

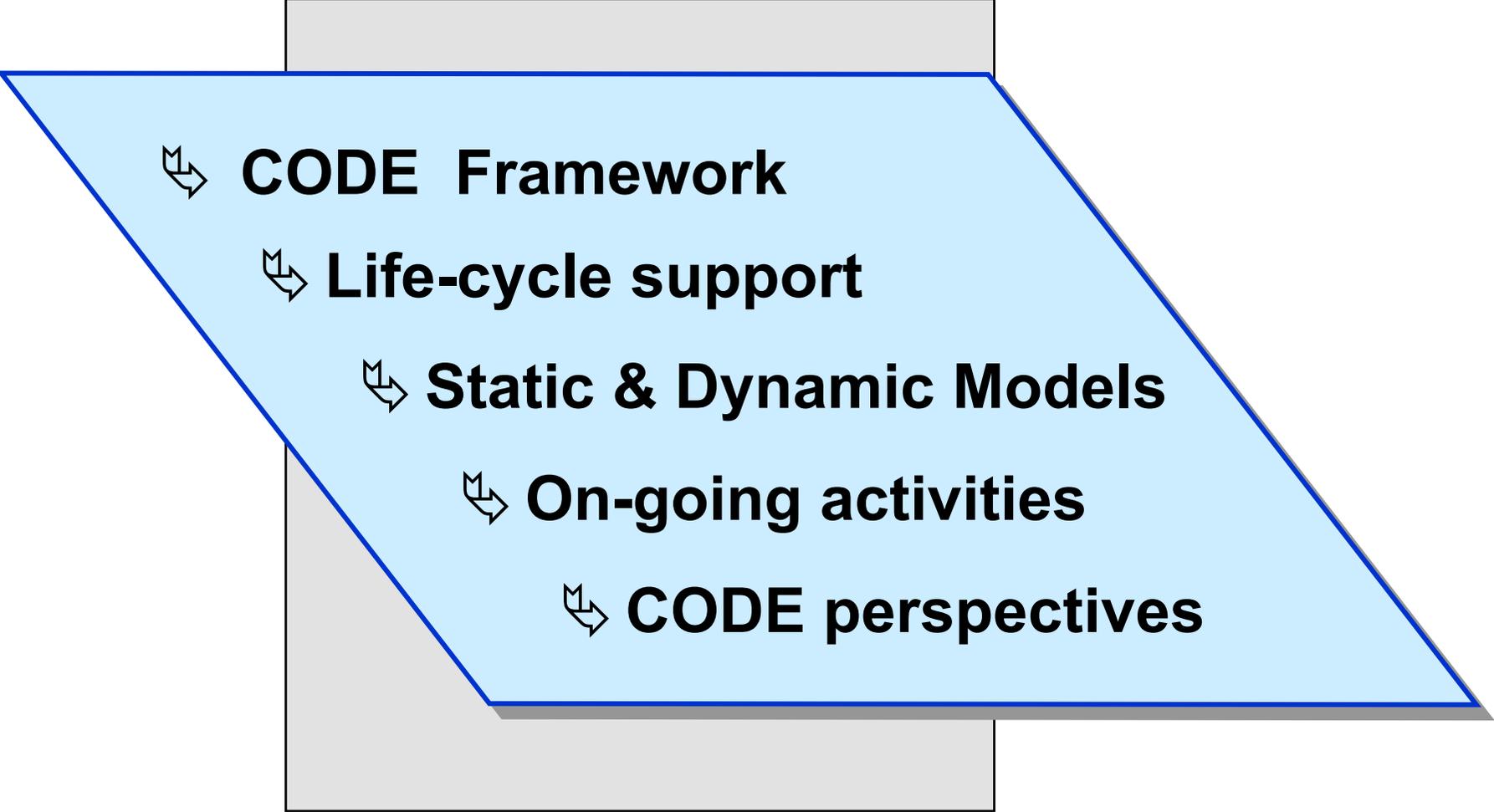
**COncurrent Dvelopment Environment**

**CODE INITIATIVE**

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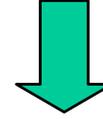
*JPL, Pasadena - 25-27 June 2002*

- 
- ↪ **CODE Framework**
  - ↪ **Life-cycle support**
  - ↪ **Static & Dynamic Models**
  - ↪ **On-going activities**
  - ↪ **CODE perspectives**

# New Design Paradigms 2002 Workshop

## Concurrent Engineering Needs

- **Support System Engineering Activity and Process**
- **Facilitate information sharing between different disciplines**
- **Ensure consistent design/data evolution along the program life cycle**
- **Provide quick response to configuration updates**
- **Support System verification and analysis during test phases and operational lifetime**

