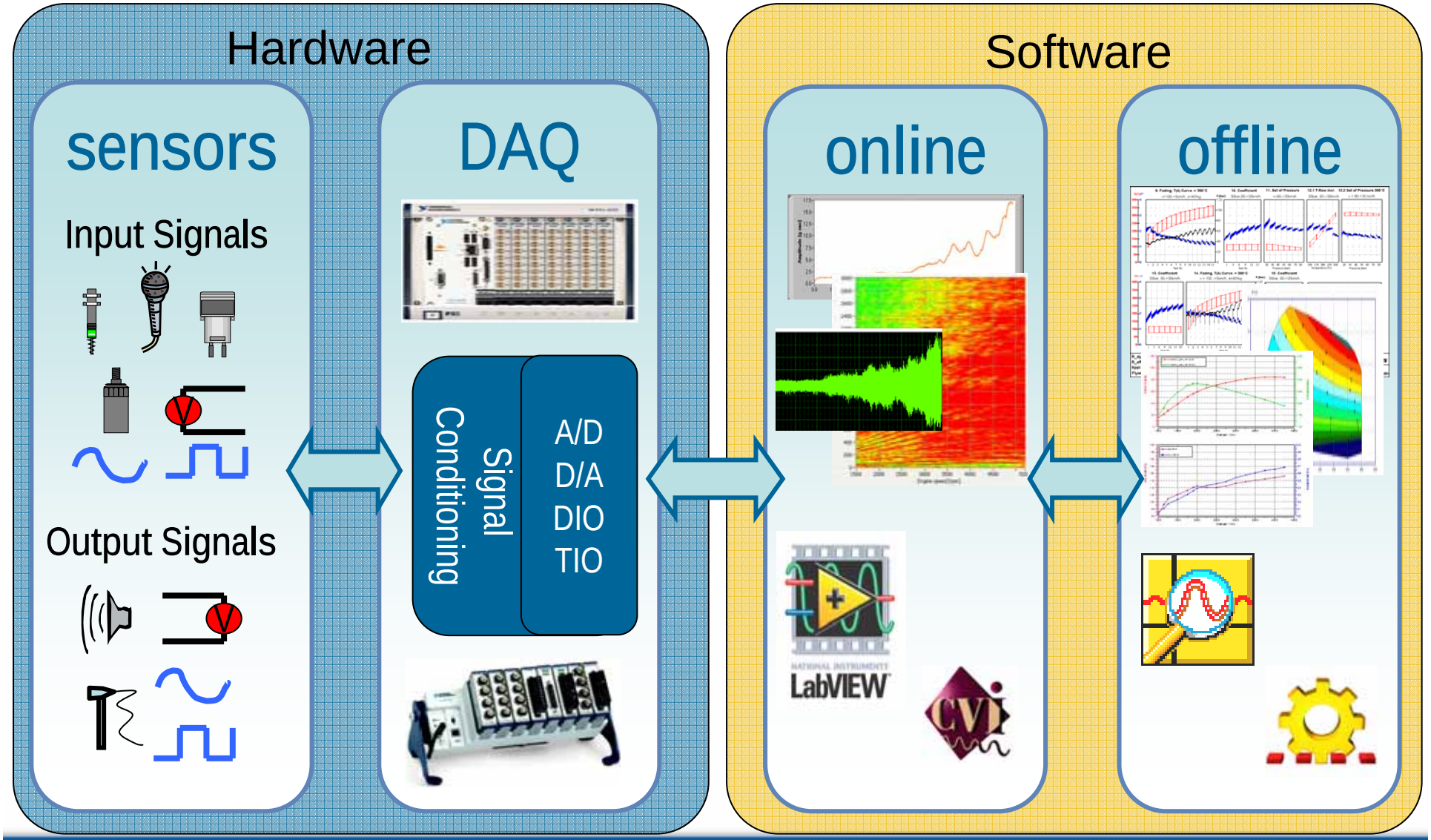
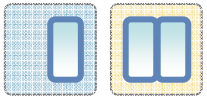
# Automotive Measurement Technology: In-Vehicle and in the Lab

Ingo Schumacher
Business Development Technical Data Management
National Instruments Germany
Ingo.Schumacher@ni.com

# Data Acquisition System Components



# Agenda



- Components of a DAQ System
- Hardware for Signal conditioning and DAQ
- Software for DAQ and online data processing
- Software for postrocessing,data management, and report generation
- Example application

