Joint Tactical Networking Center Test and Evaluation Laboratory Software Communications Architecture Version 4.1 Test Capabilities

Purpose:

This whitepaper introduces the Software Communications Architecture version 4.1 (SCA v4.1) test capabilities (SCA test tools and test documents) and proposes an approach to provide these tools and documents to the product developer and Program Management Office (PMO, also generally referred to as "the product developer") for use in SCA v4.1 conformance testing.

Background:

The SCA, developed by the Joint Tactical Networking Center (JTNC), is an open architecture framework that defines a standard way to instantiate, configure, and manage waveform applications running on a radio hardware platform. SCA v4.1 is the latest release of the SCA specifications. [1,2]

The SCA specifications establish a framework for the development of operating environments (OEs) and applications (APs). The OE of a radio set is made up of a collection of executable software components, including an operation system, a Portable Operating System Interface (POSIX) function library, middleware, and an SCA core framework implementation. APs are waveforms, networking applications, or data control applications. They are a collection of software components with SCA defined interfaces and behaviors.

SCA Test Capability:

OE Test Tool

In an effort to develop and maintain test capabilities for compliance assessments, the JTNC tasked the JTNC Test and Evaluation Laboratory (JTEL) team with development of a software application to assess compliance of a software defined radio (SDR)[3] set against the SCA v4.1 specification. JTEL developed the SCA Test Suite (STS) tool with a graphical user interface that automates SCA v4.1 OE compliance testing.

The STS automates the testing of the SCA v4.1 OE requirements as described in the SCA v4.1 specification. STS is able to generate a list of components on the radio set that STS can run tests against, as well as execute a test event for the radio, allowing the user to run STS tests for each component for the selected units of functionality and mandatory requirements. Once the test event is complete, STS provides test results and logs that assist the user in determining pass/fail status of the SDR's compliance to the SCA v4.1 specification.

The following STS artifacts are available upon request and approval from the JTNC:

- STS tool v1.0
- STS Software Verification Description v1.0
- STS Software User Manual v1.0
- STS Known Issues v1.0

AP Test Tools

JTEL has two ongoing Small Business Innovative Research efforts to develop automated tools for testing SCA applications against the SCA v4.1 specifications: SCA Complete and SCA-Pass.

SCA Complete was developed by Reservoir Labs and includes two parts: 1) Waveform Test Platform (WTP) for dynamic testing and 2) R-Check for static testing. The WTP performs SCA v4.1 requirement tests by following the procedures described in Wireless Innovation Forum's (WInnF's) SCA v4.1 Test Procedures Document (WINNF-TS-4001).[4] The WTP implemented test procedures for 60 SCA v4.1 requirements. This encompassed all of the 58 SCA requirements that are verified via dynamic analysis, according to WINNF-TS-4001. The WTP also automated test procedures for two statically-verifiable requirements using R-Check. The SCA Complete artifacts include:

- Waveform Test Platform-v1.0.exe
- SCA v4.1 Complete Waveform Test Platform User Guide

SCA-Pass is being developed by VIStology. Similar to the STS, the SCA-Pass automatically determines the list requirements implemented by the AP product, executes the procedures described in WINNF-TS-4001, saves and logs progress, and produces a test report. The development of SCA-Pass is in progress and is expected to complete in early 2023.

Test Documents and Manual Test Procedures

JTEL developed test plans and manual test procedures to perform manual OE and AP assessments against SCA v4.1 specifications. The following test documents are available upon request and approval from the JTNC:

- SCA v4.1 Specification
- JTEL SCA v4.1 Test and Evaluation Plan
- JTEL SCA v4.1 OE Requirements List
- JTEL SCA v4.1 AP Requirements List
- JTEL SCA v4.1 Manual OE Software Test Description
- JTEL SCA v4.1 Manual AP Software Test Description

Proposed Approach:

Currently, JTEL is the sole verification authority for the SCA v4.1 specifications, according to the JTEL SCA v4.1 Test & Evaluation Plan. With the availability of SCA test tools in the first quarter of fiscal year 2023, JTEL will update its test and evaluation plan and conformance policy to provide the SCA v4.1 test tools and test documents to product developers for their own SCA compliance testing. JTEL will assume responsibility for reviewing the SCA Compliance Report and the SCA test tool log report submitted by the product developer to determine the SCA compliance status of the product and to make a recommendation to the JTNC Director for issuance of the SCA compliance certificate.

To make these SCA test tools and documents widely accessible, JTEL plans to change the distribution statements of the STS and SCA v4.1 test documents to Distro A and submit them through the WInnF, the JTNC website, and the JTNC Joint Communications Marketplace (JCM) for public release. The product developers can send requests to WInnF, the JTNC, or JTNC JCM and download the STS and SCA v4.1 test documents for free. JTEL will also approve the SCA Complete and SCA-Pass for AP conformance testing once they pass the Government Acceptance Test. Product developers can purchase the AP test tool license directly from Reservoir Labs, point of contact: Jim Ezick (ezick@reservoir.com) or VIStology, point of contact: Jakub Moskal (jmoskal@vistology.com).

References:

(1) Additional information for Software Communications Architecture is available at the JTNC website: https://www.jtnc.mil/Resources-Catalog/Category/16990/sca/

(2) The SCA v4.1 specification is available at the JTNC website: https://www.jtnc.mil/Resources-Catalog/Resource-Catalog-Article-View/Article/2083253/complete-sca-41-release/

(3) A definition of SDR, including the benefits of usage, is available at the WInnF website: https://www.wirelessinnovation.org/assets/documents/SoftwareDefinedRadio.pdf

(4) Additional information for WINNF-TS-4001 is available at the WInnF website: https://winnf.memberclicks.net/assets/work_products/Specifications/WINNF-TS-4001-V1.0.0%20SCA%204.1%20Test%20Procedures.pdf