SDR - WinnComm 2014

Mathilde BRANDON - AIRBUS Group

Flexible Radio for Avionics

SESAR 9.44 project

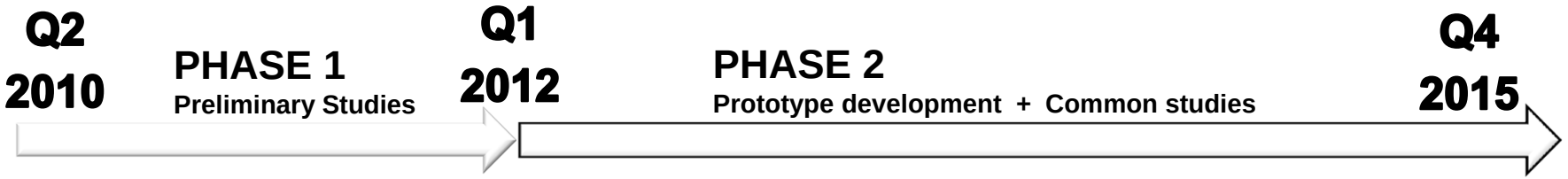
SESAR 9.44: Project overview and Scope

- Partners

AIRBUS **(Project Manager)**	**ALENIA**	**HONEYWELL**	**SELEX**

- Project Scope
  - Investigate the technical and business feasibility, for new on-board flexible radio architectures and equipment (such as SDR)
  - Develop prototypes of candidate solutions and validate

- Duration: Divided into two phases



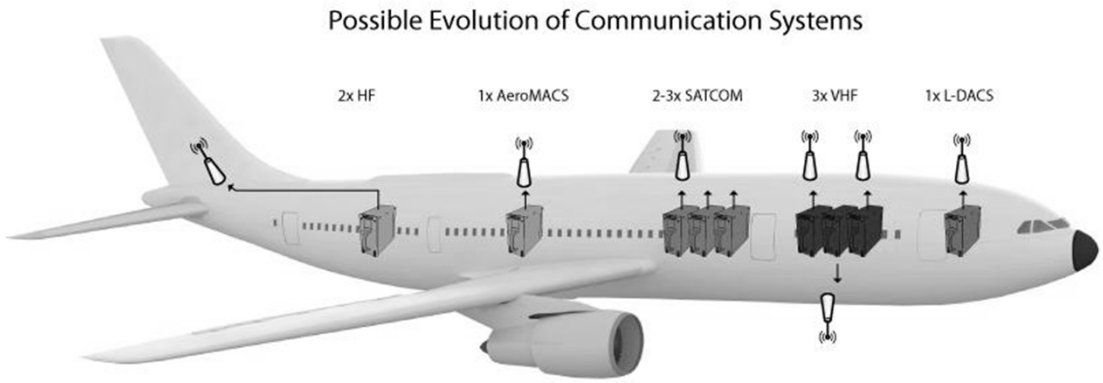
SESAR 9.44 Long term vision of future Radio for Avionics (1/3)

- Aircraft radio transmission/reception is evolving
  - Future Air Traffic Management/Airline Operation Communication applications will require more data with higher reliability and availability
    → Additional airborne radios
  - More radios needed but total size, weight and power must be reduced
    → Radios integration, reconfiguration
  - Higher Radio architectures diversity for different aircraft classes and for different airlines
    → Flexible and scalable radios
  - Communication, Navigation and Surveillance (CNS) : up to 20 radios may be needed
    → CNS integration ? Modularity ?

- SESAR 9.44 Long Term Vision of Future Avionics:
  - Reducing avionics size, weight and power is a key enabler for transition to the future communication infrastructure
  - Migration from federated architecture to distributed flexible avionics system
  - Use of Software Defined Radio platforms able to hosts multiple waveforms
  - Reduction of specific hardware, Higher modularity
  - Re-configurability and extensibility, adaptation to diverse aircraft configurations/conditions

SESAR 9.44 Long term vision of future Radio for Avionics (2/3)

