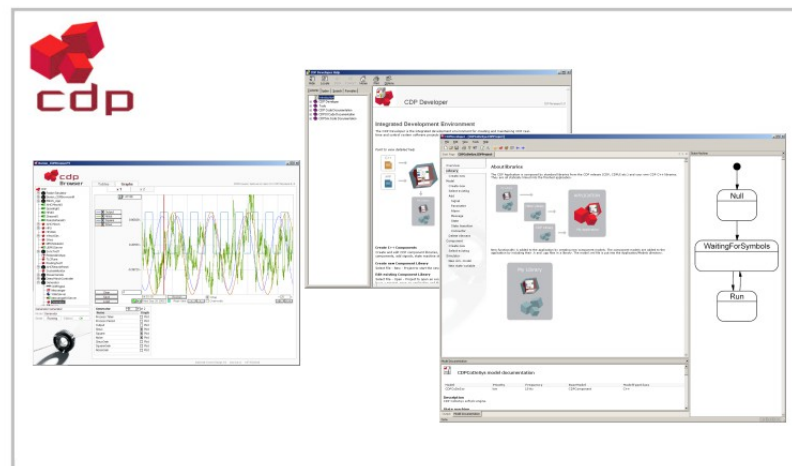




CDP



control development  
software





control development  
software

CDP dramatically changes the way control systems are built:

- Significantly reduced development time
- New possibilities giving increased performance and functionality of controlled equipment



**cdp**

**control development  
software**

- Designed for advanced and complex control systems, demanding the best possible performance, flexibility and safety



**cdp**

**control development  
software**

- Flexibility of C++ and efficiency of high- level application development
- Efficient software tools assist the development process from C++ code generation to testing and maintenance
- Middleware layer provides generic functionality and services, such as communication, allowing you to focus entirely on application development



control development  
software

CDP is:

- Component based
- Distributed
- Platform independent



# CDP foundation

We wanted to solve typical problems occurring in real- time and embedded development projects:

- Time consuming
- Special knowledge required
- Risk; will it be completed, is it stable now..
- No reuse of methodology and software
- Awkward and less known tools
- Documentation out of date
- A considerable amount of available resources used on application independent infrastructure



# CDP foundation

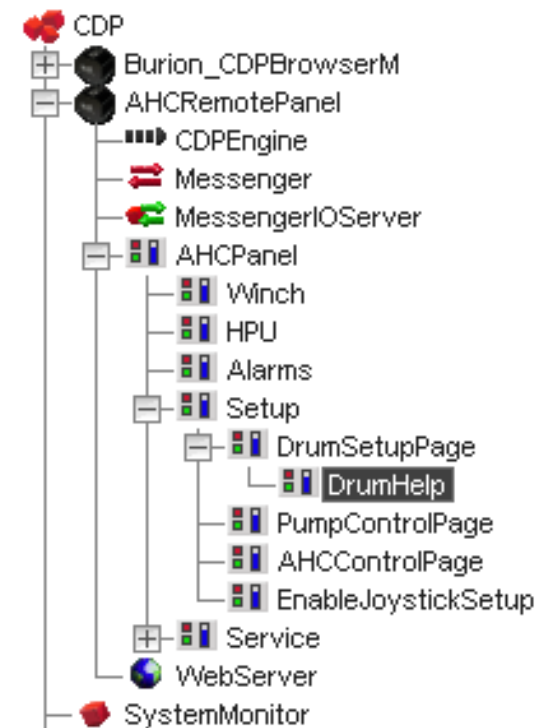
CDP is based on ideas found to increase efficiency of development and make life easier for the developer:

- Freedom to make my own solutions.
- Infrastructure: If all effort can be focused on application development, the end result will be much better.
- Develop and test on workstation.
- A simple, defined method for C++ implementation.
- Simulate parts of the physical process.
- Efficient tools for signal analysis and process state variable monitoring.



