ANSYS

**Technical Data Sheet**

# ANSYS® SCADE Suite® 17.0

ANSYS SCADE Suite is a product line of the ANSYS embedded software family of products and solutions. SCADE Suite empowers users with a model-based development environment for critical embedded software. With native integration of the formally defined Scade language, SCADE Suite is the integrated design environment for critical applications spanning requirements management, model-based design, simulation, verification, qualifiable/certified code generation and interoperability with other development tools and platforms.

SCADE Suite is tightly integrated with ANSYS SCADE® products and ANSYS Simplorer® providing a design environment that combines system and software engineering development, interactive human–machine interface (HMI) design, multiphysics simulation, application testing and lifecycle management, and code integration on target. Delivered with SCADE Suite, ANSYS SCADE System® provides an integrated software engineering solution combining software architecture and software design in a single comprehensive user interface.

### Tailored for Critical Applications

ANSYS SCADE Suite drastically reduces project certification costs by simplifying critical control application design and automating verification, qualifiable/certified code generation and documentation generation. SCADE Suite KCG Code Generator is qualifiable as a development tool under DO-178B level A, as DO- 330 TQL-1 tool under DO-178C, and certified under ISO 26262:2011 at TCL3/ASIL D and C, IEC 61508:2010 at T3/ SIL 3, and EN 50128:2011 at T3/SIL 3/4.

**ANSYS SCADE Suite KCG certification kits** provide all materials required by the certification authorities:

- Tool qualification plan (TQP)
- Tool operational requirements (TOR)
- Tool accomplishment summary (TAS) or safety case (SC)
- Compliance analysis to certification standards
- Software installation procedure (SIP)
- Tool configuration index (TCI)
- Other standard-specific documents

DO-178B and DO-178C Certification Plans for SCADE Suite Applications provide a set of generic plans supporting the certification of applications developed with SCADE Suite at level A and B.

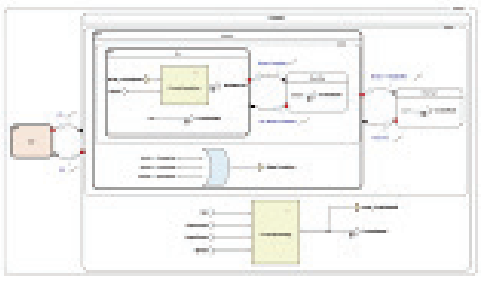
## Where can SCADE Suite be used?

SCADE Suite is used to design critical software, such as flight control and engine control systems, landing gear systems, automatic pilots, power and fuel management, cockpit displays, rail interlocking systems and signaling, automatic train operation, computer-based train control, emergency braking systems, overspeed protection, train vacancy detection, nuclear power plant controls, and many other aerospace, railway, energy, automotive and industrial applications.

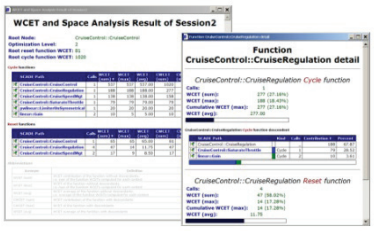
## Software Prototyping and Design

### Advanced Model-Based Design

- Intuitive and familiar graphical notation based on unlimited nesting of data flows and hierarchical state machines
- Graphical decision diagrams
- Array iterators to facilitate operator multi-instantiation and perform complex data processing
- Model completeness and determinism guaranteed
- Strongly typed language
- Static consistency checking

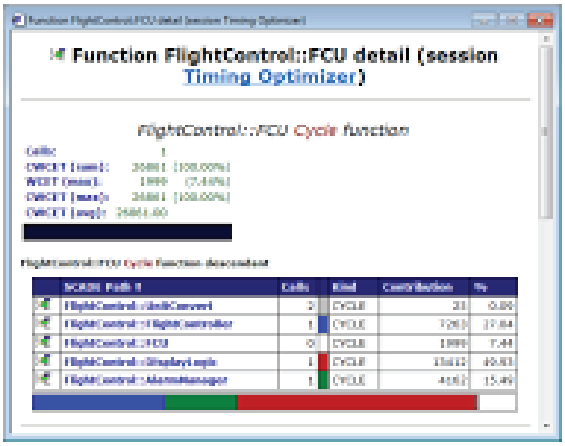


- Easy reuse and readability of design
- Efficient editing features, such as multiple connection drawing, navigation in model, search, unlimited undo
- Semantic comparison of various versions of models, packages, operators or state machines with location and reporting features
- SCADE Suite library components: integrators, hysteresis, quantizers, filters, flip-flops, truth tables, look-up tables, matrix operators, etc.
- Import of legacy code into designs