- Transition from conventional federated architecture



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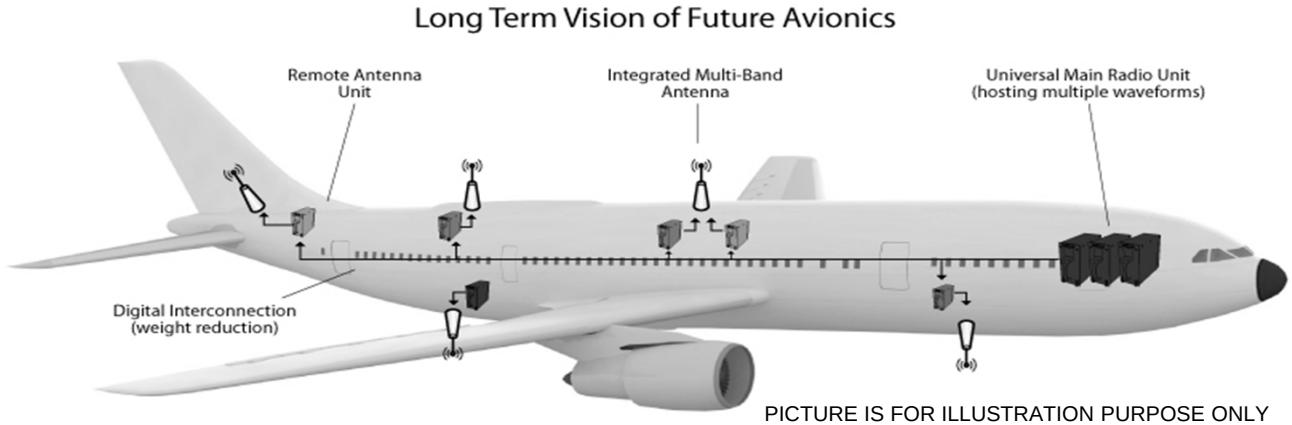
- Toward distributed flexible architecture

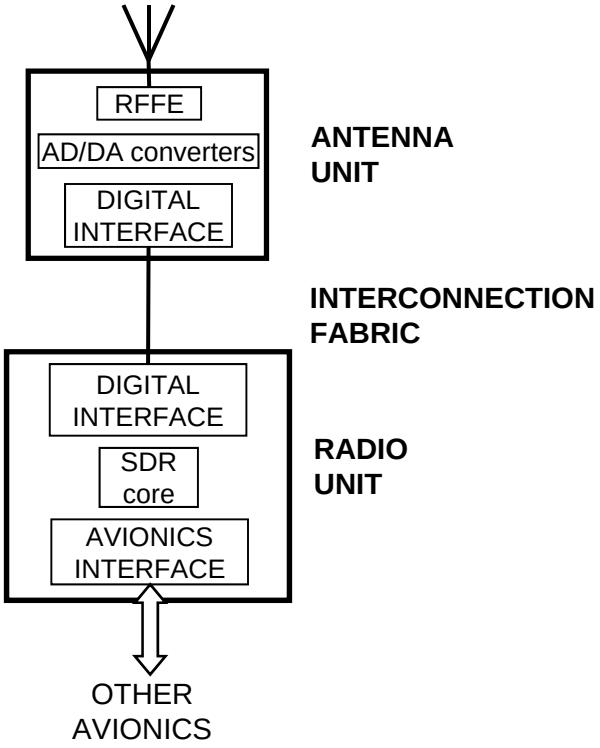


PICTURE IS FOR ILLUSTRATION PURPOSE ONLY

SESAR 9.44 Long term vision of future Radio for Avionics (3/3)

→To answer to these new evolutions/constraints: use of **Software Defined Radio** has been identified as a promising technical solution

→Future possible on-board architecture could be organized as follow:



SESAR 9.44: Activities on SDR for Avionics

WA1 – Honeywell Prototype

Category	Task	Name
Management	T1.0	Working Area 1 Management
Individual prototype specification & Design	T1.1	System requirements definition
	T1.2	System Design
Prototype development (HW & SW)	T1.3	Prototype v1 development
	T1.5	Prototype v2 development
Individual prototype verifications	T1.4	Prototype v1 integration and testing
	T1.6	Prototype v2 integration and testing
	T1.7	Waveforms demonstration
Safety Analysis	T1.8	Safety Analysis

WA2 – Selex/Alenia prototype

Category	Task	Name
Management	T2.0	Working Area 2 Management
Individual prototype specification & Design	T2.1	SELEX Demonstrator System Specification
Demonstrator development (HW & SW)	T2.2	HW/FW Components Development/Customization/Acquisition
	T2.3	SW Components Development/Customization
	T2.4	Selex Demonstrator Integration and test (HW & SW)
	T2.5	Alenia Simulation environment development and set-up
Individual prototype verifications	T2.6	Demonstration definition (plan & description)
	T2.7	Demonstration Test Lab set-up
	T2.8	Demonstration Test Trials

WA3 – Transversal activities

Task	Name	
T3.0	Phase 1 executable summary production	*Completed*
T3.1	Common concepts and requirements relevant for the prototypes	*Running*
T3.2	Survey/Study of SDR state of the art	*Completed*
T3.3	Study of a possible standard Aeronautical SDR framework and architecture	*Completed*
T3.4	Study of possible industrial/business models	*Completed*
T3.5	Study of what could be a technical Aeronautical SDR standard	*Running*
T3.6	Study of draft SDR development guidance and certification considerations	*Running*
T3.7	Study of draft SDR development guidance in regard to security considerations	*Completed*
T3.8	Impact of an SDR on existing Airframer or community standards	*Next year*
T3.9	Coordination with standardisation bodies and other initiatives	
T3.10	Cross-integration of independent prototypes components	
T3.11	Conclude Phase 2	