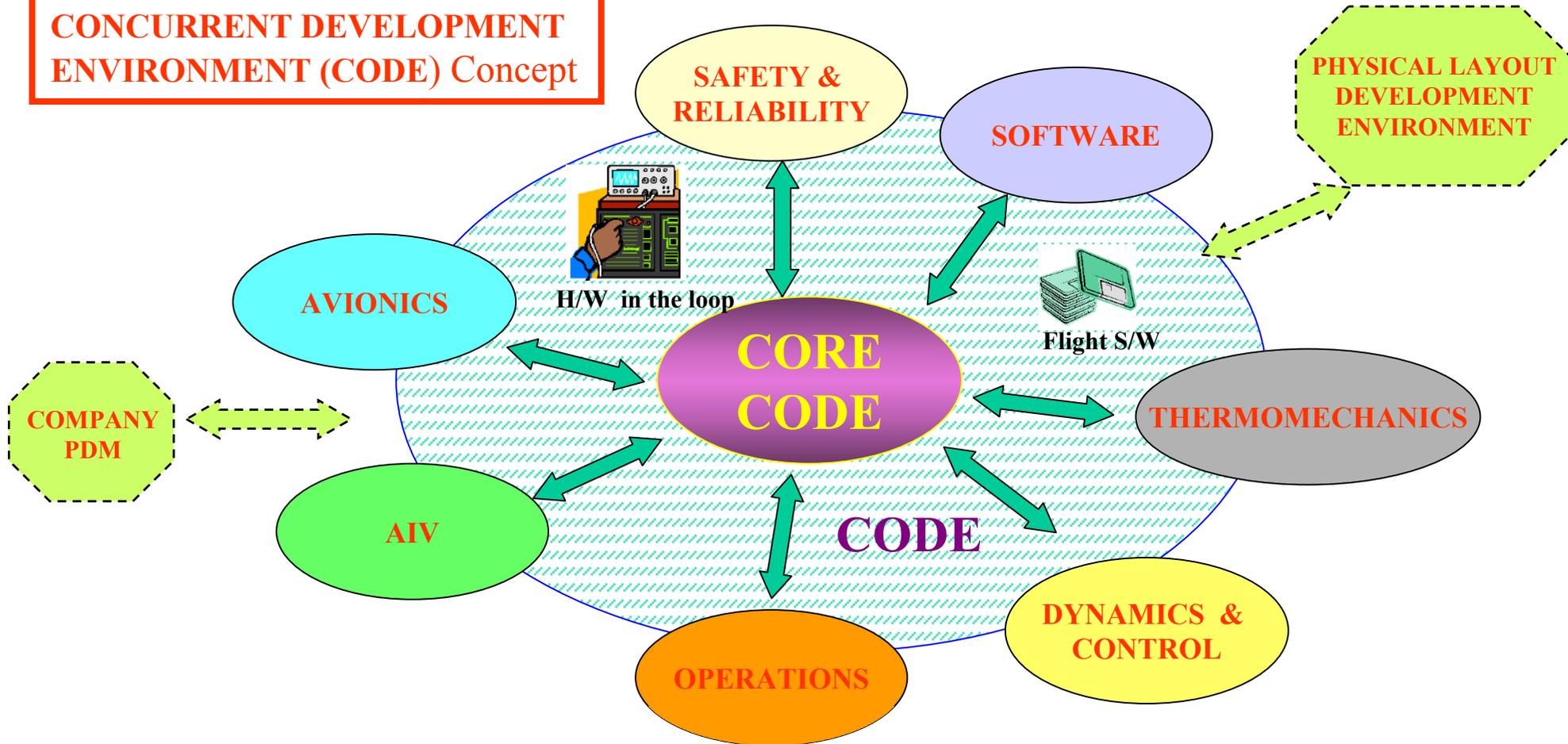


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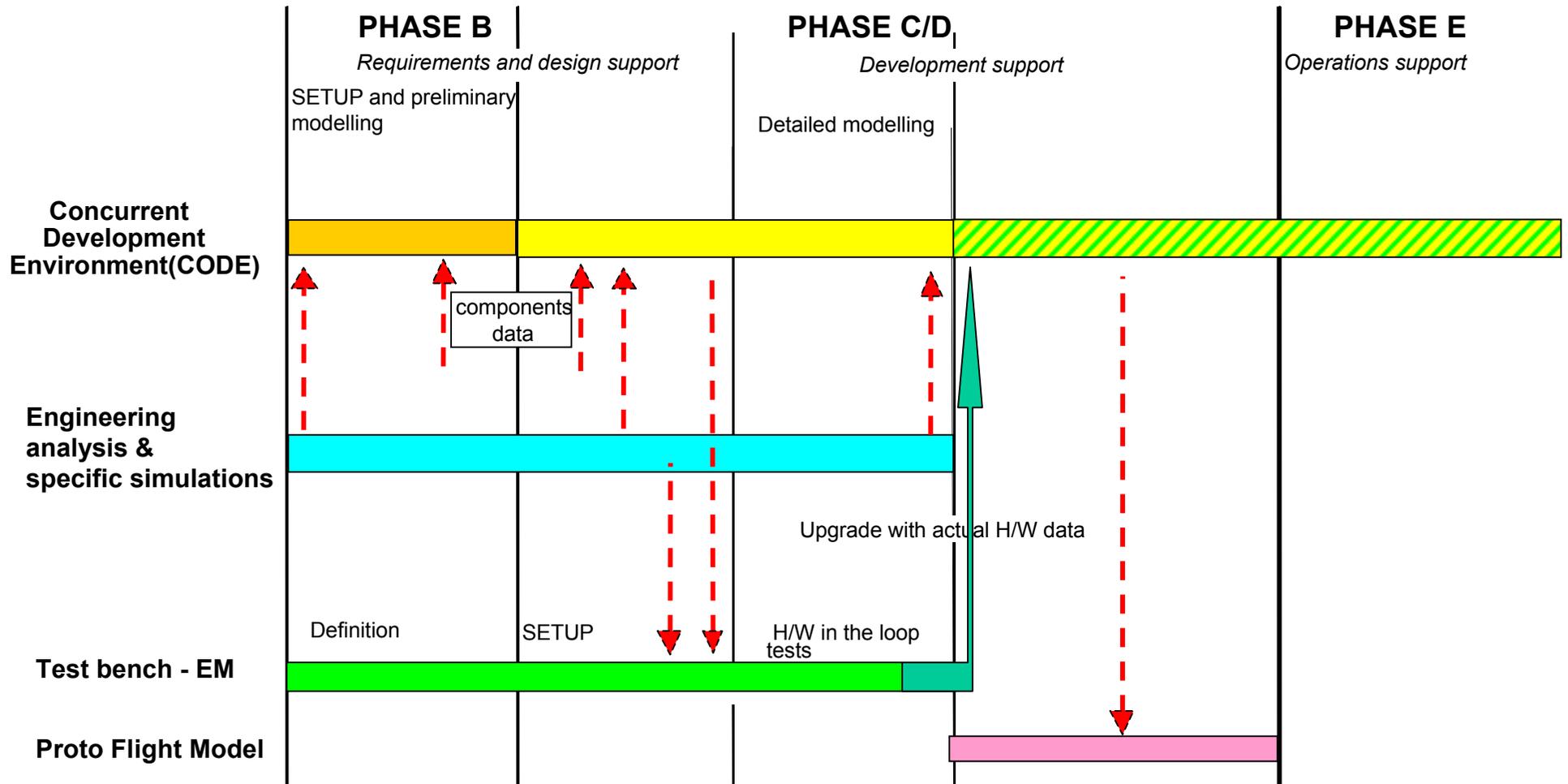
- Modeling environment
- Integrated set of (distributed) multidisciplinary models
- Flexible and modular to evolve during the different phases of the project life cycle

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**CONCURRENT DEVELOPMENT  
ENVIRONMENT (CODE) Concept**

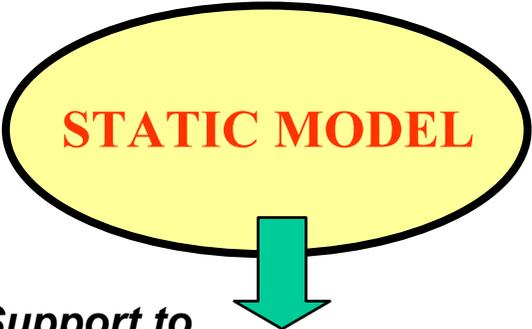


### CODE EVOLUTION ALONG TYPICAL PROJECT PHASES



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**PHASE B:** preliminary data/models (e.g. functional architecture, high level interfaces, components basic information as: power consumption, I/O data budget, I/O rate, CPU capability, etc.)



**STATIC MODEL**

*Support to*

- Configuration definition and trades
- Requirements generation and apportionment
- System budgets definition and maintenance
- Interfaces definition

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**PHASE C/D & E:** detailed models evolving with the design definition and making use of updated project information as designed, developed and tested.

