



What is 3KEYSTUDENT?

As younger workers begin careers in the power industry, it is important to understand and address the way training can best be delivered to this interactive, media-adept generation. Traditional instructor-led and hands-on training practices need to be enhanced to better meet the needs of the younger students. To address this gap, Curtiss-Wright's Simulation Group* offers the 3KEYSTUDENT™ environment, which is provided for a classroom or local intranet setting, and our web-based version, 3KEYSTUDENTω, which delivers simulator training over the Internet. Both of these environments support the 3KEYMASTER™ Intelligent Tutoring System, and the classroom environment can be enhanced with 3KEYCLASS™, our “super” Instructor Station application.

Intelligent Tutoring System

In the past, simulator-training has required the presence of qualified simulator instructors to set up training scenarios, run the simulator, and monitor student actions. The number of students that could be trained on the simulator, and how long it took to train them, had therefore been dependent, in part, on instructor availability.

Curtiss-Wright's Intelligent Tutoring System, 3KEYITS™ for classroom environments and 3KEYITSω for web-based environments, automates many of the routine functions instructors perform to administer simulator training. The ITS allows instructors to script lessons that run automatically on the simulator, record student actions and simulator response, and offer varying degrees of on-line help when needed.

Classroom Instructor Station

Imagine an instructor in a classroom with multiple students, each running their own copy of a simulator on their workstation, practicing a variety of plant or system exercises. How does the instructor monitor and control each of the student's simulator sessions—walk around the classroom looking over each student's shoulder, or from the Instructor Station, open sessions to each student's simulator?

Neither of these are practical in a classroom setting, so we developed 3KEYCLASS to provide the instructor with a tool to allow monitoring and control of all student simulator sessions from a single screen.

The remainder of this brochure provides details on 3KEYSTUDENT and the optional supporting products, 3KEYITS and 3KEYCLASS, and the benefits they offer.

3KEYSTUDENT Full Scope Simulators

- Nuclear
- Fossil
- Combined Cycle
- Gas Turbine
- Hydro
- Pipeline
- Grid



3KEYSTUDENT Environment Advantages

- Individual Student Simulator training is available both in the classroom or over the web, enabling high-quality and structured training programs geared towards certification
- Effective utilization of instructors' time—freed from tasks that can be automated, instructors can focus on observing and interacting with students and can focus on greater value-added tasks
- Provides students full operator functionality of a control room simulator, but on a single workstation
- Self-paced, effective learning—students run lessons without instructor
- Simulator-based lessons can be made available organization-wide to promote learning, e.g., to engineering or maintenance staff

*: WSC, a legacy brand of Curtiss-Wright's Simulation Group, headquartered in Frederick, MD, is a global simulation and services company. Acquired by Curtiss-Wright in 2024, WSC is recognized for the quality and efficiency of their products and flexible team-oriented approach to serving its customers.

3KEYSTUDENT Classroom Overview

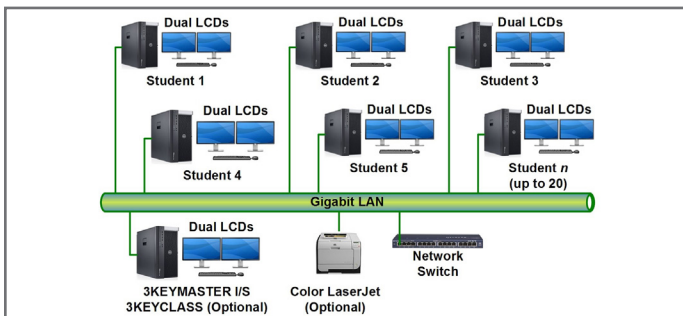
3KEYSTUDENT, in its simplest form, is used in a classroom setting with a collection of student workstations that are all fully capable of running one or more simulation loads and HMIs independently, or in a team mode, connected to a common simulator load. The setup includes an Instructor Station that can connect to each student's simulation sessions to monitor and control their simulator actions.