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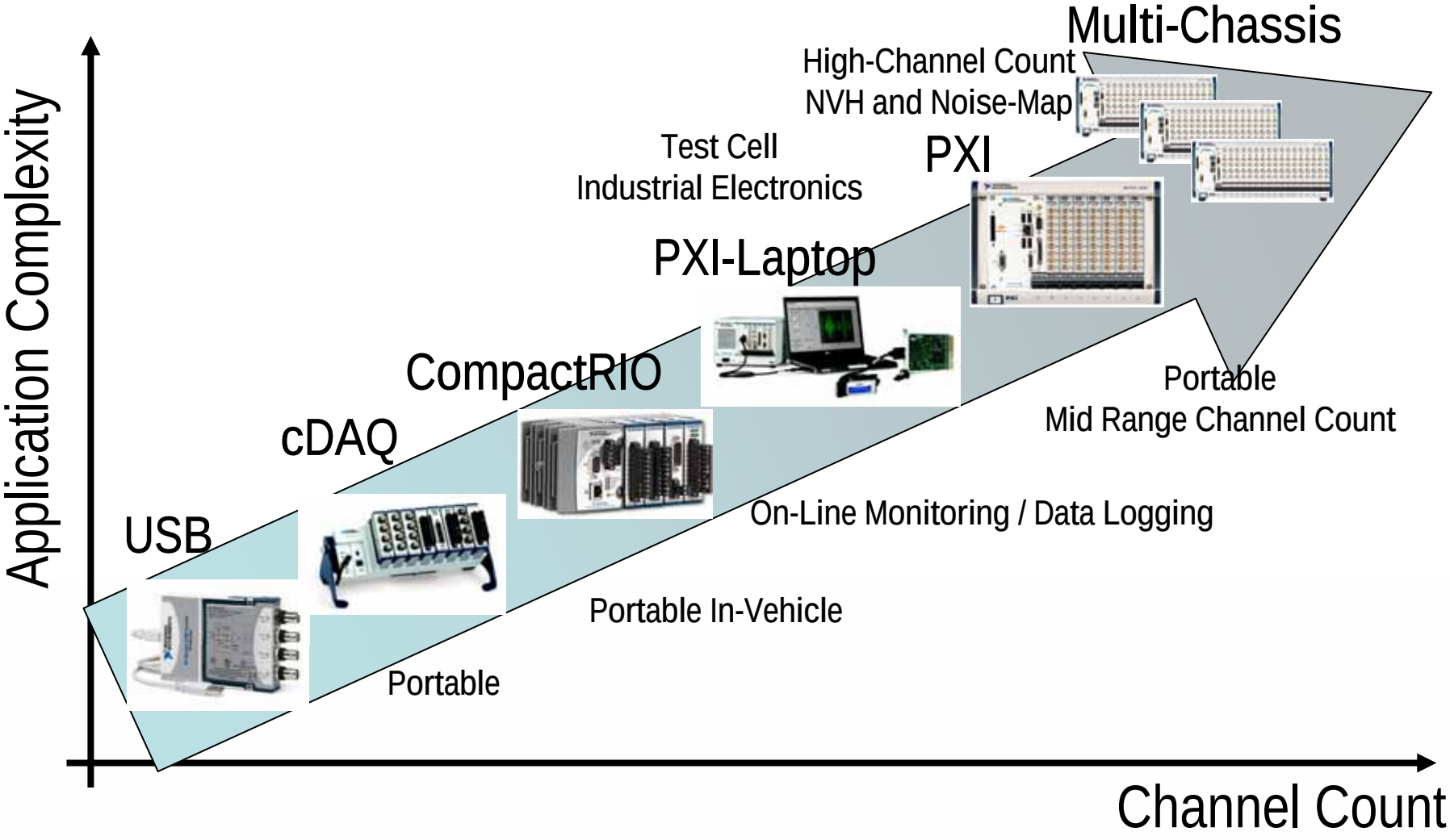
# NI DAQ Hardware Platform



