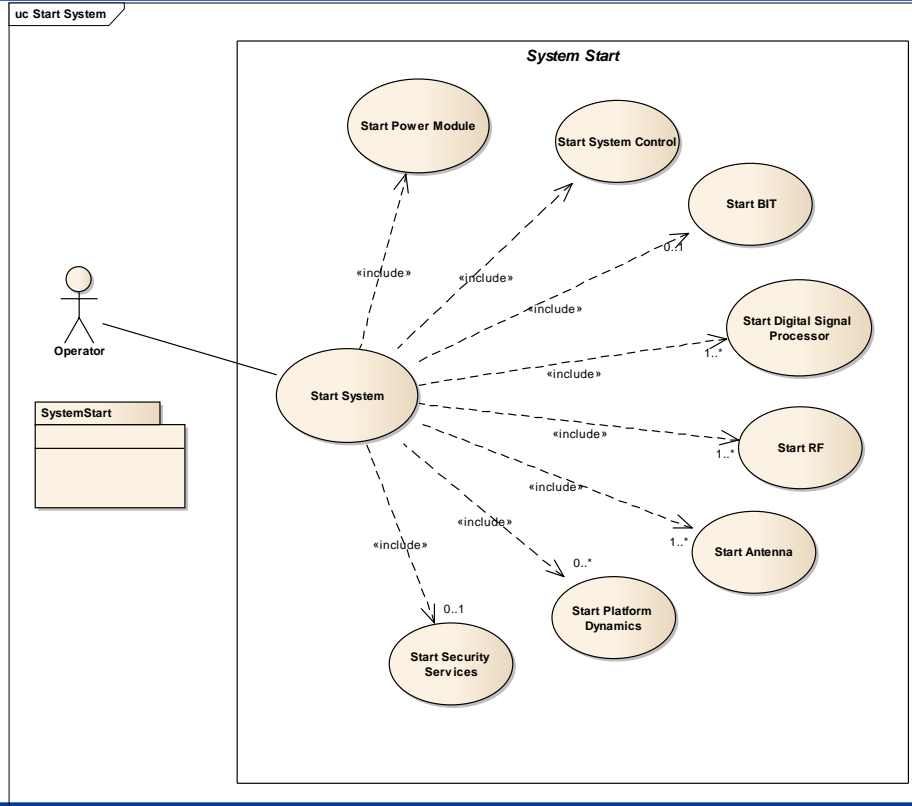**Each element has data and information attached to the element.**

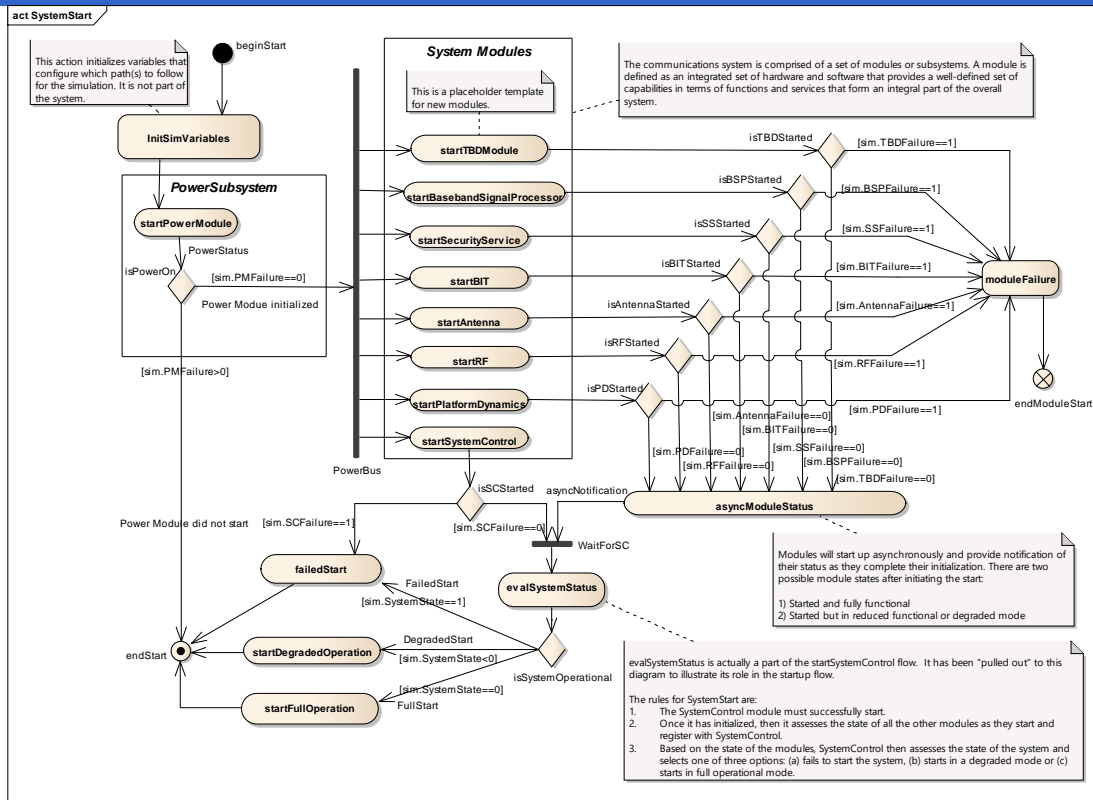**This promotes multiple views but a single model of the system.**

