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 full compliance with ARINC 661 Supplement 5 and partial compliance with ARINC 661 Supplement 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 79 ARINC 661 standard widgets and 10 extensions of Supplement 5 and 6.

SCADE ARINC 661Widgets Library Features

Full SCADE ARINC 661Widgets 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
- Widget extensions
- Compliance with Look Modeling Appendix for easy styleset customization and inter-exchange

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 Widget Creator for ARINC 661 Compliant Systems is a SCADE Suite and SCADE Display add-on allowing aircraft manufacturers and CDS developers to:

- Automate the prototyping, implementation, customization and simulation of an ARINC 661 library of widgets (look and behavior) as SCADE Suite and SCADE Display models
- Create and manage a set of the ARINC 661 configuration files that define the widgets list, widgets interfaces and widgets interdependencies

Widget Creator Features

Description of ARINC 661 widgets list and interfaces (as XML files):

- List of widgets from customer widgets library
- ARINC 661 constants used in the widgets library
- ARINC 661 types used in the widgets library
- Hierarchy of ARINC 661 widgets (parents and children)
- For each widget, definition of standard ARINC 661 interfaces (DF Parameters, Set Parameters and Events)
- Definition of widget implementation by widget: mapping between the ARINC 661 interfaces and the SCADE Suite/SCADE Display models interfaces and communication channels between widgets
ARINC 661 Widget Model Prototyping, Design (look, behavior, and styleset), Simulation, and Report Generation:

- 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)
  - Model-level debug and simulation, using SCADE Suite Simulator, of ARINC 661 widget models
  - Styleset Editor for the description of Look Capacities and Look Definition data according to appendix J (Look Modeling) of ARINC 661 standard

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 Widget Creator 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 UA Page Creator for ARINC 661
- 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.

Packaging options enable installation of a SCADE Server Creator for Host which generates a server for Windows/PC.

**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

**ARINC 661 UA Prototyping, Design and Generation**

SCADE UA Page Creator for ARINC 661 Compliant Systems is a SCADE Display add-on allowing 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.

**UA Page Creator Features**
- Creation of ARINC 661 UA DF models by instantiation of ARINC 661 widgets created with SCADE Widget Creator (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 UA 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 UA Page Creator ARINC 661 models.

**UA DF Generator Features**
- Automatic generation of binary ARINC 661 UA DFs from SCADE UA Page Creator 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 UA Page Creator 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 supplement 5 with partial support for Supplement 6 new widgets and extensions as Gestures and Animation widgets including new widgets and widget extensions

**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 Widget Creator for ARINC 661 Compliant Systems
• SCADE Server Creator for ARINC 661 Compliant Systems

ARINC 661 UA Design Environment:
• SCADE UA Page Creator for ARINC 661 Compliant Systems
• SCADE UA DF Generator for ARINC 661 Compliant Systems
• SCADE Suite UA Adaptor for ARINC 661
• SCADE LifeCycle Reporter for SCADE UA Page Creator
• SCADE UA DF Generator DO-178C Certification Kit