The classroom simulators include Windows-based simulators developed with the 3KEYMASTER simulation platform. The DCS is fully emulated, including the HMI functionality and the logic and control. The Instructor Station carries out simulator controls such as freeze, snapshot, reset, and all other Instructor Station functions.

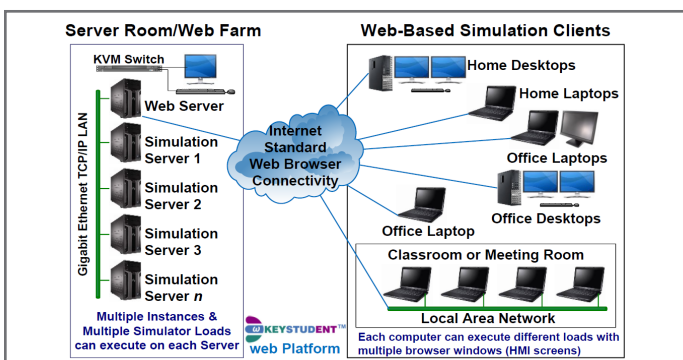
The 3KEYSTUDENT Classroom Simulator Student/Operator workstations each include:

- Full scope replica 3KEYMASTER Simulation Loads
- Capability to execute the full scope replica simulations
- Emulated DCS logic and control
- Emulated DCS HMI to mimic operator HMI screens including the alarm and trend screens
- Soft panel graphics for displaying and manipulating hardwired panel I/O points (depending on plant)

The 3KEYMASTER Classroom Instructor Station (I/S) has all the functionality of a student workstation plus the I/S software, providing instructors the ability to monitor student actions and carry out desired simulator controls such as setting initial conditions, run/freeze, insert malfunctions, etc.



3KEYSTUDENT Classroom Platform (top) and Web Platform (bottom)



3KEYSTUDENT ω Platform Overview

3KEYSTUDENT ω is Curtiss-Wright's solution for reaching students unable to participate in the traditional classroom setting by making state-of-the-art simulator training available to a student's PC via the Internet. The web-based environment utilizes remote simulation servers running both the load and client software allowing students from anywhere in the world to be trained on their desktop or laptop with simple to full scope high fidelity simulation.

The 3KEYSTUDENT ω platform usually includes our web-based Intelligent Tutoring System, 3KEYITS ω , featuring:

- Lessons that can range from simple component or system lessons, to full start-up/shutdown of a generic or a custom built specific plant simulator
- No limitation to the number of lessons that can be developed
- Expandable to deliver lessons to hundreds of concurrent users
- Lessons can be paused for any reason and resumed later
- Safe and protected environment with the simulation software running on servers located at a secure facility anywhere in the world
- Downloads are limited to graphics and simulator control functions, essentially providing real-time responses
- Multi-screen capability, allowing better visualization through multiple browser sessions connected to the same simulator

Remote Instructor Stations allow instructors or teachers from distant locations to monitor and carry out simulator controls on any of the web-connected students.

Intelligent Tutoring System Lesson Plans

Each ITS Lesson Plan, for either the local or web version, consists of steps that define the actions required to complete a given training scenario. Each step incorporates several bits of information as outlined below:

- Step Name and Description
- Vocalized Messages
- Advice to jump the user to the HMI screen necessary for the execution of step
- Conditions that, when true, allow the Lesson to proceed to the next step
- Timing and Scoring of each step or sequence of steps
- Templates for layouts
- Audio and Video files

During execution of the Lesson Plan, the student may seek "Advice," to be guided to a specific display based on the current step.

For the simulator instructors, recording features are provided to improve the efficiency of generating new lessons.

What are 3KEYITS/3KEYITS ω ?

The Intelligent Tutoring System (ITS) is not intended to replace the simulator instructors, but rather to augment and leverage their knowledge and expertise through innovative utilization of existing technologies. When used with an instructor, the ITS provides an additional source of student mentoring and advice, allowing the instructor to focus greater attention on simulator operation and student observation. When used without the presence of an instructor, the ITS permits the student to practice carefully structured event or transient exercises for the purpose of refining or refreshing skills and expertise without being allowed to practice “bad habits” or improper plant operation.

