SCARLETT

SCAlable & ReconfigurabLe

Electronics plaTforms and Tools

SCARLETT

From the Integrated Modular Avionics the First Generation architecture to the Distributed Modular Electronics solution

SEVENTH FRAMEWORK PROGRAMME

Collaborative Project - Consortium

SCARLETT: Large-scale integrating project

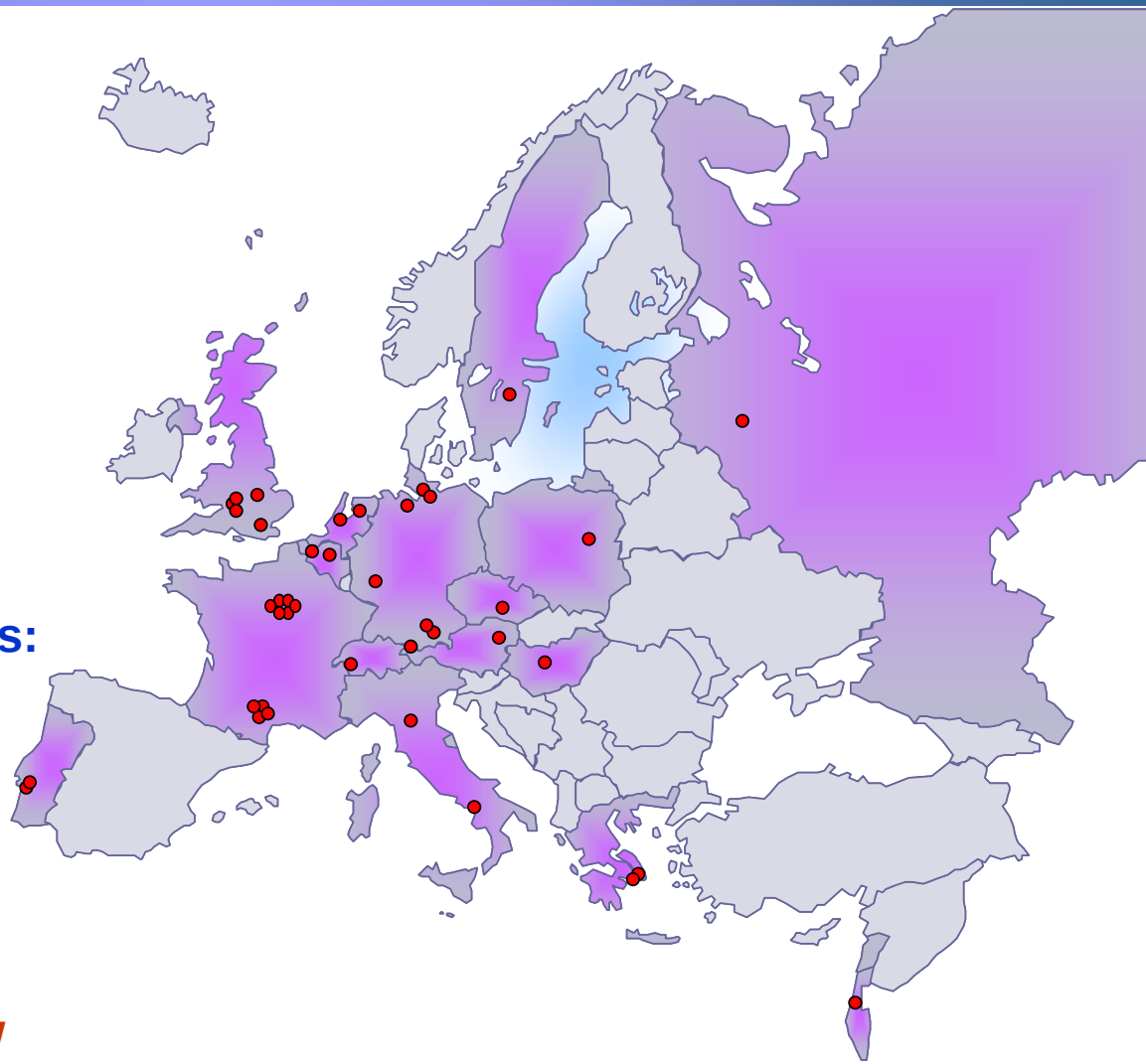
38 Partners

16 countries

Budget: 40 mln EUR

Leader: THALES France

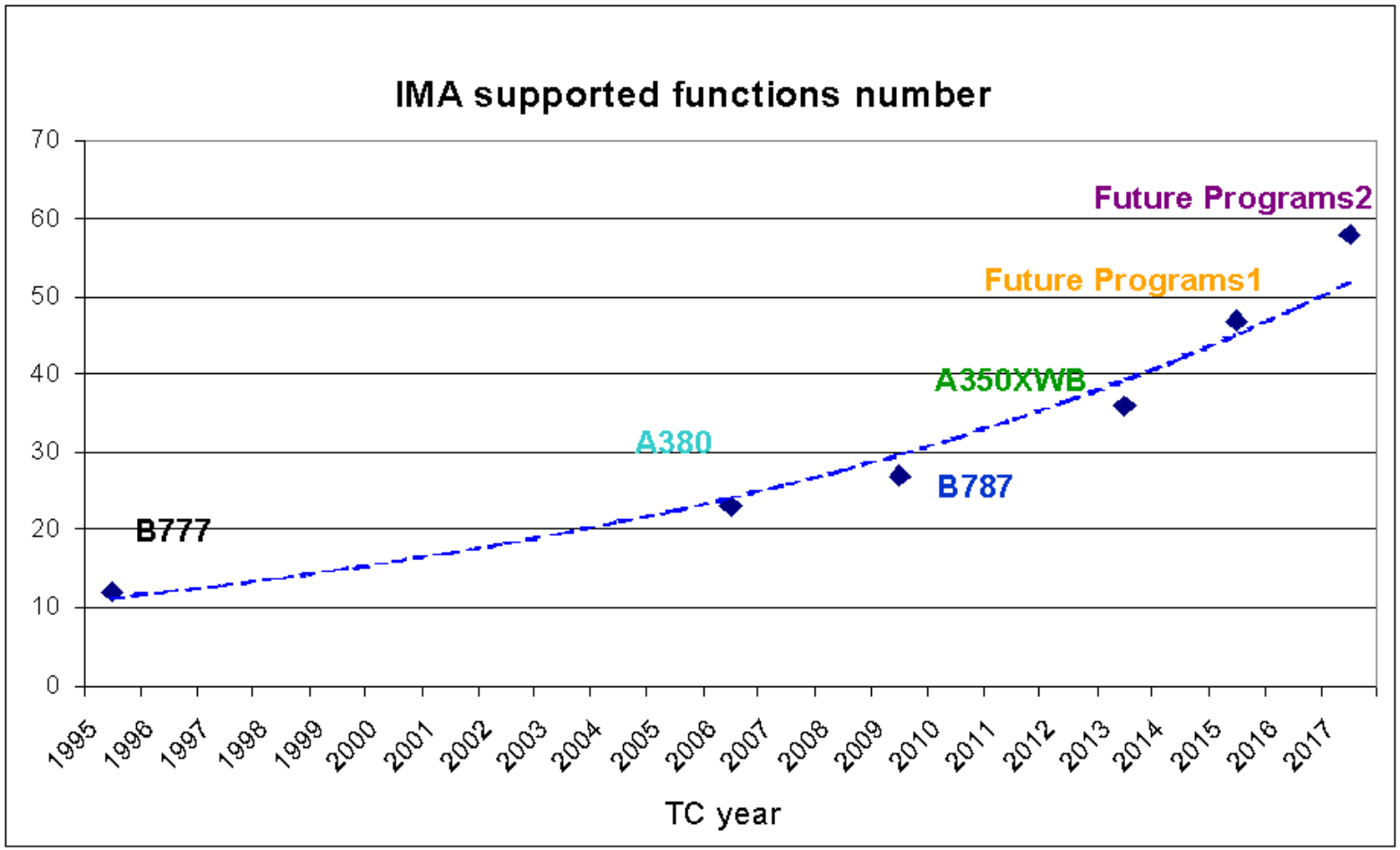
- Large Industrial Companies: Airbus, SAGEM, GEA,...
- Public Research centers: ONERA, NAL, ...
- Industrial Research centers
- SMEs
- Universities: Bremen, Bristol, Hamburg, Nottingham, Rzeszów