### Timing and Stack Size Optimization with Timing and Stack Optimizer[1]

- Analysis of worst-case execution time (WCET) and stack usage of a SCADE Suite application independently from the actual target platform
- Iterative process to focus on application parts causing long execution times or unsatisfactory stack usage and to refine the application profiling by optimizing SCADE Suite models
- Comparison of results between optimization sessions reported in SCADE Suite design environment
- Automatic and customizable detailed reporting
- Easy comparison of code performance by fine-tuning KCG options




### Java-Based Eclipse API and TCL API

- Read/write access to SCADE Suite project and model files via Eclipse modeling framework (EMF) or TCL API
- Interactive use of SCADE Suite projects from Eclipse via basic project and model explorers
- Wizard assistance for quick and easy creation of TCL scripts

### Configuration Management

- Built-in integration with configuration management tools through SCADE Suite configuration management gateway
- Granularity at operator and package levels based on multi-file storage system specification capture

### Support for Requirements Traceability

- Traceability to requirements available with SCADE LifeCycle® ALM gateway as detailed in application life cycle management

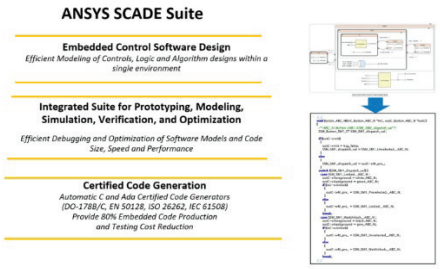
### System Specification Capture

- Refinement of software components based on structural system modeling in SCADE System

### Legacy Algorithm Design Capture

- Translation of discrete controllers prototyped with MathWorks® Simulink® and Stateflow® charts into SCADE Suite models

1. Powered by aiT, a product of AbsInt.



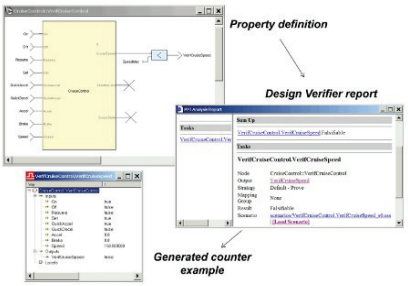

## Verification and Validation

### Debugging/Simulation with SCADE Suite Simulator

- Executable SCADE Suite designs
- Support for full simulation of C or Ada code
- Complete integration of C or Ada imported code
- Scenario recording and play back
- Early detection of specification errors
- Automatic non-regression tests
- Interactive and batch modes
- Clean and easy data tracking (access to variables and probes for debugging, values displayed in the graphical model)
- Breakpoints on control, data, and time criteria
- Support of SCADE Test Environment input formats
- Co-simulation with MathWorks® Simulink® and MATLAB®
- Simulation can be driven by Tcl scripts for complex customized scenarios
- Slave mode for connection to your simulation environment and tools (co-simulation)

### Formal Verification with Design Verifier[2]

- Verification of safety properties expressed in SCADE Suite
- Automatic counter-example production in case of property failure
- Early detection of division-by-zero errors
- Easy and intuitive use of proof or bug-chasing modes




### Model-in-the-Loop and Hardware-in-the-Loop Simulation with VeriStand Gateway

- Interactive simulation of SCADE Suite models in National Instruments VeriStand™ environment