ICSM Use Case Organization

uc [Package] Use Cases [Use Cases]

System Startup and Shutdown Use Cases and Scenarios

Start System
- + SystemStart
- + Start Antenna
- + Start BIT
- + Start Digital Signal Processor
- + Start Platform Dynamics
- + Start Power Module
- + Start RF
- + Start Security Services
- + Start System
- + Start System Control

Stop System
- + SystemStop
- + Stop Antenna
- + Stop Bit
- + Stop Digital Signal Processor
- + Stop Platform Dynamics
- + Stop Power Module
- + Stop RF
- + Stop Security Service
- + Stop System
- + Stop System Control

Operational Use Cases and Scenarios

System Control

Resource Management

BIT

Load Application

Teardown Application

Maintenance Use Cases and Scenarios

Manage Security

Integrate Module

Install Application
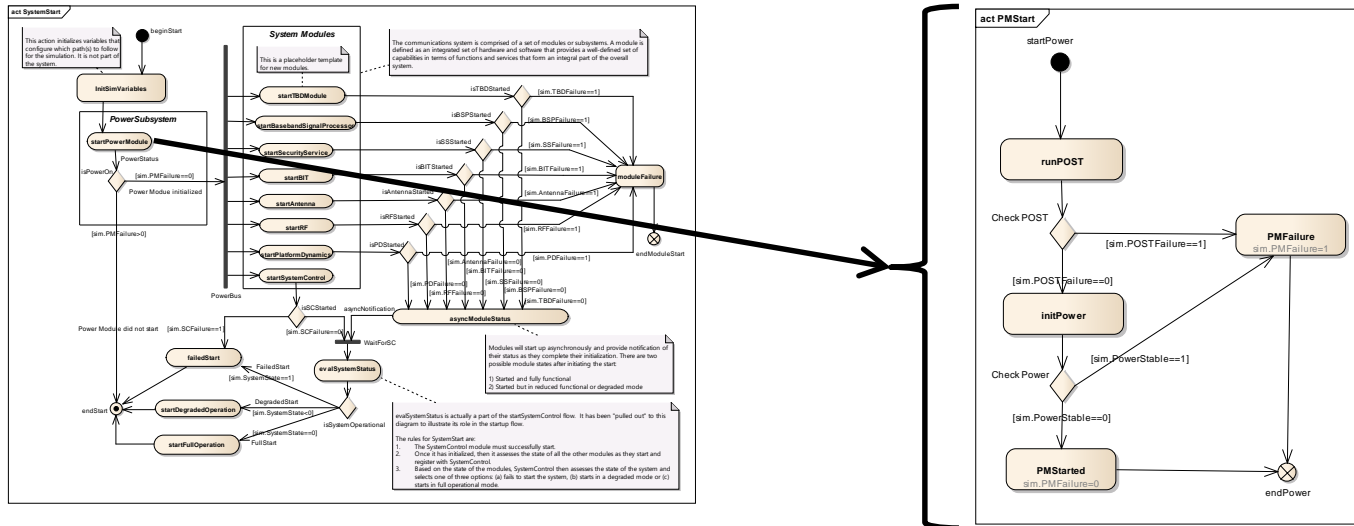
Remove Application

Slide 7

Start System Use Case

System Start Activity Diagram

Activity Decomposition

Each activity can be decomposed to lower level detail

This allows incremental development of use cases to validate operational scenarios and requirements

Low-level module interface defined through port interconnections.

Activity diagram defines control and data interfaces.

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Mapping Deployment

Status

- **Initial work on setting up a model database repository.**

- **Initial use cases for startup.**

- **Some reference models for current systems were considered.**

- **Project currently halted due to resource constraints.**

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