Collaborative Project - Schedule

SP/WP N°	WP title
SP0	**Management**
SP1	**Requirements, Architecture and Process Definition**
WP1.1	Aircraft Level Requirements
WP1.2	System Level Requirements (Incl. New functions)
WP1.3	Platform Requirements and DME Architecture
WP1.4	Process and Demonstrations Definition
WP1.5	Certification Of Reconfiguration
WP1.6	Standardisation
SP2	**Development of Avionics Solutions**
WP2.1	DME Operating System and Middleware services Solutions
WP2.2	Core Electronics Solutions (CPM, Network)
WP2.3	Remote Electronics Solutions (RDC, RPC, REU)
WP2.4	Toolset and Simulators Development
WP2.5	Common Packaging Concepts for Interchangeability
SP3	**Platform Integration**
WP3.1	Integration at module Level
WP3.2	Integration at Generic Platform Level
WP3.3	Application Devlpmt for Demonstration
SP4	**Demonstration of DME platform capabilities**
WP4.1	High Performances Data Distribution Capability
WP4.2	I/O Intensive Capability
WP4.3	High Criticality Capability
WP4.4	Reconfiguration and Maintenance Capability
SP5	**Results Assessment Exploitation and Dissemination**
WP5.1	SCARLETT Results Assessment
WP5.2	Dissemination
WP5.3	Exploitation

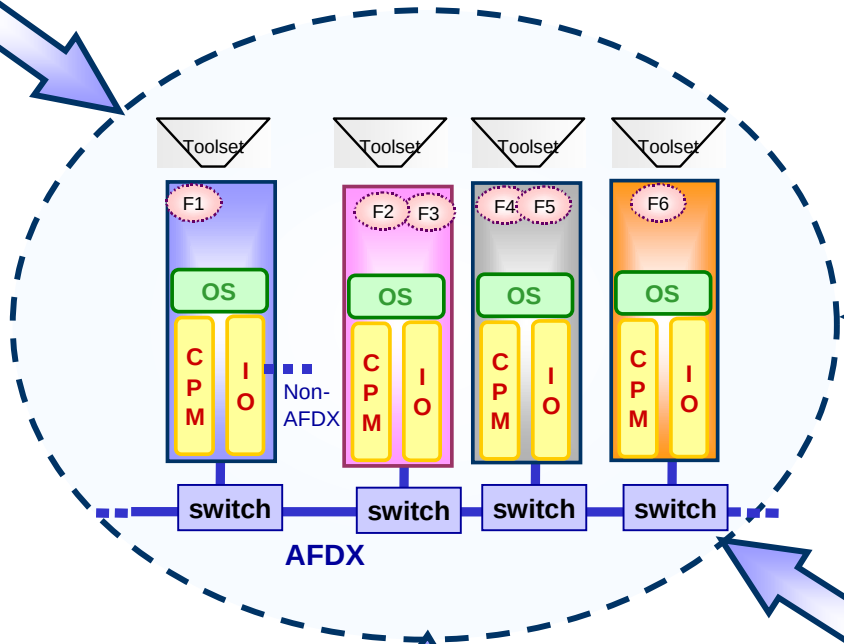
Distributed Modular Electronics



- Next generation IMA platform will need to provide more computing power and interface capability
- Volume / weight / power consumption constraints will remain

