WInnF SDR Standards

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Agenda

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About CC SCA

Coordinating Committee for International SCA Standards

CC SCA Mandate

To support the harmonization of the SCA standards at the international level for the mutual benefits of all stakeholders to include:

- Defining an industry driven SCA evolution roadmap for the international community
- Profiling the SCA specification and related APIs to define internationally accepted variants that are hosted by the Forum
- Developing extensions to the SCA standards that address any gaps between the defined SCA evolution roadmap and Forum accepted SCA specification variants
- Providing implementation and certification guides, tools etc. easing implementation and supporting proliferation
- Establishing and managing industry led certification programs where appropriate

The CC SCA is led by a Steering group of worldwide tactical radio manufacturers

HARRIS

THALES

Raytheon

ROHDE&SCHWARZ

Rockwell Collins

FINMECCANICA

a4ESSOR alliance for ESSOR

Hitachi Kokusai Electric

indra

WInnF Standards for SDR

Standards serving SDR in the general sense

JTNC-developed

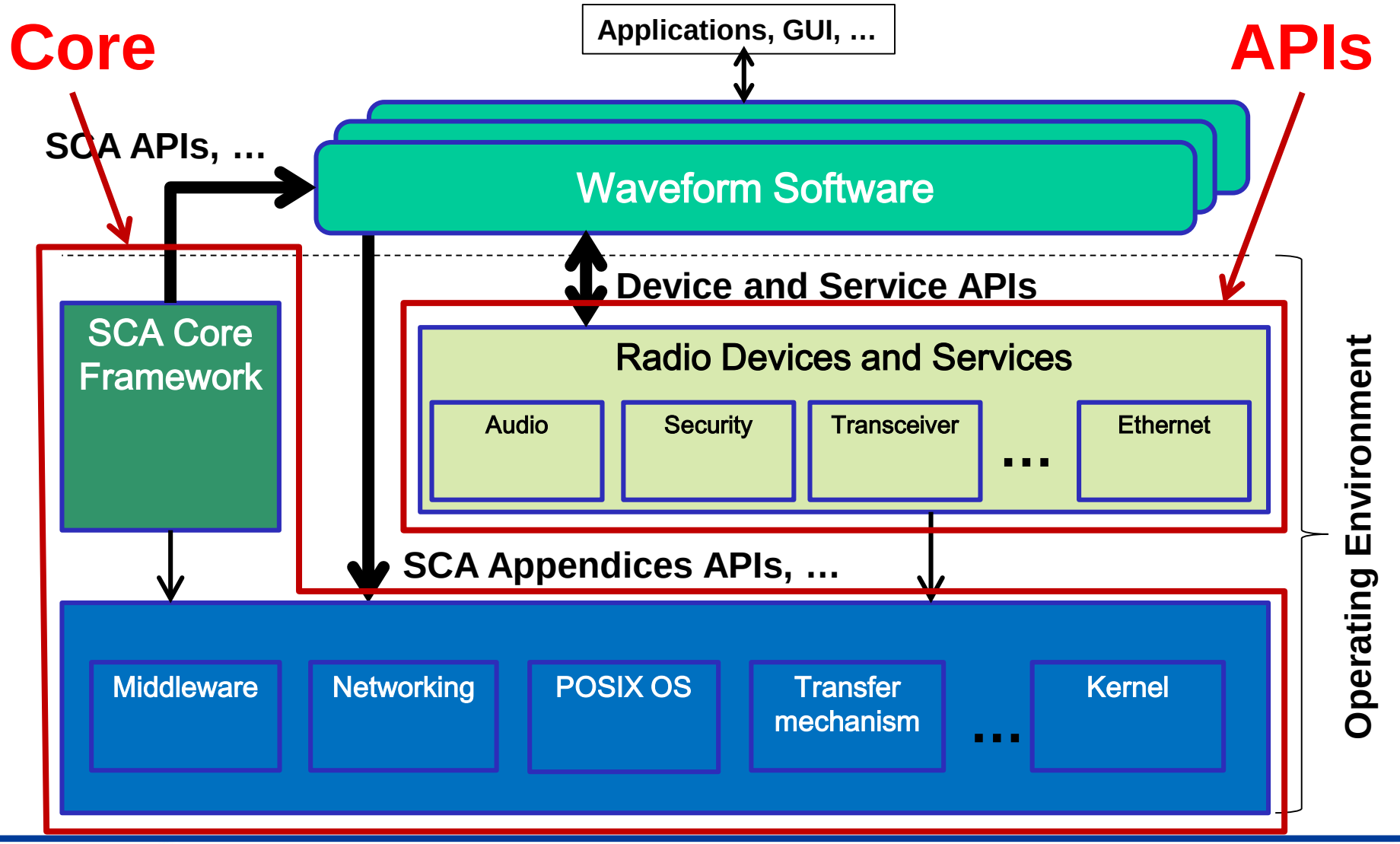
- **SCA 2.2.2 and 4.1**
- **APIs**

WInnF-developed Standards

- **Transceiver Facility (incl. API + Properties)**
- **International Radio Security Services (IRSS) API**
- **(U)Lw AEPs**
- **PIM IDL Profiles**

Issues collection form available on WInnF website

Core and APIs



Activities status

SCA 4.1 compliancy has completed

A one year long project

- Started March 2016
- Completed March 2017

Delivered vork product

- A specification of compliancy criteria for all of the SCA 4.1 requirements
- Document number: **WINNF-16-P-0025-V1.0.0**

