MINISTÉRIO DA CIÊNCIA E TECNOLOGIA
INSTITUTO NACIONAL DE PESQUISAS ESPACIAIS

# Specifying Satellite Behavior for an Operational Simulator

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# Analysis of the Simulation Model Platform Adoption in the Context of INPE's Simulators

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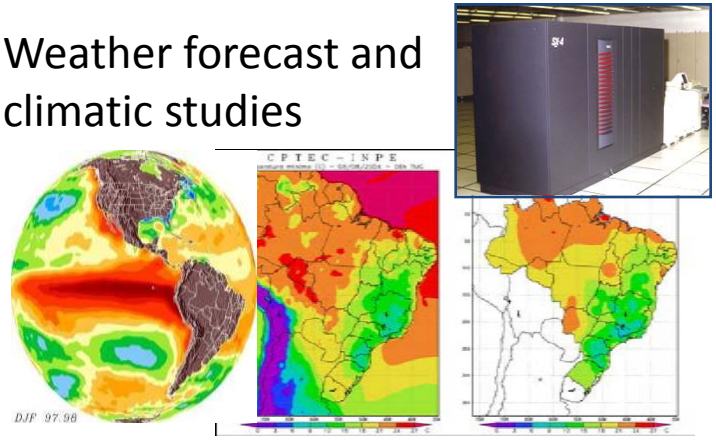
# Instituto Nacional de Pesquisas Espaciais - INPE

**Mission**: To produce science and technology in space and earth environmental areas and to offer particular products and services to improve Brazilian Science and Technologies progress.

# Main areas

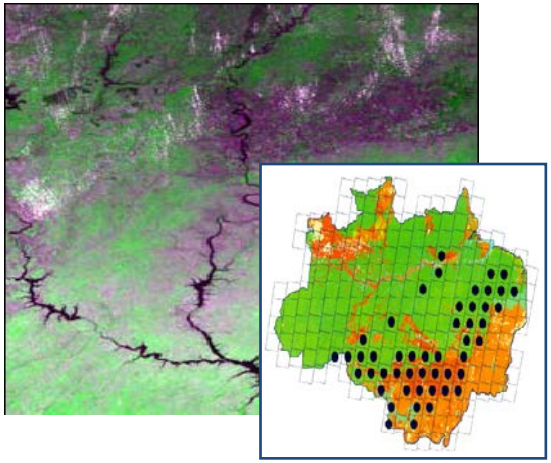
Atmospheric and Space Sciences

Weather forecast and climatic studies

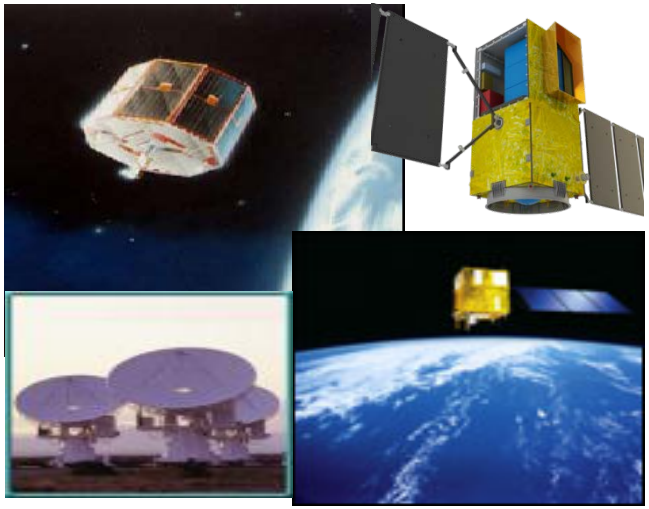



Integration and Test Laboratory

Earth Observation



Space Engineering and Technology

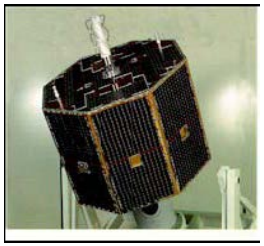


Satellite Control Center

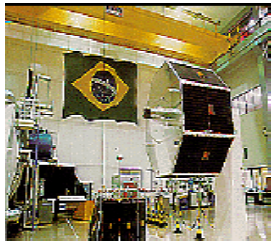
# Brazilian Space missions - past

**Data Collecting Satellites**

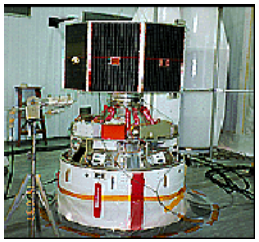
**Brasilian Space Mission with no external cooperation**