**STATIC MODEL**

**DYNAMIC MODEL**

## *Phase C/D Support*

- Design consolidation, validation and maintenance
- Performances and interfaces verifications
- S/W modules integration
- AIT procedures preparation for EGSE simulation
- Operation sequences preparations & validation
- Support to AIT trouble shooting

## *Phase E Support*

- Mission data evaluation
- Trend analysis
- Trouble shooting
- Operative sequences modification
- S/W updates

# New Design Paradigms

## 2002 Workshop

### STATIC MODEL CONCEPT DEFINITION

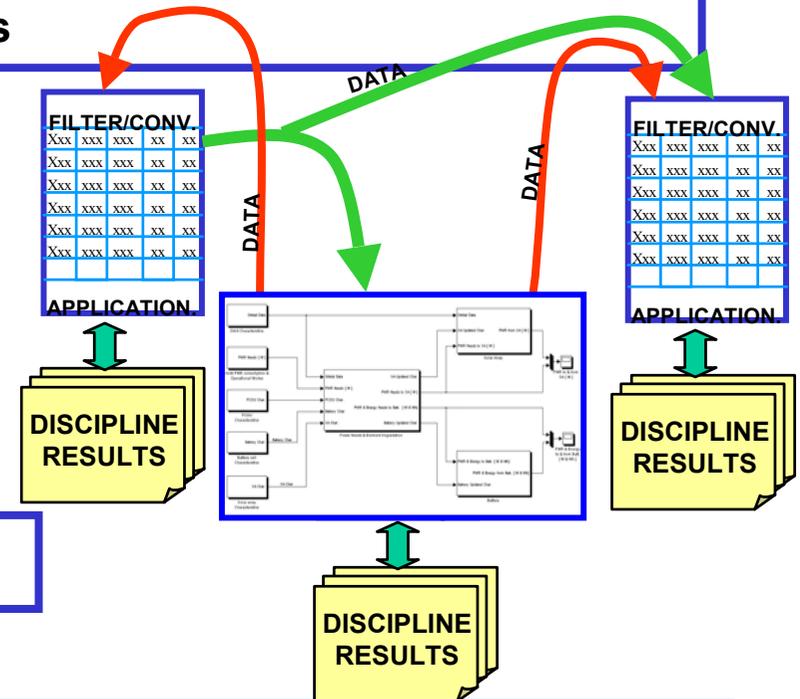
- Functional integration of different disciplines DBs & Simulation models
- Automatic data exchange between disciplines
- Open loop interaction between different discipline results
- Fast worst case analysis and configuration trades

Identification of models interfaces

Identification of database interfaces

Identification of functional links

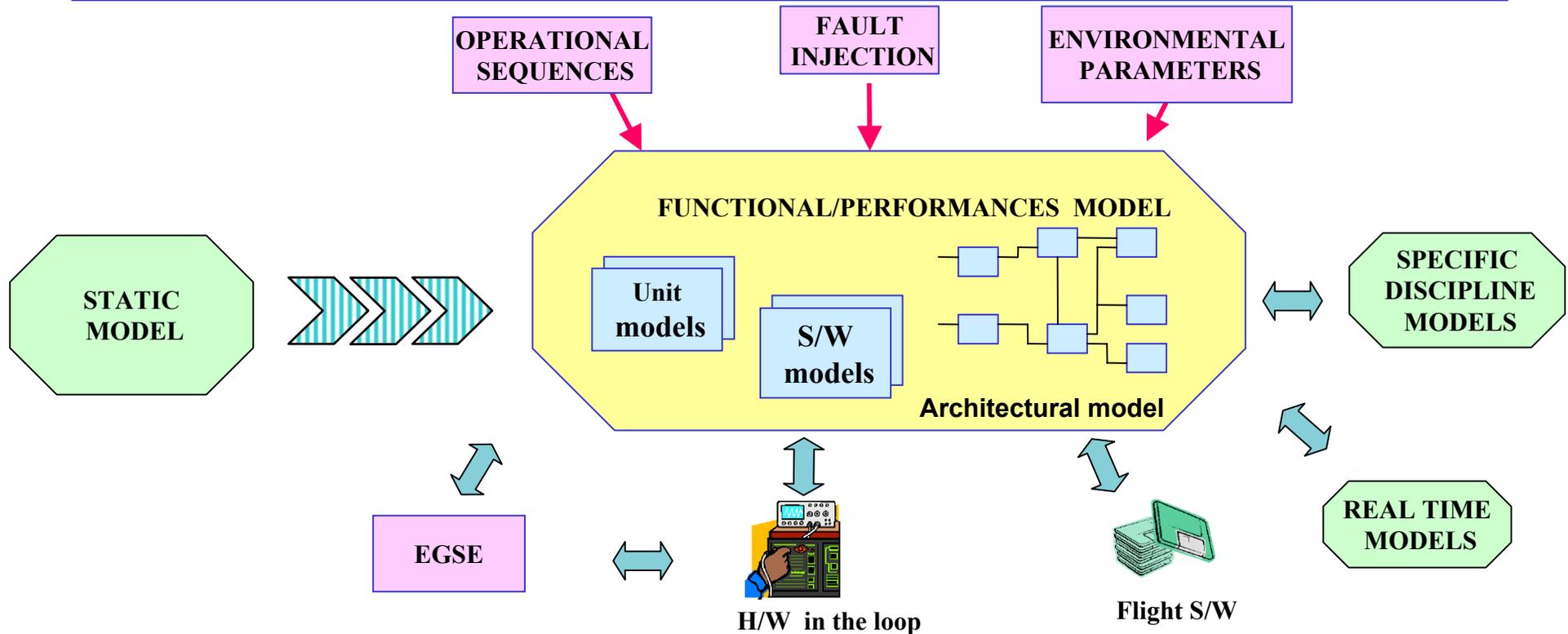
Definition of transfer protocols



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## **DYNAMIC MODEL CONCEPT DEFINITION**