A breakthrough towards international adoption and usage of the SCA 4.1

- A step towards certification
- Internationally and openly elaborated
- Openly available

One step further in internationalization of SCA

Transceiver Next is completing

Started Jan 2015

Main work product: *WInnF Transceiver Facility V2*

- A critical API for any SDR, since directly related to the radio
- > 2 years of active standardisation effort
- > 10 years of technical track record

Companion work product: *Absolute Transceivers Use Case*

- Report addressing usage of the API for a class of radios

Both work products passed work group ballot and heading to publication

C++ and FPGA PSMs are nearly finalized

Undergoing activities

Development of Transceiver Next PSMs

- C++ and FPGA close to completion
- SCA expected by end 2017
- Contributors willing to provide additional PSMs (e.g. C, Java…) are invited to develop and submit them

Planning project for SCA 4.1 Verification Procedures

- Idea: leveraging the successfully completed SCA 4.1 Compliance with standard Verification Procedures
- Intention is to streamline existing verification approaches
- Aiming to kick-off before July a 12/18-months project
- Stakeholders from MoDs, Radio manufacturers and Tools providers joining in discsussions

Planned activities

Federated Time Services

- Developing a unified (e.g. leveraging US, ESSOR and GE backgrounds plus industry experience) Timing Service (« what time is it »)
- Adding Timer capabilities (« wake me up »)
- Project that could be kicked-off by the end of 2017

Coalition Interoperability

- Making a forward-looking report depicting
  - Ad hoc coalition scenarios of various national configuration
  - Implied gaps in available standards to enable realization of the scenarios
- Now dormant, the project could be relaunched