The foundation of the ITS is the integrated development environment, which allows an instructor to build decision logic matrix arrays ranging from the simple to the complex. To make the interface as intuitive as possible, the graphical user interface features “drop down” menus, and “drag and drop” icons for building logic statements relative to each observed parameter imported from the simulation. The system also allows recording of actions performed on the simulator to build a sequence of lesson steps that can then be enhanced with messages, advice, and media.

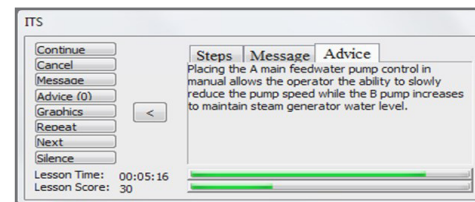
Because the ITS is completely integrated with the 3KEYMASTER environment, it allows developers to utilize existing Instructor Station scenarios, initial conditions, and malfunctions, etc. that can easily be incorporated into ITS Lessons.

Features

- All user capabilities on the Classroom 3KEYITS are available to 3KEYITS ω users over the web
- Role-based: developer mode for creating lessons, and user mode for running lessons
- Seamless integration with the 3KEYMASTER Simulation Environment
- Incorporation of simulator control commands to automate running lessons, e.g., for initialization, run, freeze, etc.
- Simulator parameters access for use in lessons
- Embedding “safe and efficient operations” benchmarking information in the lesson plan to evaluate student sessions, e.g., equipment line-up, operating limits for parameters, transient ramp-rates, etc.
- Embedded text, audio, or video instructional material in the lesson plan for on-line help
- User-selectable instruction mode (see diagram)
- Speech recognition and voice synthesizer features allow interaction with the simulator without the distraction of writing or reading
- Includes registration and security functions, supports web-based security and company firewalls

3KEYITS and 3KEYITS ω Advantages

- Enables a high-quality and structured training program geared towards certification
- Approved lessons can be re-used automatically for reinforcement
- On-line testing and recording of student responses for certification
- Provides time and score; compliant with SCORM Learning Management Systems
- Lessons can be geared for beginner level students who are unable to access the advanced level lessons until promoted by the Instructor
- Provides training consistency and standardization
- On-line and context-specific tutoring available at time of student need
- Self-paced and effective learning; students can run a lesson plan without the aid of an instructor
- Promotes in-depth learning with lesson plans that describe the inner workings of systems—not just common operating scenarios. Deeper understanding promotes better response in abnormal situations
- Ideal computer based training (CBT) tool—always available, anytime, and anyplace



ITS Control Interface: Provides access to Steps, Messages, Advice, and Student lesson controls. Shows lesson timing/progress and score.

Show Me

Provide the learner with:

- Guided demonstration
- Operational fundamentals (“why”)

Learner will:

- Complete a lesson
- Practice the procedure and learn the operations fundamentals
- Answer review questions (reinforce knowledge)

Mentor Me

Provide the learner with:

- Access to the plant simulator
- Guidance from the Intelligent Tutoring System (ITS)

Learner will:

- Perform actions on the simulator
- Complete lessons in a specified time limit
- Receive instructions and advice throughout the lesson

Test Me

Provide the learner with:

- Access to the plant simulator
- Operational/procedure steps

Learner will:

- Perform operational steps in the simulator
- Demonstrate ability to run the plant properly and efficiently

What is 3KEYCLASS?

In a classroom simulator setting, with each student's workstation having the ability to run any of their installed simulators, the instructor needs a tool to conveniently oversee each student's simulator session. To do this, our Simulation Group developed the 3KEYCLASS "super" Instructor Station. Through this application, the instructor has the ability to supervise multiple students from a single display and can start, stop, and monitor the simulation user activity. It is capable of monitoring up to twenty students running 3KEYMASTER and allows controlling individual simulators/clients in standalone or multi-user mode (more than one client connected to a single simulation host). The application consists of three views to make this possible: Conductor, Students, and Class as shown in the screenshots.