# The NI USB Family

Bus-Powered

Modular I/O for Sensors

1.25 MS/s AI
2.8 MS/s AO

Low-Cost

# NI cDAQ Technology

High-Speed Parallel Signal Streaming

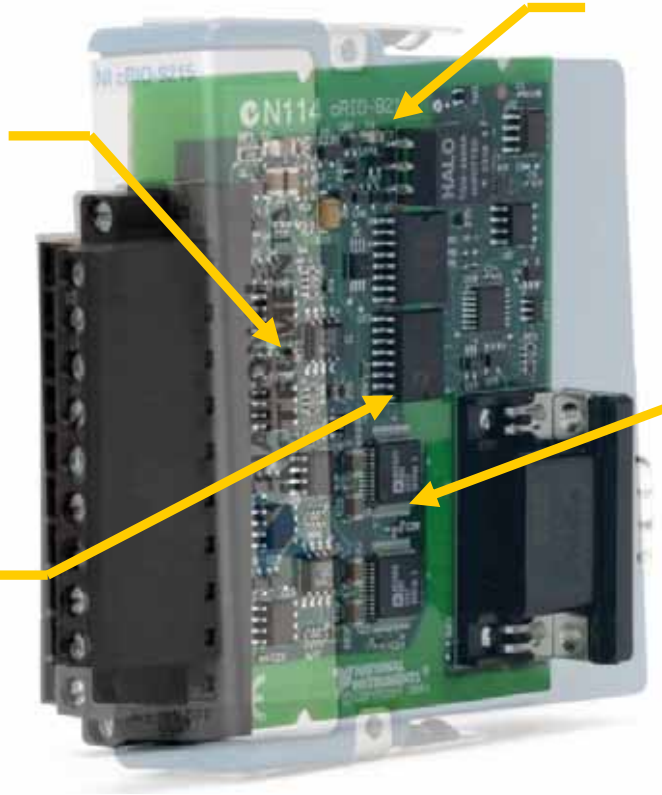
USB STC-2 Timing and Triggering

Module Auto-Detection and Control

# Integrated DAQ, Signal Conditioning & Connectivity

**Guaranteed Accuracy**
NIST traceable calibration

**Built-in Signal Conditioning**
Direct connection to industrial sensors and actuators

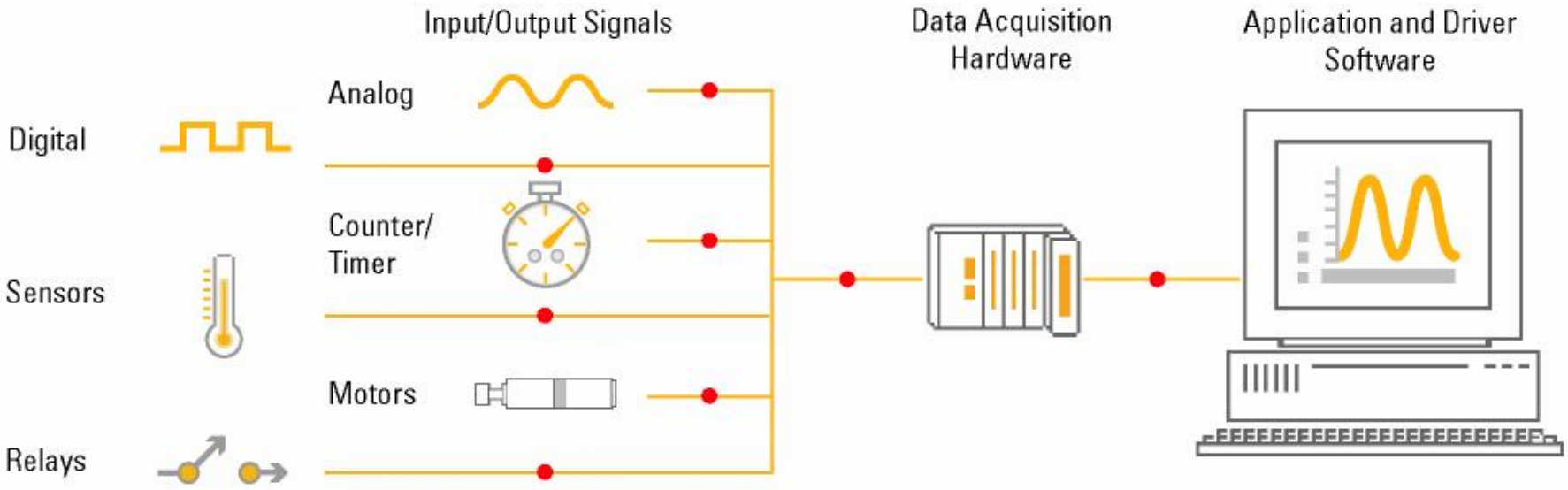


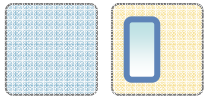
**Signal to Backplane Isolation barrier**
Safety, noise immunity, common mode rejection

**Available 24-bit Delta-Sigma ADC**
DSA signals, TEDS enabled, built-in antialiasing filters

# Broad Sensor Compatibility

- Thermocouples
- RTDs
- Thermistors
- Strain gauges
- Photo sensors
- Potentiometers
- Load Cells
- Optical Encoders
- Microphones
- Accelerometers
- pH electrodes
- Headmeters
- Flowmeters
- Pressure gauges
- *Many more…*





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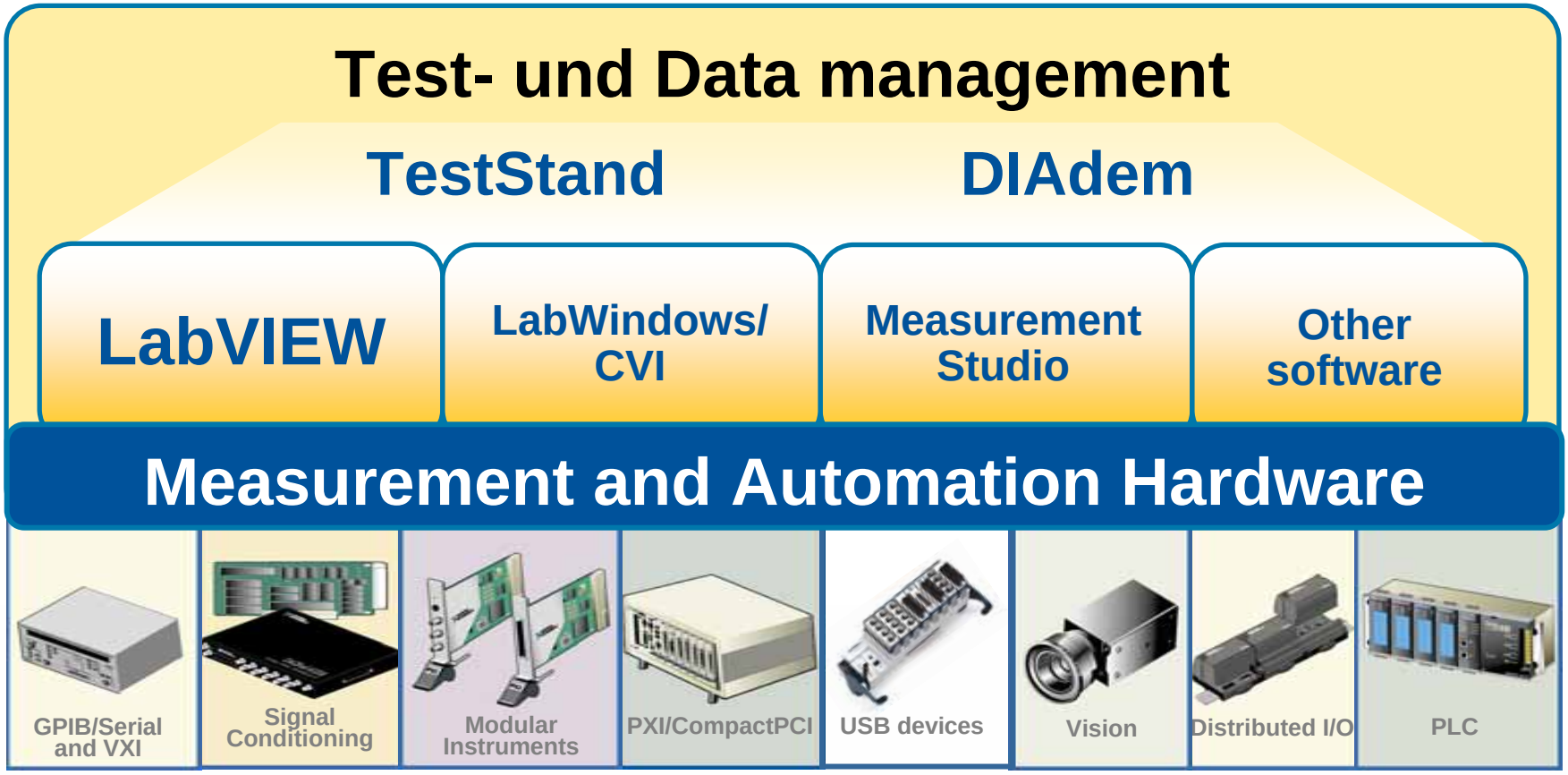
# NI Product Platform