# Component Architecture

- Components in a hierarchical structure
- Implementation reduced to component creation
- Components are actually reusable

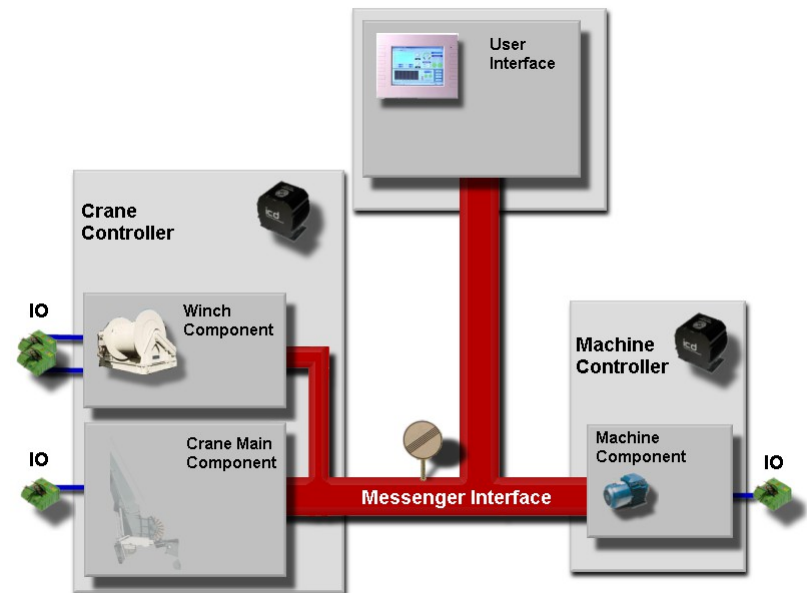






# Distributed

- Logical structure independent of physical
- CDP provides real- time communication between components





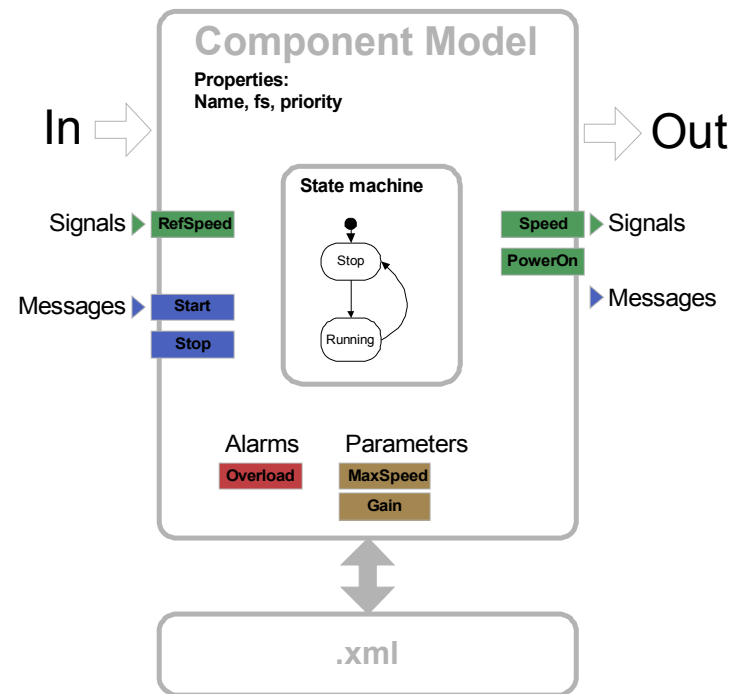
# Distributed Development

- The distributed, component- based architecture makes it easy to distribute development to separate teams or individuals
- Typically, a new component will have a clear and simple specification of its interface, since all lower- level interfacing and communication issues are solved by CDP



# Component model

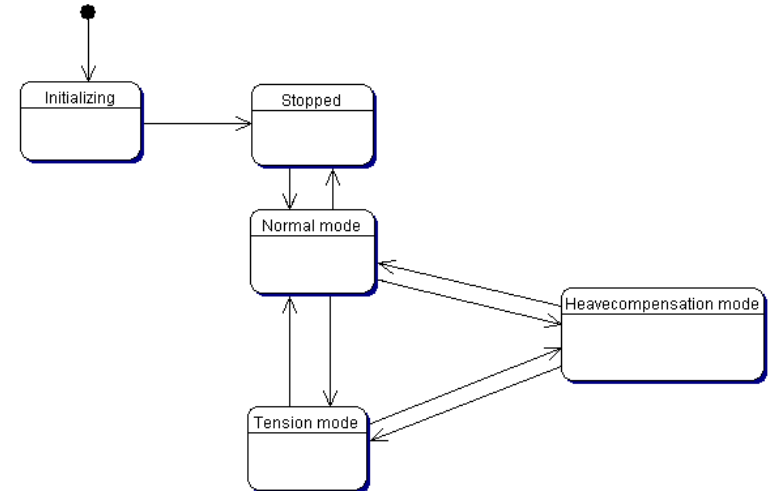
- State machine and periodic process
- Signals
- Messages
- Alarms
- Parameters
- Persistent in .xml
- Consistent code structure