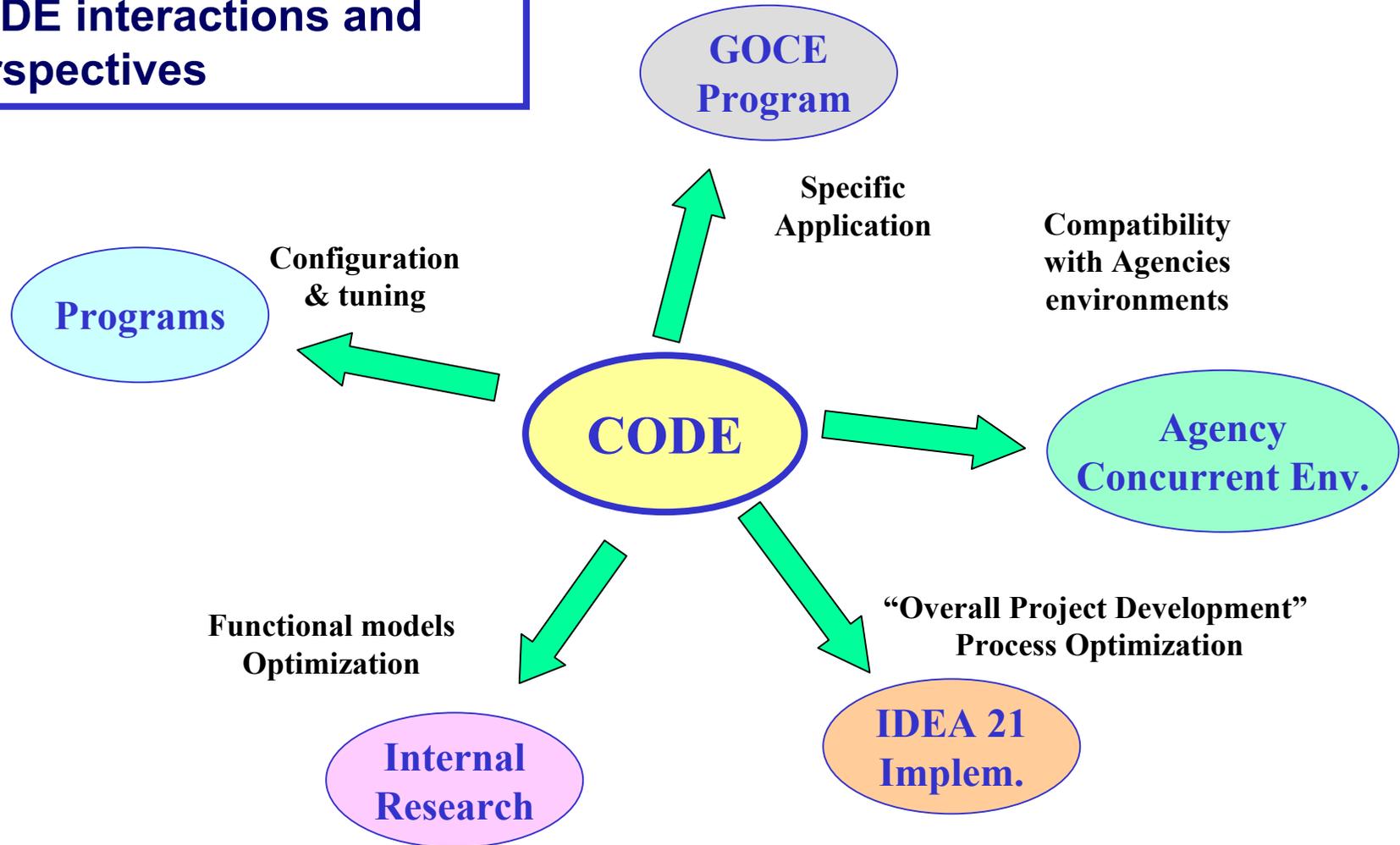
- Quasi Real time simulation
- Closed loop interaction among models belonging to different disciplines



# New Design Paradigms

## 2002 Workshop

### CODE interactions and perspectives



## **ON-GOING ACTIVITIES**

### ***Collaboration between Alenia Spazio and Politecnico di Torino (Aerospace Department - Systems Engineering)***

#### ***• Objectives:***

- ☞ Identify work methodologies**
- ☞ Identify tools used/needed in each engineering discipline**
- ☞ Identify different integration approaches into the concurrent environment**
- ☞ Primary decomposition, i.e. identify interfaces, involved data, points of interaction**

