Ansys

SCADE®

SCADE® 2020 R2 Solutions for ARINC 661 Compliant Systems

SCADE Solutions for ARINC 661 Compliant Systems is a simulation toolset that empowers engineers to prototype and design ARINC 661 compliant systems, embedded Cockpit Display Systems (CDS) and User Applications (UA).

For CDS developers, the toolset features a customizable ARINC 661 compliant widgets library, delivered as SCADE Suite and SCADE Display models; ARINC 661 configuration files to define the widgets list and their interfaces; and the automated generation of an ARINC 661 Server.

For UA developers, the toolset features the design of UA pages as models, the automatic generation of standard binary and XML Definition Files (DF), and the automatic generation of communication code between SCADE Suite UA models and any ARINC 661 Server.

With SCADE Solutions for ARINC 661 Compliant Systems, aircraft manufacturers, CDS developers and avionics UA developers or integrators can ensure **compliance with ARINC 661 Supplement up to 6**. They can drastically increase productivity while achieving the highest level of quality and compliance with DO-178B/C safety objectives, as required for the certification of CDS and UA avionics applications.

Modular, model-based, certifiable and configurable, SCADE Solutions for ARINC 661 Compliant Systems significantly decrease overall avionics software development and modifications costs. They also decrease the time-to-certification and are an important step in allowing for more modular certification of ARINC 661 compliant aircraft components.
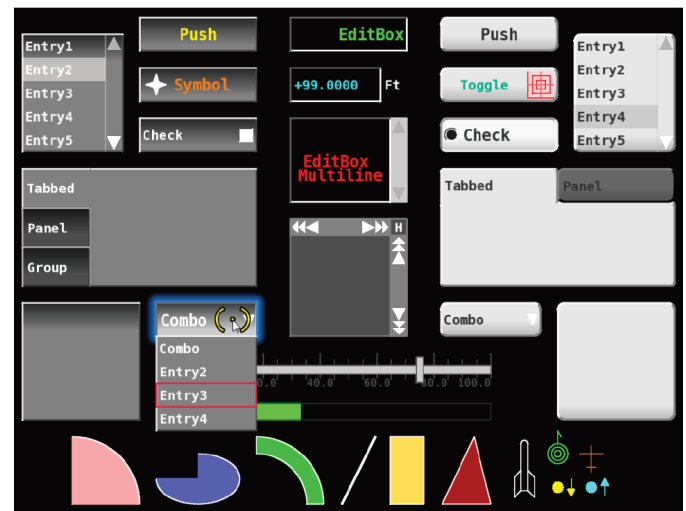
The ARINC 661 Standard