Additional market expectation

Increase operational reliability

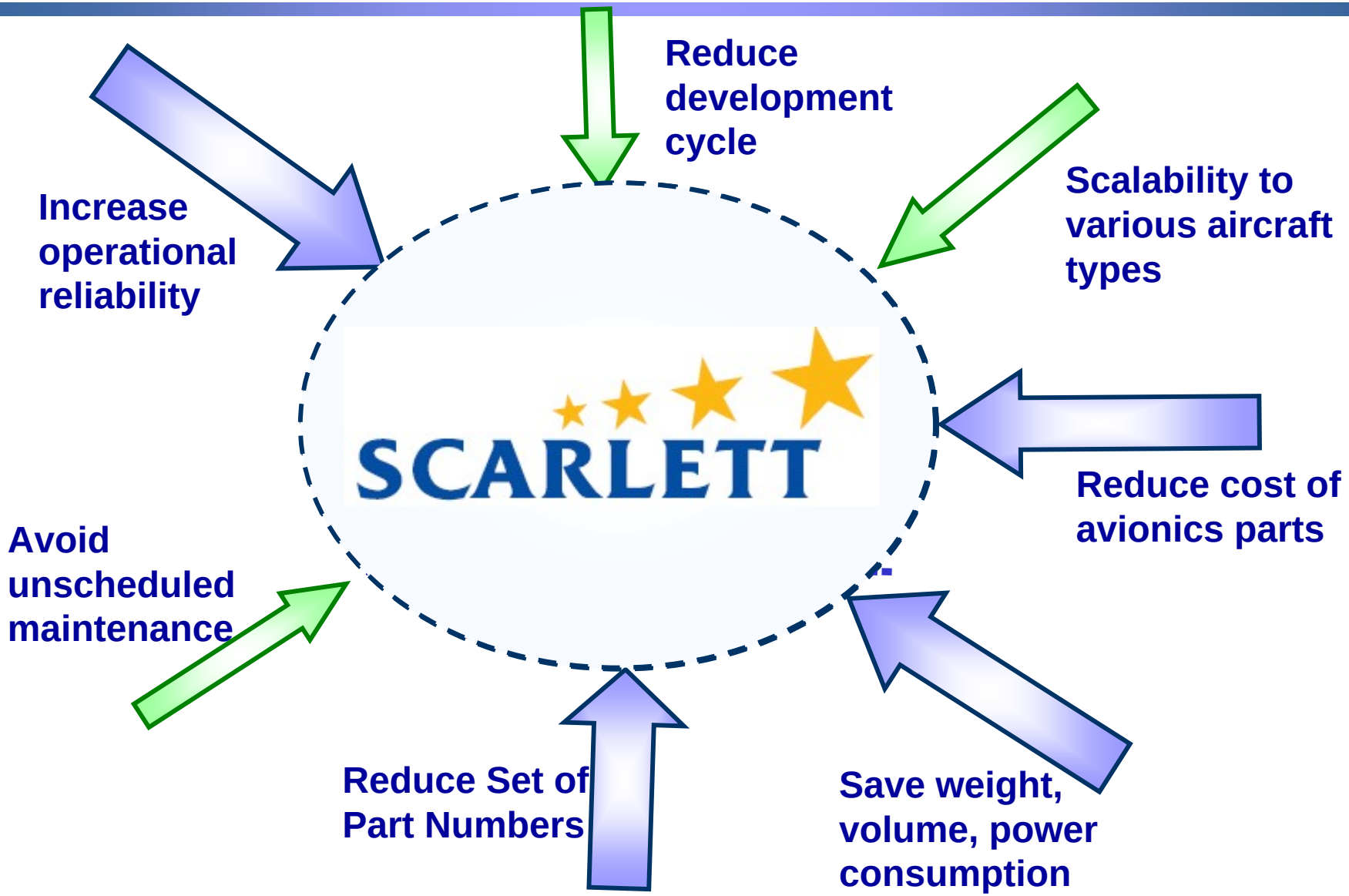


Reduce cost of avionics parts

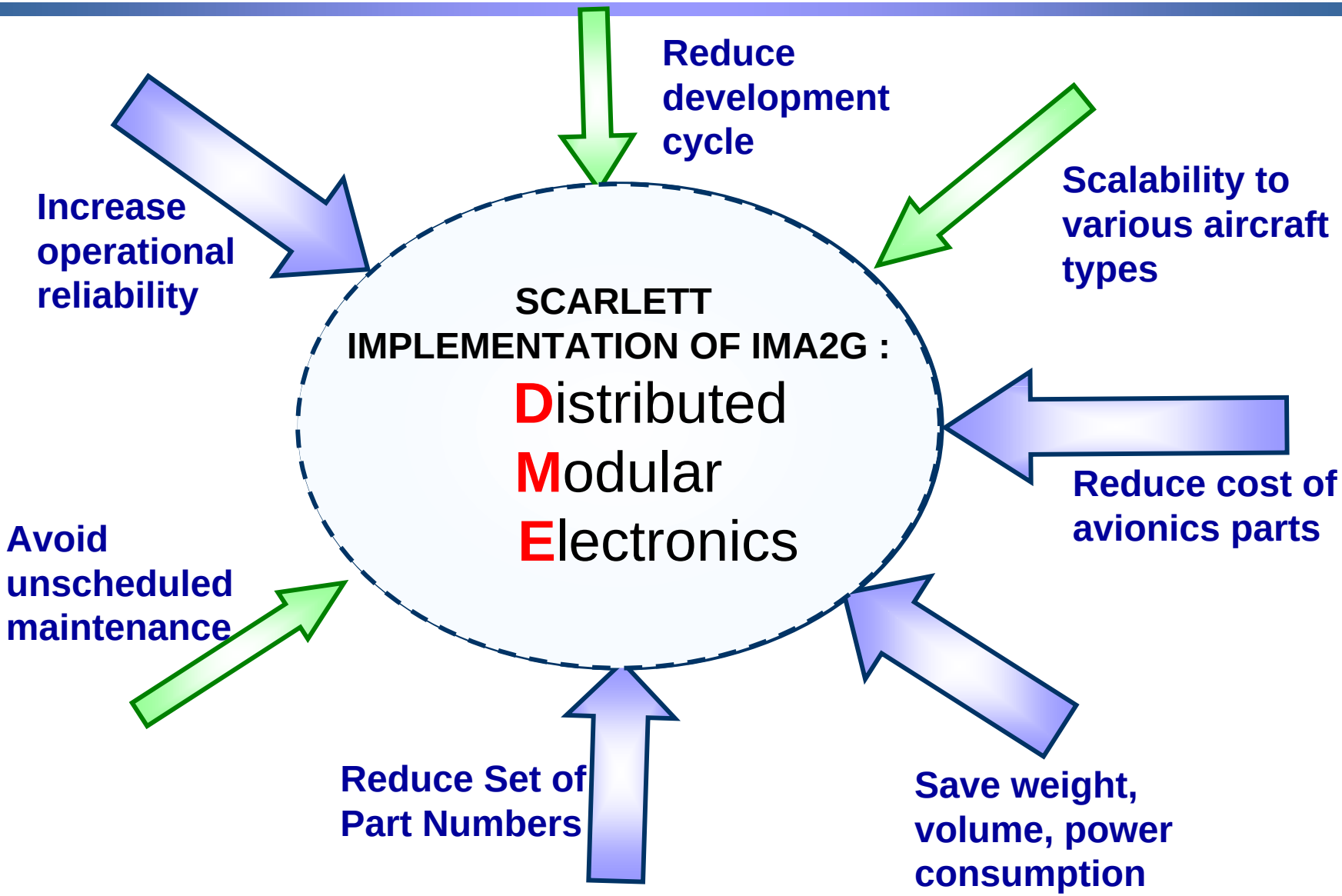
Reduce Set of Part Numbers

Save weight, volume, power consumption

Additional market expectation



SCARLETT Approach



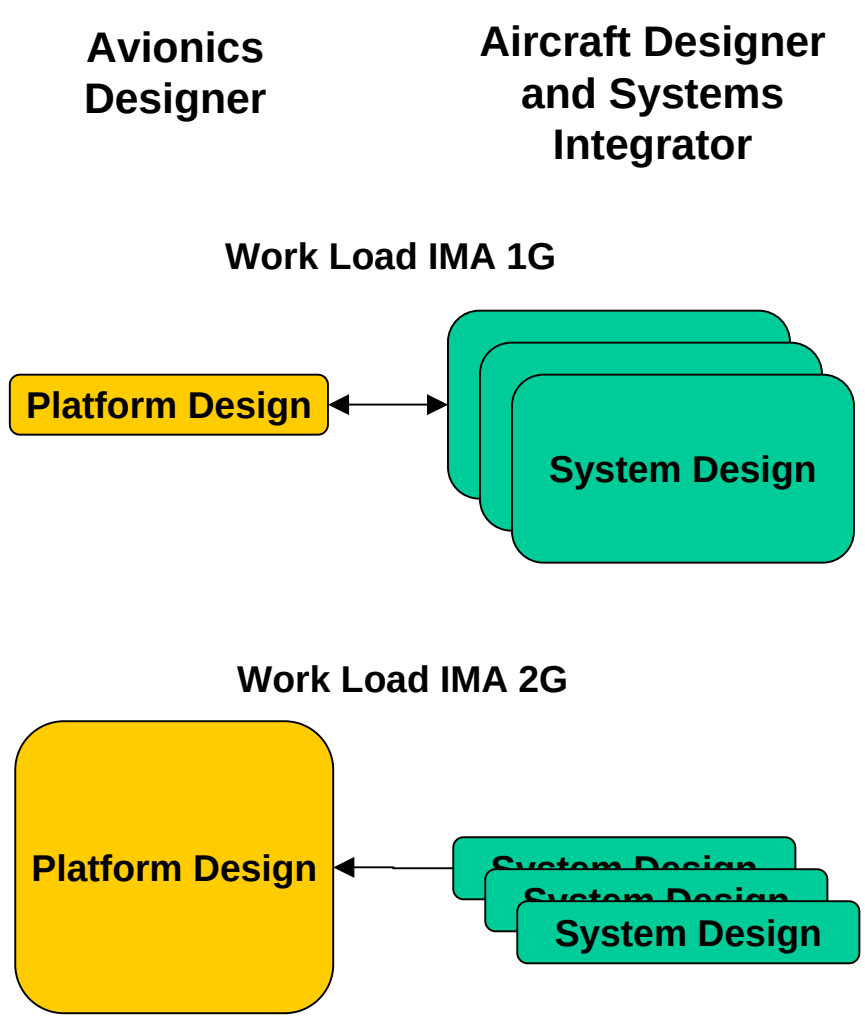
General: Changes from IMA 1G to 2G

- IMA 2G will provide the system designer with more options for integration in terms of computing power and communication

- IMA 2G increases the integration level in terms of
  - Criticality level of hosted systems
  - Number of hosted systems in IMA
  - System integration level