SCD1 93



SCD2A 97



SCD2 98

**Earth Imaging Satellites**

**China-Brazil cooperation**

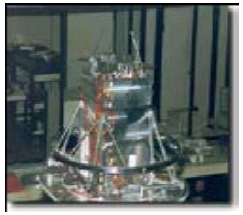
CBERS1 99

CBERS2 03

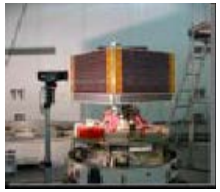
CBERS2B 07

**Scientific and technological Satelites**

SACI-1 99

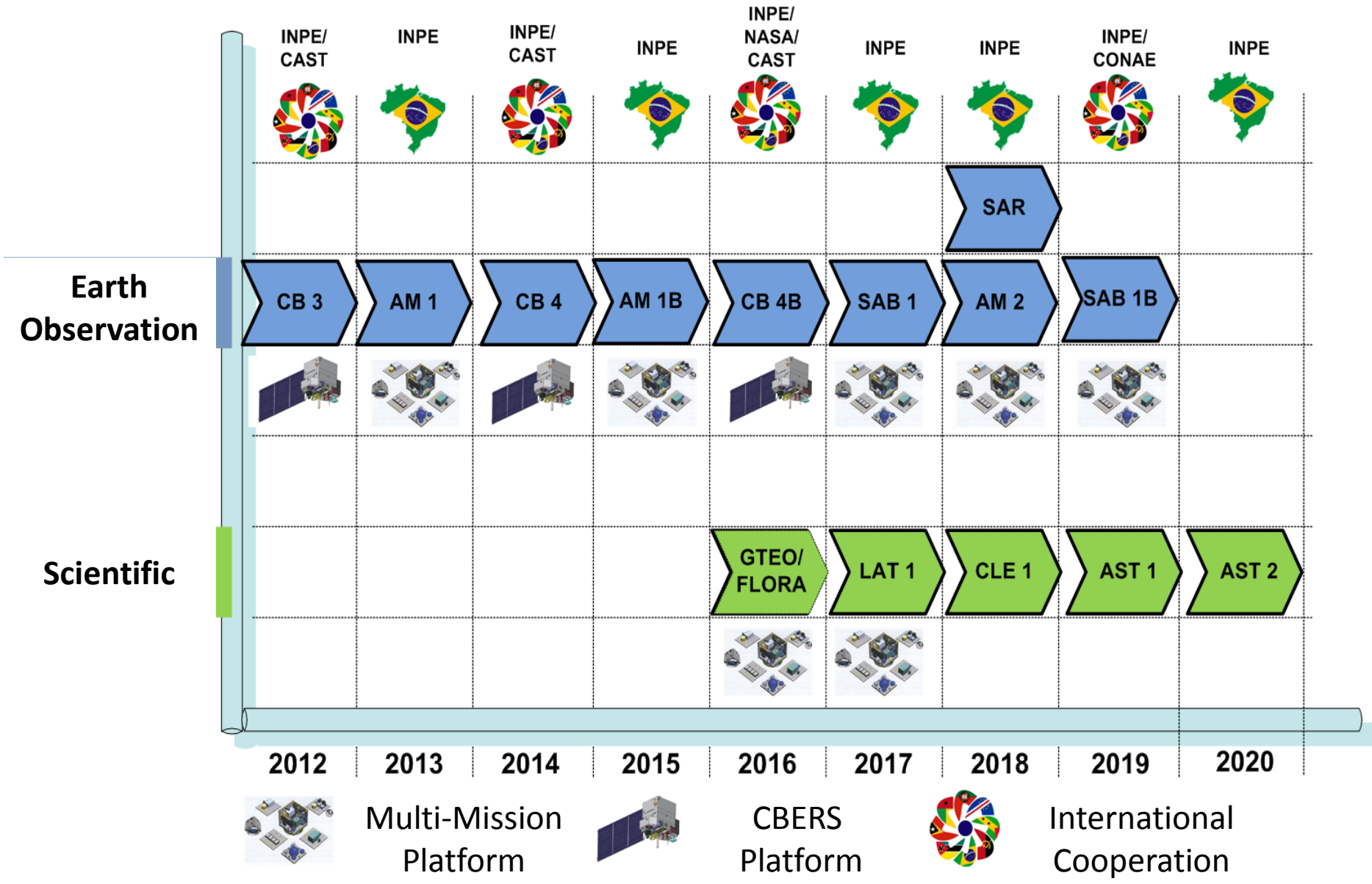


SACI-2 99



Satec 03

# Missions Plan - 2011



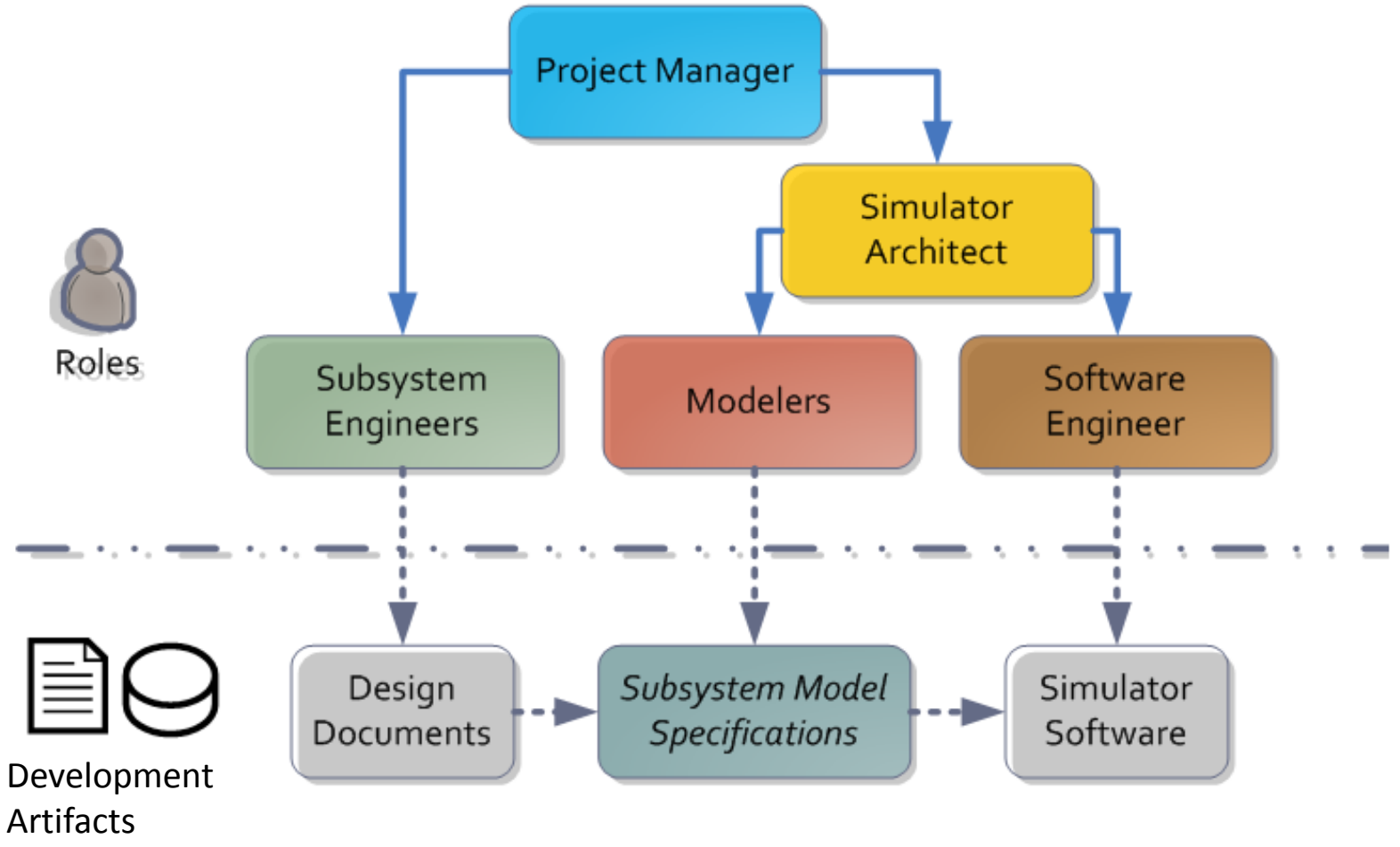