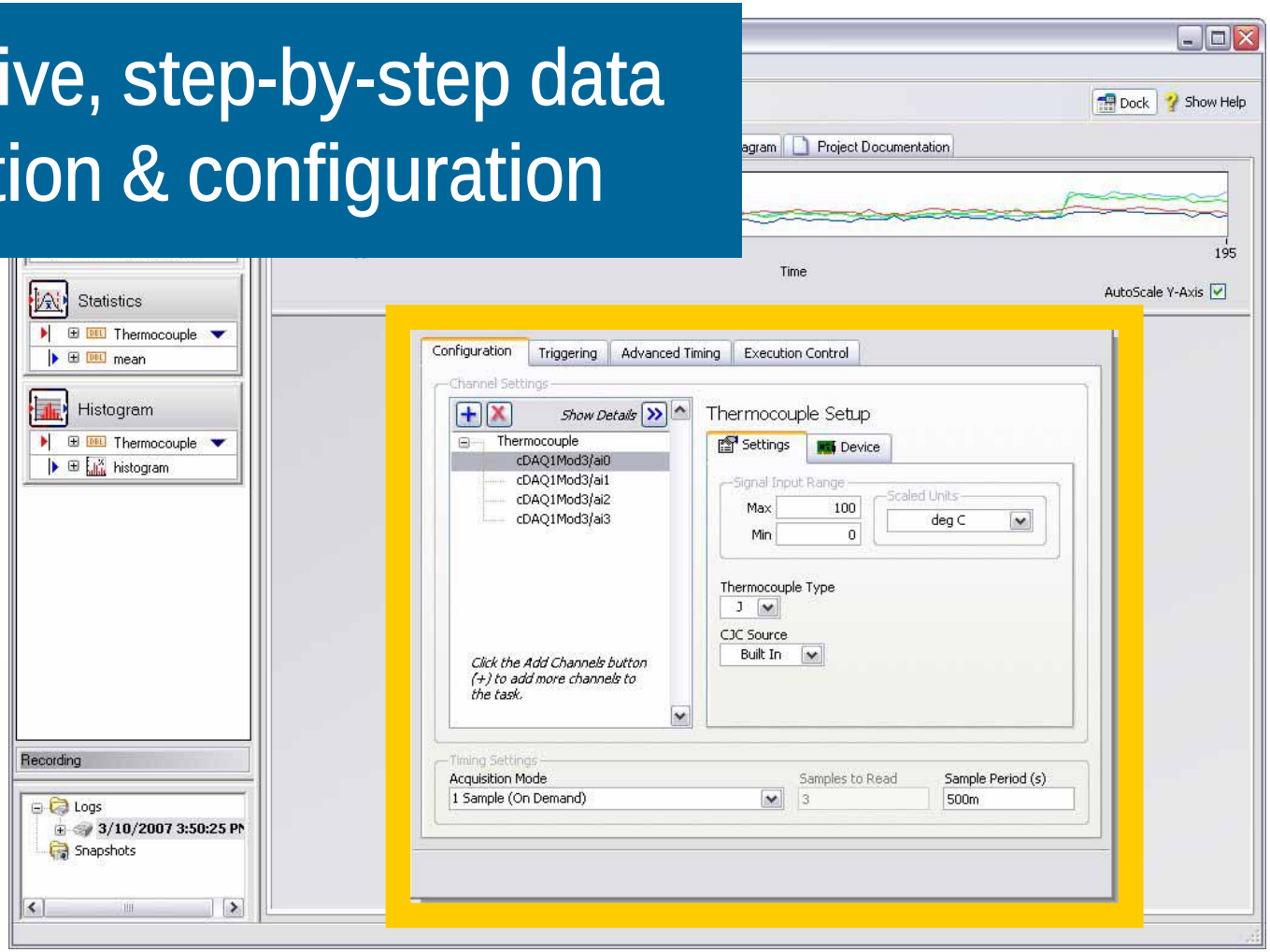


# NI LabVIEW Signal Express

- Log and analyze measurements without programming
- Quickly set up and configure data logging systems with plug and play USB technology
- Connect to 250+ DAQ devices, 400+ instruments and 1,000s of sensors