→ IMA 2G means an increased complexity in terms of technology and processes

→ IMA 2G objective is to optimize tool usage and their processes



SP3. Platform integration

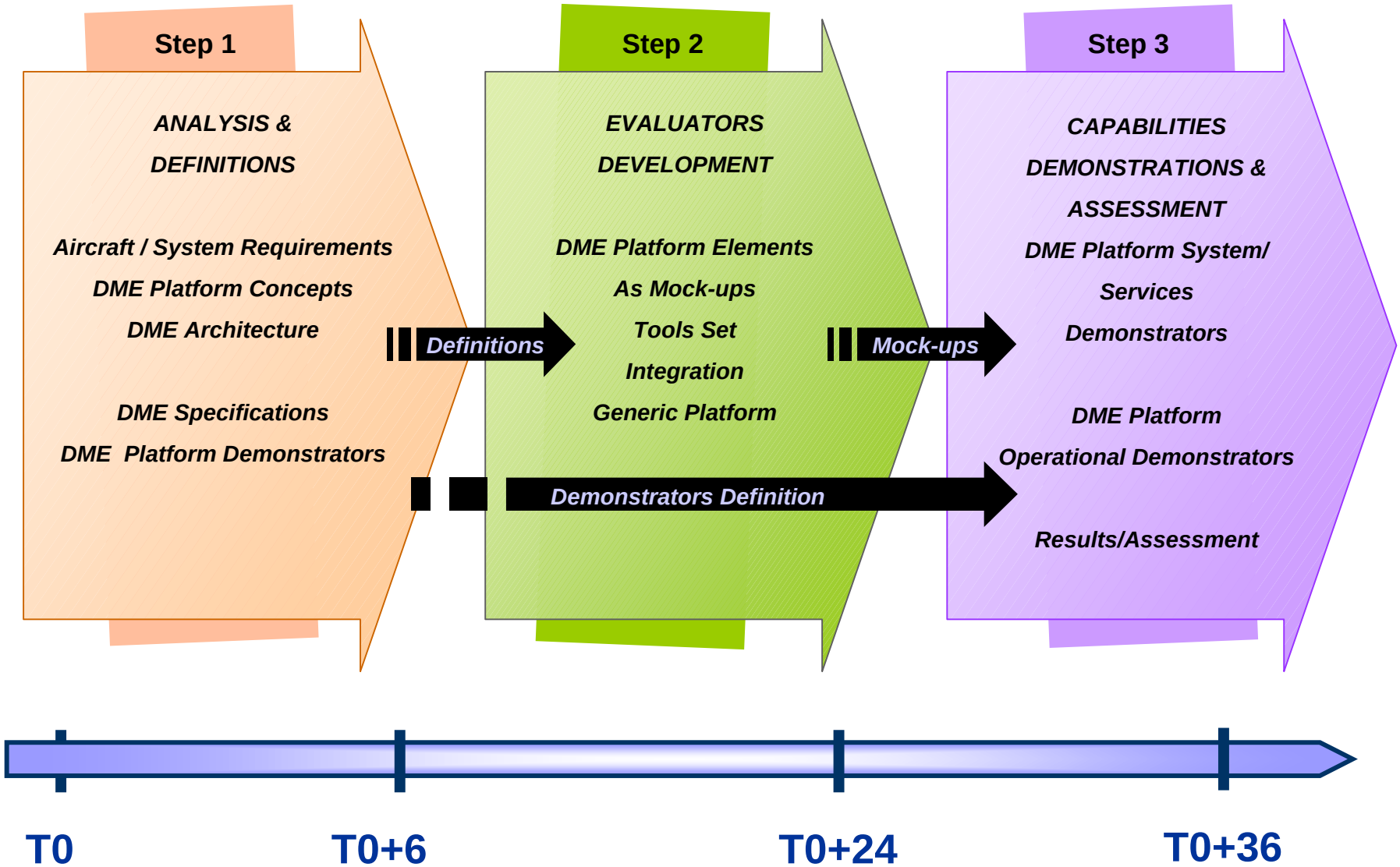
Definitions

- Common Resources – An IMA Component which can be configured to perform a variety of functions
- AFDX – Avionic Full Duplex Switched Ethernet
- IMA Perimeter – The list of systems hosted by IMA Components

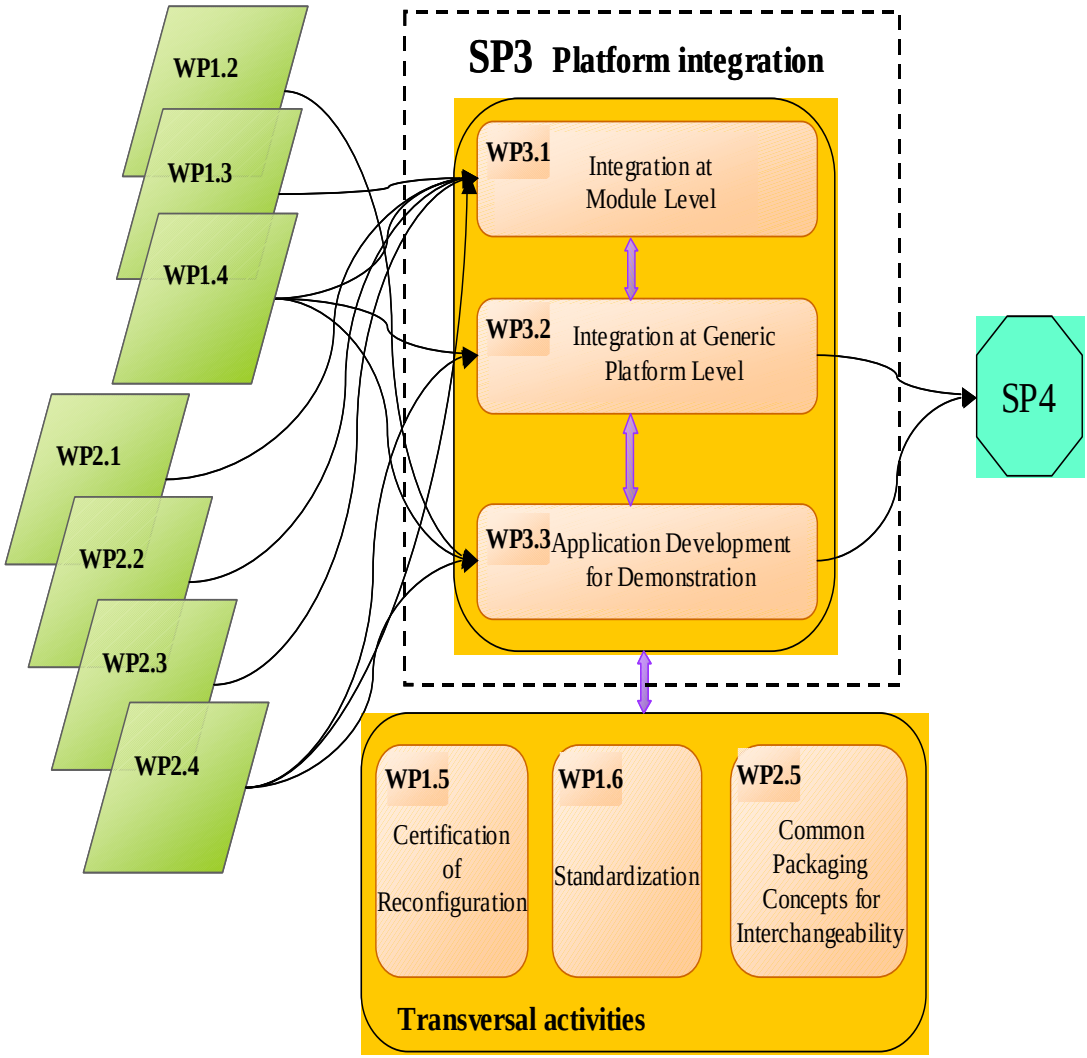
Only a few different hardware modules:

- CPM – Core Processing Module
- RPC – Remote Power Centre
- REU – Remote Electronics Unit
- RDC – Remote Data Concentrator
- IRDC Intelligent RDC
- IOM – Input Output Module
- Smart Device (Sensor or Actuator)