Outline of Transceiver Facility V2

Transceiver Next

Started early 2015 aiming for completion fall 2015

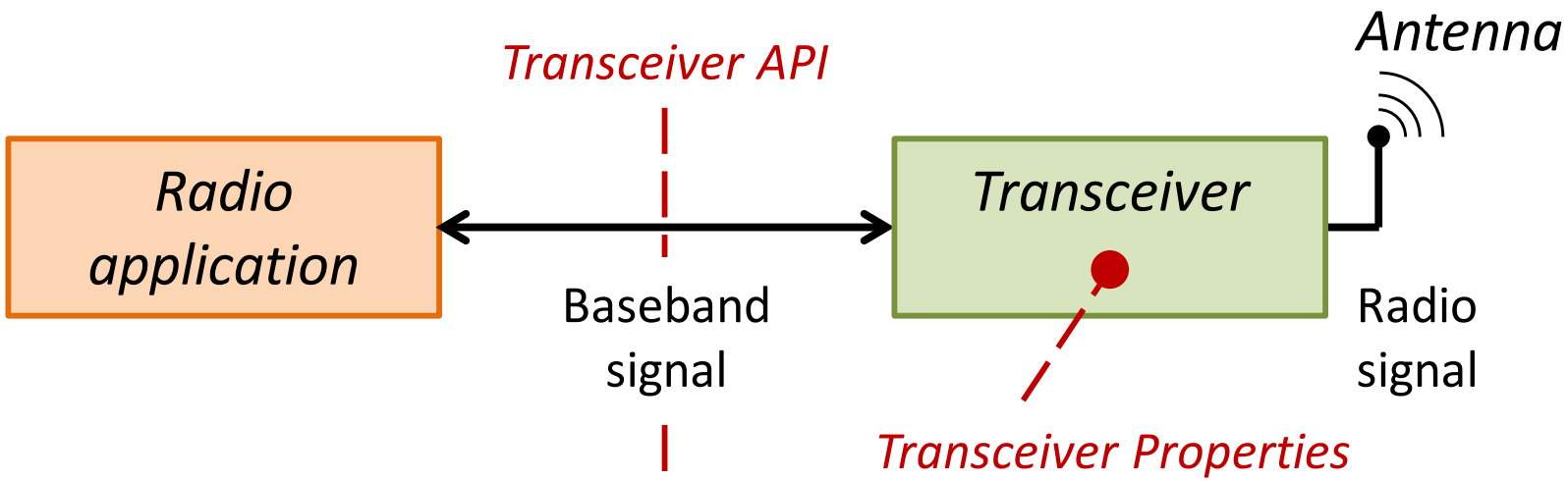
- Delayed because of high interest and active participation
  - Cobham, DGA, ENSTA, Harris, FKIE, HKE, JTNC Standards, Leonardo, NordiaSoft, Rockwell-Collins, Rohde & Schwarz, Thales
  - International outreach: CAN, FR, GE, IT, JAP, US
- 6 F2F meetings: Paris x 2, Gatineau x 2, Wichita, Erlangen, Rennes
- Weekly 2h teleconferences – Est. ~ 4000 man-hours effort