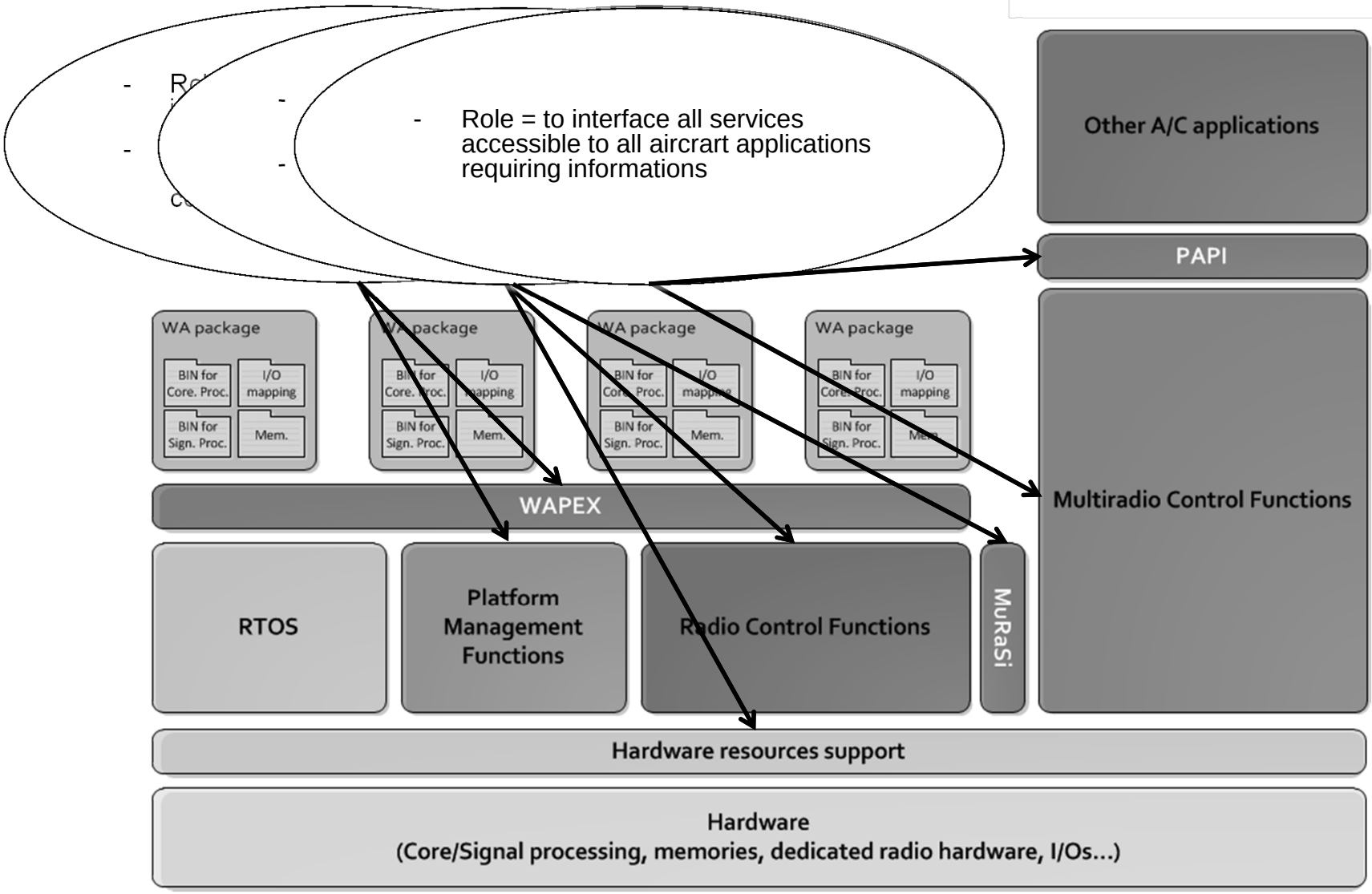
SESAR 9.44 Task 3.3: SDR framework for avionic context (1/3)

- T3.3 objectives are to:
  1. Define a framework for civil aviation on-board software radio, notably by defining:
     - Common definitions
     - Common building blocks
     - Key interfaces
  2. Identify the different elements which could be standardized

- The SDR framework for avionics has to :
  - Be simple
  - Minimize the software volume overhead, not much software complexity
  - Allow simple implementation without complicated systems
  - Be open and generic to allow multiple suppliers to adapt products