SCARLETT Schedule



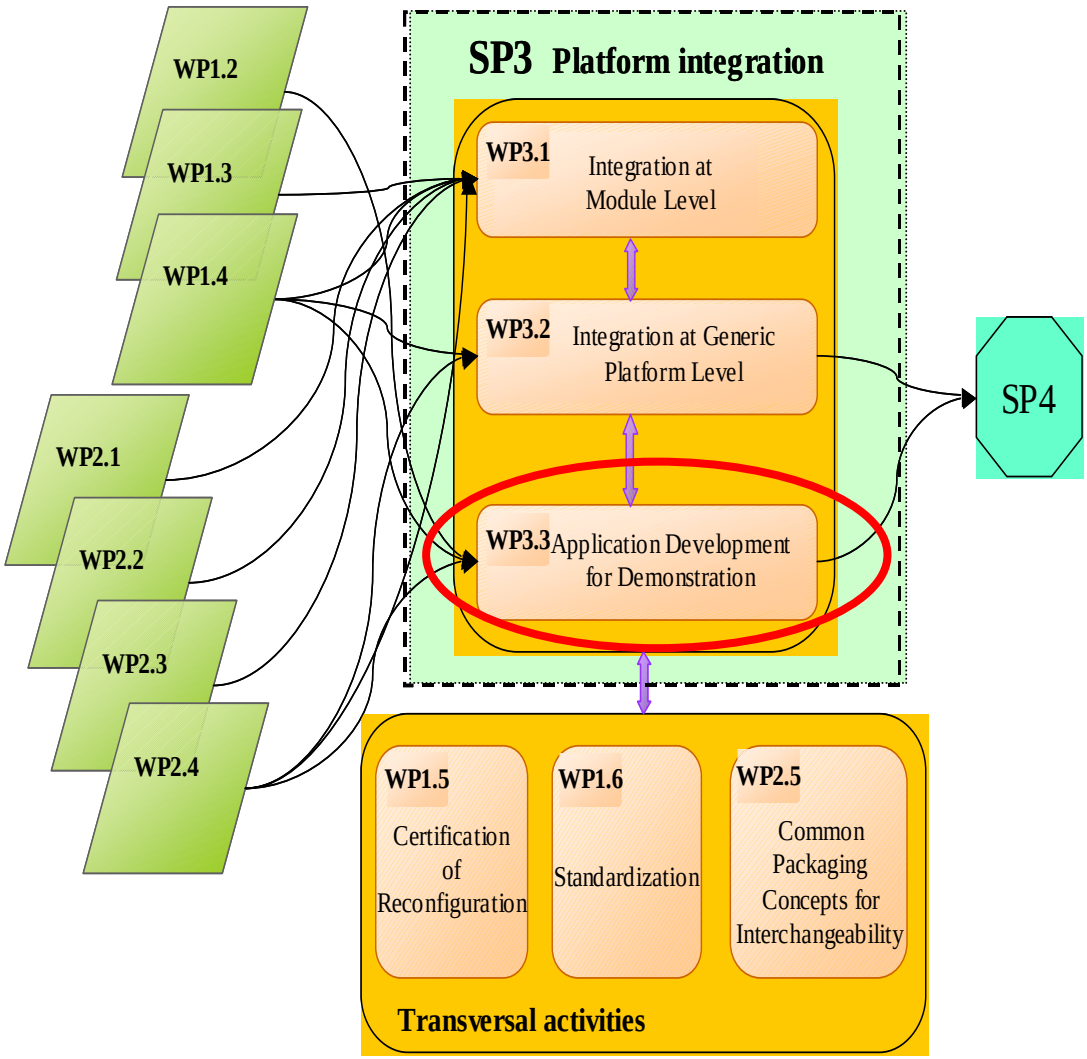
SP3. Platform integration

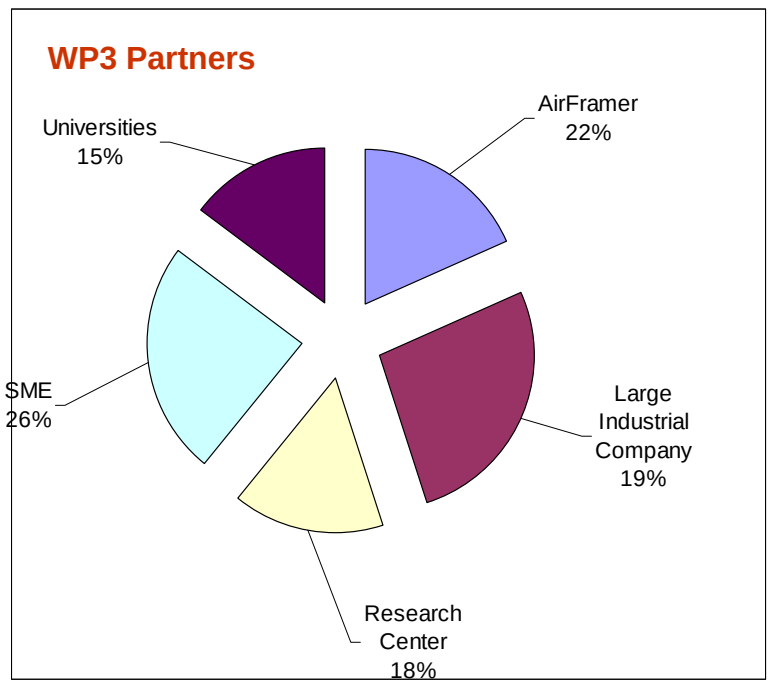


Outputs

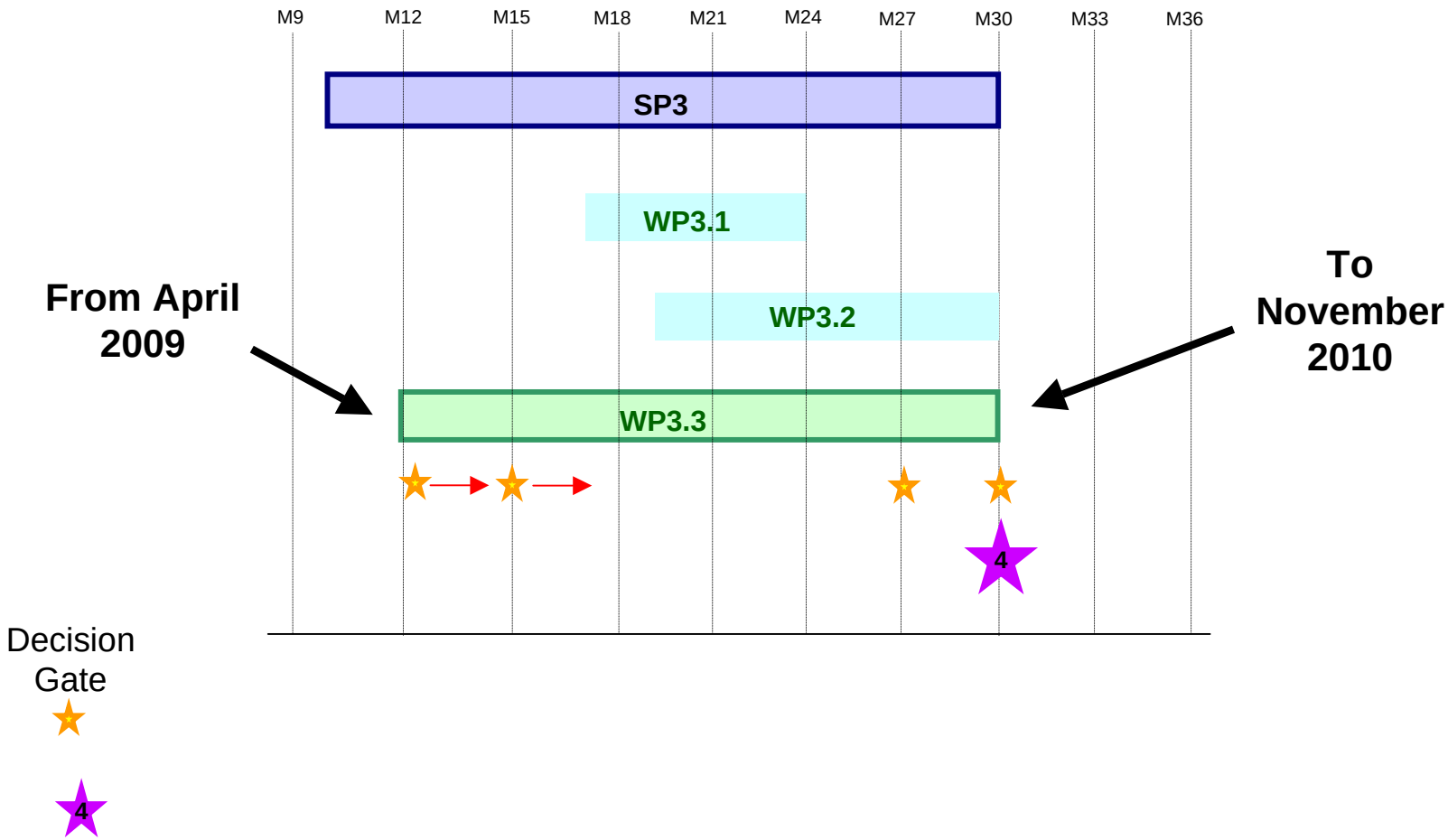
- **Generic Platform**
  - verified
- **CPMs, Network and Remote Electronics**
  - integrated
  - verified
- **Test Applications for Demonstrators**
  - verified

