

NATIONAL INSTRUMENTS

LabVIEW™



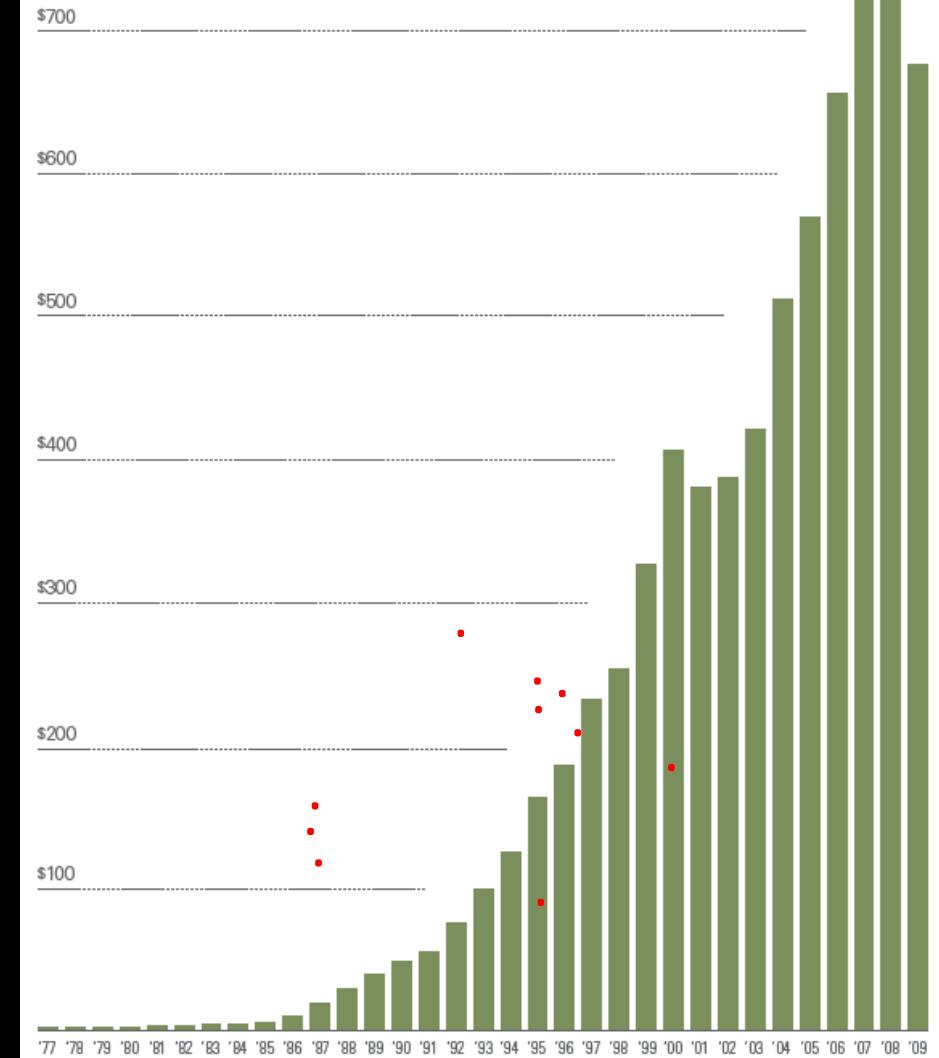
2010

Zileriu Vlad
Sales Manager Romania
National Instruments

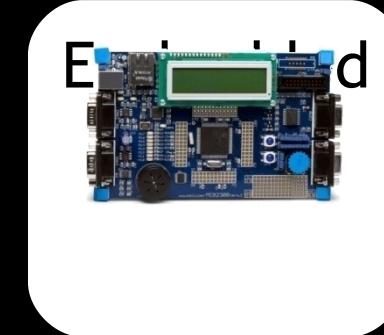
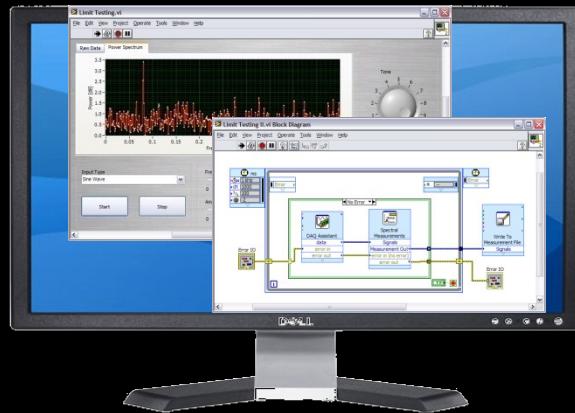
What You'll Do Today



ments at a



Virtual Instrumentation with LabVIEW



Virtual Instrumentation Case Study



HUSH-HUSH: BOEING, PARTNERS TRYING TO REDUCE JET NOISE

1. General Electric has come up with a single-slope block-carbon-fiber lining that traps noise escaping out the front of the engine. It also is testing a perforated titanium ring that also traps engine noise yet still can be heated to keep the cowling's front edge from icing up.

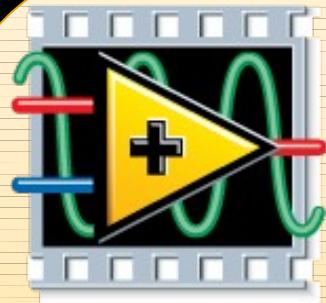
2. Two sets of "chevrons" — scalloped edges at the rear of the engine cover — reduce the noise of air flowing through and over the outside of the engine. General Electric and Boeing say the chevrons GE will build for the 787. For testing, Boeing has placed a 747 engine modified with the chevrons and linings on a 777 belonging to All Nippon Airways.

JUDY STANLEY • THE WALL STREET JOURNAL

The image shows a Boeing aircraft with various noise reduction features highlighted. A callout box labeled 'HUSH-HUSH' discusses the 'General Carbon' lining and a 'perforated titanium ring'. Another callout box labeled '2.' discusses 'chevrons' and their purpose in reducing noise. An inset image shows a ground-based test facility with a large aircraft engine mounted on a mobile platform for testing.

What is LabVIEW?





NATIONAL INSTRUMENTS

LabVIEW™

G

Programming
Language

Hardware Support

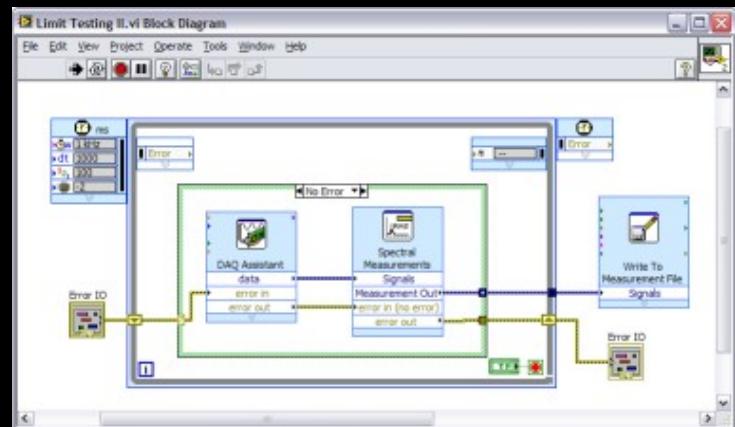
Analysis and
Technical Code
Libraries

Reporting and
Data Visualization
Tools

Technology
Abstraction

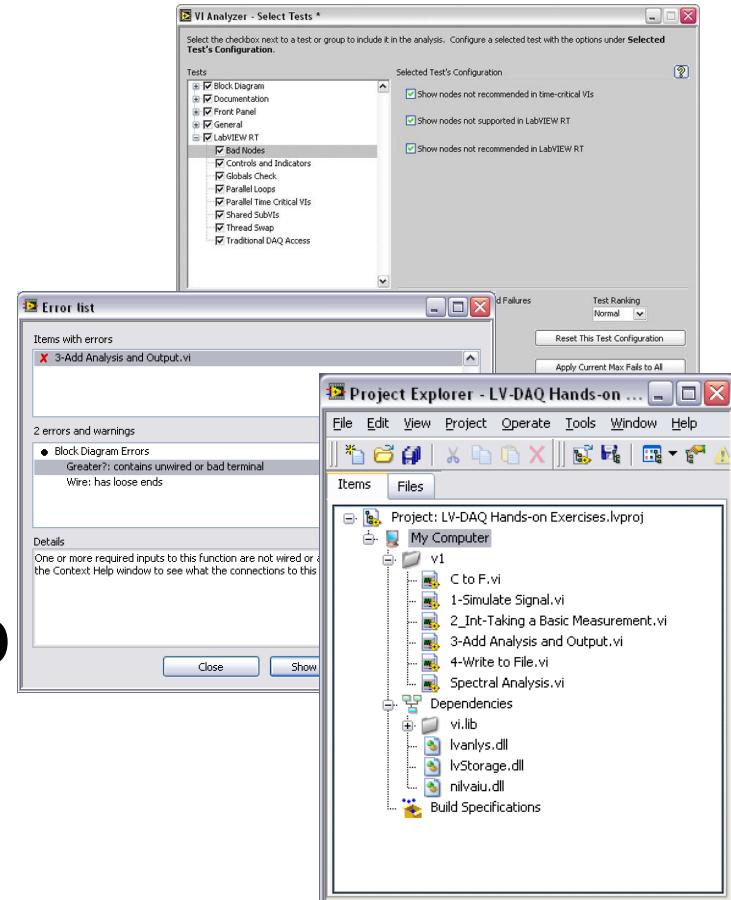
Models of
Computation

LabVIEW is a Programming Language

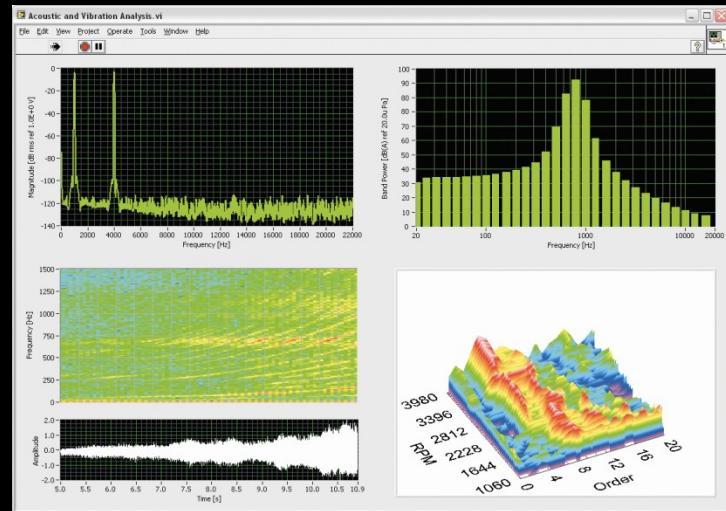


LabVIEW is a Development Environment

- Debugging tools
- Assistants
- Configurable functions
- I/O Finder
- Easy UI Development
- Software Engineering Tools
- Performance Tools