# Ongoing satellite simulators

Spacecraft Dynamics Simulator to the AMAZONIA-1 Satellite

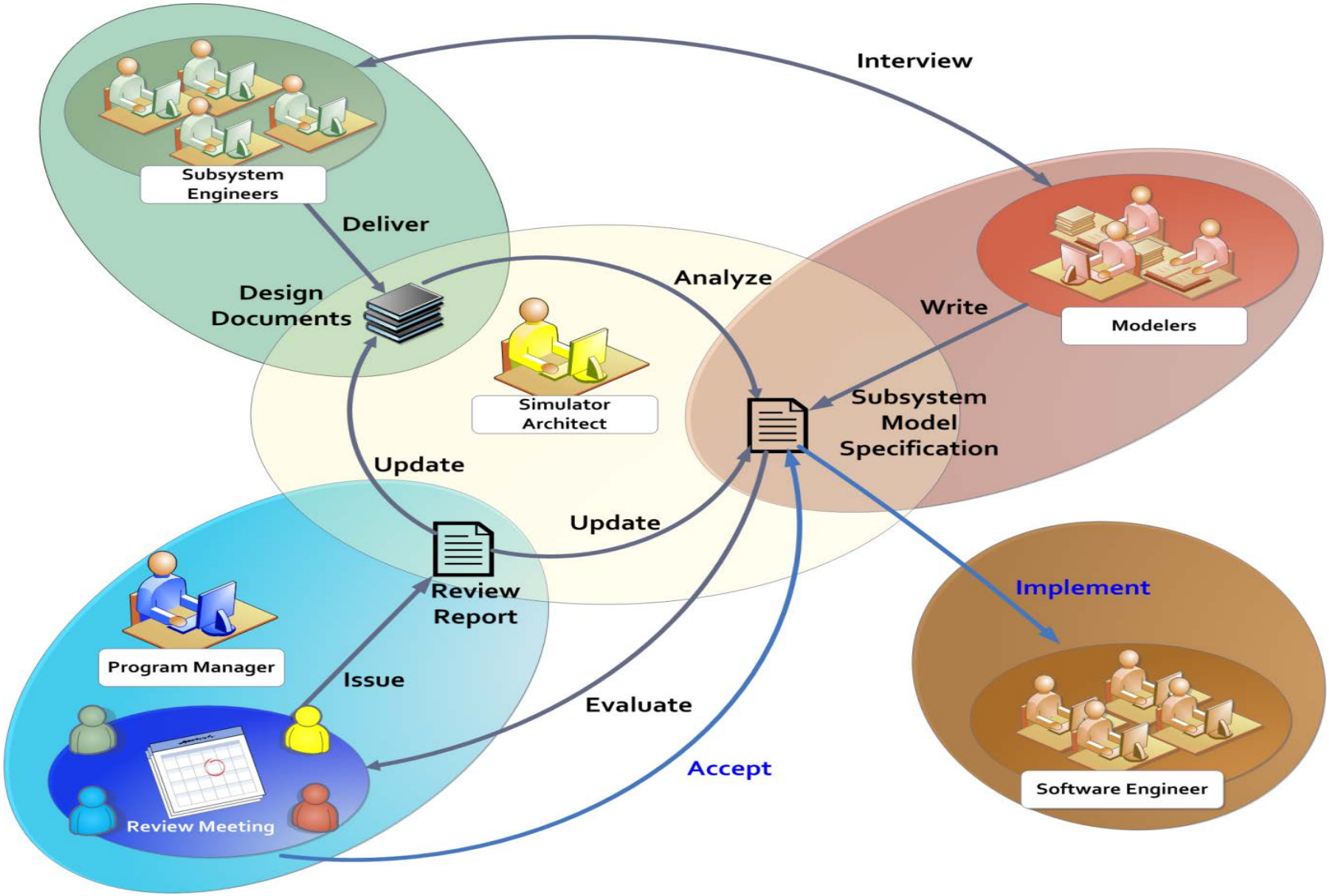
Advanced Inertial Systems (SIA) Simulator