The ARINC 661 standard normalizes the design of interactive CDS and the way the CDS communicates with UAs, such as Flight Management Systems, Flight Control Systems, and Flight Warning Systems, by using predefined and standardized graphical widgets, some of them changeable through pilot interaction (trackball, keyboard, tactile screens, etc.), and by standardizing the communication protocol at runtime between a UA and the CDS. ARINC 661 ensures that the full CDS interactively behaves with the avionics systems in the same manner, regardless of UA developer and CDS supplier.
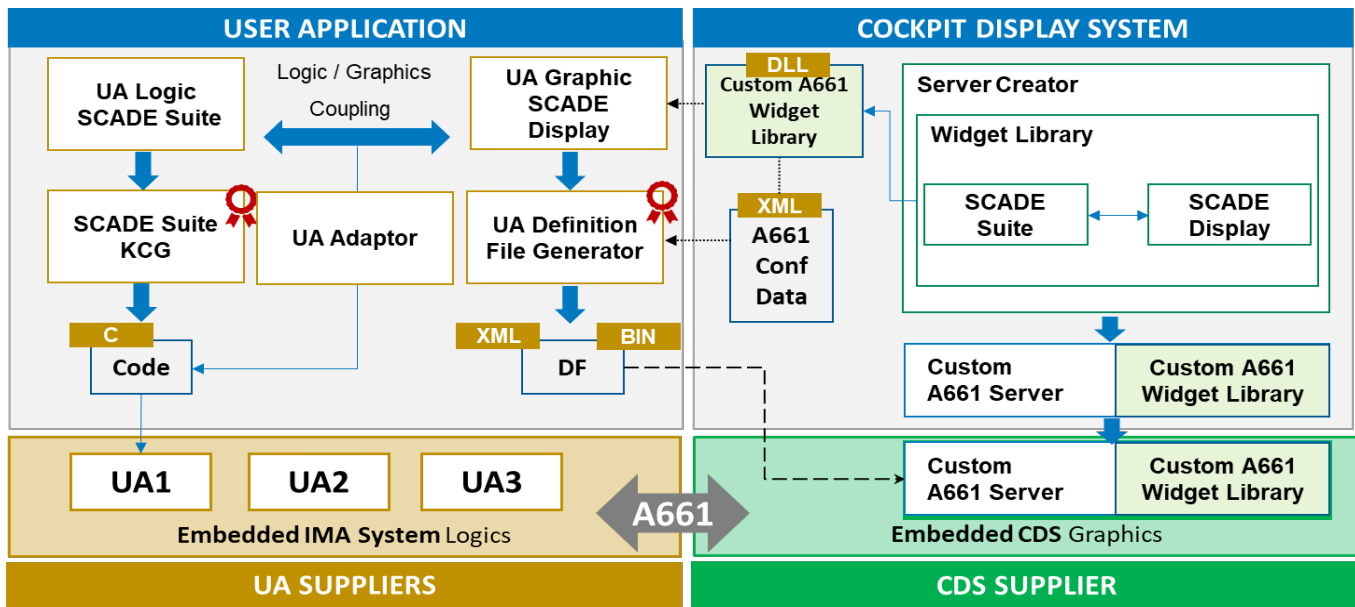
ARINC 661 Widget Prototyping and Design

Customizable Widgets Library

To accelerate the development of an ARINC 661 widgets library, the SCADE Widgets Library features a set of customizable SCADE Suite and SCADE Display models, associated Software Requirements Specification (SRS), and Project Documentation data for all 92 ARINC 661 standard widgets and extensions of Supplement 6.

SCADE ARINC 661 Widgets Library Features

Full SCADE ARINC 661 Widgets Library of Models:

· Set of ARINC 661 XML configuration files.

· SCADE Suite models for description of the widgets' behavioral logic.

· SCADE Display models for description of the widgets' graphical and interactive parts.

· Manual C code (when needed) to complete the description of the widgets' behavioral logic, graphical or interactive parts.

Widgets Library Software Documentation:

- Software Requirements Specification (SRS) of the Widgets Library.

- Design Standards (for SCADE Suite and SCADE Display Design) and Coding Standards (for manual C code) used for the development of the Widgets Library.

- Guidelines explaining how the elements of the Widgets Library and its software documentation should be used, customized and adapted by the end-user within its platform and DO-178B/C certification environment.

SCADE Server Creator User Interface:

The dedicated UI for the ARINC 661 Server Creator is a SCADE Display Advanced Modeler add-on that allows CDS developers creating and customizing an ARINC 661 compliant server defining the server parameters and settings, the widget library and all other ARINC 661 configuration data.

Features:
- Description of ARINC 661 widgets list and interfaces (as formal XML files).

- List of widgets contained in the custom widget library.

- ARINC 661 constants used in the widget library.

- ARINC 661 types used in the widget library.

- Hierarchy of the ARINC 661 widgets (parents & children).

- For each widget, definition of standard ARINC 661 interfaces (DF Parameters, Set Parameters and Events).

- For each widget, definition of the widget implementation: mapping between the ARINC 661 interfaces and the SCADE Suite/Display model interfaces, communication channels between widgets.