SP3. Platform integration





SP3. Platform integration



WP3.3. Application Development

WP3.3. Application Development for Demonstration

(Leader: General Electric Aviation, UK)

T1. High Performances Data Distribution demonstration

T2. I/O intensive demonstration

T3. Time Critical demonstration

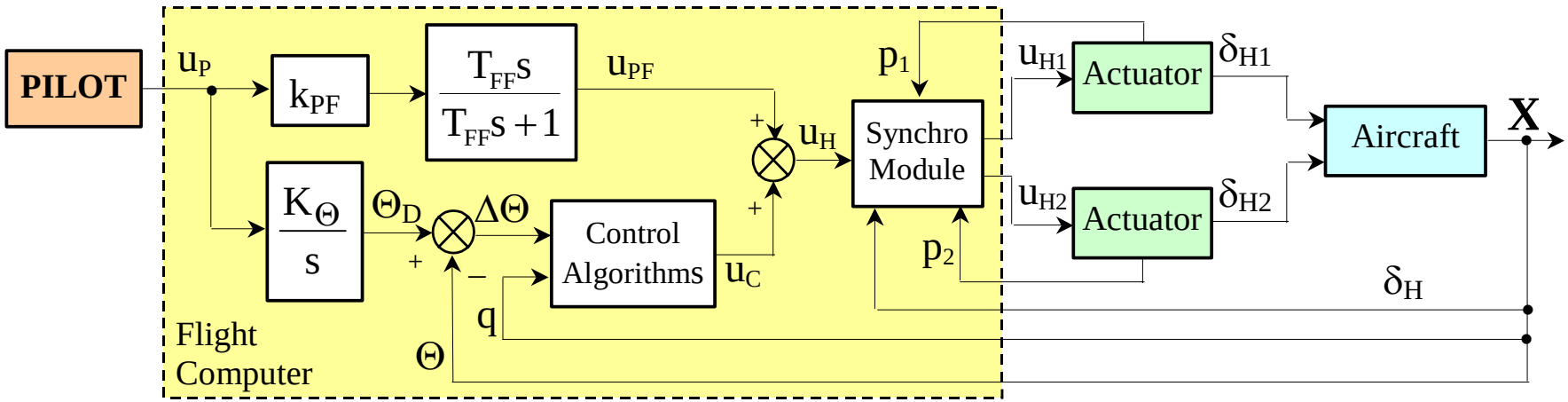
- **Braking Control Application**
- **Fire/Smoke Detection Control Function**
- **Elevator Control Application (RUT)**

T4. Reconfiguration and Maintenance demonstration

Elevator Control Application

Indirect (Fly-by-Wire) Flight Control System

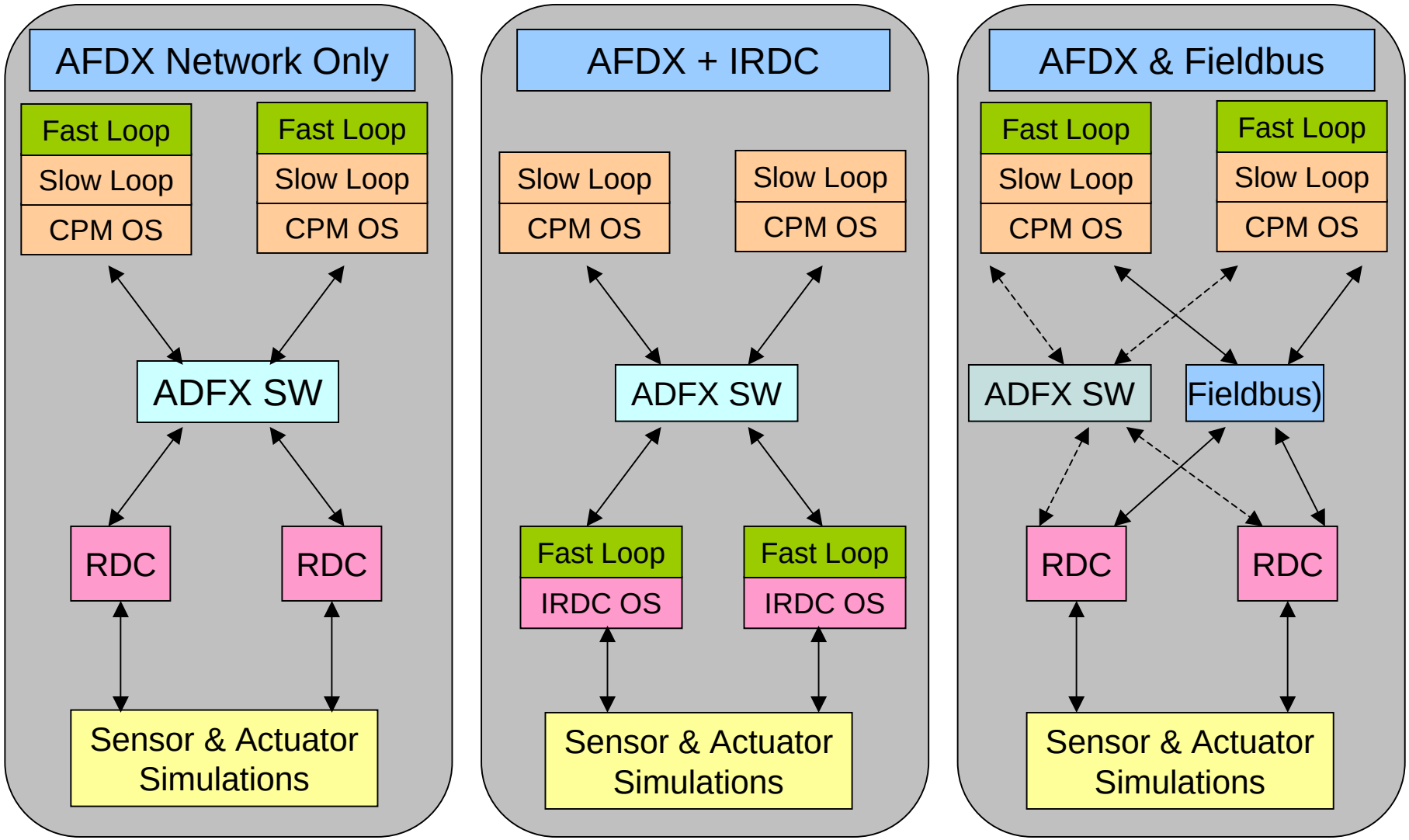
Rate Command / Attitude Hold Control



Designers' tasks:

