SVFuA and the Evolution of the SCA

Experiences with SCA 2.2.2 and Expectations in SCA 4.1

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Workshop "*Evaluation, Analysis & Prototype of SCA 4.1 Results*"

SDR15-WInnComm, San Diego (CA, USA), March 24-26th, 2015

Motivation

International SCA-based SDR Programs

- Military tactical communication is taking the next step in evolution
  - Key enabler: modern Software Defined Radio (SDR) technology
  - To utilize this technology in a standardized way, the US authored the Software Communications Architecture (SCA) specifications
  - SCA-based SDRs have attained high interest worldwide
  - The SCA 2.2.2 was the first version to become globally adopted

http://groups.winnforum.org/d/do/6610

"The SCA specifications are an important corner stone to SDR standardization and … a prerequisite to enable timely and cost efficient porting and integration of waveforms, especially multinational and secure waveforms for combined operations."

Rüdiger Leschhorn, *Rohde & Schwarz*

Software Communications Architecture

Objective, History & Current Status

see also: http://groups.winnforum.org/SCA-History

- The objective of the SCA standards is two-fold
  - provide the mechanisms required to deploy waveform applications
  - standardize the interfaces between the platform and waveform applications

2000	**SCA 1.0**	first official version
2001	**SCA 2.2**	specified for the first radio product release
2004	**SCA 2.2.1**	interim version
2004	~~**SCA 3.0**~~	innovative interim version, cancelled shortly after
2006	**SCA 2.2.2**	stable version; currently most modern version in use
2012	**SCA 4.0**	improved version; not in use up to now
2015	**SCA 4.1**	further improved version with backward compatibility to 2.2.2

SCA 2.2.2 Overview

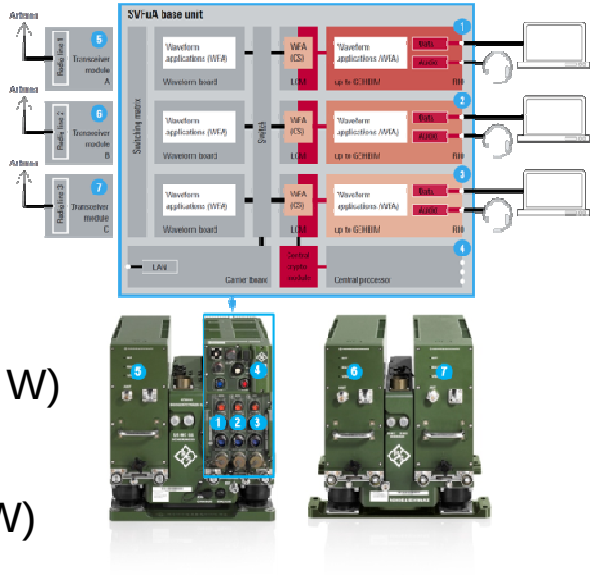
Some Insights

- The organizational benefits of the SCA 2.2.2 include
  - mature tool-chains and established certification processes
  - labor division between companies
- The technical benefits of the SCA 2.2.2 include
  - portable waveform applications
  - modularity enabling reuse of waveform components, scalability and ease of integration of new features
- These benefits have successfully been leveraged by current programs like JTRS/JTNC and SVFuA as well as studies like ESSOR
- But open issues remain which are not optimally addressed by the SCA 2.2.2
  - in particular the lack of support for small battery powered systems

The German SVFuA Program

Streitkräftegemeinsame Verbundfähige Funkgeräteausstattung (SVFuA)

- Development of a modular SDR for land mobile platforms
  - kick-off in Dec. 2008
  - three wireless communication lines
  - SCA 2.2.2 / JTRS APIs + SVFuA extensions
  - SW-based INFOSEC / MLS
  - three types of radio modules supporting
    - HF - frequencies (1.5 – 30.0 MHz, 20 W, ext. 400 W)
    - VHF/UHF - frequencies (30 – 600 MHz, 50 W)
    - Broadband - frequencies (600 MHz – 3 GHz, 50 W)
  - several waveforms
    - legacy: e.g., SEM 80/90/93, MAHRS/Tiger, HaveQuick I/II, NATO Fixed Frequencies
    - prepared for future WFs like COALWNW



For more details see SDR-WInnComm-Europe, November 2014, Rome (Italy)

Lessons Learned

From SVFuA and other International SCA 2.2.2 SDR Programs

- Powerful secure SCA 2.2.2 SDRs can be realized, offering benefits like
  - well-defined interfaces for managing waveforms in a common way
  - separation of the waveform application (WFA) from the platform

    → these two advances paved the way to interoperability through portability
  - modularity and reuse of waveform components
  - scalability and ease of integration of new features

    → these two advances allow flexible insertion of new technologies as well as the division of work and in the long run cost reduction

The SCA 2.2.2 has proven to be an mature solution for powerful and secure SDRs (for land mobile platforms)

Lessons Learned

From SVFuA and other International SCA 2.2.2 SDR Programs

- But open issues remained which are not optimally addressed by the SCA 2.2.2
  - from a German perspective the most pressing issue is the lack of
    - support for small battery powered systems
    - with heterogeneous processing capabilities (GPP, DSP, FPGA)

→ this was a key driver for evolving the SCA beyond 2.2.2

Next Step in SCA Evolution

From SCA 2.2.2 to 4.0

- Major enhancements in comparison to 2.2.2
  - supports incorporation of additional lightweight platforms via profiles
  - permits static component connections
  - supports nested waveforms and interconnections
  - incorporates technology advances as well as Government and industry lessons learnt

- The changes greatly improve the capability of the SCA to support lightweight, power-efficient platforms

Next Step in SCA Evolution (cont.)

From SCA 2.2.2 to 4.0

- SCA 4.0 provided solutions for most current issues
  - however SCA 4.0 introduced a backward compatibility issue with SCA 2.2.2:
    - porting an existing SCA 2.2.2 compliant WFA to an SCA 4.0 compliant SDR platform would have required substantial rework

  → due to the significant investments into SCA 2.2.2 worldwide this was a hindrance towards adoption

  - to date, no program is known, that is based on 4.0

Next Step in SCA Evolution

From SCA 2.2.2 over 4.0 to 4.1

- The new SCA 4.1 provides a crucial edge over SCA 2.2.2
  - SCA 4.1 provides the substantial advances of SCA 4.0
  - SCA 4.1 solves the backward compatibility issue
  - SCA 4.1 includes further improvements like the ultra-lightweight profile

    → the standardized profiles enable optimal scaling of SCA 4.1 to a wide range of formfactors, from vehicular to handheld

Conclusions

Evolution of the SCA

- For an SCA 2.2.2 compliant SDR switching to SCA 4.1 will not provide substantial capability improvements.
- For a future SDR - especially ones that are battery powered – the SCA 4.1 is the recommended solution.

SCA 2.2.2 and SCA 4.1 will coexist on the market and eventually also within the waveform applications.

Thanks for your Attention!

Questions or Comments?

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