# Component model

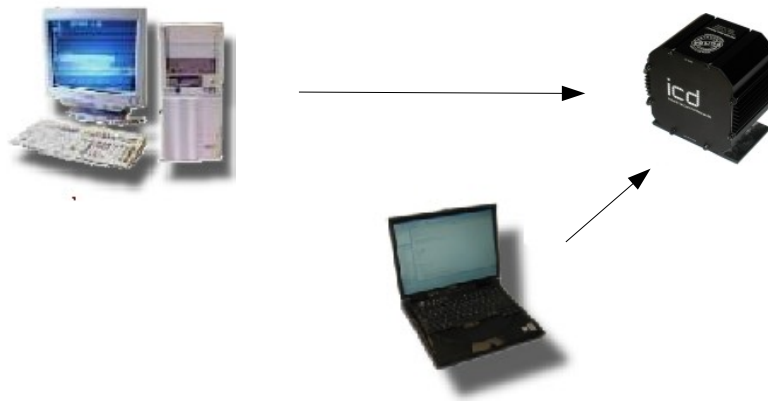
- State machine with State Transitions
- Can also create new threads





# Platform independent

- Supports Windows and real- time operating system
- Can run application tests on the workstation
- Same application code on workstation and target





# Use existing code

- Existing code can be integrated in to components
- Adds CDP functionality to old programs, bringing them into the future



# Signals and parameters

- Signal member objects let you monitor and transfer values used in the C++ code in real-time
- In the code, both Signals and persistent parameter objects are used as if they were primitive data types like int or double

## Create Signal in CDPDeveloper..

Overview  
Library  
Create new  
Model  
Create new  
Select existing  
Add  
Signal  
Parameter

Add signal

Model:

☐ Add to component

Signal name:  C++ variable name:

Description:

## Looks like this in C++ code..

```
protected:  
    /** Member variables */  
  
    // CodeGenerator: Add parameters here  
  
    Signal<double> m_in; // [] My input signal.  
    // CodeGenerator: Add signals here
```

## Use it like primitive member..

```
void MyFilter::ProcessNull()  
{  
    m_out = 0.9*m_out + 0.1*m_in;  
}
```

## Get values from other source by setting routing..

MyFilter.In

Properties		
Property	Value	Change
Description	My input signal	
Value	0	
*** No routing ***		
	Generator:Generator:Output	

More

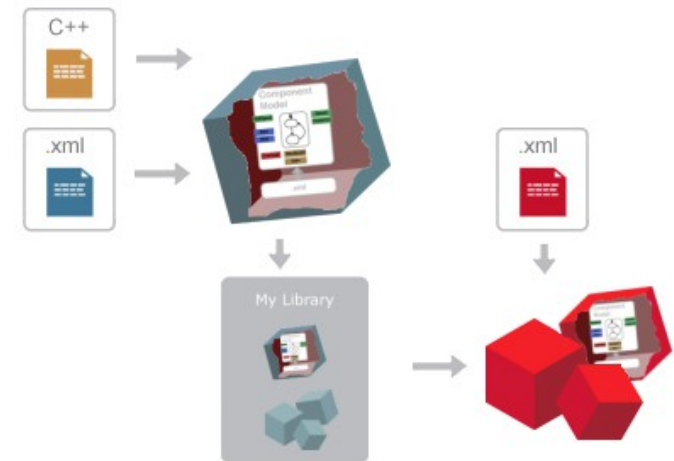
## Use CDPBrowser to monitor value..





# Development process

- C++ programming of new components result in model libraries, which are selected and linked to executable binaries
- No need for C++ programming when distributing and configuring applications which consist of components already developed and tested
- CDPDeveloper generates all necessary framework code for new CDP components
- Applications are created by instantiating and configuring components from model libraries