### Worst-Case Execution Time (WCET) and Stack Size Analysis with Timing and Stack Verifiers[3]

- Computation of WCET and stack usage of a SCADE Suite application for a specific target
- Aggregation of results from different code generation settings and comparison at model level
- Fully automated process
- Fully customizable from SCADE Suite or by TCL scripts
- Supported processor targets for WCET analysis: PowerPC e200 family, PowerPC MPC 5xx family, PowerPC e300, PowerPC MPC 755s, and ARM Cortex
- Supported processor targets for stack analysis: all PowerPC and ARM Cortex-R4
- Available on request: LEON2, LEON3, NEC V850E1/PHO3, TriCores 1766/1796/1797

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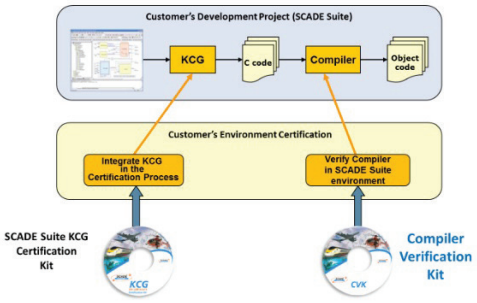


## Automatic Code Generation

### Automatic Code Generation

- Generated code properties
  - Fulfills embeddable code constraints: static memory allocation, static bounded loops, no recursion
  - High-quality and safe C and Ada production code: optimized, customizable, readable, and traceable
  - No dead code introduced by KCG
  - Portable code
- Qualifiable/certified SCADE Suite KCG 6.4
  - Qualifiable as DO-330 TQL-1 tool under DO-178C
  - Qualifiable as development tool under DO-178B
  - Qualified under ISO 26262:2011 at ASIL D and C
  - Certified under IEC 61508:2010 at SIL 3
  - Certified under EN 50128:2011 at SIL 3/4
- SCADE Suite KCG 6.6
  - C and Ada code generation
  - Easy handling of generated code: access to generated data and model elements through dedicated API
  - Language and typing extensions (new iterators, bitwise operators, 8/16/32/64-bits numeric types (signed/ unsigned), and 32/64-bits floats

### Code Integration

- Automatic integration of the generated code to Wind River® VxWorks® 653 and VxWorks® CERT, Green Hills® Software INTEGRITY™-178B, SYSGO PikeOS, and other RTOSes
- Customizable RTOS adaptors for generated code
- ASAM MCD-2 MC code calibration capability linked to model object

### Object Code Verification with SCADE Suite Compiler Verification Kit

Supports early verification of the correctness and consistency between the development tools chain and the target platform.

- Demonstrates the C code generated by SCADE Suite KCG is correctly compiled by the C target compiler and resulting code executes correctly on a given target platform
- Consists of a test suite that performs normal low-level testing of code structures generated by SCADE Suite KCG and compiled with user C compiler
- The test suite consists of a C sample containing all elementary C constructs (including combinations) generated by KCG from a SCADE Suite model. Input vectors exercising C sample code and producing 100 percent MC/DC coverage are also provided.
- Customizable automation execution scripts

## SCADE Tools Integration

**Synchronization with Software Architecture Design**
Integration of SCADE System and SCADE Suite allows for the complete software design process, from architecture to detailed design of components:

- Evolution of architecture and design of software components in parallel and resynchronization upon request at chosen project milestones
- Bi-directional synchronization between architecture models and design models
- Consistent and efficient management of I/Os and data definitions and changes
- No duplication of efforts in synchronizing interfaces defined at architecture level and refined at design level software design level can be integrated into the system level thanks to SCADE System capabilities.

**Connectivity with System Simulation Tools**
SCADE Suite integrates seamlessly with ANSYS® Simplorer®, through the FMI/FMU co-simulation standard, to enable interactive E/E and multiphysics simulation sessions.

- Functional mock-up unit (FMU) export out of SCADE Suite models for connection to ANSYS Simplorer and all FMI-compliant system simulation tools
- Support for FMI 2.0 model exchange export

**Development of Embedded Human-Machine Interfaces (HMI)**
ANSYS SCADE Suite delivers capabilities to design the control logic associated with graphical HMIs designed in SCADE Display.