# What is LabVIEW SignalExpress?

## Interactive, step-by-step data acquisition & configuration



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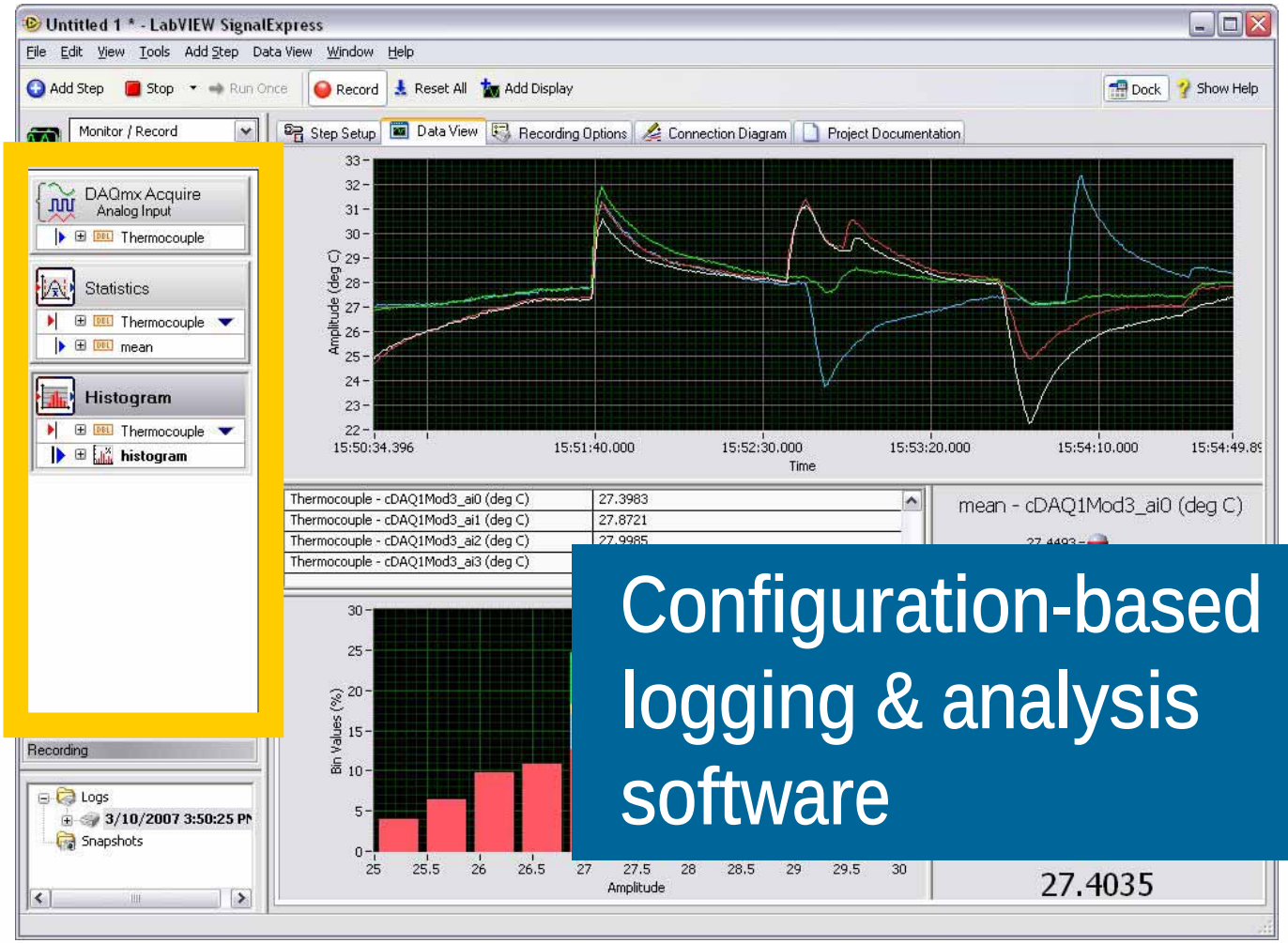
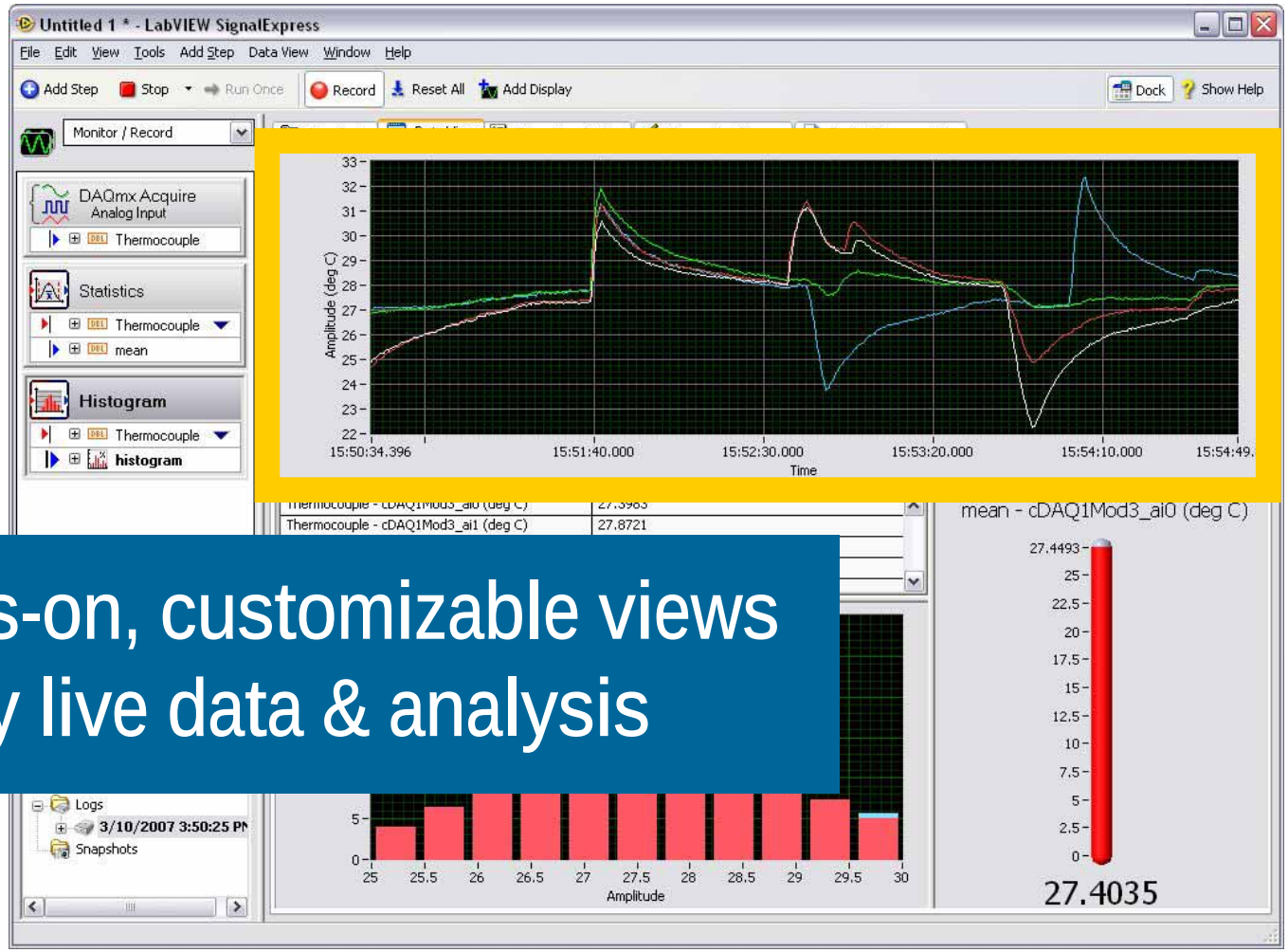