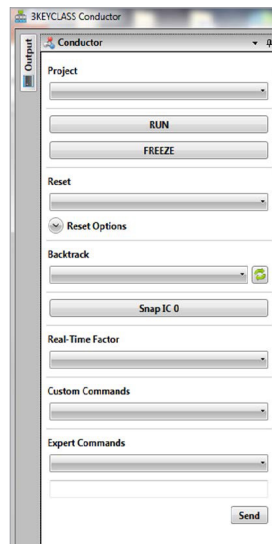
Class View

Allows the Instructor to select and highlight one or more students to perform supervisory and control actions using Conductor View.

Conductor View

From Conductor View, the Instructor can:

- Select Loads / Projects
- Reset Initial Conditions
- Run / Freeze Simulation
- Snap a temporary IC
- Set Real-time Factor
- Use Custom and Expert Commands for malfunctions, remote functions, event triggers, etc.
- Launch full Instructor Station of Student's simulation

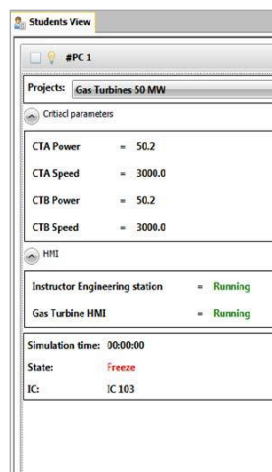


Conductor View

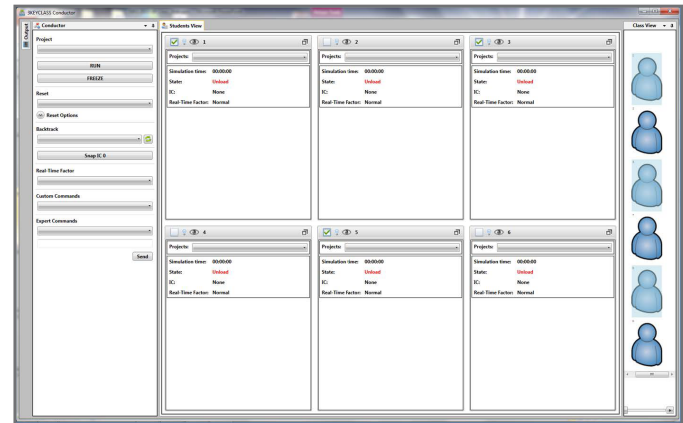
Students View

The Students View provides an Overview and can be expanded to provide a detailed view. These views provide the Instructor with controls and status information of each student's simulation:

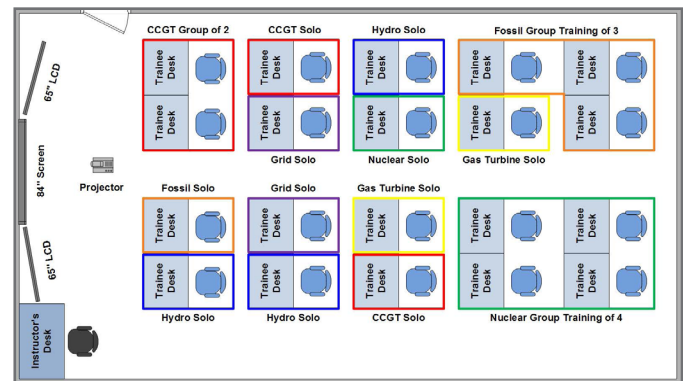
- Loaded Project/Simulator
- Simulation Running Time
- Model State: (Run/Freeze/Unloaded)
- Loaded Initial Conditions
- Instructor-definable Critical Parameters
- Loaded HMIs & Status (useful with multi-monitors)



Student View



Instructor Control Window



Training Classroom

3KEYCLASS Features and Benefits

- Improves Instructor efficiency in a classroom with multiple simulators; can focus on training delivery and instruction, rather than technology
- Load/Unload each student's computer with the specific simulator loads
- Reset one or more student simulators initial conditions, simultaneously
- Activate scenarios or trigger expert commands on one or more student computers
- Supervise student progress through monitoring of critical parameters
- View HMI screens being used by students