- Structure of pitch control system
- Control law calculation
- Properties of actuators and actuators' controllers
- Synchronization of actuators' load moments

Elevator Control Application



Elevator Control Application

Time Critical Systems

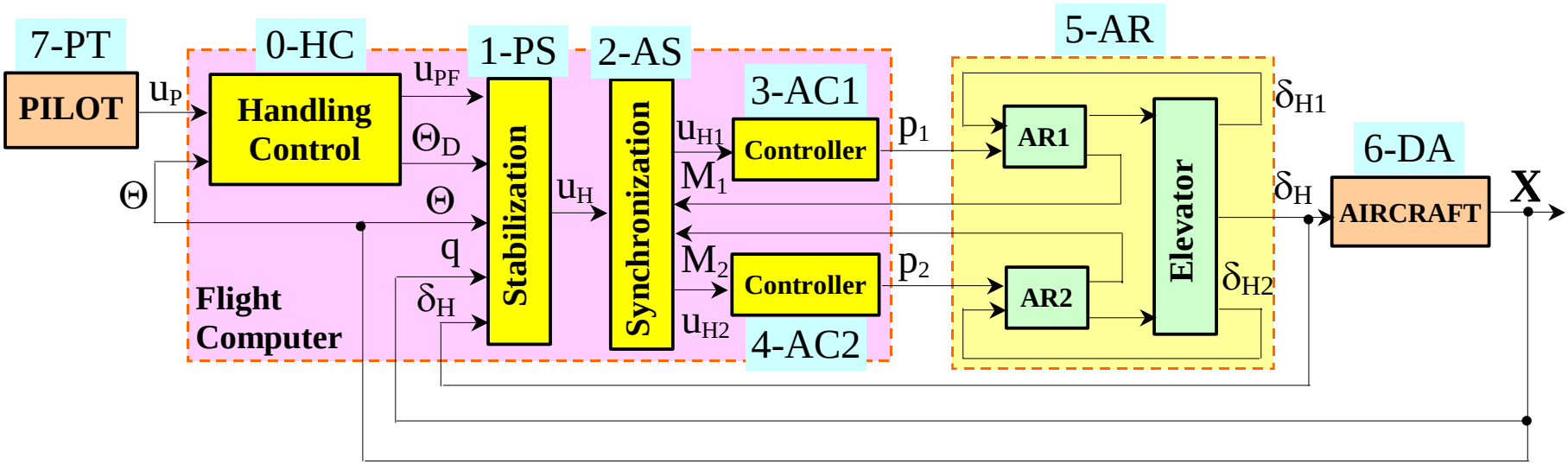
- Guaranteed (maximum) Response time
- Systems who have to perform a defined function within a time period
  - Maximum response time $t < t_{MAX}$
  - Within a defined time period $t_{MIN} < t < t_{MAX}$
  - Only periodic functions so far
- Avionics must support:
  - Short periods / high rate
  - Must provide low latencies
  - Must provide deterministic behaviour

Real Time Operating System - Time Critical Requiments

- VxWorks – Wind River
- PikeOS – SysGo
- ARINC 653 - Avionics application software standard interface