Configuration-based logging & analysis software

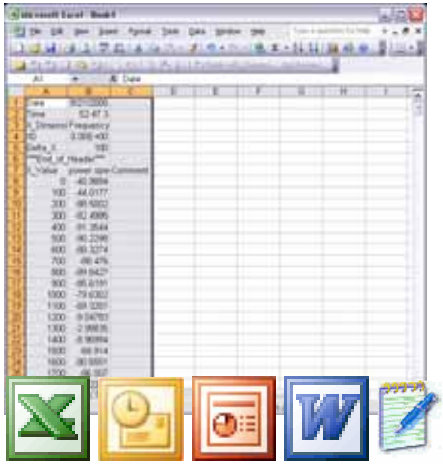
# What is LabVIEW SignalExpress?




Always-on, customizable views display live data & analysis

# What is LabVIEW SignalExpress?


Export to Office Applications



Stream data to disk

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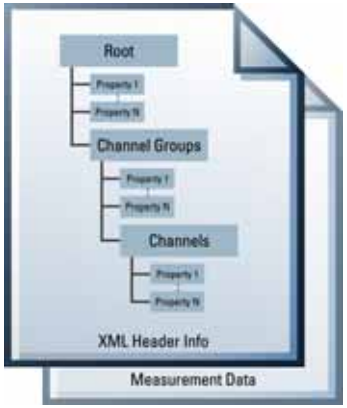
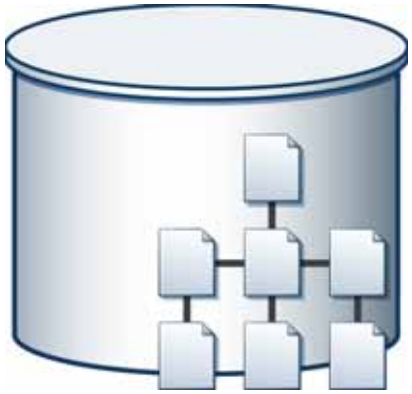
# Offline Steps in the Workchain

Acquiring large amounts of data is easy!

But what do we do with the data afterwards?