LabVIEW Has Built-in Engineering Libraries



LabVIEW Easily Connects to Hardware I/O



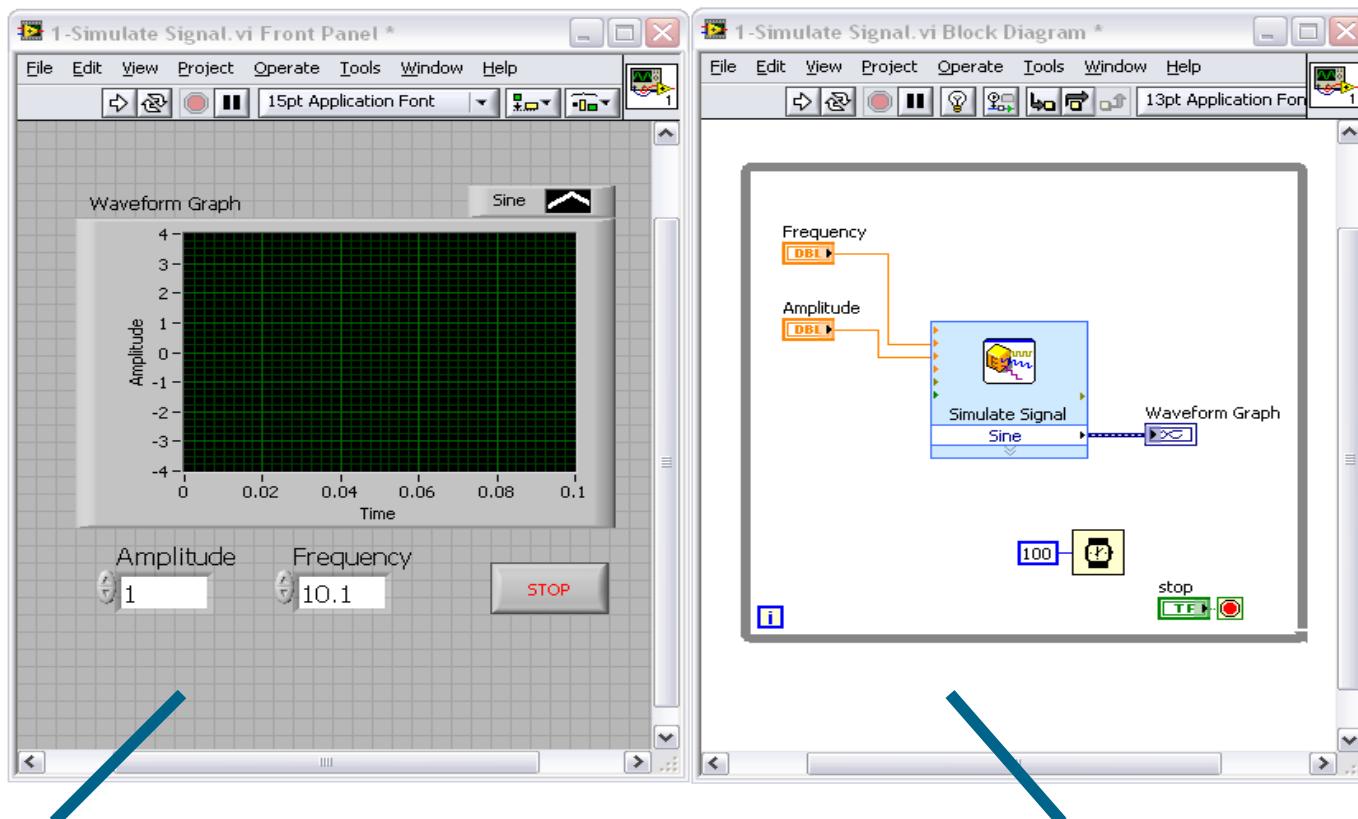


LabVIEW Fundamentals



The LabVIEW Environment

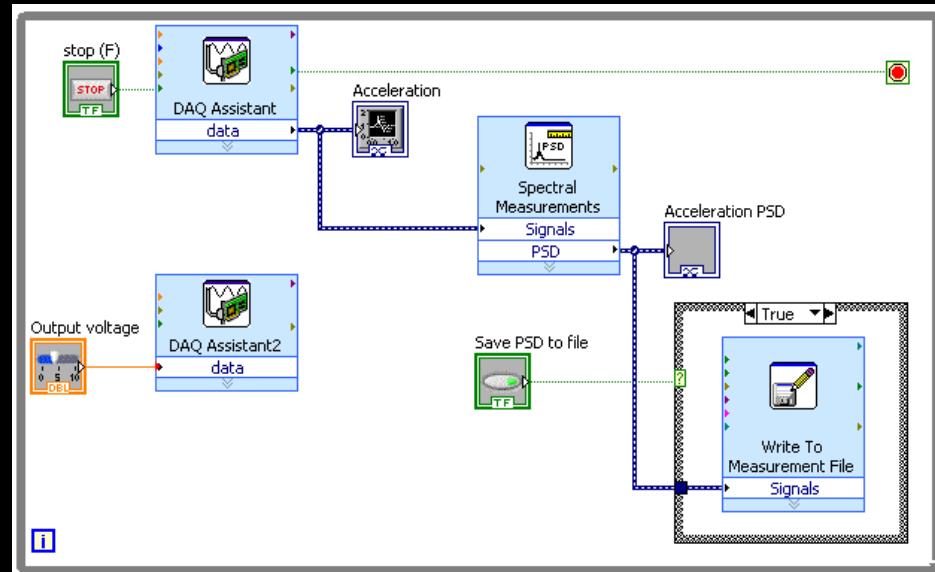
“VI” = program or function



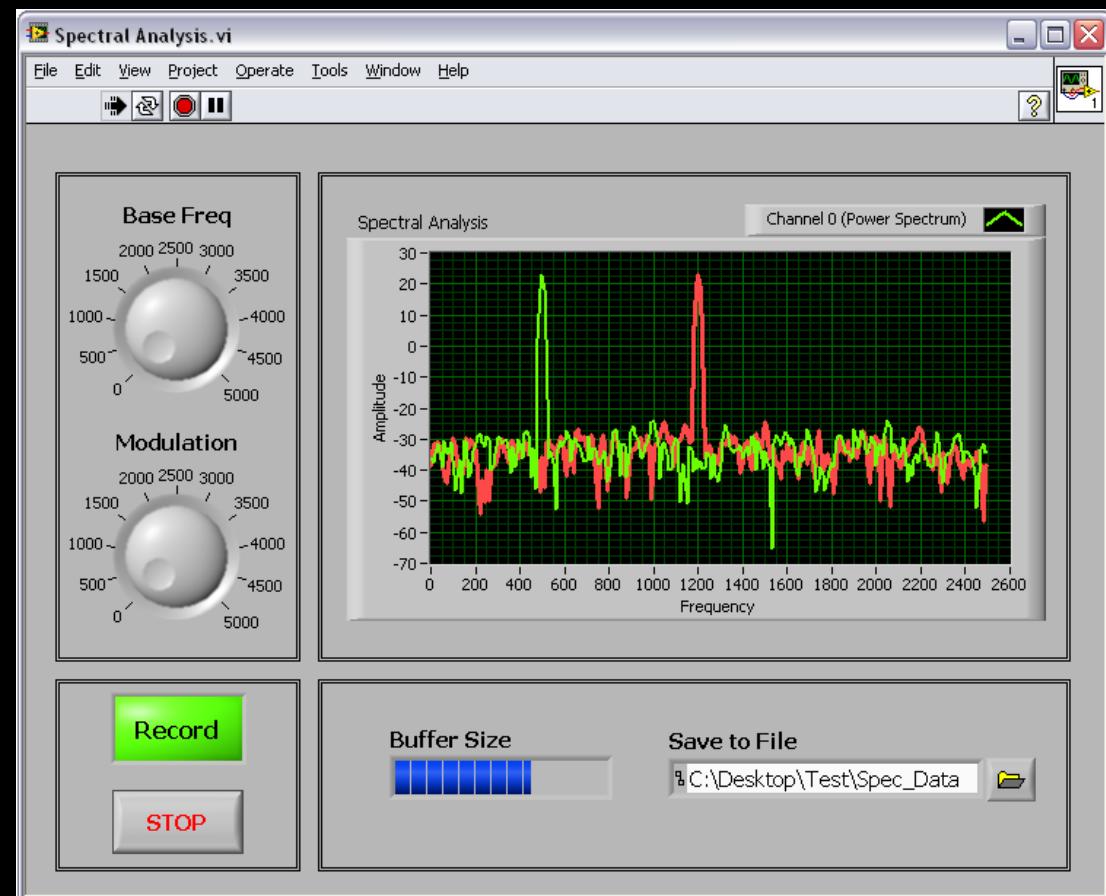
“Front Panel” = user interface

“Block Diagram” = code

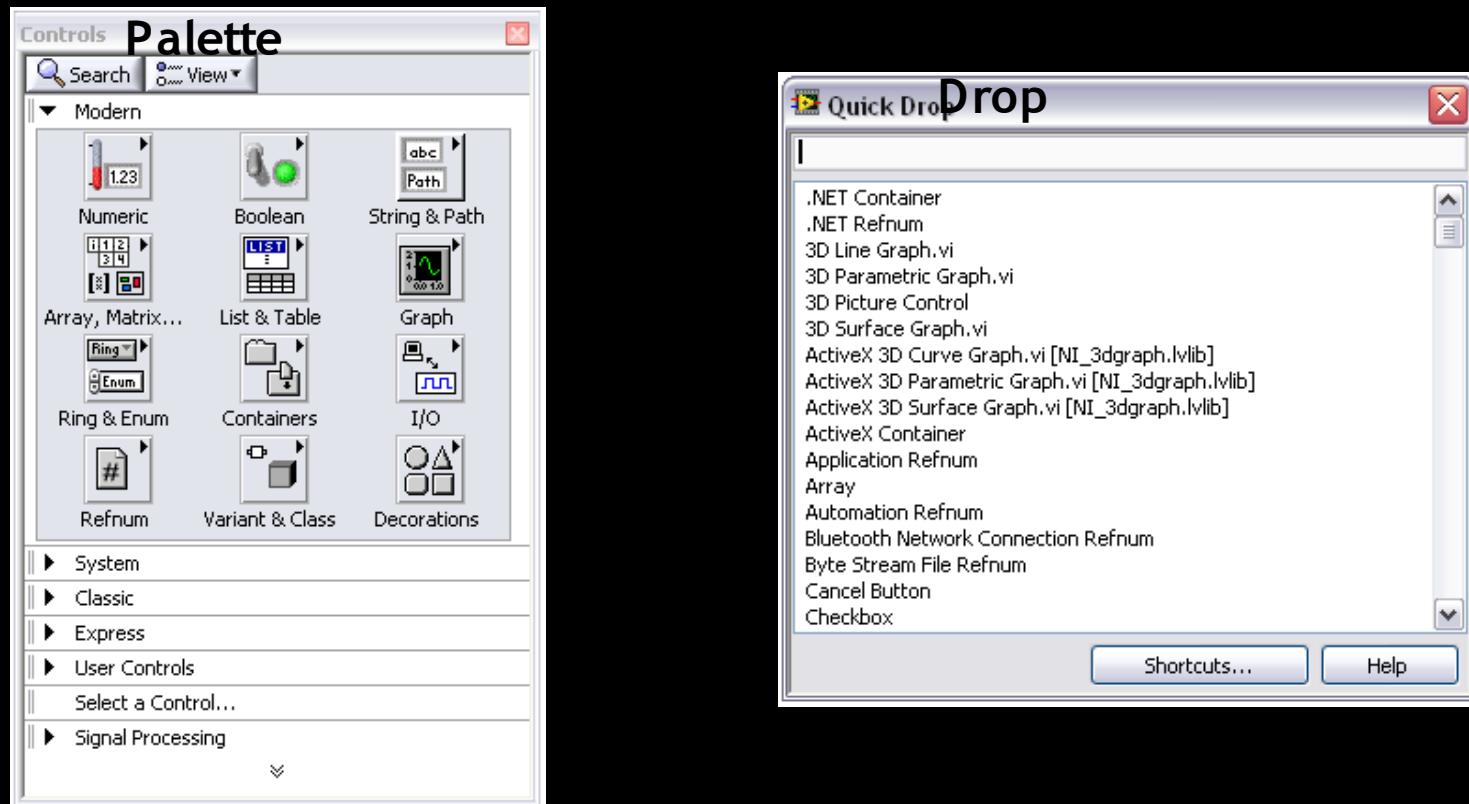
Exercise: Open and Run Final Application