- ARINC 661 Widget Model Design (including look, feel and Style-set) and Simulation.

- Design of standard or custom ARINC 661 widgets as SCADE models:

  - SCADE Suite for the behavioral logic.

  - SCADE Display for the interactive graphics.

  - External C source code (if required).

  - Style-set Editor for the description of Look Capacities and Look Definition data according to appendix J (Look Modeling) of ARINC 661 standard.

  - Model level debug and simulation, through the SCADE Suite Simulator, of ARINC 661 widget models.

  - Automatic generation of binary ARINC 661 Widgets Library, for integration into the SCADE Display Advanced Modeler for ARINC 661 (with Server Creator).

  - Automatic C source code generation, for integration into the ARINC 661 Server, from an ARINC 661 Widgets Library (with Server Creator).
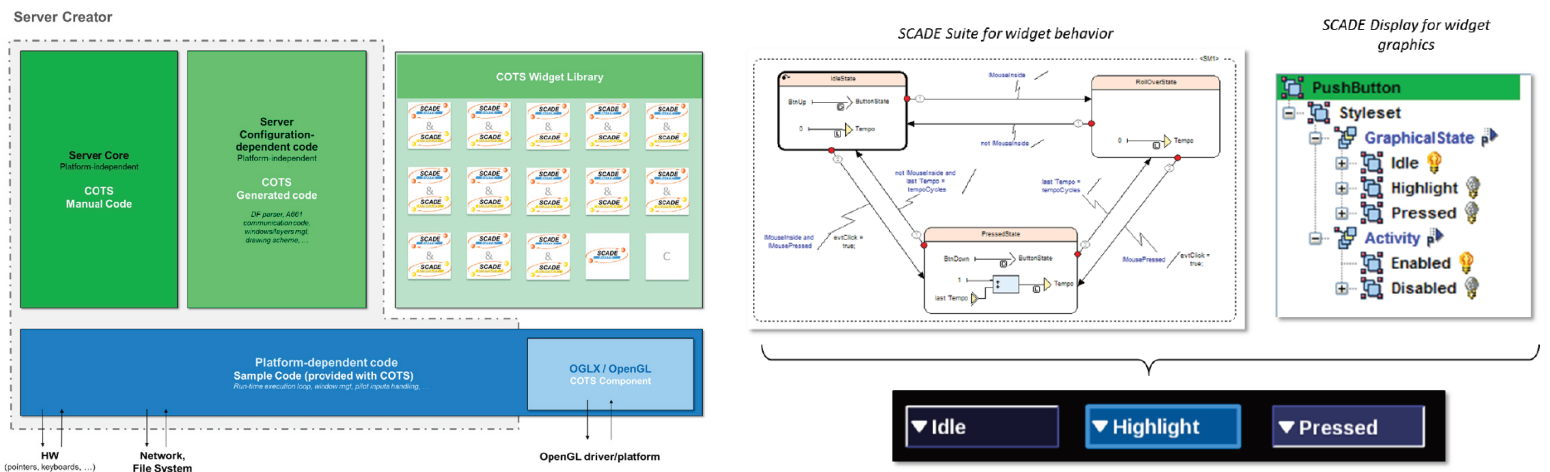
/ ARINC 661 Server Generation

SCADE Server Creator for ARINC 661 Compliant Systems allows aircraft manufacturers and CDS developers to automatically generate the majority of the ARINC 661 server C source code, including:

- The widgets library C source code generated from the widget models (created with SCADE Server Creator User Interface or delivered in the SCADE Widgets Library) by using SCADE Suite KCG and SCADE Display KCG.

- The C code corresponding to the widget-dependent parts of the ARINC 661 server — such as DF parsing, server-side communication protocol management, windows and layers logic, drawing scheme, etc. — from a set of ARINC 661 Configuration Files.