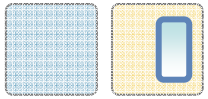



Storage and Archive

Datamining

Analysis and Report

# NI Data Management Components



- **NI TDM - File format**
  for efficiently storing measurement data including descriptive information

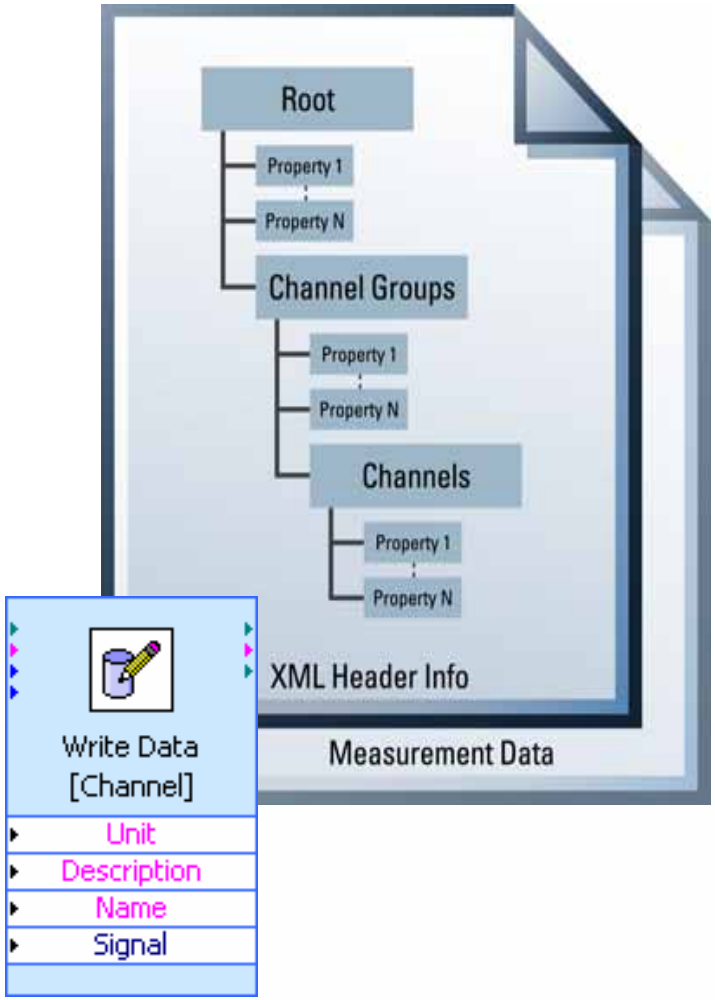
- **DIAdem DataFinder**
  for searching and mining file repositories without any IT effort for setting up or maintaining a data base

- **DataPlugins**
  for searching and processing existing file repositories without any file conversion required

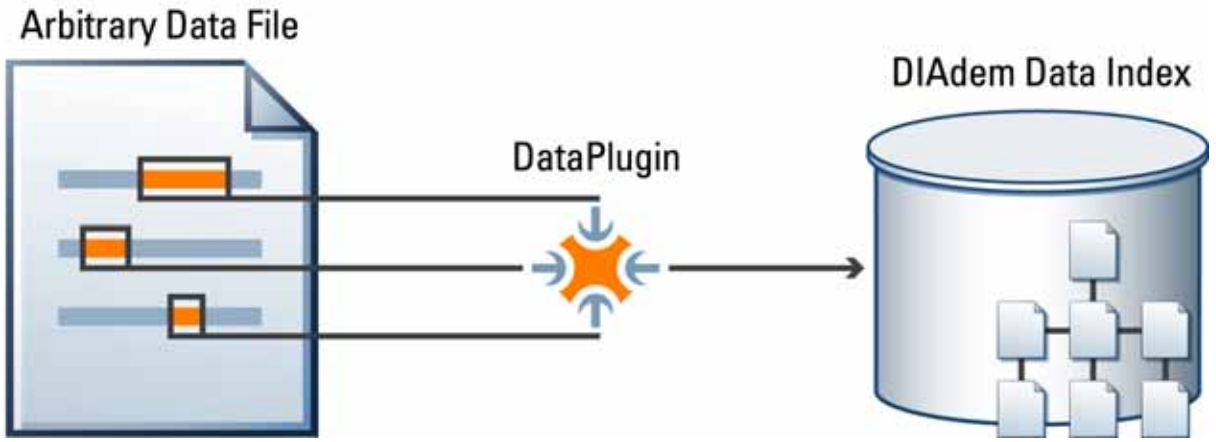
# NI TDM-File format

- Simple: Easiest approach to store self describing measurement data in LabVIEW, LabWindows/CVI, DIAdem and other NI software.
- Flexible: Allows to add custom attributes to every file, channel group and channel
- Fast: TDMS, the TDM file for streaming applications
- Ready to use: Use NI DIAdem for data mining and reporting without requiring any programming or IT effort
- Open
  - Microsoft Excel-AddIn
  - Public documentation*
  - TDM-Header-Writer-API* for creating TDM files in non-NI software applications