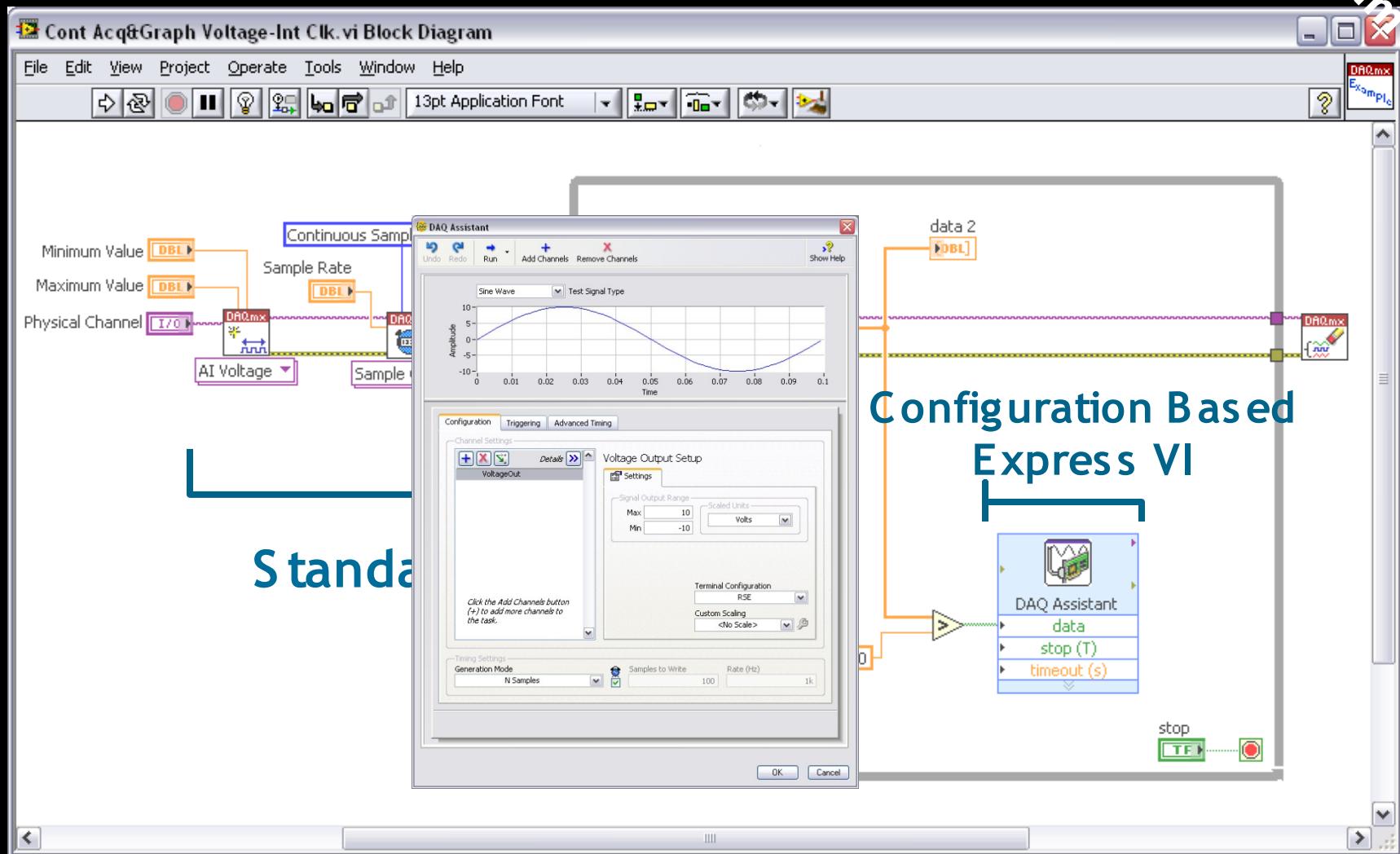
Controls & Indicators



Finding Front Panel Objects



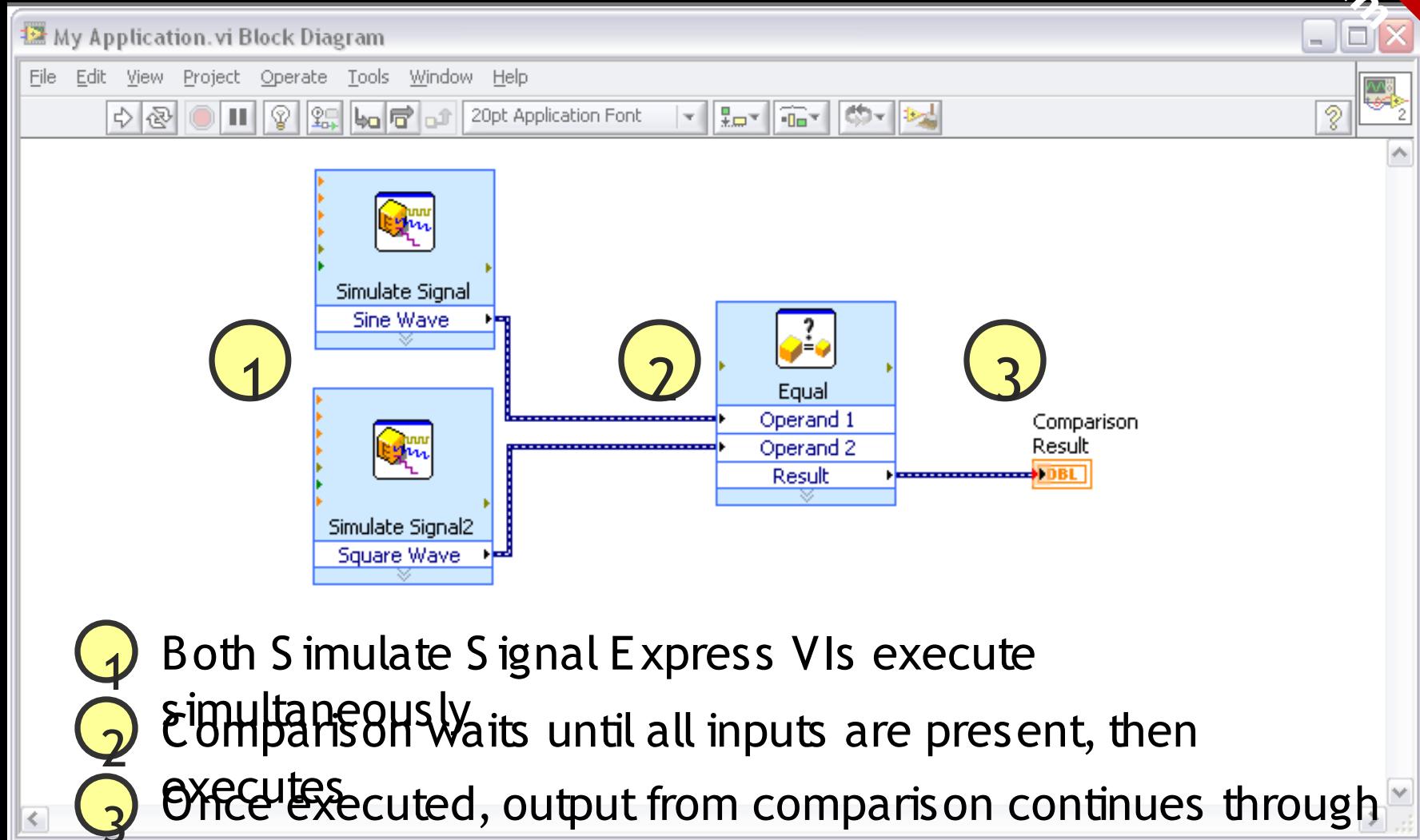
Functions and Express VIs



Standard

Configuration Based
Express VI

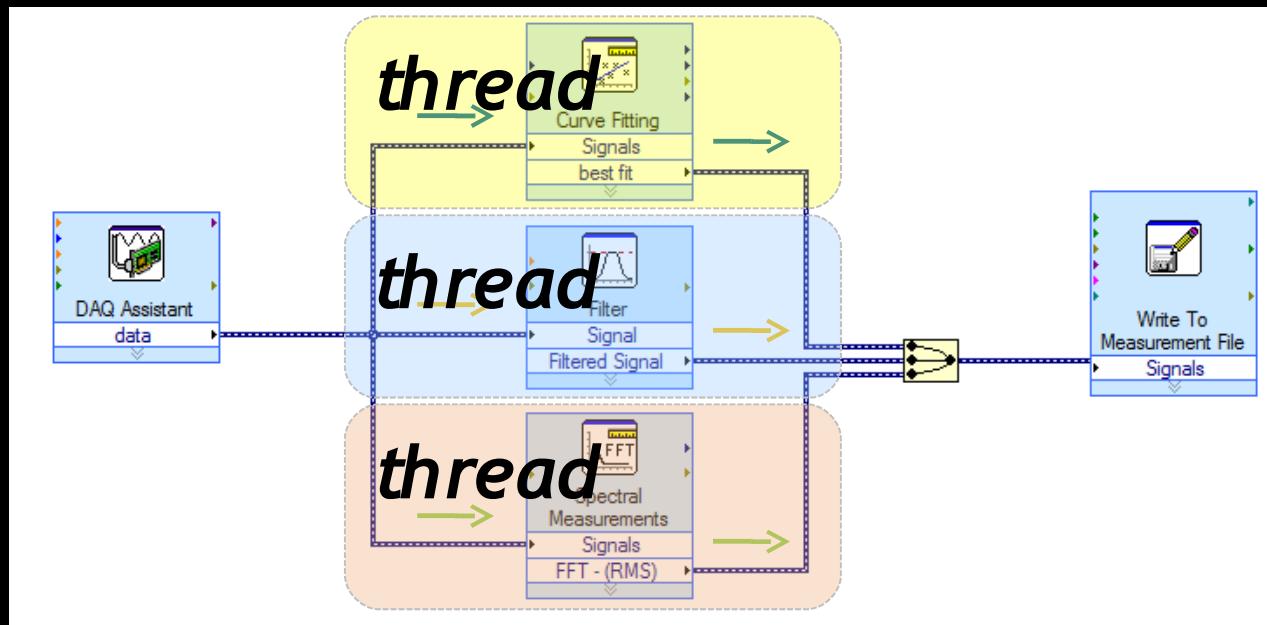
Dataflow Programming



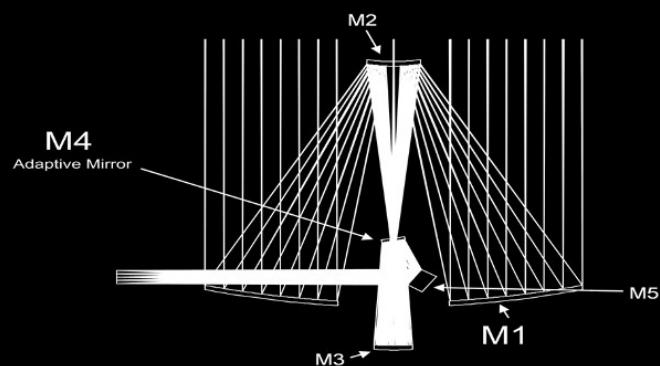
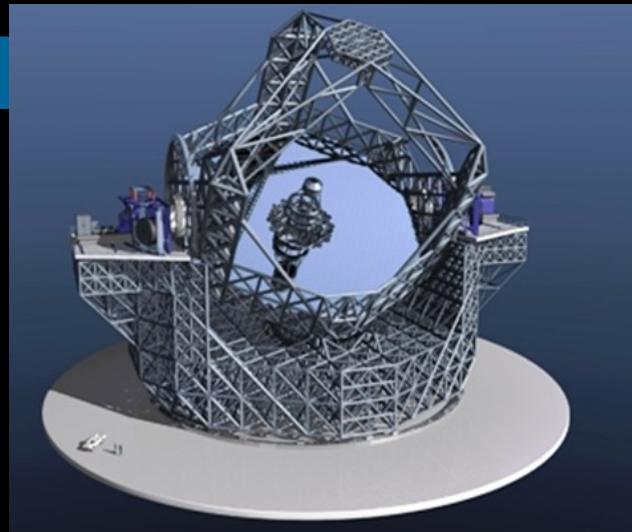
- 1 Both Simulate Signal Express VIs execute simultaneously
- 2 Comparison waits until all inputs are present, then executes
- 3 Once executed, output from comparison continues through

