3KEYMASTER™ Distributed Control Systems Simulation

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 require that they be accurately represented in the simulation environment, with adequate simulator control and visualization capabilities, for effective training and V&V (see SAE brochure).

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 WSC, 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.

### DCS Simulation methods

WSC 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

### Comparison of Emulation/Stimulation Cost Issues

<table>
<thead>
<tr>
<th>Description</th>
<th>Full Stimulation</th>
<th>Virtual Stimulation</th>
<th>Hybrid</th>
<th>Full Emulation</th>
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</thead>
<tbody>
<tr>
<td>Data</td>
<td>N/A - Data by DCS Vendor</td>
<td>Low - Data needed for proper interface with emulated HMI</td>
<td>Medium - Data needed for communication between HMI and emulated software</td>
<td>High - Data is needed to accurately emulate actual DCS, more accurate data means better simulation</td>
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<td>Proprietary Restrictions</td>
<td>Highest - All rights to hardware and software are proprietary to DCS vendor</td>
<td>High - All rights to software are proprietary to DCS vendor</td>
<td>Medium - Primary issue is in communication protocol between DCS HMI and emulated software</td>
<td>N/A - All hardware and software completely independent of DCS vendor</td>
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<td>Schedule</td>
<td>Lowest - Time is spent on accurately interfacing DCS with simulation models</td>
<td>Low - Time is spent on accurately interfacing DCS with simulation models and emulated HMI hardware</td>
<td>High - Time is spent on emulating DCS software and interfacing with DCS HMI</td>
<td>Highest - Time is spent on emulating DCS software</td>
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<td>Upgrades</td>
<td>Medium - Not difficult to implement, but may be expensive</td>
<td>Medium - Variable</td>
<td>Low - May be more difficult but can be implemented by in-house staff or third party</td>
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<td>Maintenance</td>
<td>High - Heavily dependent on DCS vendor for proprietary parts and software</td>
<td>Medium - Hardware maintenance costs low, but heavily dependent on DCS vendor for proprietary software</td>
<td>Medium - Software maintenance costs low, but heavily dependent on DCS vendor for proprietary software</td>
<td>Low - Inexpensive, readily available hardware and non-proprietary software utilized</td>
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<tr>
<td>Classroom Simulators</td>
<td>Highest - Each instance of DCS has full cost of proprietary hardware</td>
<td>Lowest - Inexpensive, readily available hardware and non-proprietary software utilized</td>
<td>Medium - Software maintenance costs low, but not heavily dependent on DCS vendor for proprietary software</td>
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</table>

Example of 3KEYMASTER L&C drawings with signal status values at run-time
Why Choose WSC’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 WSC’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
- Extensibility - WSC’s generic approach can be applied to any DCS
- Stimulation Experience - WSC has 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 CIMPPLICITY; GE Fanuc PLC; Bailey INFI 90 and Symphony; Westinghouse WDPF Classic, Westation, and Ovation; Siemens TXP; Moore Controls; Fisher-Porter; Foxboro I/A; ABB Pro-Contr; 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

To learn more about WSC’s simulation products, solutions, and services, visit

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