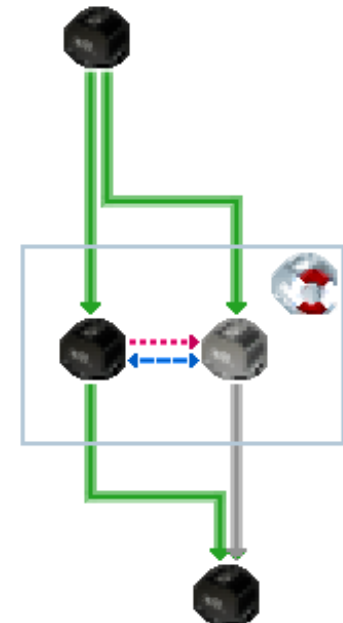






# Option: CDP Redundancy

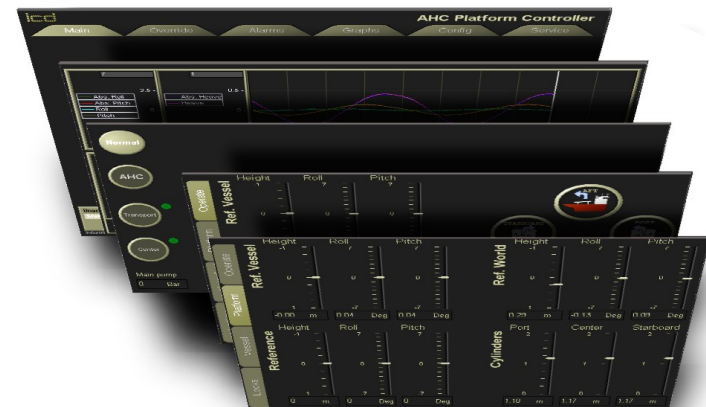
- Full redundancy functionality and the power of C++ programming
- Can run on different hardware and operating system
- Performance only limited by hardware
- Flexible set-up to suit any application requirements





# Option: CDPUI

- Graphical user interface for control systems
- Integrated with control software
- Makes traditional 'HMI' obsolete





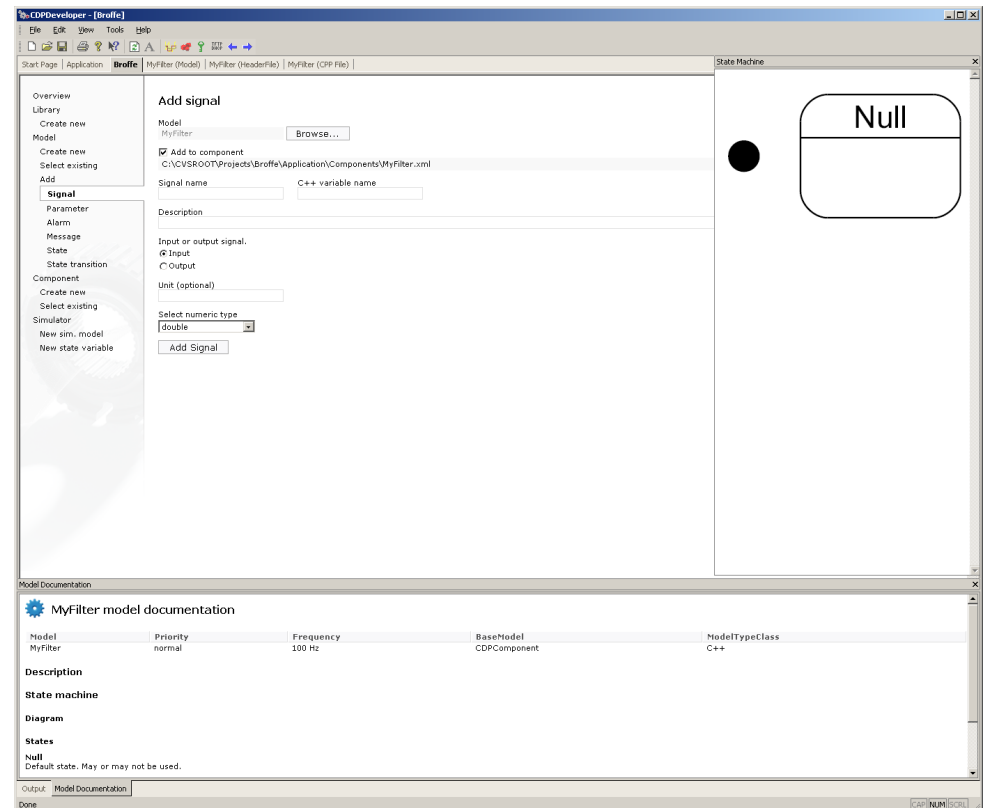
## Option: CDPsim

- Dynamic simulation toolkit
- Simulate non-linear and complex models
- Integrated with control software
- Hardware-in-the-loop
- Reduce risk by simulating parts of the physical process