Automatic Multithreading in LabVIEW

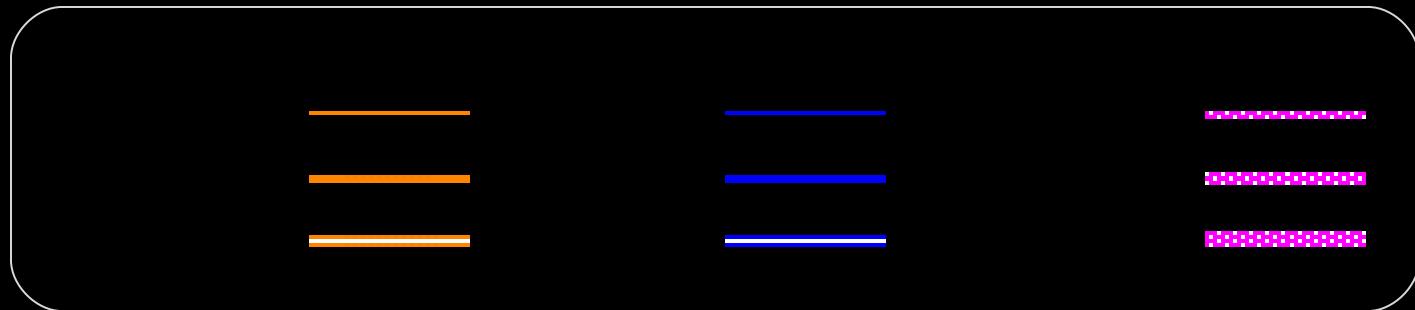
Block
Diagram



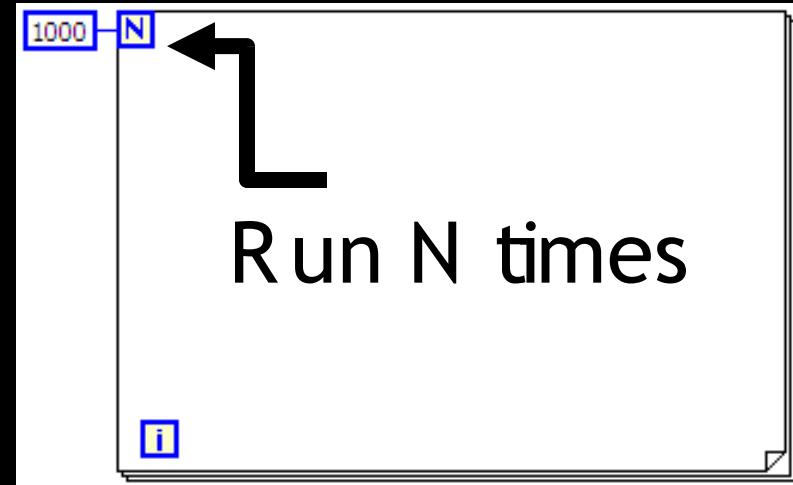
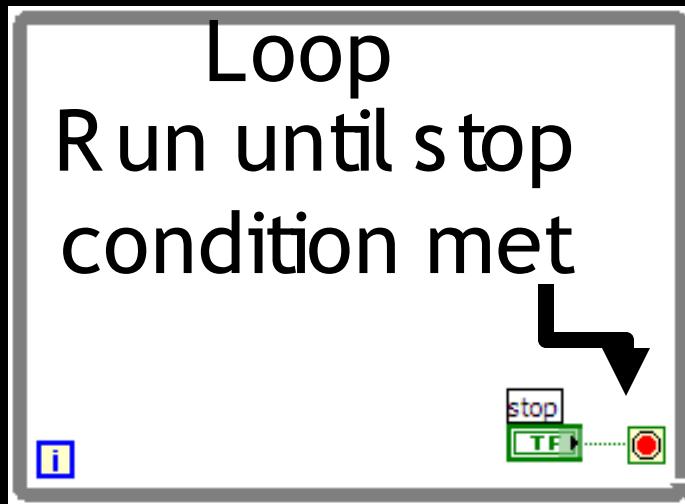
European Southern Observatory LabVIEW Multicore comp



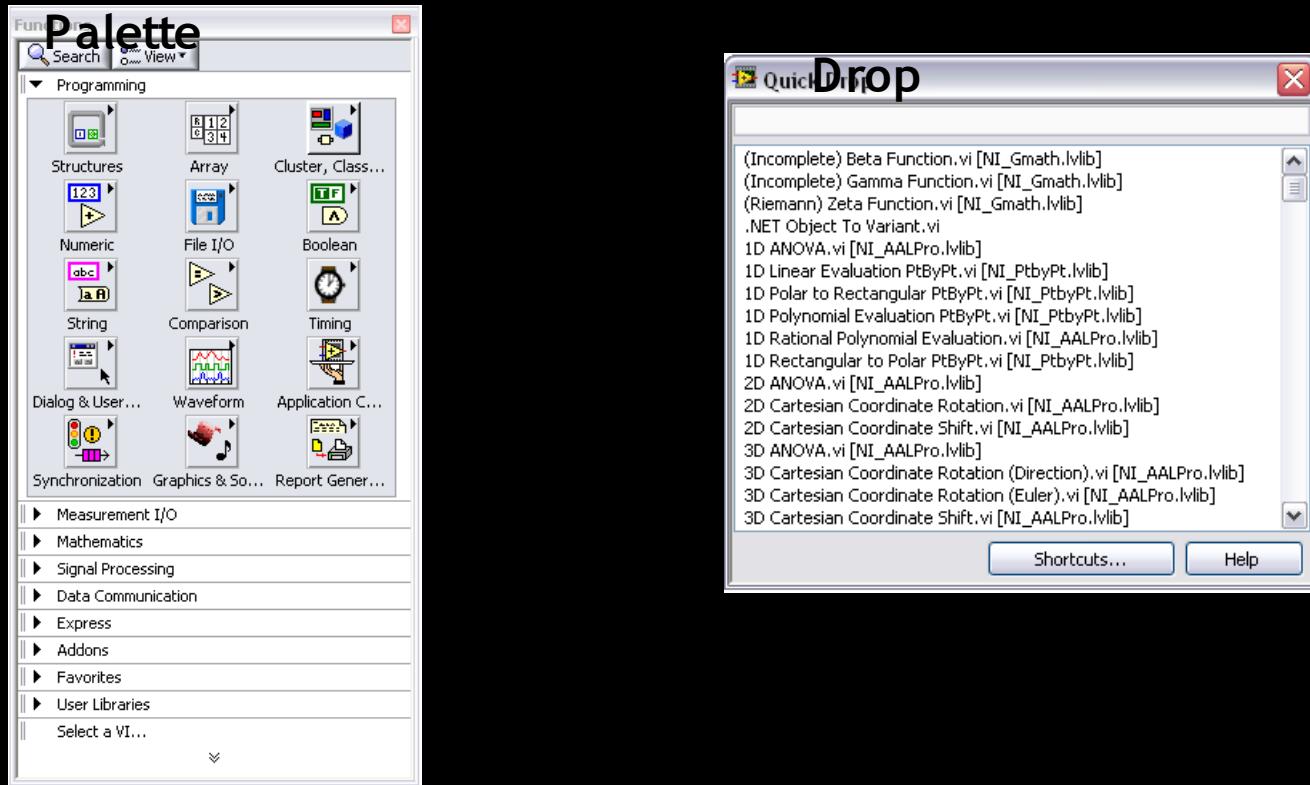
Wires and Data Types



Execution Control Structures



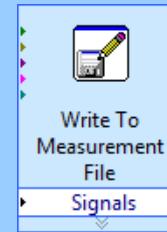
Finding Block Diagram Functions



As Complex as You Need

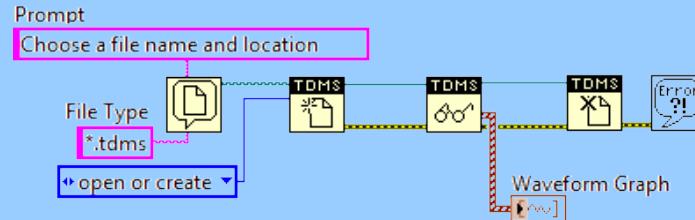
Express
VIs

Quick, easy



Regular
VIs

Hides
unnecessary
details

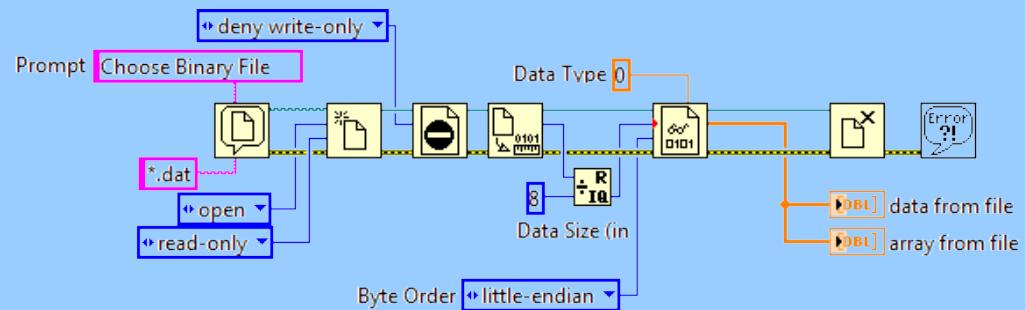


Low-level
VIs

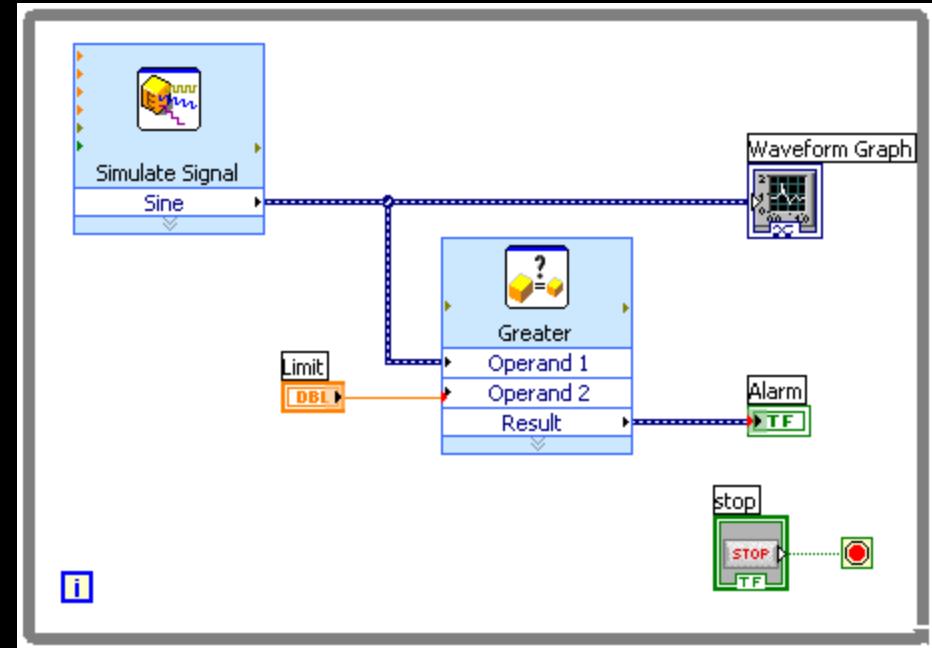
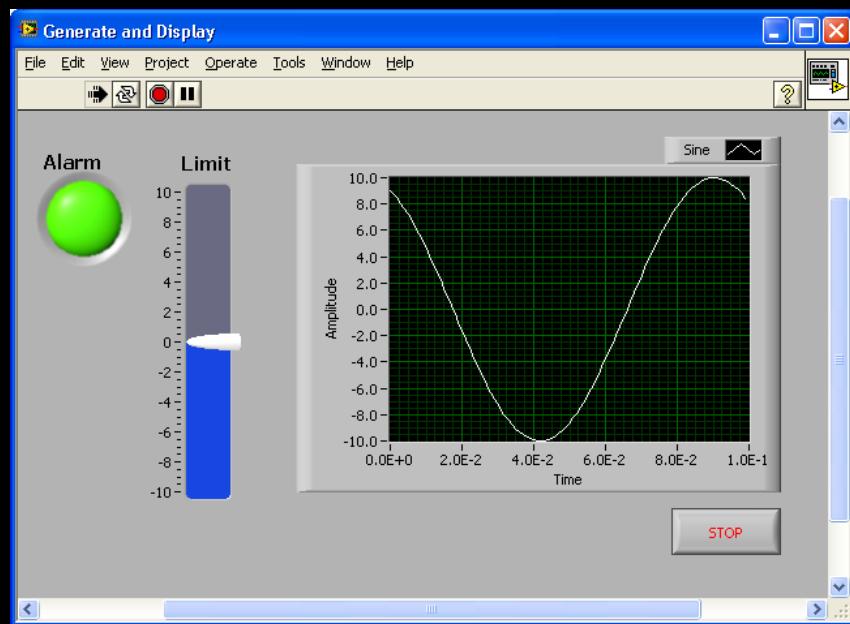
Retains power
and flexibility