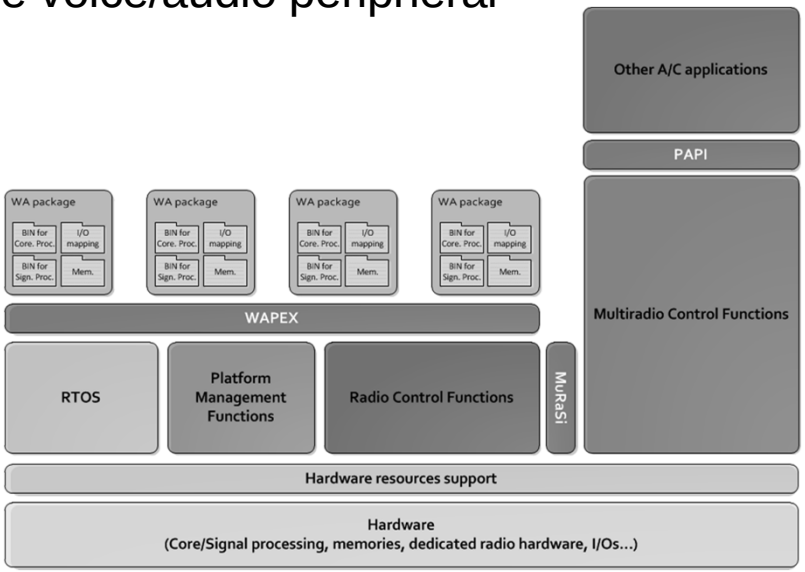
- The proposed SDR framework for Avionics is inspired from:
  - existing SDR architectures for radio functions (ETSI, SCA,…)
  - avionics shared architecture (IMA)

SESAR 9.44 Task 3.3: SDR framework for avionic context (2/3)



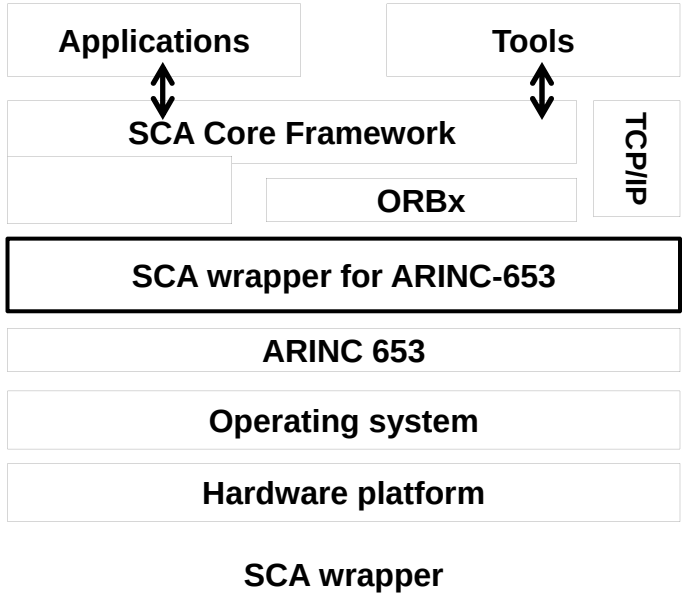
SESAR 9.44 Task 3.3: SDR framework for avionic context (3/3)

- Need or interest to standardize components of the framework is being assessed. Potential candidates being assessed are:
  - Interface between RF front-ends and the platforms
  - API between WF Application and Platform Functions (WAPEX)
  - Interface between radio functions and multiradio functions (MuRaSi)
  - Interface between multiradio functions and other aircraft applications (PAPI)
  - Digital interface between the radio and the voice/audio peripheral
  - Interface between router and radio
  - Packaging

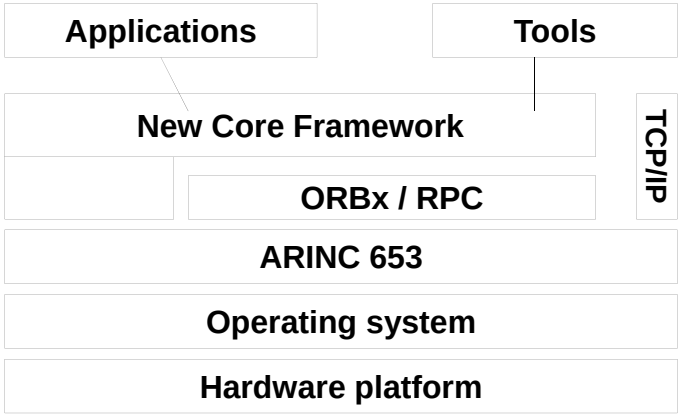


Considerations regarding the WAPEX interface

- APEX (ARINC 653) allows suppliers to develop waveform with addition of a wrapper (out of the framework)



SCA wrapper



ARINC653 based OE

- ~~APEX~~ ➔ APEX. There seems to be no need to extend current APEX API

THANK YOU FOR YOUR ATTENTION

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