# Tools: CDPDeveloper

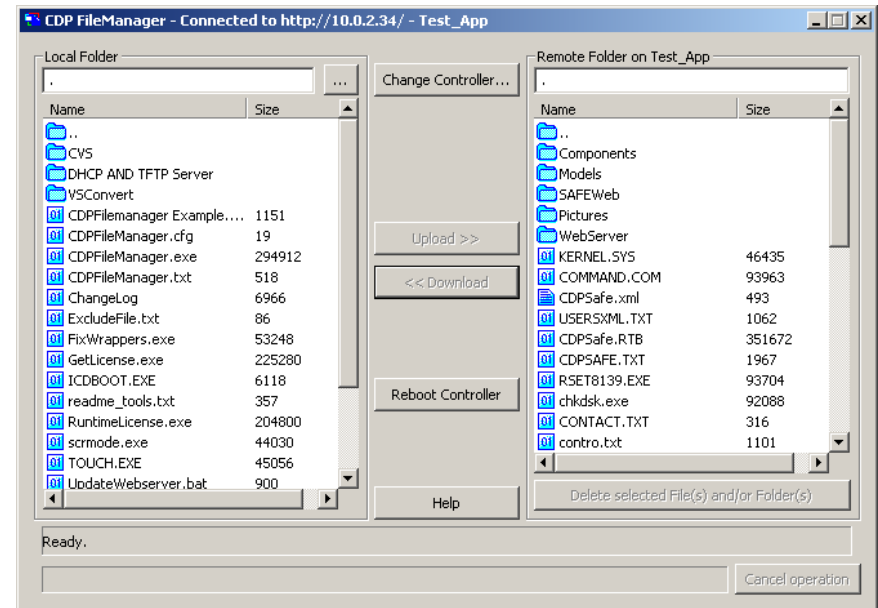
- Development environment for CDP
- Code generator
- View and edit .xml and C++ files
- View and generate documentation





# Tools: CDPFileManager

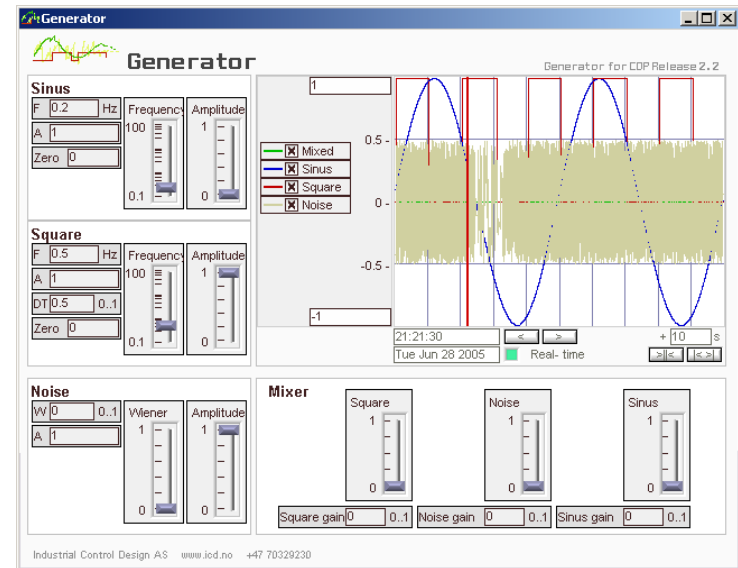
- Upload and download files to target controller