Powerful,
flexible,

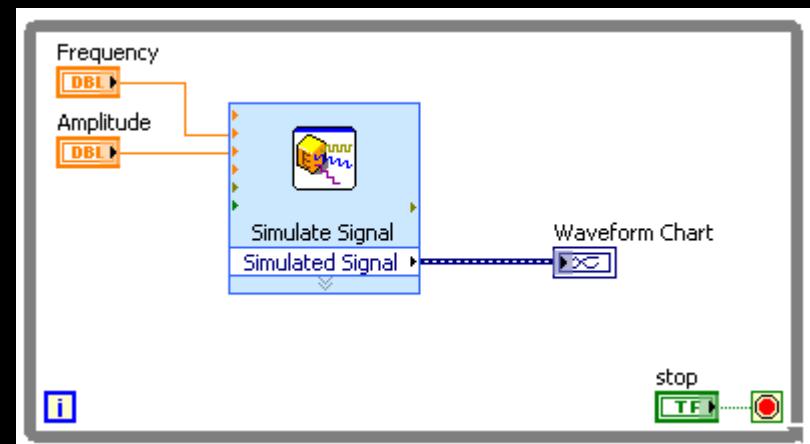
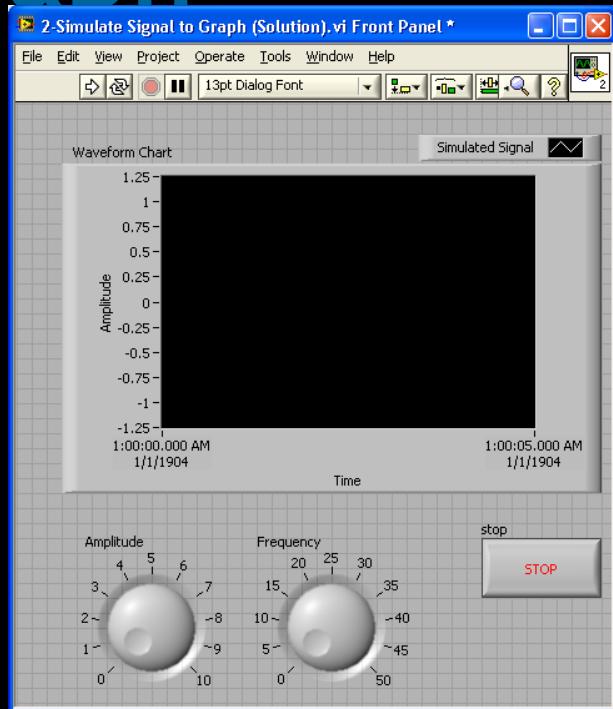
Difficult, time-
consuming



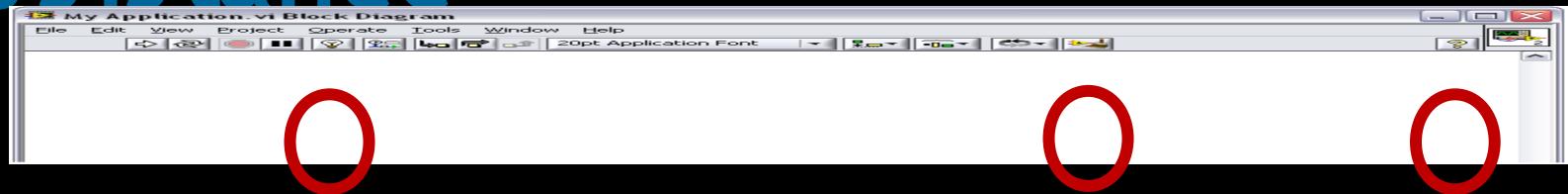
Instructor Demo: Creating a Basic VI



Exercise 2: Simulate Signal to Graph



Built-in Programming Assistance



Highlight Execution

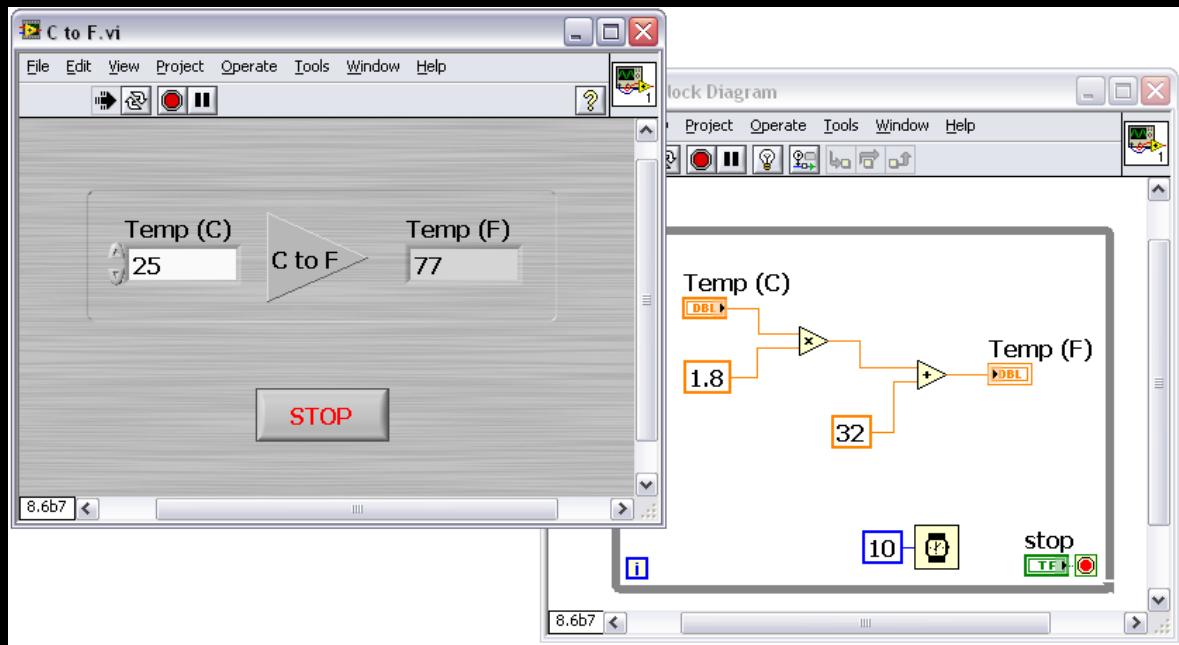


Block Diagram
Cleanup



Context Help

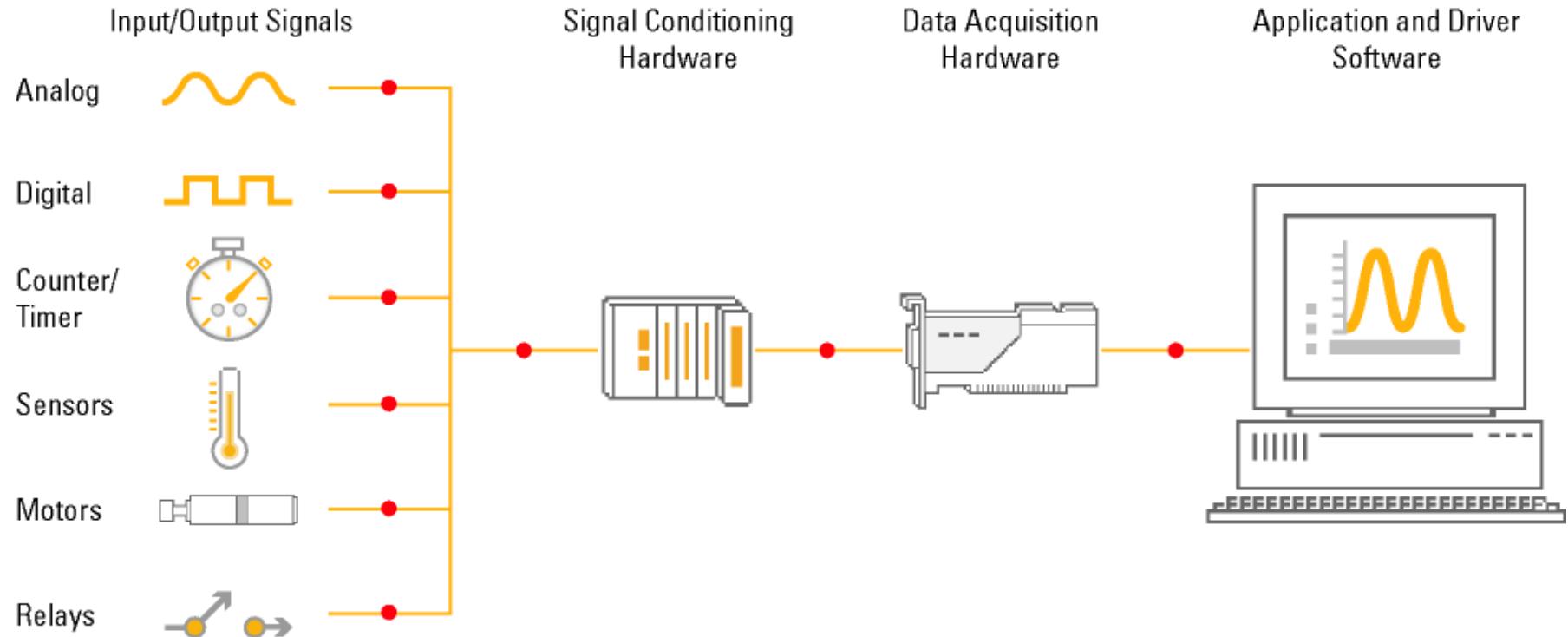
Instructor Demo: Using Help Tools



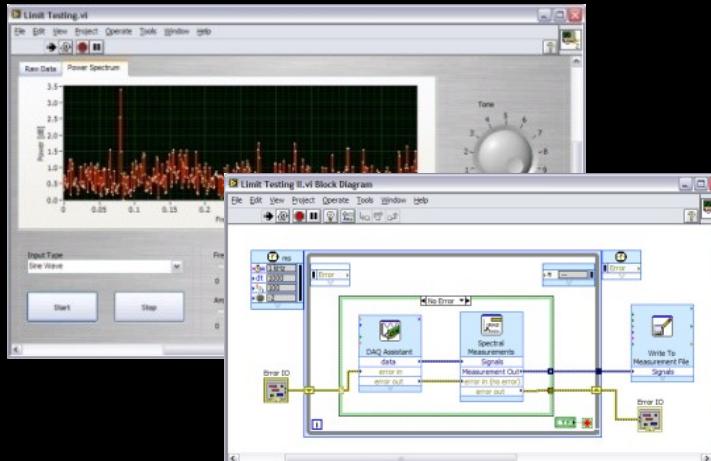
Data Acquisition with LabVIEW



PC-Based Data Acquisition (DAQ)