In addition to the code generated by SCADE Server Creator, the Server code is completed by C source code corresponding to:

- The core part of the server, independent from the platform architecture (RTOS / HW / drivers), which contains the common services and structures used by various parts of the Server. Modifying this part is required only if new or custom capabilities are needed in the Server;

- The architecture part of the platform-dependent part of the Server, which includes the main loop, the I/O dispatching, OpenGL/video initialization, and the definition of the windows and layers configuration. This part requires end-user customization to match the architecture of the target.

/ Server Creator Features

Automatic generation of a large part of the ARINC 661 Server source code

- Automatic generation of a readable and printable report from the "ARINC 661 Configuration" files, describing the parameters, creation structure, event structures or run-time modifiable parameters tables for each widget with the same layout as the ARINC 661 standard specification.

- Source code of a configurable ARINC 661 Server Automatic generation of binary ARINC 661 Widgets Library, for integration as a WYSIWYG (What You See Is What You Get) environment, into the SCADE Display ARINC 661 Advanced Modeler.

- Automatic generation of binary ARINC 661 Widgets Library, for integration as a WYSIWYG (What You See Is What You Get) environment, into the SCADE Display ARINC 661 Advanced Modeler.

- Automatic C source code generation, for integration into the ARINC 661 Server, from an ARINC 661 widgets library.

- Support of Symbols and Pictures Graphical Definition.

- Support of GBK/UTF-8 character sets.

SCADE Server Creator also enables automatic generation of an executable ARINC 661 server for Windows/PC host machines from the ARINC 661 Widgets Library and Configuration Data.

Generated Server Characteristics

- Portable (natively works under Windows and Linux).

- Configurable through the ARINC 661 configuration files (customizable list of widgets, customizable widget interfaces —definition or runtime parameters, events, etc. — customizable dependencies between widgets).

- Configurable part of the ARINC 661 Server automatically generated by Server Creator.

- Limited and well-identified platform dependencies (such as memory management, graphics resource access, main scheduling, etc.).

- Multi UA support, multi DF support.

- Mixing ARINC 661 pages with multiple SCADE Display-generated "symbology" layers.

- Management of several Display Units (DU), Windows and Layers "configurations," automatically generated from XML configuration files.

- Run-time reconfiguration of the DUs, Windows and Layers.

- Multi-cursor support, multiple "keyboard-like" devices support.

- Communication protocol based on Ethernet and TCP/IP (customizable by the user).

- Configurable resources and stylesets as binary data.

Ansys SCADE ARINC 661 Test Automation Framework

The ARINC 661 Test Automation Framework provides comprehensive services allowing the testing automation of ARINC 661 widgets (based on Python Libraries).

ARINC 661 UA Prototyping, Design and Generation

SCADE Display ARINC 661 Advanced Modeler allows UA designers to prototype and design ARINC 661 UA DF pages as models on a host workstation. Designers instantiate ARINC 661 widgets and model all DF parameter types with real-time WYSIWYG feedback for all standard and custom widgets.

SCADE Display ARINC 661 Advanced Modeler

- Creation of ARINC 661 UA DF models by instantiation of ARINC 661 widgets created with SCADE Server Creator User Interface (or delivered by default with the tool).

- Same front-end as SCADE Display, with advanced editing capabilities and ergonomics.

- A default ARINC 661 widgets library (binary), enabling fast start design of UA DF pages compliant with ARINC 661.

- Supplement 5.

- Integration of the host binary ARINC 661 server for WYSIWYG design.

- Co-simulation enabled with UAs designed as SCADE Suite models and the ARINC 661 server.

- Co-execution enabled with UAs designed as SCADE Suite models and the ARINC 661 server.

- Support of Symbols and Pictures Graphical Definition, including a dedicated WYSIWYG UA symbol editor.

- Support of extensions.

- Styleset Editor for the description of Look Definition data according to appendix J (Look Modeling) of ARINC 661 .

- Supplement 6.