Project is now delivering

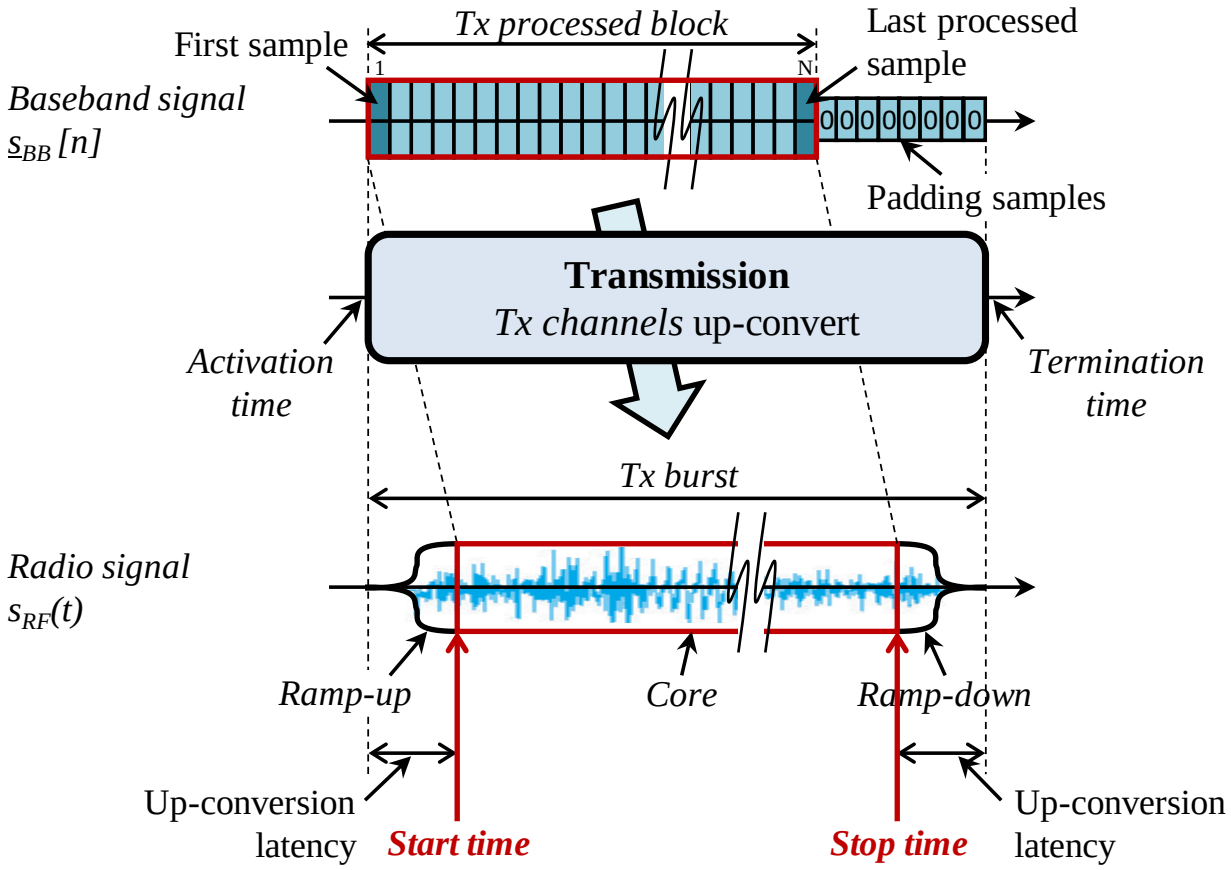
Possible follow-up activities

- Domain-oriented profiles (portability improvement)
- Capabilities extensions (multiple applications, application controlled reconfigurations…)

Overview of Transceiver Facility



Principle of transmission phase



Transmit transfer function

Ideal frequency-domain model

$$\underline{\dot{s}}_{RF}(f + f_c) = \alpha . \mathrm{rect}(f/B) . \underline{\dot{s}}_{BB}(f), \qquad f \in [-F_s^{BB}/2 ; +F_s^{BB}/2]$$

Real life frequency-domain model

$$\underline{\dot{s}}_{RF}(f + f_c) = \underline{H}_{Tx}(f) . \underline{\dot{s}}_{BB}(f), \qquad f \in [-F_s^{BB}/2 ; +F_s^{BB}/2]$$

Equivalent time-domain model

$$s_{RF}(t) = \sum_{k=0}^{L-1} \left[\left(\Re\left(\underline{s}_{BB}[k]\right) . \cos(2\pi f_c t) - \Im\left(\underline{s}_{BB}[k]\right) . \sin(2\pi f_c t) \right) . h_{Tx}(t - t_s - k/F_s^{BB}) \right],$$