NI DAQ Platforms



One application,
multiple targets



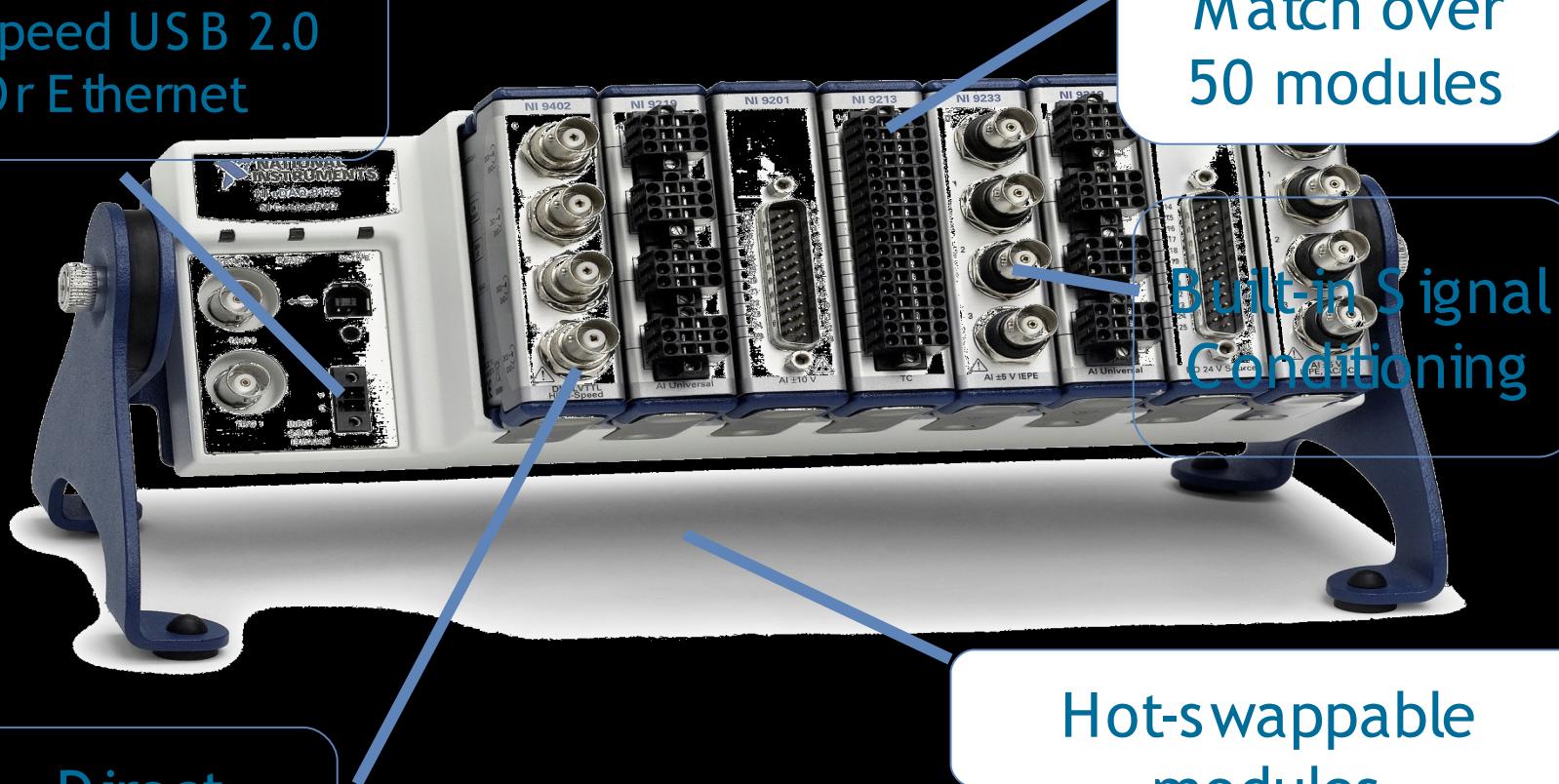
CompactDAQ



Ethernet

Example DAQ System

Hi-Speed USB 2.0
Or Ethernet



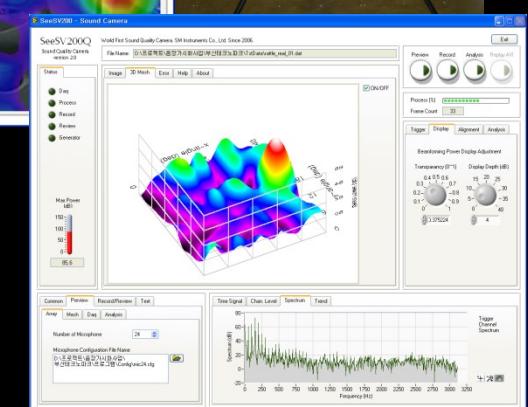
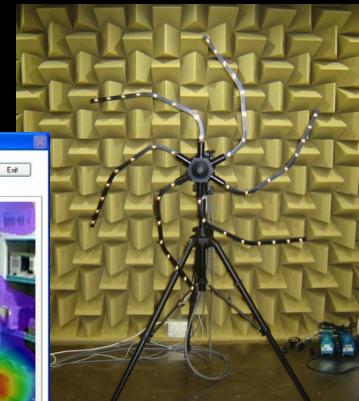
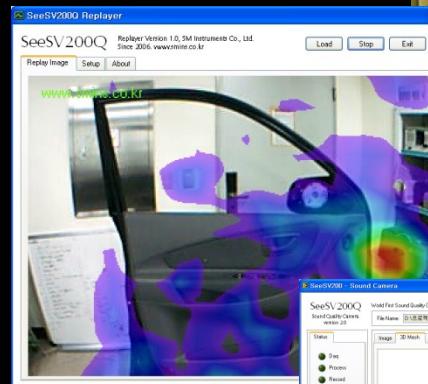
Direct
sensor
connectivity

Hot-swappable
modules

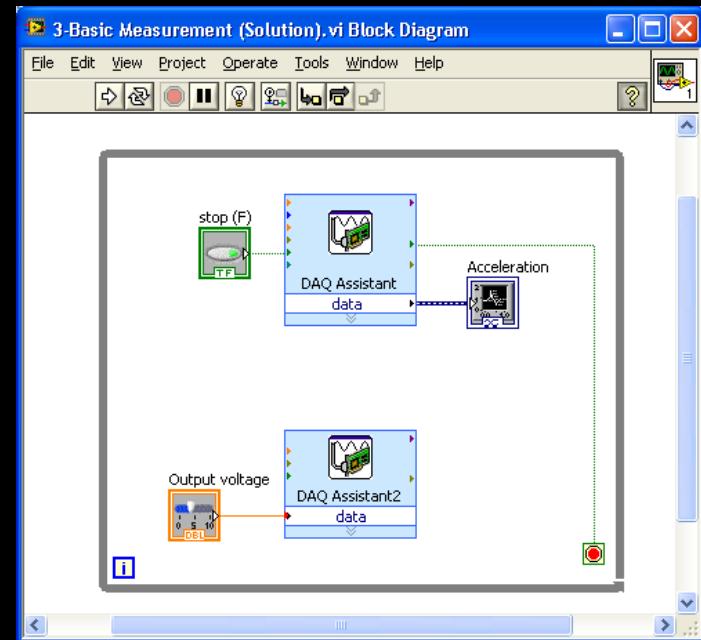
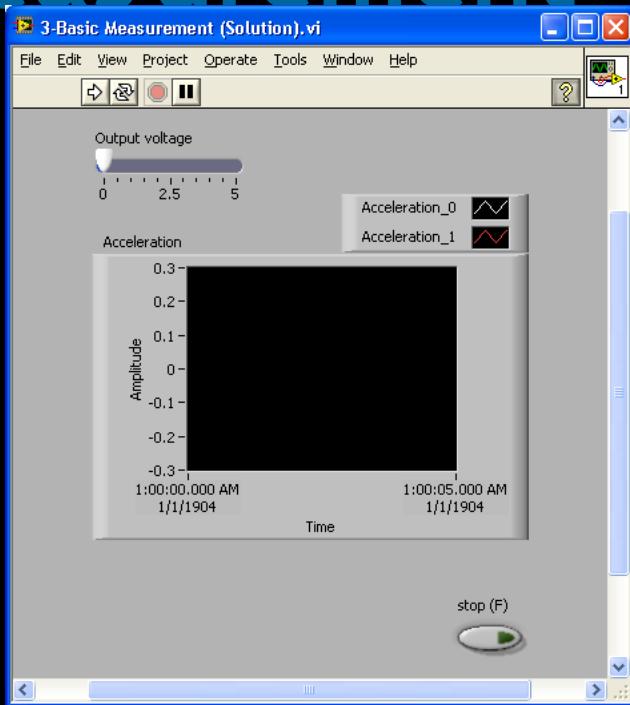
CompactDAQ Door Rattle Noise Analyzer



ting.



Exercise 3: Taking a Basic Measurement



Analysis and Signal Processing



LabVIEW Signal Processing, Analysis and Math

- **Signal Processing & Analysis**

- Waveform Generation
- Waveform Conditioning
- Waveform Monitoring
- Waveform Measurements
- Signal Generation
- Signal Operations
- Windows
- Digital Filters
- Spectral Analysis
- Transforms
- Point-by-Point

- **Mathematics**

- Numeric
- Elementary and Special Functions
- BLAS/LAPAC-based Linear Algebra
- Curve Fitting
- Interpolation / Extrapolation
- Probability and Statistics
- Optimization
- Ordinary Differential Equations
- Geometry
- Polynomial
- Formula Parsing
- 1D & 2D Evaluation

Using Analysis Functions

The screenshot shows the LabVIEW Block Diagram window titled "My Application.vi Block Diagram". The menu bar includes File, Edit, View, Project, Operate, Tools, Window, and Help. The toolbar contains icons for selection, zoom, and various tools. A font size dropdown set to "20pt Application Font" is visible. The main area displays several block diagrams:

- Configuration Based:** On the left, a configuration node labeled "Spectral Measurements" is expanded to show "Signals", "FFT - (RMS)", and "Phase". Its output connects to three signal processing blocks: "FFT", "PSD", and "Waveform Chart".
- Programmatic, Low-Level VIs:** In the center, a configuration node labeled "Spectral Measurements" is expanded to show "Signals", "FFT - (RMS)", and "Phase". Its output connects to three signal processing blocks: "FFT", "PSD", and "Waveform Chart".
- Text-based MathScript Node:** On the right, a MathScript Node contains the following script:

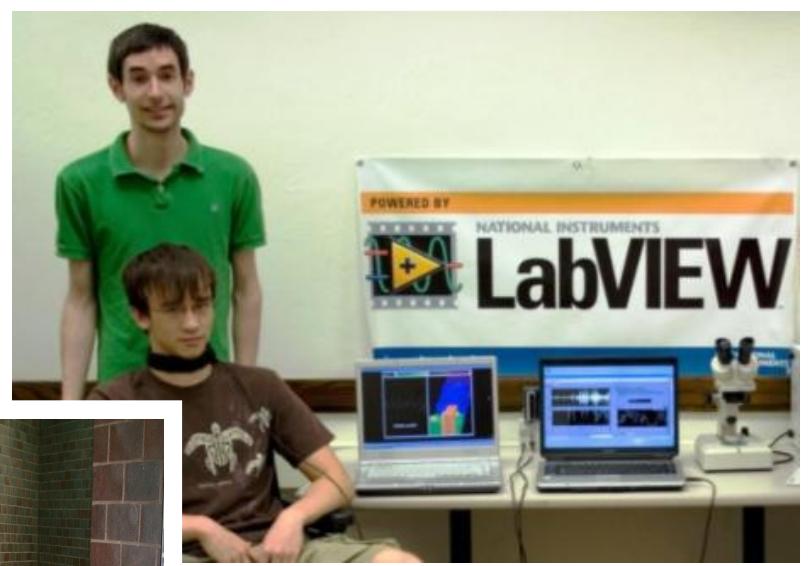
```
%This script generates cosine coordinates
length = 1.23;
n=0:length;
x=cos(2*pi*a*n);
```

The node has two inputs: "length" and "a", both connected from the previous "FFT" block. The output "x" is connected to a "Waveform Chart" block.

