ANSYS® SCADE®17.0 Solutions for ARINC 661-Compliant Systems
Design Environment for Aircraft Manufacturers, CDS and UA Suppliers

ANSYS SCADE Solutions for ARINC 661-Compliant Systems is a tool chain that empowers users to prototype and design ARINC 661-compliant and embedded cockpit display systems (CDSs) and user applications (UAs).

For CDS developers, the tool chain features a customizable ARINC 661-compliant widgets library delivered as ANSYS SCADE Suite® and ANSYS SCADE Display® models, allows creation of ARINC 661 configuration files to define the widgets list and their interfaces, and provides for the automated generation of an ARINC 661 server. For UA developers, the tool chain includes 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.

The ARINC 661 Standard
The ARINC 661 standard normalizes the design of an interactive CDS and the way it communicates with a UA, including flight management systems, flight control systems and flight warning systems. It uses predefined and standardized graphical widgets, some of which are controlled by pilot interaction (trackball, keyboard, tactile screens, etc), and standardizes 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 the UA developer and CDS supplier.

With ANSYS 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 drastically increase productivity while achieving the highest level of quality and compliance with the 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 decreases overall avionics software development and modifications costs. This tool chain also decreases time-to-certification and allows for more modular certification of ARINC 661-compliant aircraft components.
ANSYS SCADE ARINC 661 Widgets Library Features

Models:
- Set of ARINC 661 XML configuration files
- ANSYS SCADE Suite models for description of the widgets' behavioral logic
- ANSYS 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 from ARINC 661 supplement 5
- Compliance with Look modeling appendix for easy style set customization and interchange

Widgets Library Software Documentation:
- Software requirements specification of the widgets library, describing the requirements for the look and feel of the widgets
- 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

ARINC 661 Widget Prototyping and Design
Customizable Widgets Library
To accelerate the development of an ARINC 661 widgets library, the ANSYS SCADE widgets library features a set of customizable ANSYS SCADE Suite® and ANSYS SCADE Display® models, associated software requirements specification (SRS), and project documentation data for all 77 ARINC 661 standard widgets and seven extensions of supplement 5.

SCADE Widget Creator
SCADE widget creator for ARINC 661-compliant systems is an ANSYS SCADE Suite and SCADE Display add-on that allows 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. SCADE server creator also allows for automatic generation of an executable ARINC 661 server for Windows®/PC host machines, out of the ARINC 661 widgets library and configuration data.

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 style set), 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
  - Design of look capacities and look definition data according to appendix J (look modeling) of ARINC 661 supplement 6
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 (according to ARINC 661 supplement 5)

ARINC 661 Server Generation

ANSYS SCADE UA Page Creator

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 / HEW / 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.

SCADE Server Creator also allows for automatic generation of an executable ARINC 661 server for Windows/PC host machines, out of the ARINC 661 widgets library and configuration data.

Packaging options allow installation of a SCADE server creator for host to generate a server for Windows/PC.
ANSYS SCADE 17.0 Solutions for ARINC 661-Compliant Systems

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
• Cosimulation 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
• Style set 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 (according to ARINC 661 supplement 5)
• Unified project structure across SCADE products for managing project files and resources
• Model API supporting all SCADE UA page creator concepts and constructs

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” device support
• Communication protocol based on Ethernet and TCP/IP (customizable by the user)
• Configurable resources and style sets as binary data

ARINC 661 UA DF Prototyping and Design
ANSYS SCADE UA Page Creator

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 host workstation. Designers instantiate ARINC 661 widgets and model all DF parameter types with real-time WYSIWYG feedback for all standard and custom widgets.
ARINC 661 UA and DF Generation

ANSYS SCADE UA DF Generator

SCADE UA DF generator for ARINC 661-compliant systems is a tool 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 6.4.3 qualifiable as DO-330 TQL-1 tool under DO-178C
- UA DF generator 6.4.3 qualifiable as development tool under DO-178B
- 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 (according to ARINC 661-5 supplement)
- Full support of ARINC 661 supplement 5 including new widgets and widget extensions

UA Communication Code Generation

ANSYS SCADE Suite UA adaptor for ARINC 661-compliant systems is an add-on module for 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 an associated DF.

**ANSYS SCADE Suite UA Adaptor Features**

- Automatic generation of C communication code for the SCADE Suite UA (corresponding to “set parameters” and “get events”) from the connection data between a SCADE Suite UA model and a SCADE UA page creator model (or a binary DF) to conform to the ARINC 661 standard
- 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
- Cosimulation between a SCADE Suite UA model and a DF 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 including new widgets and widget extensions
ANSYS SCADE Tools Integration

Logic Design in ANSYS SCADE Suite
The ANSYS SCADE Solutions for ARINC 661-Compliant Systems toolset is built on top of SCADE Suite to allow for development of widgets behavior and UA logic.

Graphics Design in ANSYS SCADE Display
The ANSYS SCADE Solutions for ARINC 661-Compliant Systems toolset is built on top of SCADE Display to allow enable development of interactive symbology of widgets and the layout of UA pages.

Application Life Cycle Management
SCADE Solutions for ARINC 661 Compliant Systems integration with ANSYS SCADE LifeCycle® allows:
• Connection to application lifecycle management (ALM) tools through SCADE LifeCycle ALM gateway for requirements traceability from models
• Traceability link creation in SCADE UA page creator or SCADE widget creator to perform traceability analysis in ALM tool environments
• Automatic documentation generation from SCADE UA page creator and SCADE widget creator with SCADE LifeCycle reporter

Minimal/Required System Configuration

<table>
<thead>
<tr>
<th></th>
<th>Microsoft® Windows XP Professional SP3 or Windows 7 SP1</th>
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</thead>
<tbody>
<tr>
<td>OS Platforms</td>
<td></td>
</tr>
<tr>
<td>CPU processor</td>
<td>1.5 GHz or faster</td>
</tr>
<tr>
<td>RAM</td>
<td>1 GB minimum (2 GB recommended)</td>
</tr>
<tr>
<td>Disk Space</td>
<td>1 GB minimum</td>
</tr>
<tr>
<td>Protocol</td>
<td>Network adapter and TCP/IP installed and configured for license management</td>
</tr>
<tr>
<td>Display</td>
<td>16-bit color, 1280x1024 screen resolution recommended</td>
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ANSYS SCADE Solutions for ARINC 661-Compliant Systems

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 Certification Kit:
- SCADE UA DF Generator 6.4.3 DO-178B&C Levels A and B Certification Kit

SCADE Solutions for ARINC 661 User Documentation and Online Help

Contact Information

Contact one of our sales representatives at ansysinfo@ansys.com

Discover the latest news on our products and technology at ansys.com/Products/Embedded-Software