Operational Satellite Simulator for the 3&4 China-Brazil Earth Resources Satellite (SIMC3)

# SIMC3 SIMULATOR DEVELOPMENT ORGANIZATION CHART

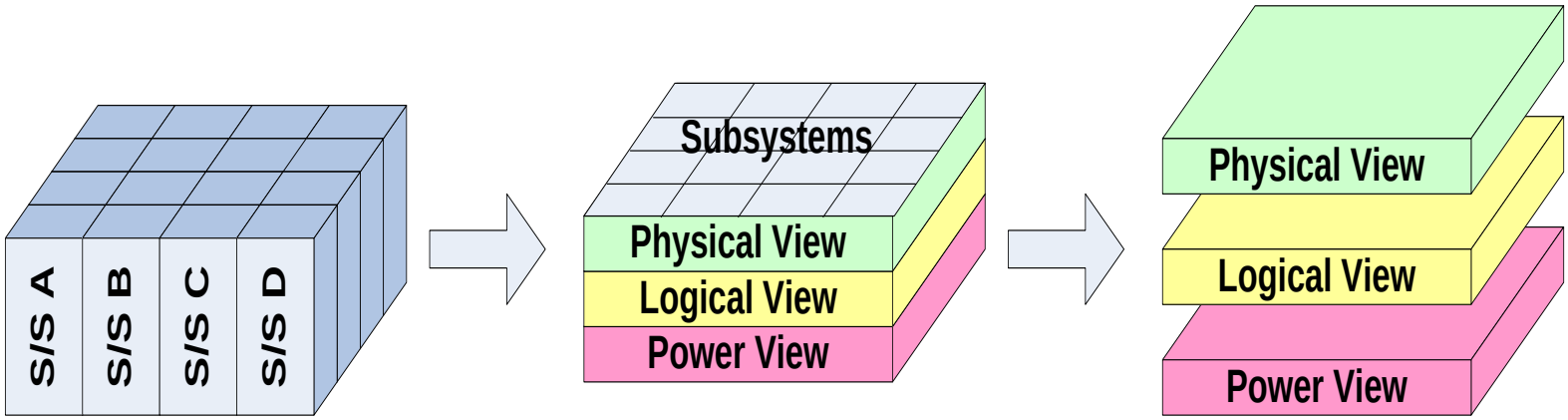


# SIMC3 Development Workflow

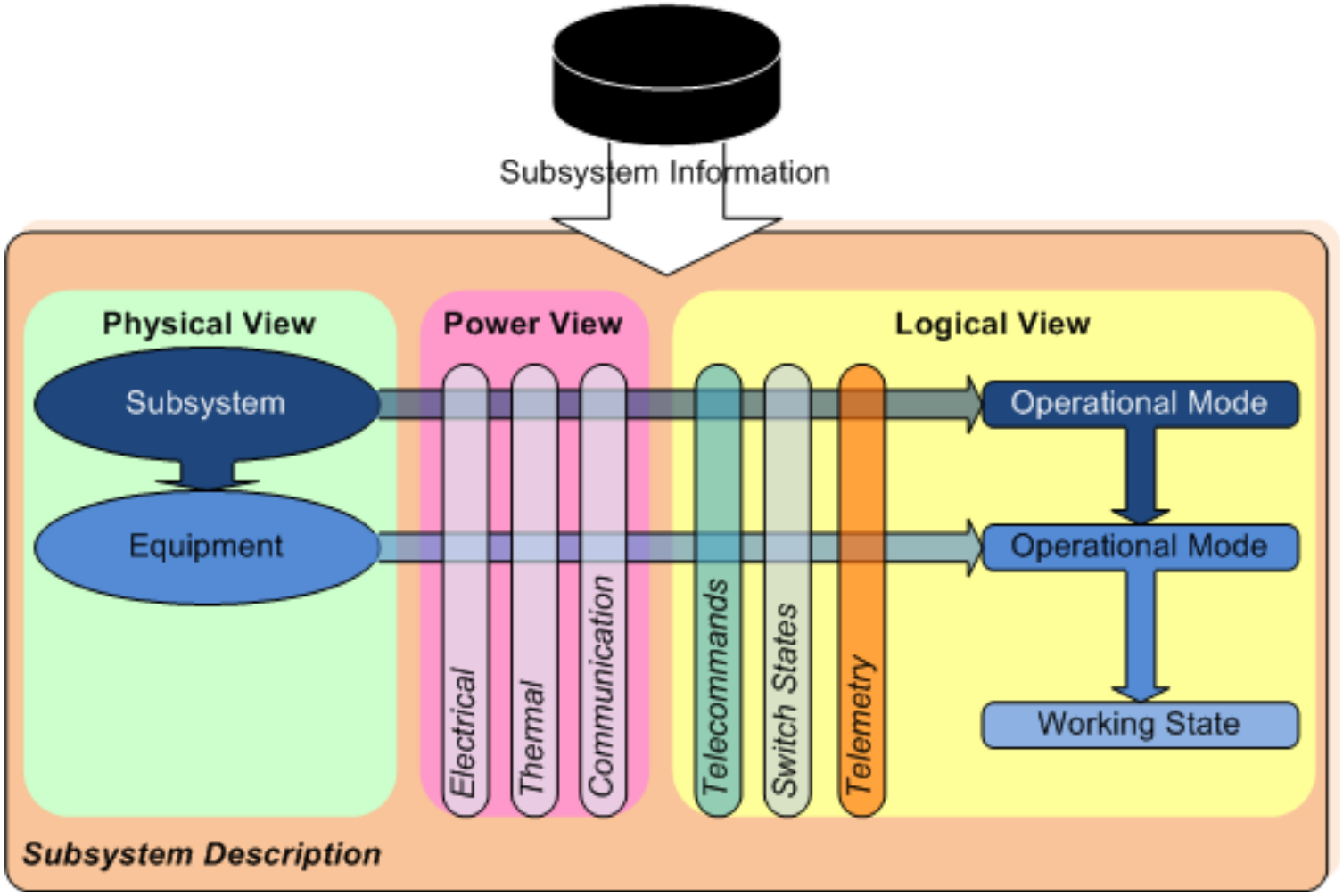