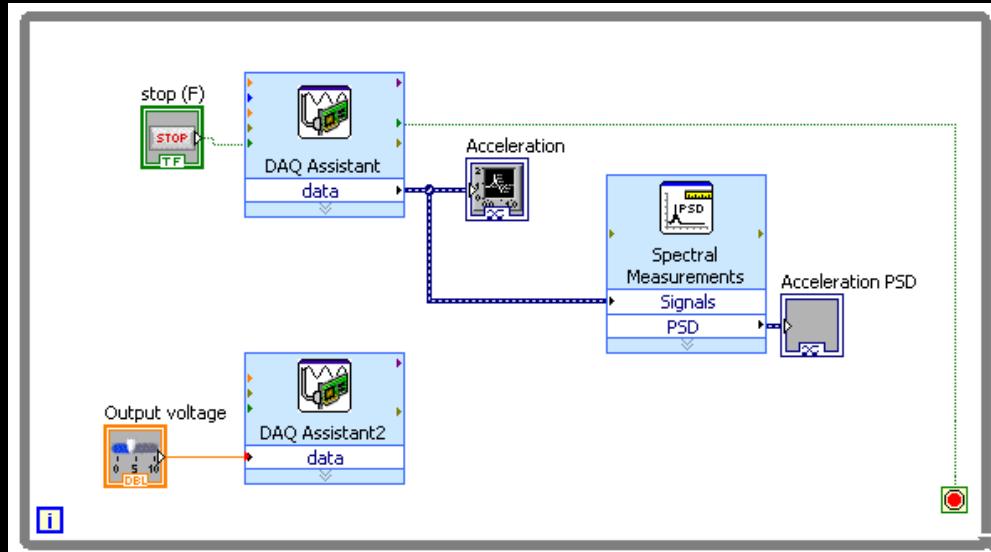
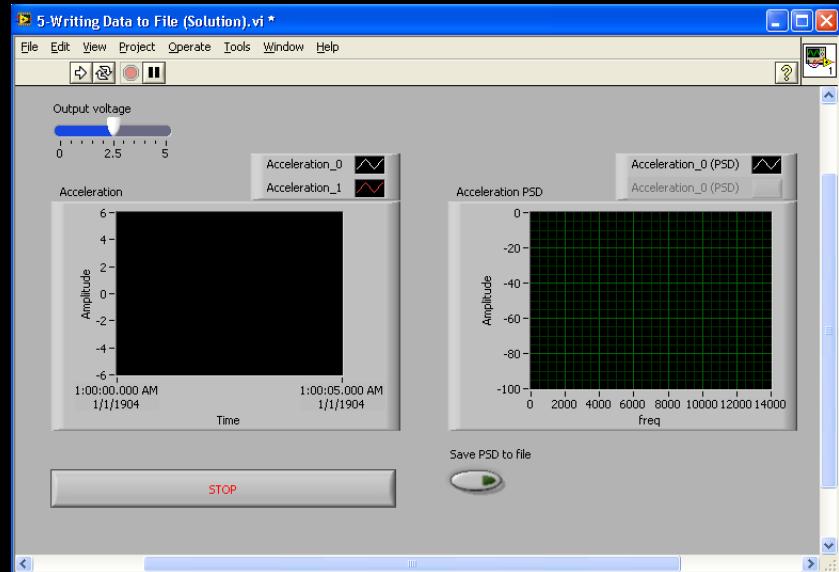
Advanced Analysis - Mind/Computer Interface

ambient

www.theaudio.com



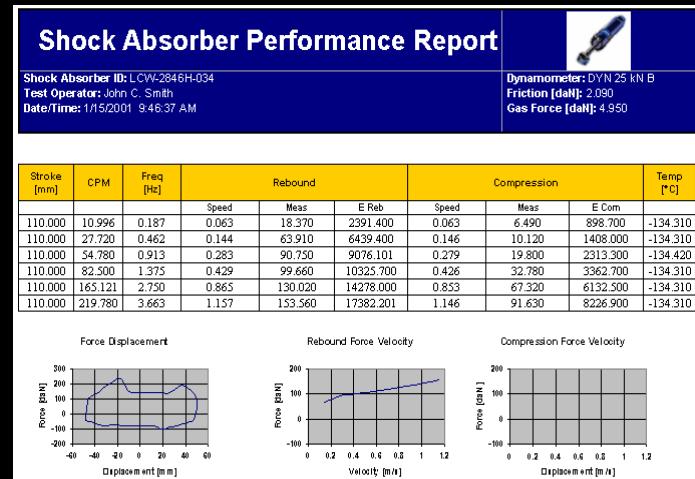
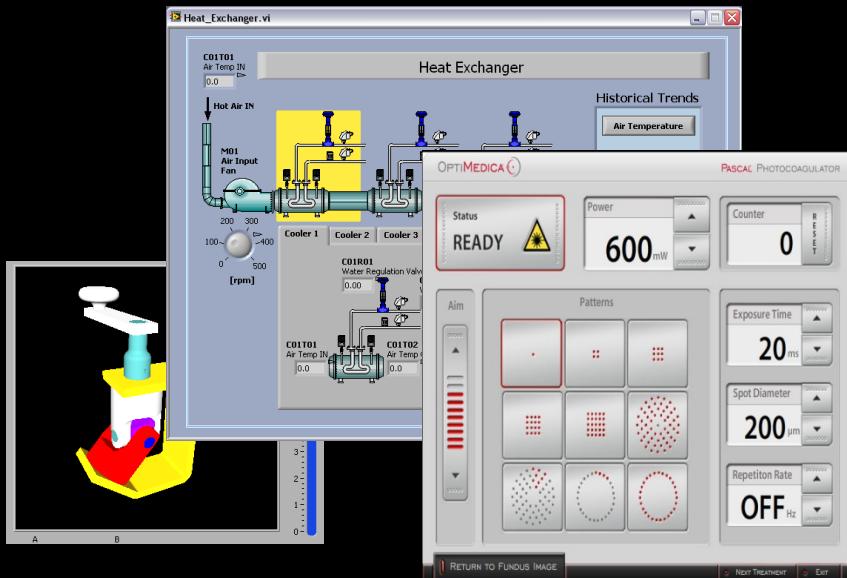
Exercise 4: Add Analyses and Output



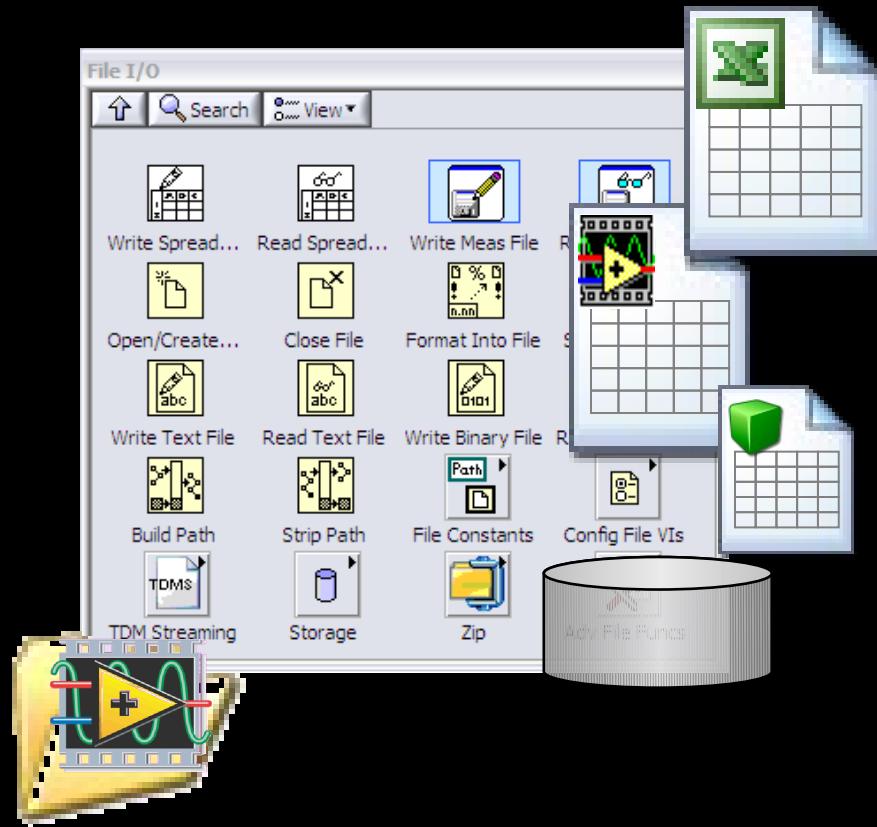
Reporting and Data Visualization



Data Visualization and Communication



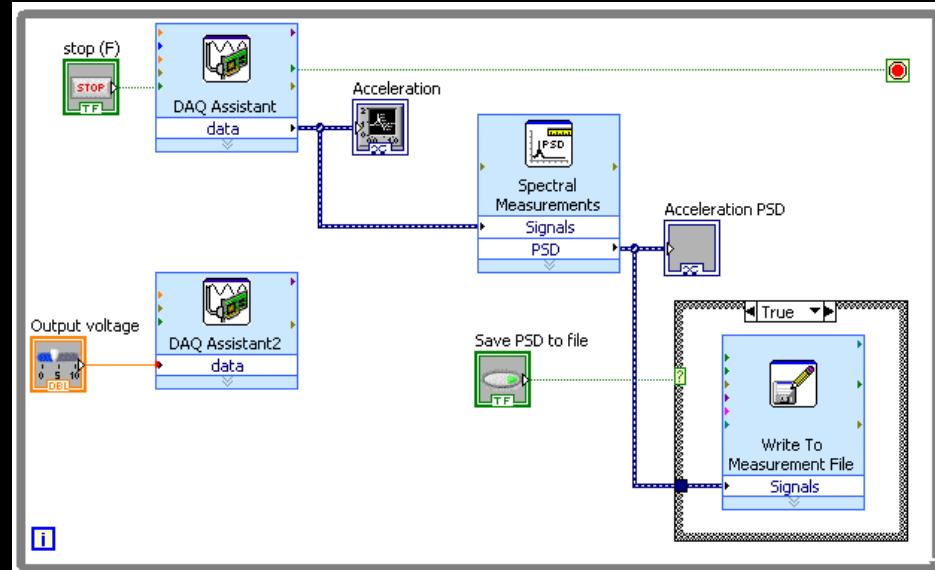
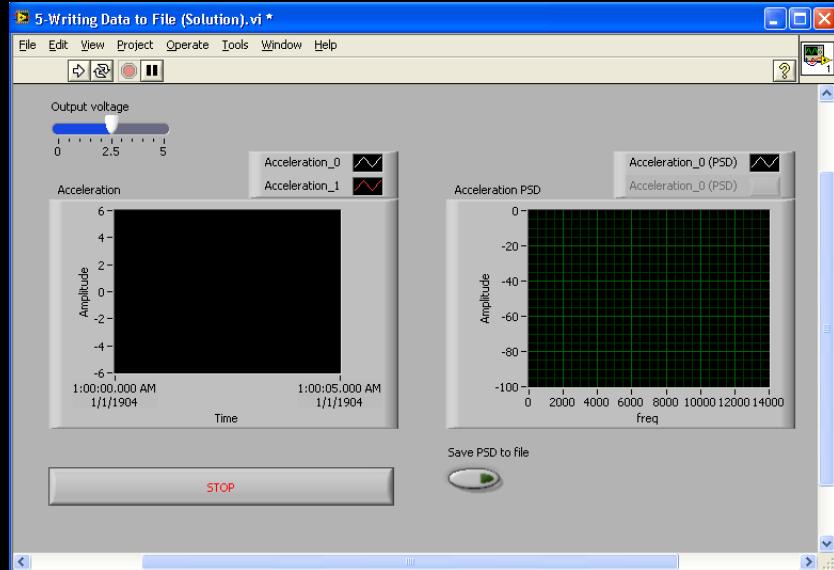
LabVIEW Supported Storage Types