Elevator Control Application

Structure of the elevator control application



Flight Computer Modules

0 – (HC) Handling Control Module

1 – (PS) Pitch Stabilization Module

2 – (AS) Actuators Synchronization Module

3 – (AC1) Actuator Controller No 1

4 – (AC2) Actuator Controller No 2

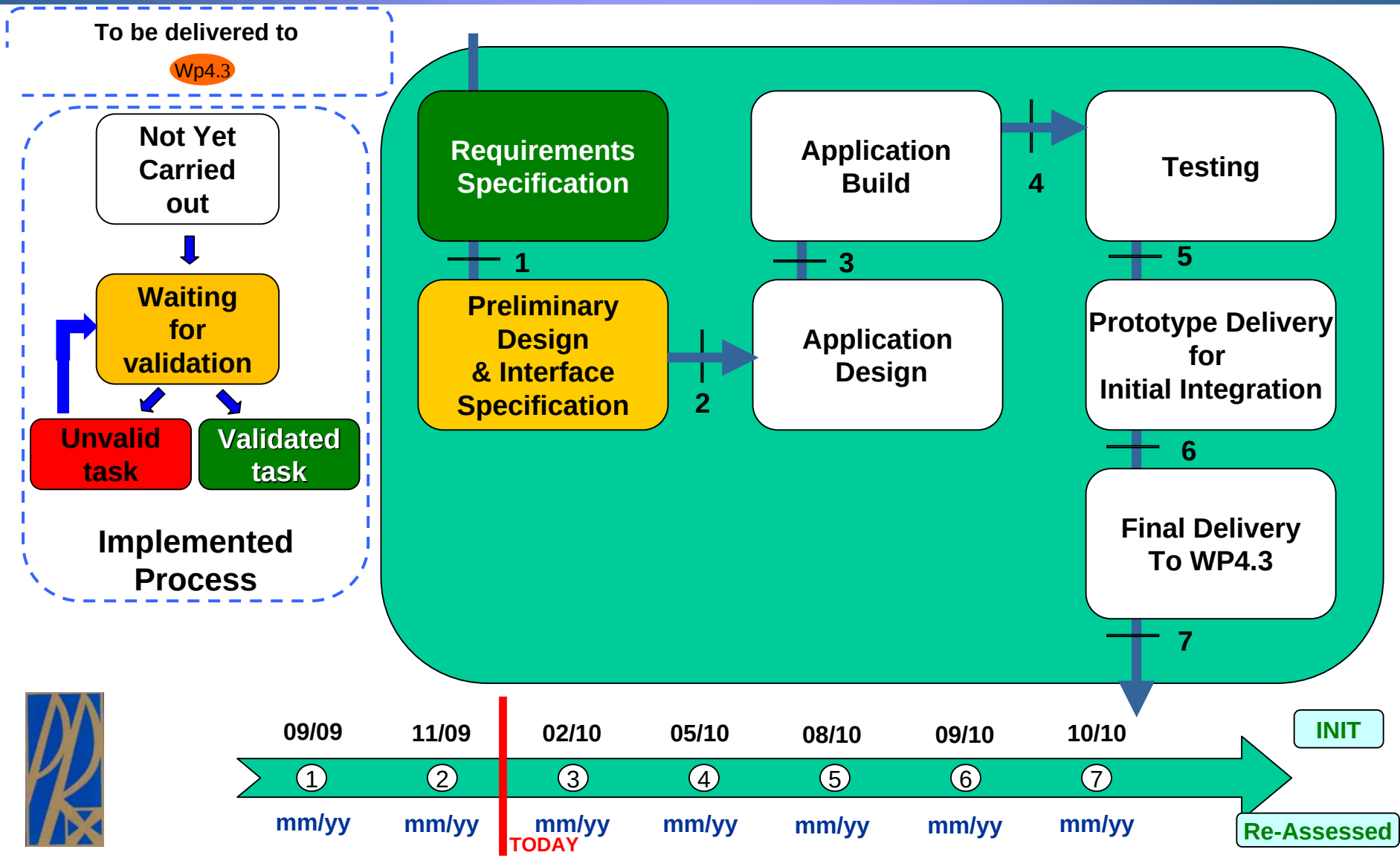
Modules for simulation and testing

5 – (AR) Actuators and Elevator Dynamics Model

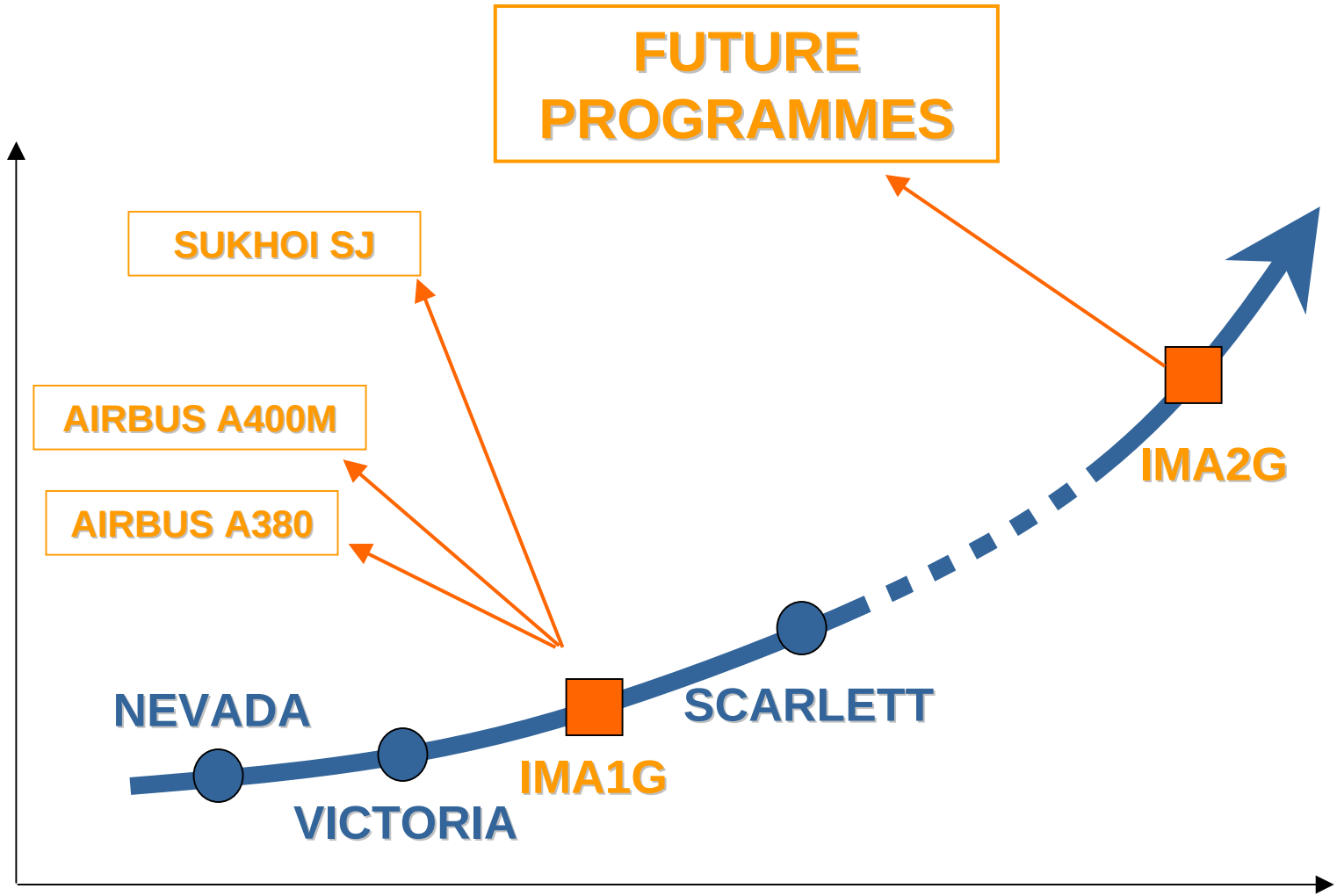
6 – (DA) Model of Aircraft Longitudinal Dynamics

7 – (PT) Model of Pilot's Steering Signal

Schedule & Progress of WP3.3
Elevator Control Application / RUT



The future of SCARLETT
SCARLETT and Way Forward



The future of SCARLETT
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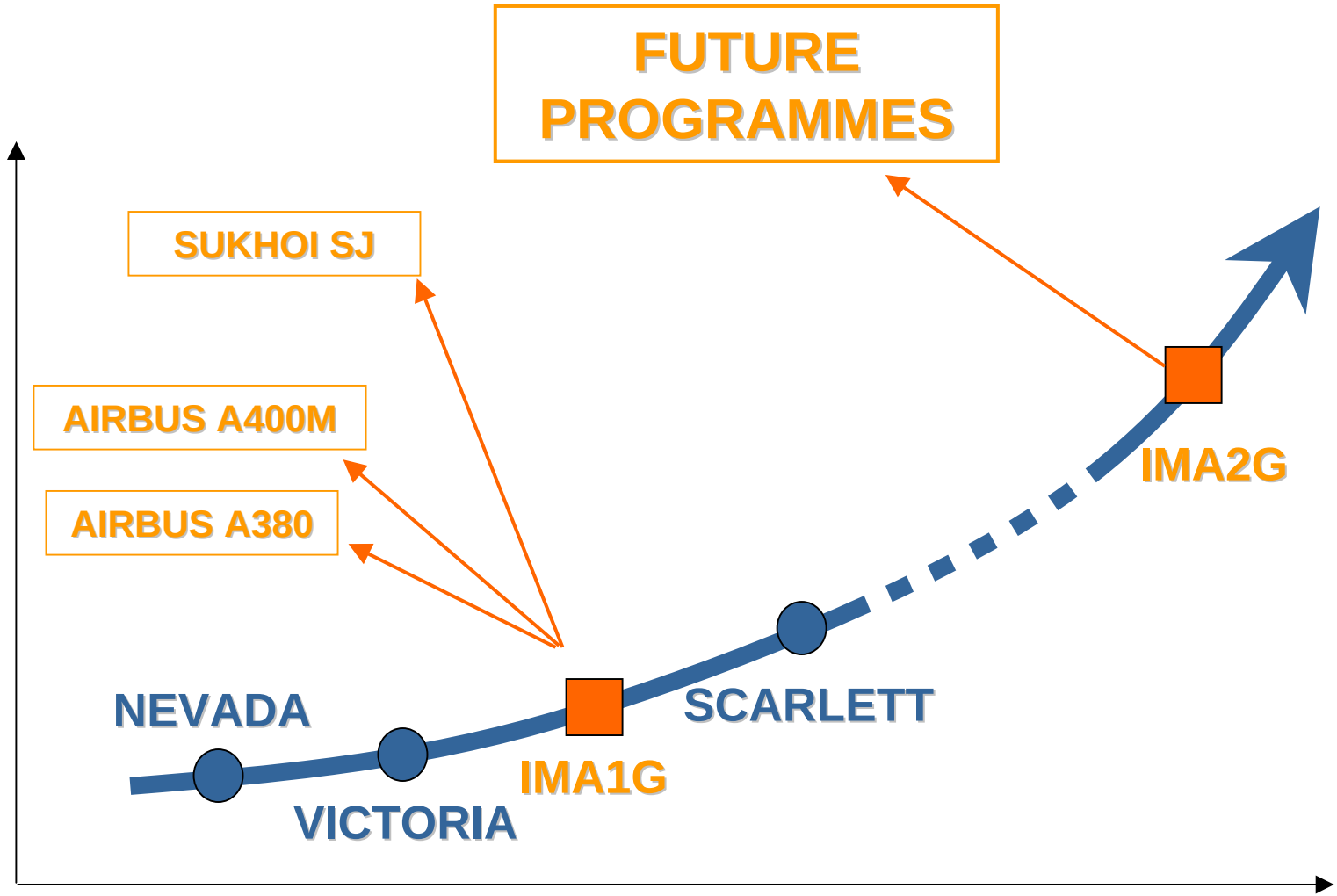

Thank you for your attention