# Generic solution to document the Satellite Behavior:

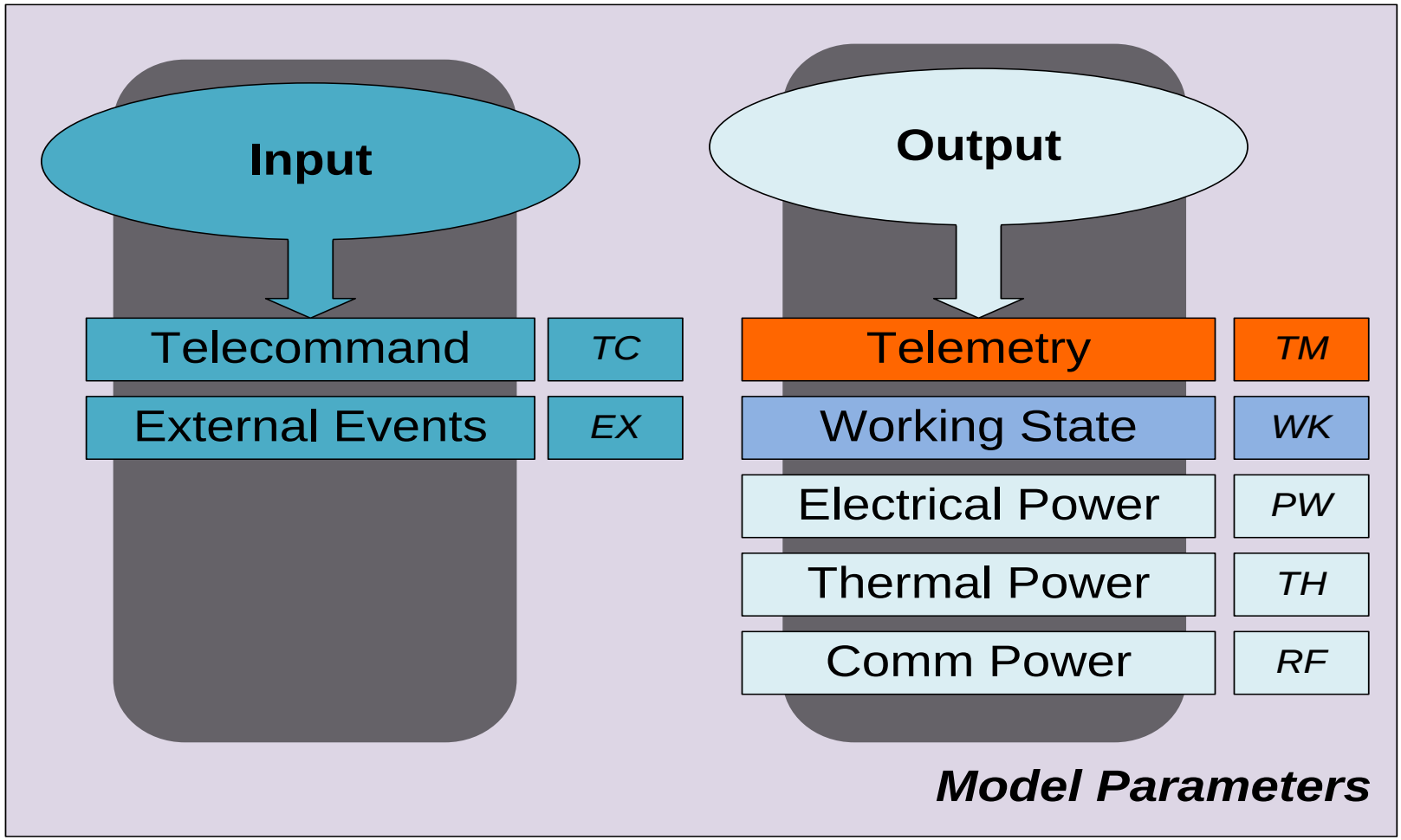
# to breakdown the complexity into Subsystems and Views