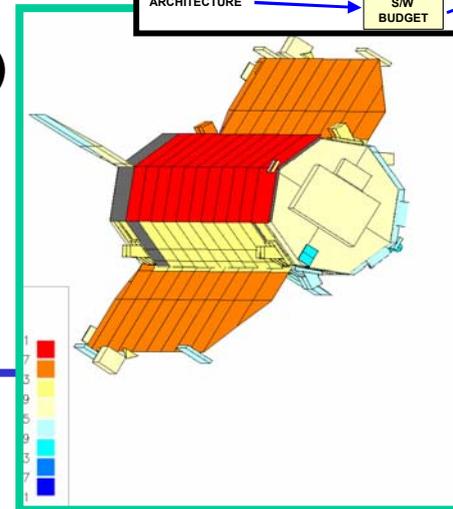
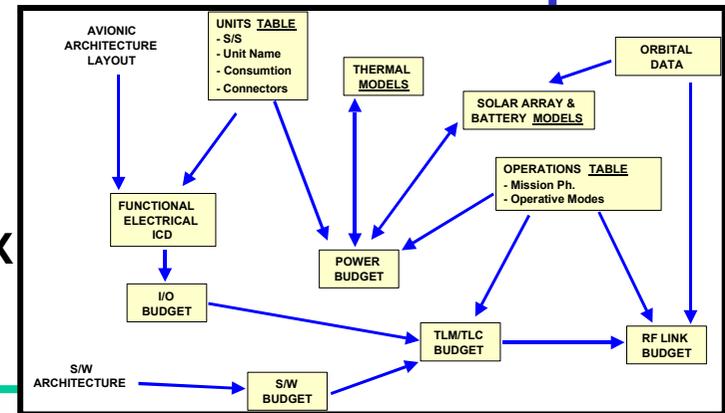
#### ***• Already Involved fields/disciplines:***

- Avionics (Electrical power system, TT&C, Data handling)**
- Software**
- Thermal control**
- AOCS**

### ON-GOING ACTIVITIES

#### FIRST CODE PROTOTYPE

- Simple scenario (Power Budget)
- Multiple Platforms: PC-Windows, HP-UX, SGI-IRIX
- I/F with,
  - AOCS simulator
  - THERMAL models (ESATAN, ESARAD)
  - Avionics DB
  - Operations DB
- Real case study
  - GOCE satellite (ESA)



# New Design Paradigms 2002 Workshop

## Current investigations and Evolution Perspectives

- Evaluation & choice of a modeling environment
- Distributed engineering
- I/F with physical models
- Real-time support



*Simulink - like*



*HLA - CSCW*



*STEP*



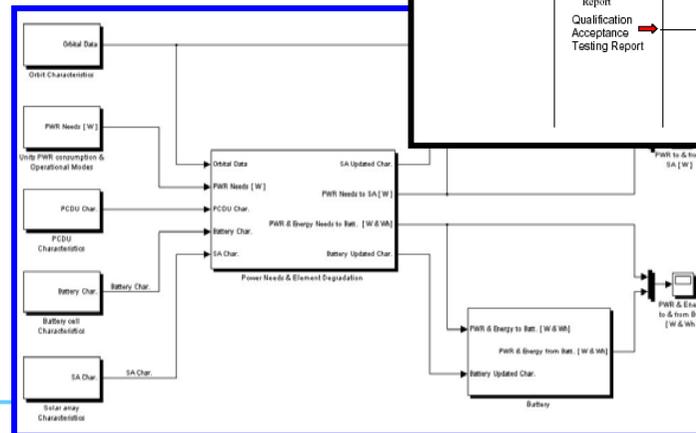
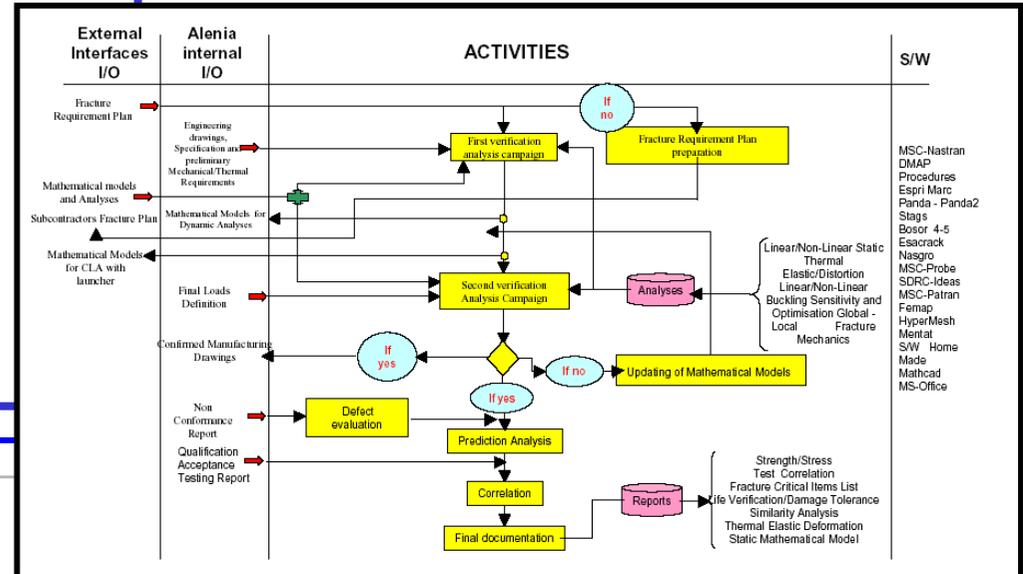
*GRID computing*