- Specification of Definitions Files interfaces (runtime parameters and events from ARINC 661 messages).

- Support of GBK/UTF-8 character sets.

- Unified project structure across SCADE products for managing project files and resources.

- Model API supporting all SCADE Display ARINC 661 Advanced Modeler Page Creator concepts and constructs.

SCADE UA DF Generator for ARINC 661 Compliant Systems is a generation tool that allows you to generate standard binary and XML Definition Files from SCADE Display ARINC 661 models.

/ UA DF Generator Features

- Automatic generation of binary ARINC 661 UA DFs from SCADE Display ARINC 661 models.

- Configured by a set of ARINC 661 configuration files (defining widgets list and interfaces).

- Export of standard XML DF.

- UA DF Generator qualifiable as a DO-330 TQL-1 tool under DO-178C.

- SCADE UA DF Generator Certification Kits provide all material required by DO-178B/DO-178C for the certification authorities (including TQP, TOR, IRS, TR, TAS, TCI, etc.).

- Support of Symbols and Pictures Graphical Definition.

- Support of GBK/UTF-8 character sets.

- Full support of ARINC 661 supplement 5 and 6 including new widgets and widget extensions.

SCADE Suite UA Adaptor for ARINC 661 Compliant Systems is an add-on module of SCADE Suite KCG C Code Generator that allows UA designers to automatically generate the ARINC 661 compliant C communication code between the SCADE Suite UA and the ARINC 661 Server for a given associated DF.

/ SCADE Suite UA Adaptor Features

- Automatic generation of C communication code for the SCADE Suite UA, corresponding to "set parameters" and "get events," conforming to the ARINC 661 standard, from the connection data between a SCADE Suite UA model and a SCADE Display ARINC 661 model (or a binary DF).

- Configured by a set of ARINC 661 configuration files (defining widget list and interfaces).

- Dedicated UI for editing of mapping data between UA and DF at the model level.

- Co-simulation between a SCADE Suite User Application model and a Definition File based on ARINC 661 host server.

- Filtering of ARINC 661 messages for SCADE Suite and UA DF model connections, according to DF interface names.

- Dedicated SCADE Suite library for ARINC 661 modeling.

- Full support of ARINC 661 up to supplement 6.

/ SCADE Tools Integration

Logic Design in SCADE Suite

SCADE Solutions for ARINC 661 Compliant Systems are built on top of SCADE Suite to allow for developing the widgets' behavior and the User Applications' logic.

For information on the SCADE Suite product line, see the SCADE Suite technical data sheet.

Graphics Design in SCADE Display

SCADE Solutions for ARINC 661 Compliant Systems are built on top of SCADE Display to allow for developing the interactive symbology of widgets and the layout of UA pages.

For information on the SCADE Display product line, see the SCADE Display technical data sheet.

Application Life Cycle Management

The life cycle management of CDS and UA developed with SCADE Solutions for ARINC 661 Compliant Systems can be supported by SCADE LifeCycle®:

·   Connecting Application LifeCycle Management (ALM) tools and setting requirements traceability from models

·   Generating documentation automatically from models

For information on the SCADE LifeCycle product line, see the SCADE LifeCycle technical data sheet.

/ SCADE Solutions for ARINC 661 Compliant Systems Product Line

ARINC 661 CDS Design Environment:

·   SCADE Widgets Library for ARINC 661 Compliant Systems.

·   SCADE Display ARINC 661 Advanced Modeler.

·   SCADE Server Creator for ARINC 661 Compliant Systems.

ARINC 661 UA Design Environment:

·   SCADE Display ARINC 661 Advanced Modeler.

·   SCADE UA DF Generator for ARINC 661 Compliant Systems.

·   SCADE Suite UA Adaptor for ARINC 661.

·   SCADE LifeCycle Reporter for SCADE Display ARINC 661.

·   SCADE UA DF Generator DO-178C Certification Kit.