# Subsystem Description Elements



# Model Parameters Elements



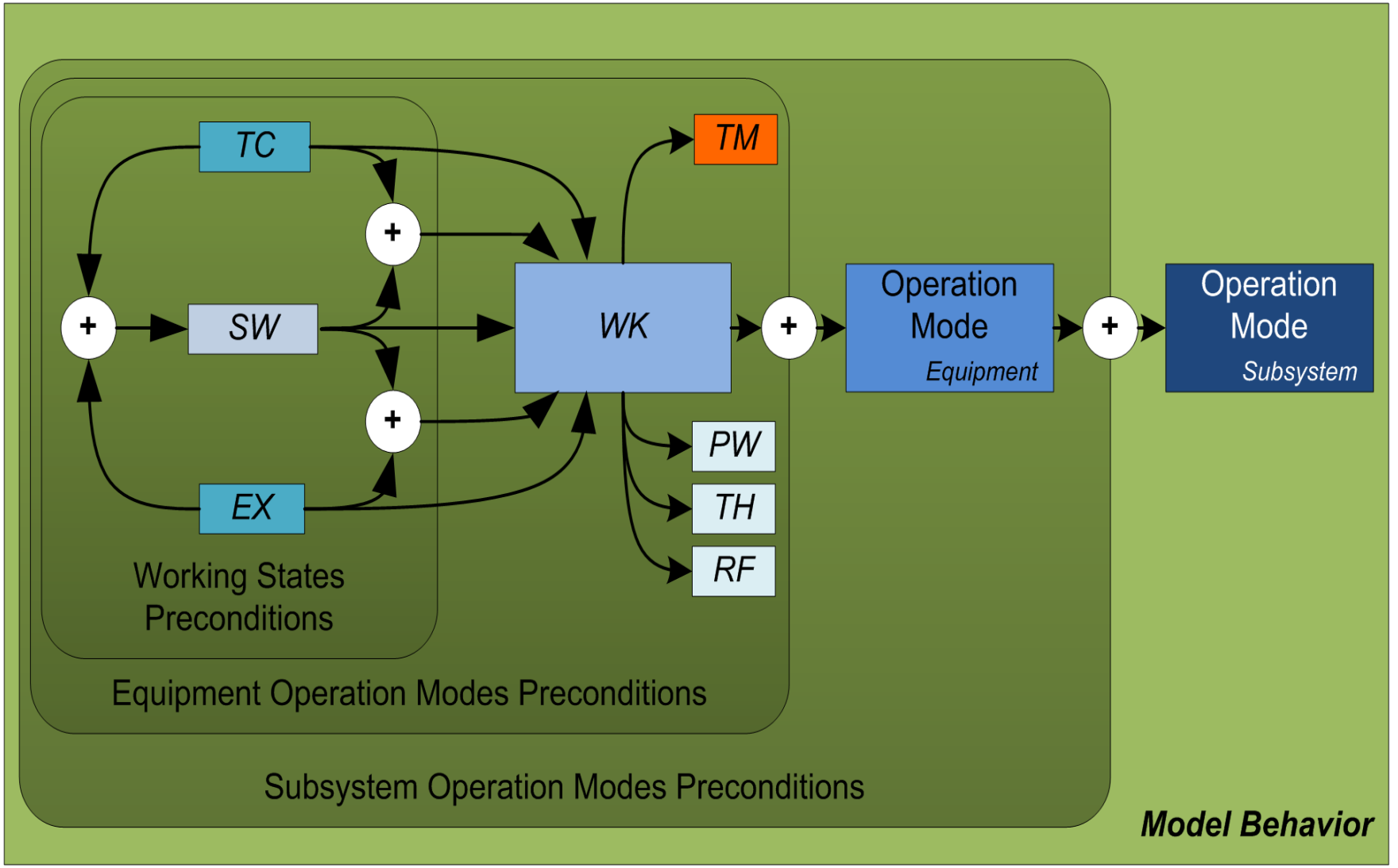
# Model Behavior Rule Representation

| Preconditions | | | Effects | | |
|---|---|---|---|---|---|
| **Param A** | **Param B** | **Param C** | **Param X** | **Param Y** | **Param Z** |
| a1 | b1 | c1 | x1 | y1 | z1 |
| a2 | b2 | > c2 | x2 | y2 | z2 |
| <= a3 | | - | x3 | - | Z+C |

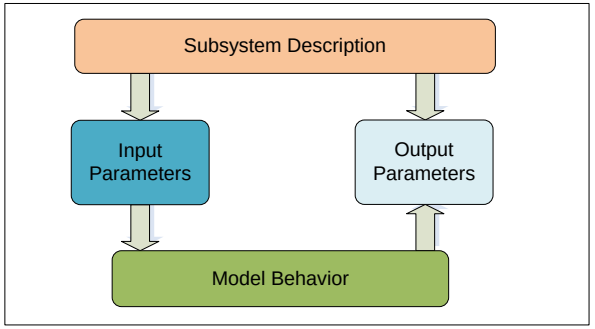
**Equivalent to:**

**if (A == a1 and B == b1 and C == c1)**
**then (X = x1, Y = y1, Z = z1)**

# Elements of the Model Behavior



# Conclusion




- difficulty to achieve a consensus was mainly due to the different skills, backgrounds and cultures of the people involved. Unsucceeded attempt:
  - 1st - algorithmic pseudo-codes
  - 2nd - set of tables derived from the operational database

- A solid culture was established inside the institution concerning the models writing


Thank you