## Current investigations and Evolution Perspectives

### Evaluation & choice of a Modeling Environment

- Model library
- Project configurable
- Multiple scenarios
- Links to external tools
- Source code generation



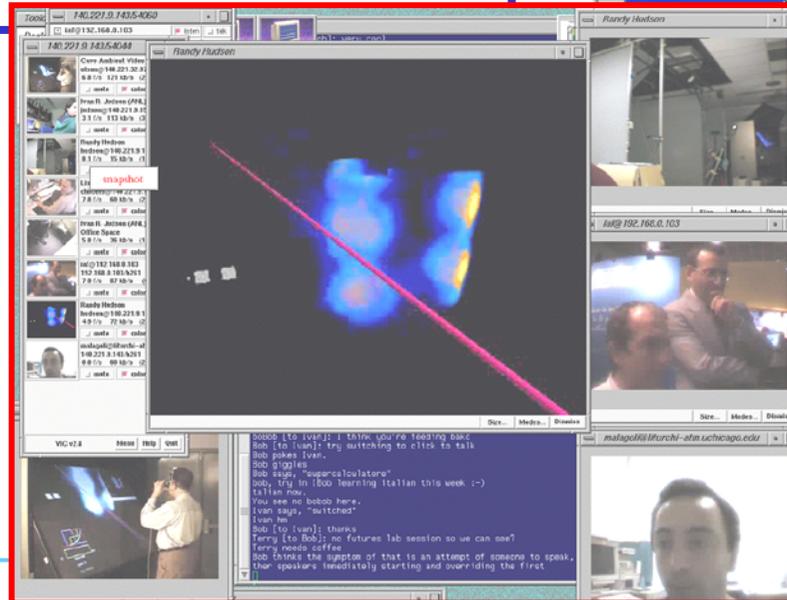
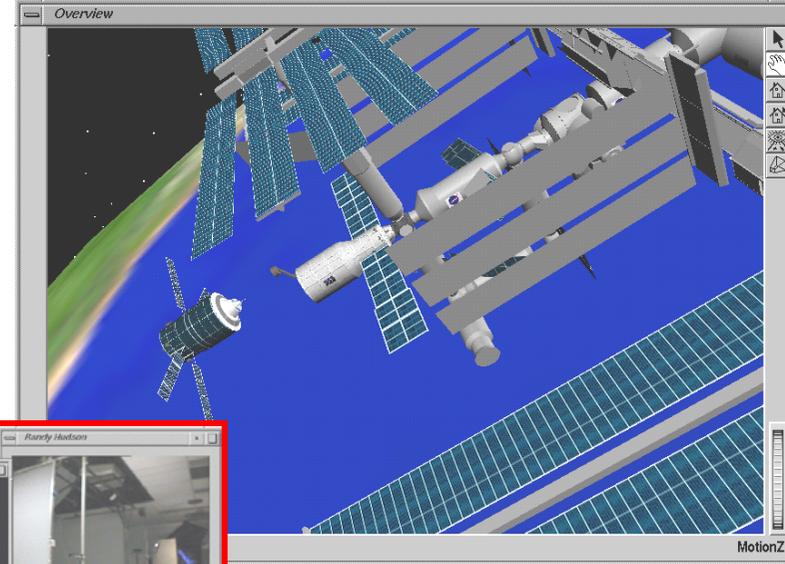
Simulink - like

# New Design Paradigms 2002 Workshop

## Current investigations and Evolution Perspectives

### Distributed Engineering

- Distributed Simulation
- Remote control (e.g. Teletesting)
- Collaborative Engineering



