3KEYMASTER™ DCS Simulation

Distributed Control Systems Simulation Modeling

CURTISS-WRIGHT

Nuclear Power Products and Services

What are the DCS Simulation Choices?

Distributed Control Systems (DCS) provide a modular, reliable, and cost-effective method of implementing control systems, with superior data management capabilities. They are being used, not just for new plants and equipment, but also for control system upgrades at existing installations. Their increasing prominence in control rooms requires that they be accurately represented in the simulation environment, with adequate simulator control and visualization capabilities, for effective training and V&V.

Today, DCS vendors often provide "virtual" versions of their DCS systems.

This development, along with the inherent computer-centric approach to control system design and configuration of DCS systems, opens up an array of choices for DCS simulation. From a practical and cost perspective, there are trade-offs involved in choosing one approach over another. At Curtiss-Wright*, the belief is that there is no universal solution to these trade-offs, but that all options should be supported. The final decision on which approach to pursue for a customer has to be based on the unique circumstances of that customer. A description of various DCS simulation approaches and factors that should be considered in decision-making are provided in the table below.

DESCRIPTION	FULL SIMULATION	VIRTUAL SIMULATION	HYBRID	FULL EMULATION
Data	**N/A** – Data by DCS Vendor	**Low** – Data is needed for proper interface with emulated HMI	**Medium** – Data is needed for communication between HMI and emulated software	**High** – Data is needed to accurately emulate actual DCS; more accurate data means better emulation
Proprietary Restrictions	**Highest** – All rights to hardware and software are proprietary to DCS vendor	**High** – All rights to hardware and software are proprietary to DCS vendor	**Medium** – Primary issue is in communication protocol between DCS HMI and emulated software	**N/A** – all hardware and software are completely independent from DCS vendor
Schedule	**Lowest** – Time is spent on accurately interfacing DCS with simulation models	**Low** – Time is spent on accurately interfacing DCS with simulation models and emulated HMI hardware	**High** – Time is spent on emulating DCS software and interfacing with DCS HMI	**Low** – Time is spent on emulating DCS software
Upgrades	**Medium** – Not difficult to implement, but may be expensive	**Medium** – Varies	**Low** – May be more difficult, but can be implemented by in-house staff or third party	**Low** – May be more difficult, but can be implemented by in-house staff or third party
Maintenance	**High** – Heavily depends on DCS vendor for proprietary parts and software	**Medium** – Hardware maintenance costs low, but heavily depends on DCS vendor proprietary software	**Medium** – Software maintenance costs low, but heavily depends on DCS vendor proprietary hardware	**Low** – Inexpensive, readily available hardware and non-proprietary software utilized
Classroom Simulator	**Highest** – Each instance of DCS has full cost of proprietary hardware	**Low** – Inexpensive assuming license fee is included, readily available hardware can be used	**High** – Each instance of DCS has full cost of proprietary hardware	**Lowest** – Inexpensive, readily available hardware and non-proprietary software utilized

*: 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.

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DCS Simulation Methods

Curtiss-Wright's Simulation Group supports all the approaches below to provide the best and most cost-effective solution for a specific customer.

- ***Full Stimulation*** – replica DCS, consisting of hardware and software, is integrated with the simulator
- ***Virtual Stimulation*** – a replica virtual version of the DCS software is used on emulated hardware
- ***Hybrid*** – a replica DCS HMI hardware platform is used with emulated software
- ***Full Emulation*** – emulated DCS hardware and software is used

Why Choose Curtiss-Wright's DCS Solutions?

3KEYMASTER™'s object-oriented technology, superior integration capability, a growing library of translators, and flexibility to choose any DCS simulation method are well suited for providing a superior and cost-effective DCS simulation experience.

Advantages of Curtiss-Wright's DCS Solutions

- ***Logic and Control Accuracy*** – Automated tools extract data from the DCS database to create replica 3KEYMASTER™ drawings, with full logic and control accuracy
- ***Seamless Integration*** – The open architecture allows the chosen DCS method (stimulation, virtual, or emulation) to be easily integrated with process models within the 3KEYMASTER™ or third-party environment
- ***Extendibility*** – Our generic approach can be applied to any DCS
- ***Stimulation Experience*** – We have wide experience in integrating stimulations from major vendors, e.g., Foxboro, Yokogawa, and Max Controls
- ***Emulation Expertise*** – Systems already emulated include GE Mark V with I-DOS and CIMPLICITY; GE Fanuc PLC; Bailey INFI 90 and Symphony; Westinghouse WDPF Classic, Westation, and Ovation; Siemens TXP; Moore Controls; Fisher-Porter; Foxboro I/A; ABB ProControl; Alstom P320; Toshiba; Max Controls; Honeywell TDC 3000; and others
- ***Powerful Data Visualization*** – Parameters belonging to objects in 3KEYMASTER™ logic and control drawings can be displayed in tables and trend charts. Object icons can be animated based on process model supplied signal values
- ***Faithful HMI Replication*** – Automated tools extract dynamic object data in the DCS HMI, migrate the static images of the HMI to 3KEYMASTER™, and re-insert the dynamic objects
- ***Reduced Error Rate*** – Maximizing automation in the translation process reduces conversion errors

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