- Co-design: Tight design-level integration of critical logic and graphic components in embedded applications
- Co-simulation: Early prototyping and validation in white-box and black-box mode between display application logic and graphic components
- Co-reporting: Integration of report generation between SCADE Suite models and SCADE Display graphical specifications
- Co-generation: Integrated deployment of SCADE Suite and SCADE Display generated code

**Testing Environment**
The development of applications in SCADE Suite can be extended with testing activities supported by SCADE Test.

- Creating and managing test cases, setting up and launching test execution from SCADE Test execution for host
- Measuring coverage at models and generated code level with SCADE Test model coverage
- Generating test harnesses for target testing with SCADE Test target execution

In addition, SCADE Test rapid prototyper provides requirements validation capabilities relying on interactive graphical panels.

**Application Life Cycle Management**
The life cycle management of applications developed in ANSYS SCADE Suite can be supported by ANSYS SCADE LifeCycle:
- Connecting Application Lifecycle Management (ALM) tools and setting requirements traceability from models
- Generating documentation automatically from models

## Minimal/Required System Configuration SCADE Suite Product Line

| | |
|---|---|
| OS Platforms[1] | Microsoft® Windows® 7 SP1 (64-bit)2 or Windows 8.1 (64-bit) |
| C/C++ Compilers | Visual C++® 6.0, 7.0, 7.1<br>Visual C++ 2005 and 2008<br>GNU C Compiler 3.4.5 |
| CPU processor | 1.5 GHz or faster |
| RAM | 1 GB minimum (2 GB recommended) |
| Disk Space | 1 GB minimum |
| Protocol | Network adapter and TCP/IP installed and configured for license management |
| Display | 16-bit color, 1280x1024 screen resolution recommended |

1. SCADE Suite KCG 6.4 is qualifiable on Windows XP Professional SP3 (32-bit) and Windows 7 SP1 (64-bit) platforms whereas SCADE Suite KCG 6.1.3 is qualifiable on Windows XP Professional SP2/SP3 (32-bit) and Windows 7 SP1 (64-bit) platforms. Microsoft® Windows 7 SP1 (64-bit)2 or Windows 8.1 (64-bit)
2. SCADE Suite application is compiled on Windows 7 SP1 (32-bit). Tests performed on other platforms ensure all SCADE Suite tools support them.

## ANSYS SCADE Suite Product Line

ANSYS SCADE Suite Advanced Modeler:
- Editor
- Checker
- Simulator
- Configuration Management Gateway
- Model API and Eclipse Plug-In
- Code Integration for FMI and Simplorer®
- Application Lifecycle Management Gateway
- SCADE Display Integration
- SCADE System Integration
- Simulink® Wrapper (S-functions)
- Gateway for National Instruments VeriStand™
- RTOS Adaptors (VxWorks 653, VxWorks CERT, INTEGRITY-178B, OSEK, MicroC/OS-II) and “user-definable” adaptors
- User documentation and online help

| |
|---|
| SCADE Suite Timing and Stack Optimizer |
| SCADE Suite Design Verifier |
| SCADE Suite Timing and Stack Verifier |
| SCADE Suite Gateway for Simulink® |
| SCADE Suite KCG Code Generator |
| SCADE Suite KCG Certification Kits:<br>• SCADE Suite KCG 6.4 or 6.1.3 DO-178B/C Levels A and B Certification Kits<br>• SCADE Suite KCG 6.4 ISO 26262 ASIL D and C Certification Kit<br>• SCADE Suite KCG 6.4 or 6.1.3 IEC 61508 SIL 3 Certification Kit<br>• SCADE Suite KCG 6.4 or 6.1.3 EN 50128 SIL 3/4 Certification Kit<br>• SCADE Suite KCG 6.4 or 6.1.3 IEC 60880 Certification Kit |
| SCADE Suite Compiler Verification Kit |
| ANSYS SCADE Test Integration:<br>• SCADE Test Model Coverage<br>• SCADE Test Environment for Host<br>• SCADE Test Target Execution (LDRA, RTRT, VectorCAST, Generic Target) |
| SCADE LifeCycle Integration:<br>• ANSYS SCADE LifeCycle Reporter |

**Contact Information**

Contact one of our sales representatives at
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