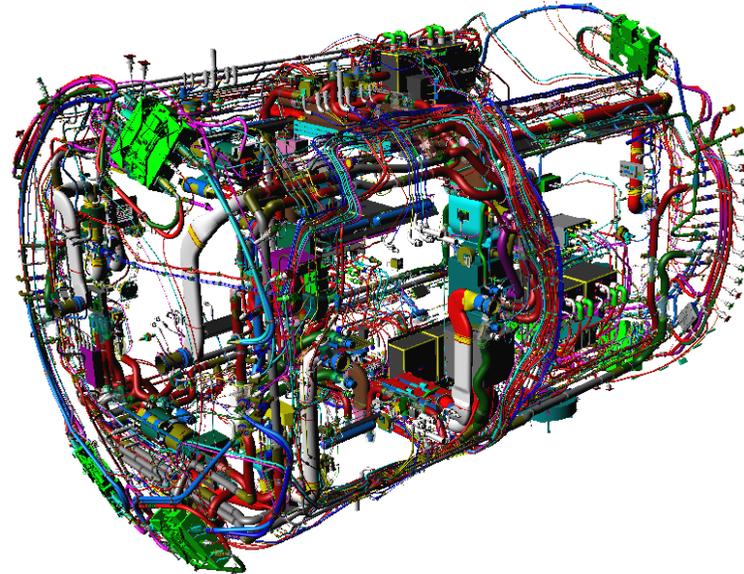
- HLA
- CSCW

# New Design Paradigms 2002 Workshop

## Current investigations and Evolution Perspectives

### I/F with physical models

- Physical configuration
- CAD systems
- Digital Mock-Ups



### Exchange protocols:

- STEP

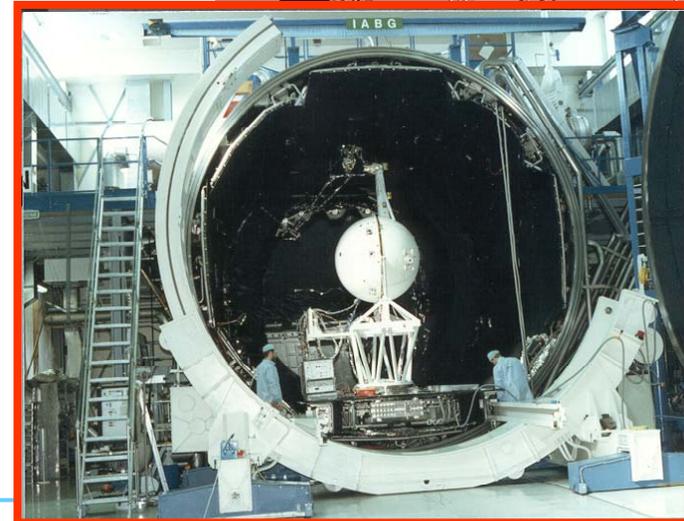
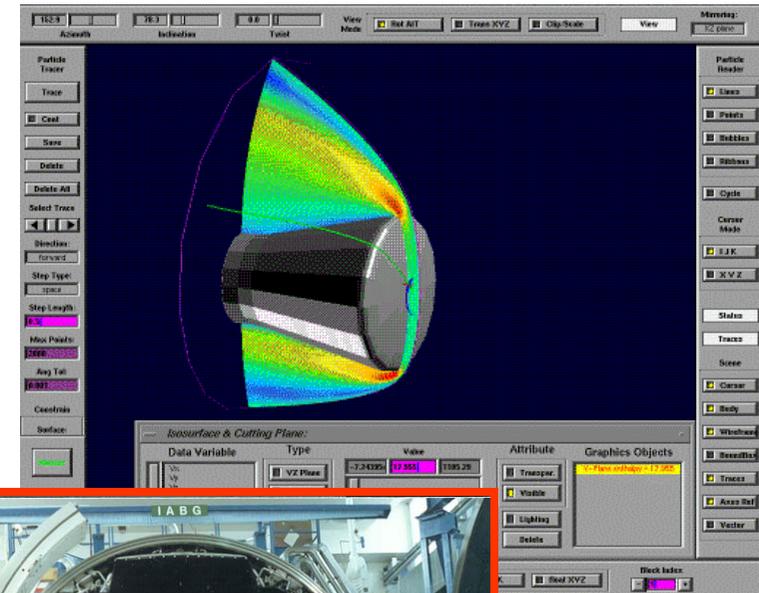
# New Design Paradigms 2002 Workshop

## Current investigations and Evolution Perspectives

### Real-time support

- Use of Parallel processing
- H/W-in-the-loop
- Man-in-the-loop (astronauts training)

- GRID computing
- 3D immersive VR systems



## **CONCLUSIONS**

- CODE is an Alenia Spazio on-going initiatives aimed at:
  - *identifying and implementing a simulation environment*
  - *integrating multidisciplinary models as well as S/W and H/W in the loop*
  - *evolving during the project life cycle*
- Fruitful collaboration with Politecnico di Torino
- CODE will be gradually made available to support current projects (e.g. ESA-GOCE) and will be more extensively used for future scientific missions

*Harmonisation of applied methodologies and model interfaces is considered an important area of collaboration with Agencies as well as with major International partners*