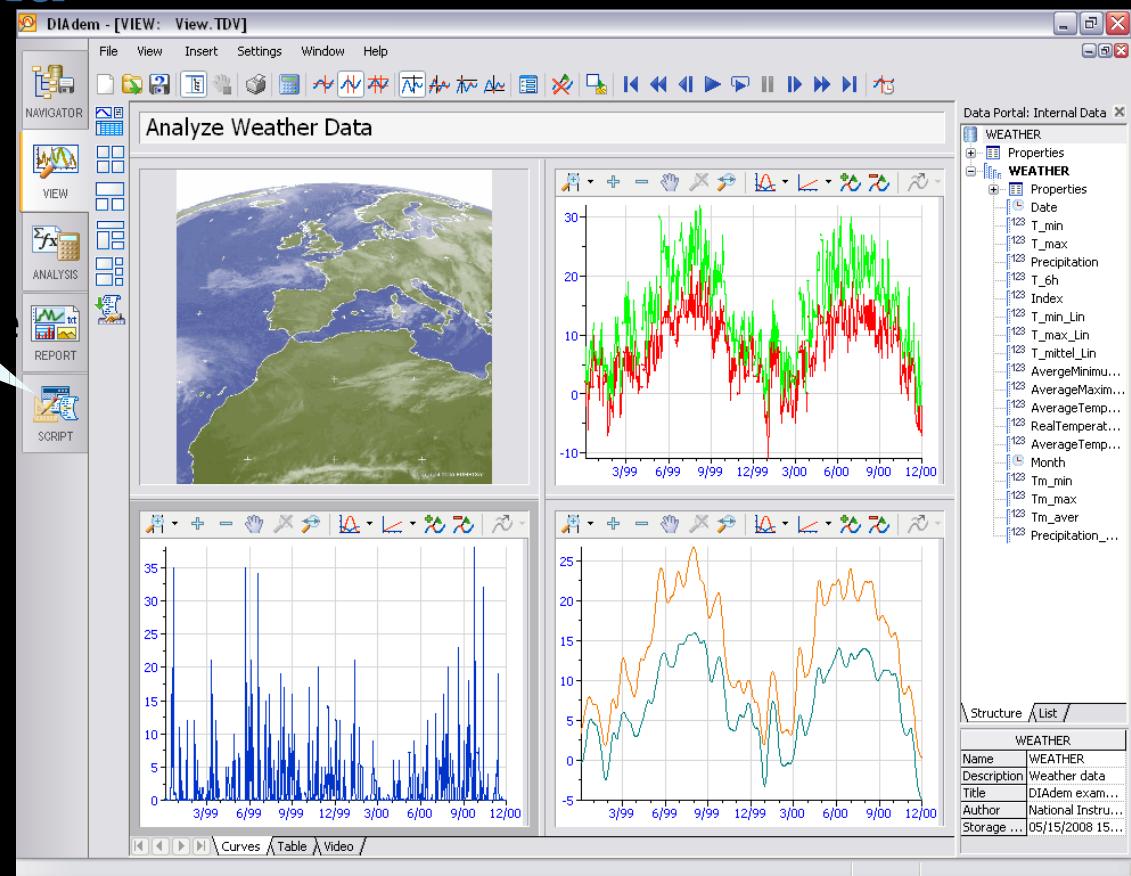
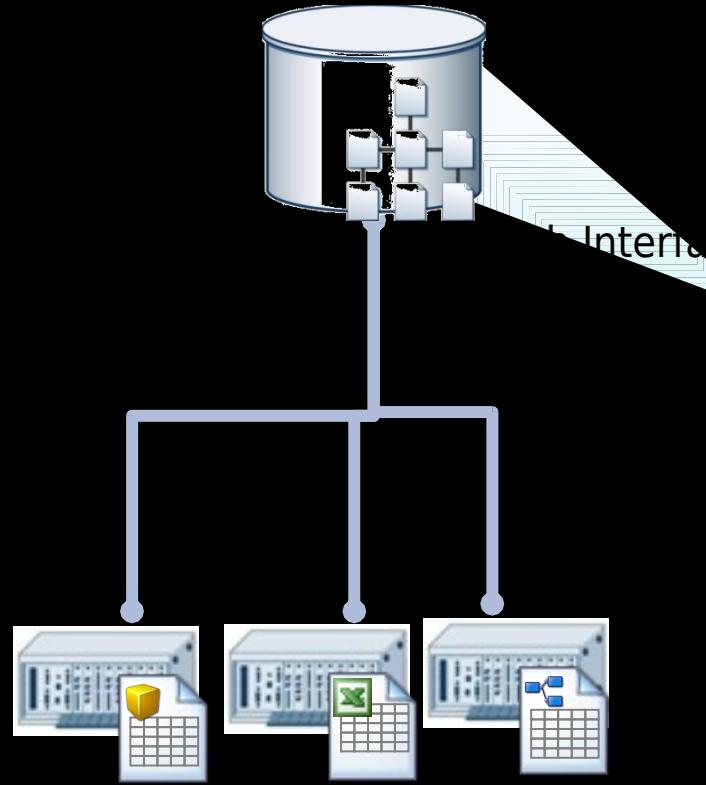
Fjord & Bælt - Acquire, Analyze and Log acoustic communication of killer whales



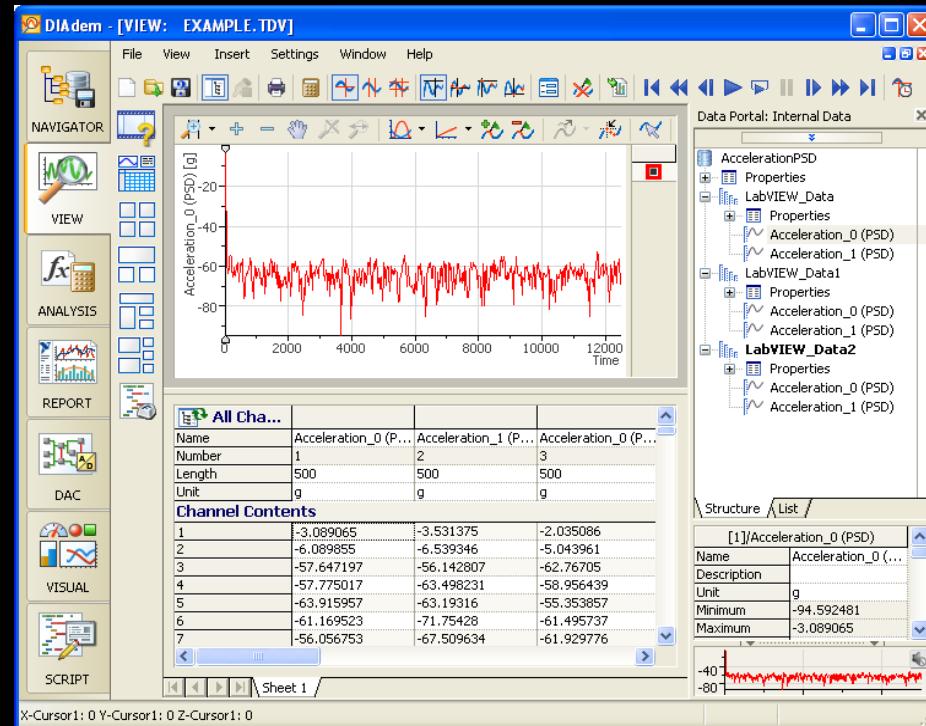
Exercise 5: Write to File



Software to Interactively Manage, Analyze and Report Measurement Data



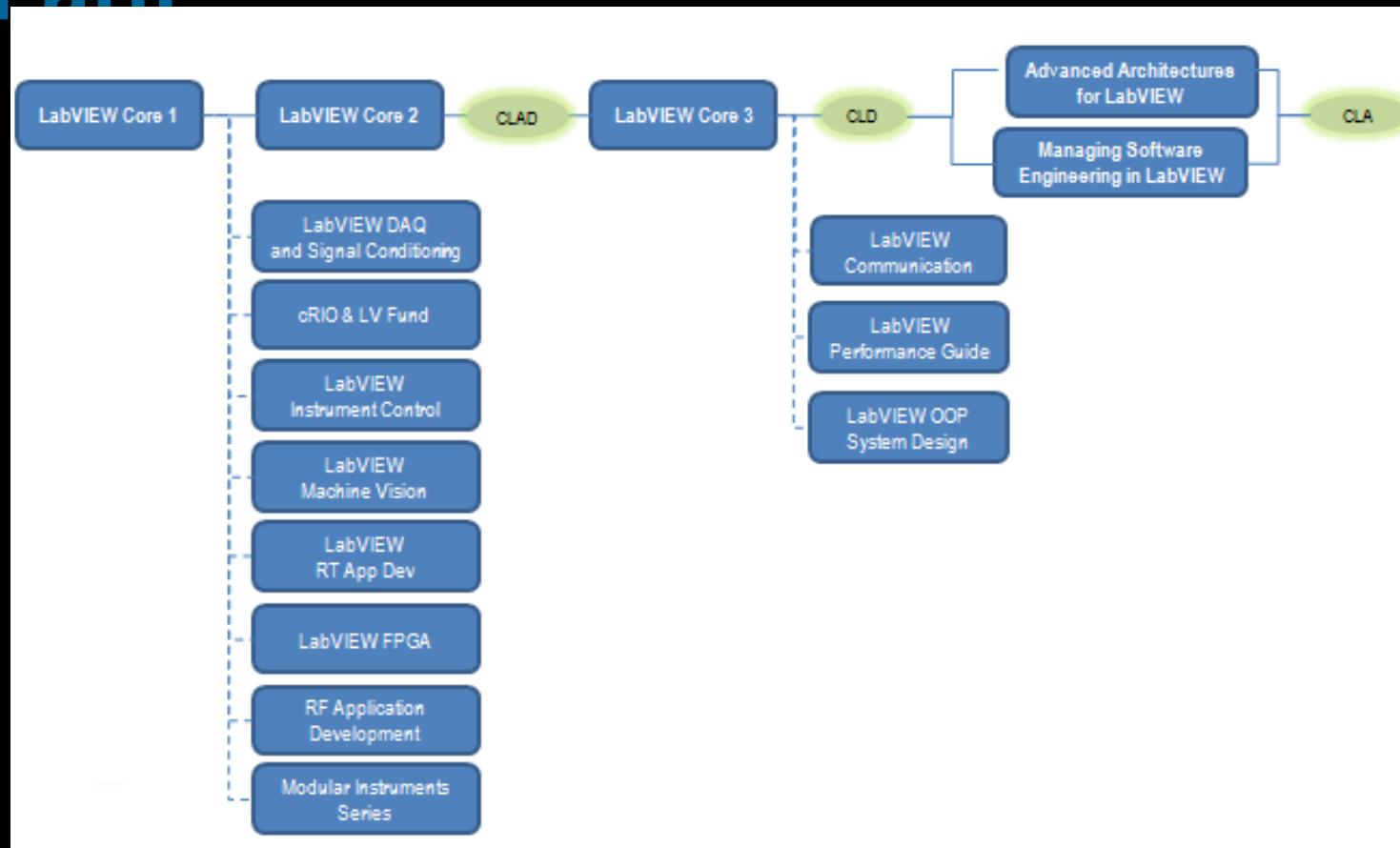
Exercise 6: Reading the Data in DIAdem



Next Steps



LabVIEW Training and Certification Path



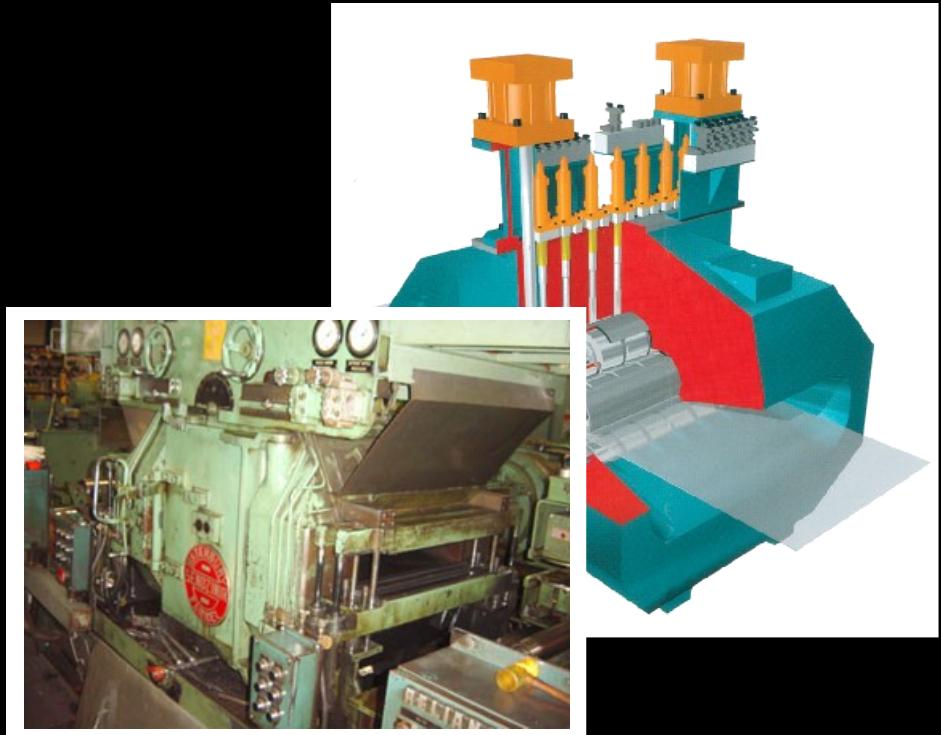
ni.com/romania/training

Training and Certification Membership Program



**Thank you for your
attention!**

Control for Steel Rolling Mill



CompactDAQ Safety helmet crash test