# Tools: Generator

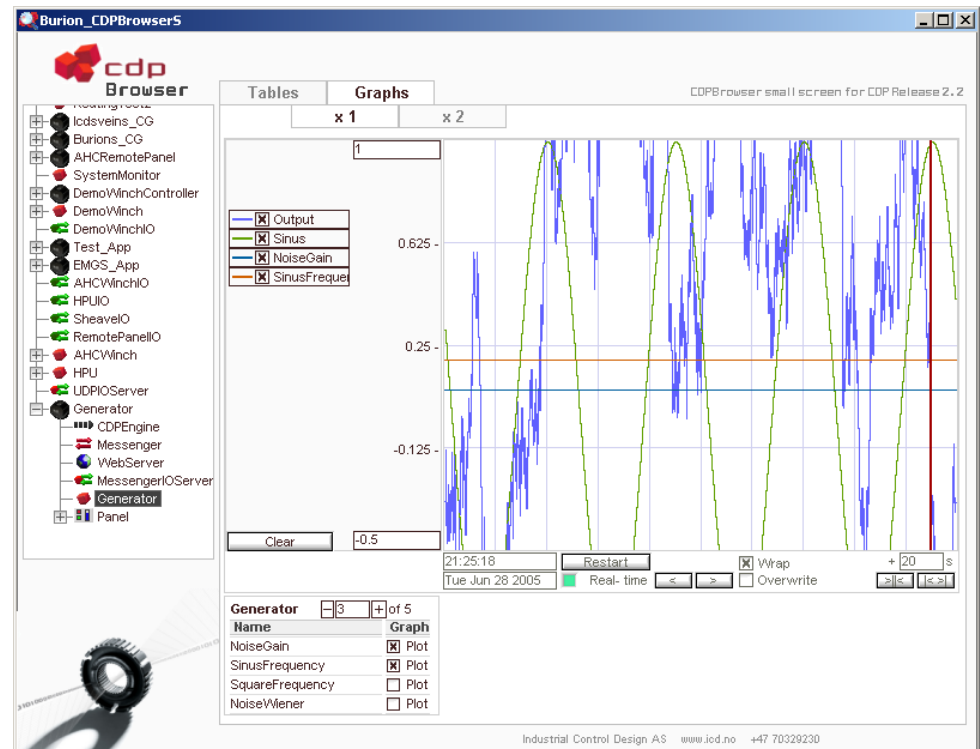
- Signal source for testing and simulation
- Easily extendable to suit your custom needs





# Tools: CDPBrowser

- Browse all CDP applications and components
- Monitor and edit signals, parameters, alarms
- Send messages





# Tools: WebServer

- Monitor and edit signals, parameters, alarms
- Edit properties
- View and generate documentation

Generator - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://localhost:81

cdp Username: SuperUser Access level: System Maintenance & configuration

Generator

File management  
Logout  
Message log

Components

Generator  
CDPEngine  
Messenger  
WebServer  
MessengerIOServer  
Generator  
Panel

Generator.Generator

Properties

Property	Value
Name	Generator Generator
Parent	Generator
Description	
ShortName	Generator
Handle	0x00040036
Model	Generator
XMLFileName	Components\Generator\Generator.xml
AutoXML	Generator\Generator.xml
Alias	
Process frequency (fs)	1000
OverrideStateMachine	<input type="checkbox"/>
OverrideState	Null
Debug	<input type="checkbox"/>
ActivateWait	1
Activate	<input checked="" type="checkbox"/>
Current state	Running

Description

Alarms

Ack	Alarm name	Status	Level	Alarm text
<input type="checkbox"/>	Broken signal routing	OK	WARNING	n/a
<input type="checkbox"/>	Signal not updated	OK	WARNING	n/a

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Signals

Signal name	Value	Unit	Description
Noise	0.455		Noise signal.
NoiseAmplitude	1		Noise amplitude.
NoiseGain	0		Noise gain.
NoiseWiener	0	0.1	Wiener noise gain.
Output	0		Mixed output.
Process Period	9.872e-004	s	Process interval [s].
Process Timer	0.011	s	Process run time each s.
Sinus	-0.379		Sinus signal.
SinusAmplitude	1		Sinus amplitude.
SinusFrequency	0.2	Hz	Sinus frequency.
SinusGain	0		Sinus gain.
SinusZero	0		Sinus zero offset.
Square	1		Square signal.
SquareAmplitude	1		Square amplitude.
SquareDutyCycle	0.5	0.1	Square duty cycle.
SquareFrequency	0.5	Hz	Square frequency.
SquareGain	0		Square gain.
SquareZero	0		Square zero offset.

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Messages





# Case: AHC Platform

- 3 degrees of freedom active motion- compensated platform
- Non-linear, multivariable control
- Extensive use of simulation



# Case: AHC Platform

- Graphical user interface and control on same computer
- Distributed IO
- CDP makes it possible to use standard off-the-shelf hardware for this high-performance application



# Case: Software development

- Using simulator to test control application
- Everything runs on workstations



# Case: Testing

- At first, all mechanical parts are simulated
- Gradually enabling more physical parts
- Using simulated vessel movement to test on-shore



# Case: AHC Platform in-use



CDP

# Industrial Control Design AS

[www.icd.no](http://www.icd.no)