$$t \in [t_s ; t_s + L/F_s^{BB}]$$

API services

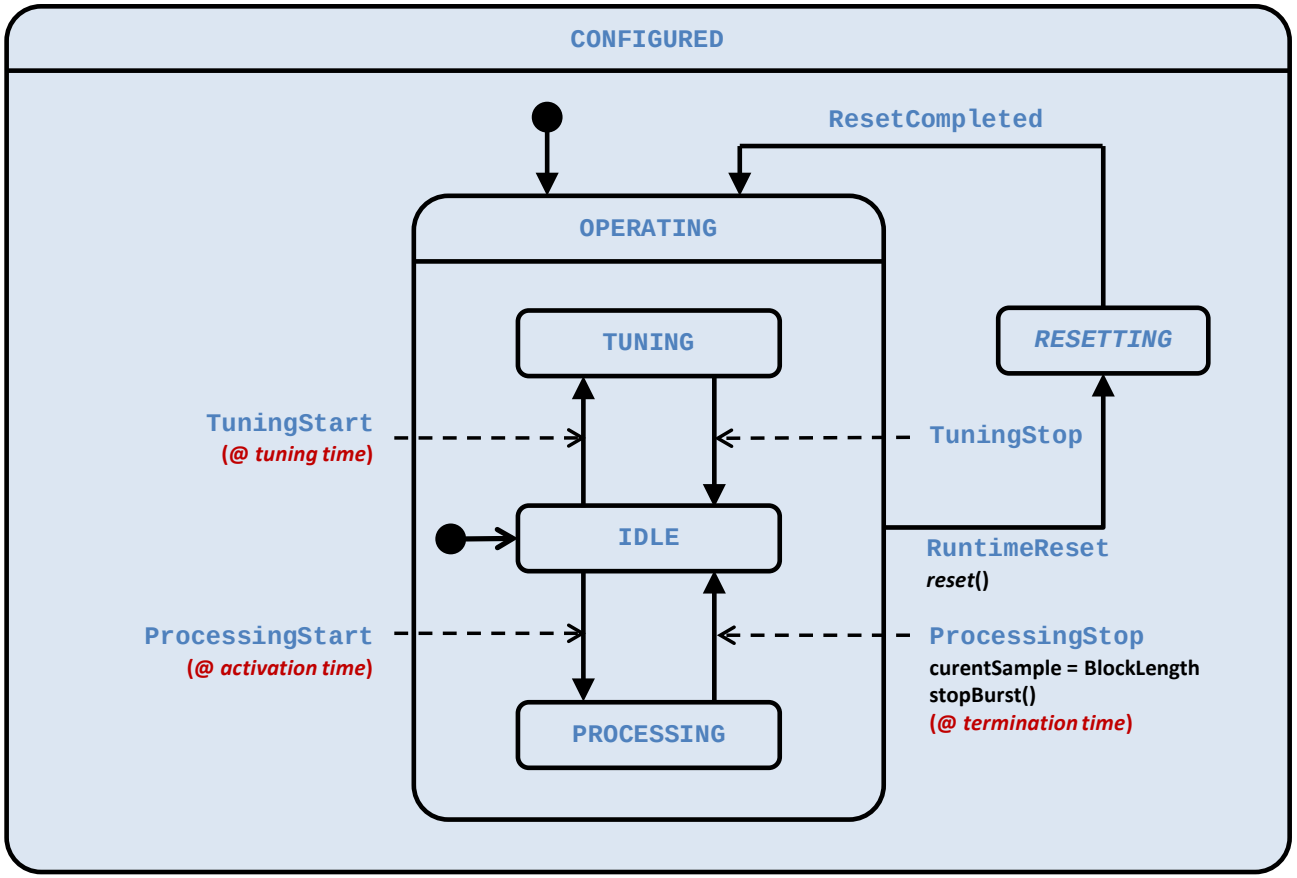
Provide services (called by the radio application)

Services groups / Modules	Services / Interfaces	Primitives
Management	::Management::Reset	*reset()*
	::Management::RadioSilence	*startRadioSilence()* *stopRadioSilence()*
BurstControl	::BurstControl::DirectCreation	*startBurst()*
	::BurstControl::RelativeCreation	*scheduleRelativeBurst()*
	::BurstControl::AbsoluteCreation	*scheduleAbsoluteBurst()*
	::BurstControl::StrobedCreation	*scheduleStrobedBurst()*
	::BurstControl::Termination	*setBlockLength()* *stopBurst()*
BasebandSignal	::BasebandSignal::SamplesTransmission	*pushTxPacket()*
	::BasebandSignal::RxPacketsLengthControl	*setRxPacketsLength()*
Tuning	::Tuning::InitialTuning	*setTuning()*
	::Tuning::Retuning	*retune()*
GainControl	::GainControl::GainLocking	*lockGain()* *unlockGain()*
TransceiverTime	::TransceiverTime::TimeAccess	*getCurrentTime()* *getLastStartTime()*
Strobing	::Strobing::ApplicationStrobe	*triggerStrobe()*

Use services (called by the transceiver)

Services groups	Service / Interface	Primitives
BasebandSignal	::BasebandSignal::SamplesReception	*pushRxPacket()*
Notifications	::Notifications::Events	*notifyEvent()*
	::Notifications::Errors	*notifyError()*
GainControl	::GainControl::GainChanges	*indicateGain()*

Main state chart



Transceiver Facility Take aways

Key facts

- Only 18 primitives, a state machine with only 5 states
- (Unique) standard set of 80-100 properties for portability engineering
- Extensive debug and integration support (standard exceptions and errors)

3 essential services groups: bursts creation, bursts tuning and samples exchanges

Extremely scalable to user needs, from low cost to high end transceivers and applications

All in not more than 100 pages

Leverages large set of contributors experiences

Conclusions

Conclusions

Projects are actively being carried on

- SCA 4.1, Transceiver Next, Federated Time Services
- SDR standards are reaching industrial maturity
- International harmonization progresses

Need to explore correlation between emerging matters (dynamic spectrum management, coalition networking, BFT, geographical services, radio cohabition…) and SDR expertise

- Coalition interoperability project

Thank you for your attention
Questions?