* free of charge available on request by e-mailp



# DIAdem DataFinder: How does it work?

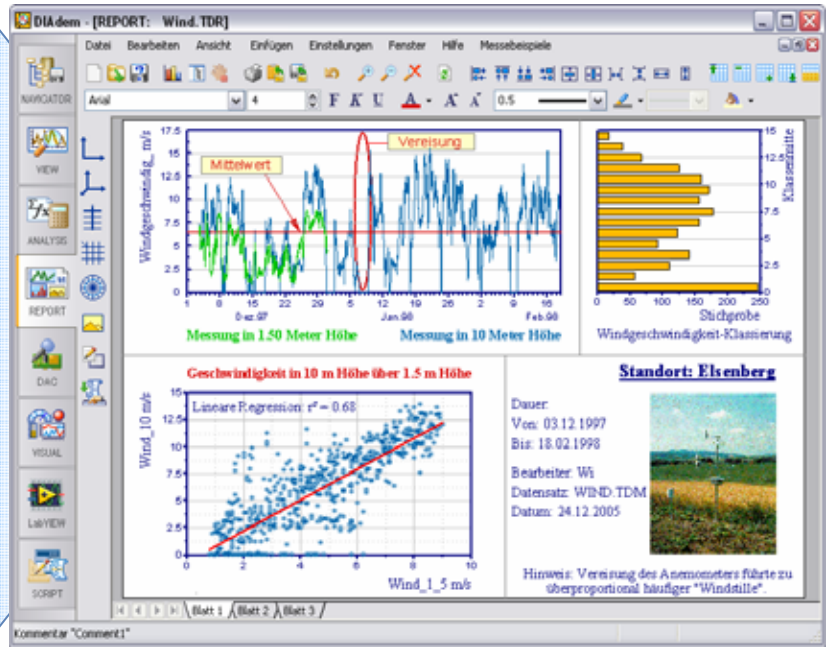



- The DIAdem Data Index stores descriptive information of your data files
- Works with any data file you have a DataPlugin for *
- It builds automatically and updates periodically
- No IT support required to install, configure or maintain

*visit www.ni.com\dataplugins

# NI DIAdem

- Data post processing tool designed for technicians, engineers and researchers
- Ready to use data search and data mining without expensive IT effort
- Easy and flexible access to data bases and files (ni.com/dataplugins)
- Interactive analysis and report generation without programming (PDF, HTML ...)
- Turn-key applications based on VBScript and custom user interfaces



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# In-Vehicle Datalogger Prerequisites

- DC Power
- Lightweight, portable
- Measurement support for
  - Suspension
  - Fuel system
  - Comfort control
  - Brakes
  - *Many more…*

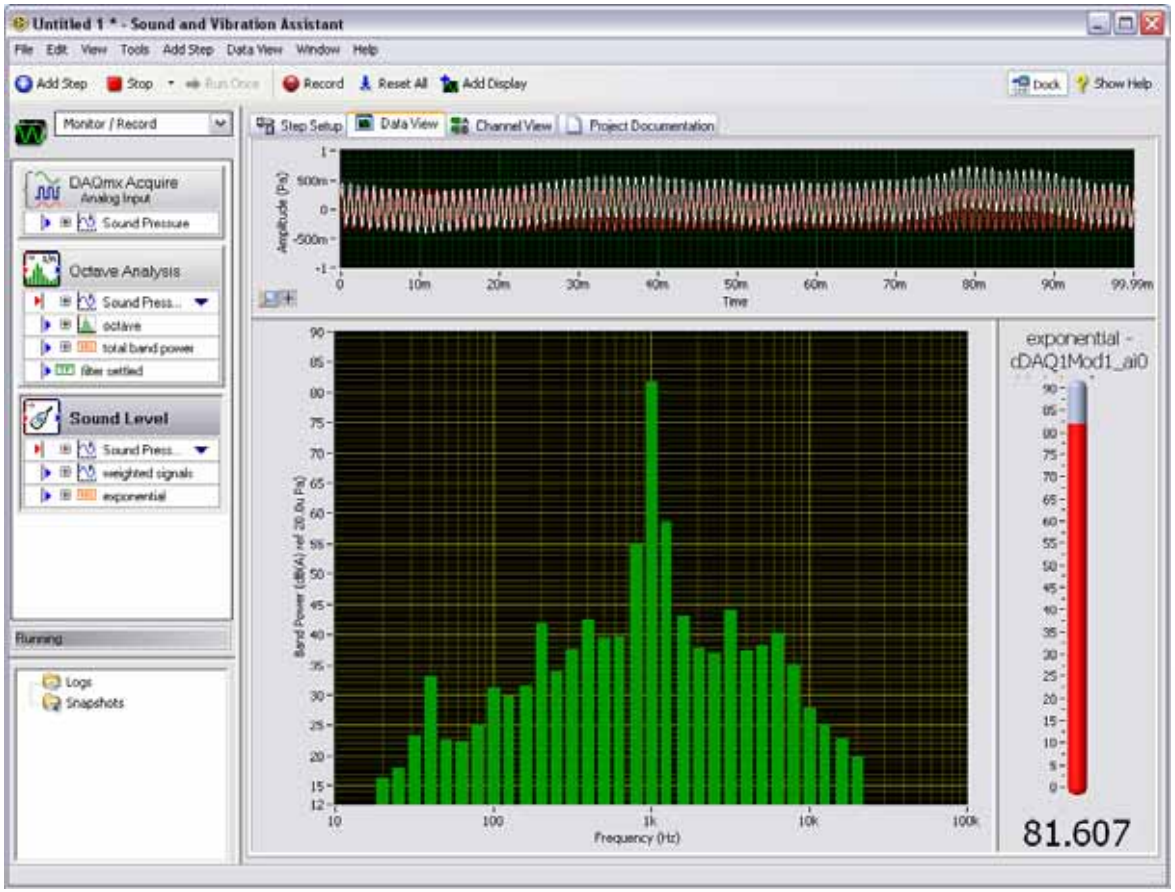
# NI Compact DAQ Platform

- True plug & play USB
- Automatic detection & configuration of hardware
- Focus on measurements and tests vs. hardware/software setup
- Reduced setup time

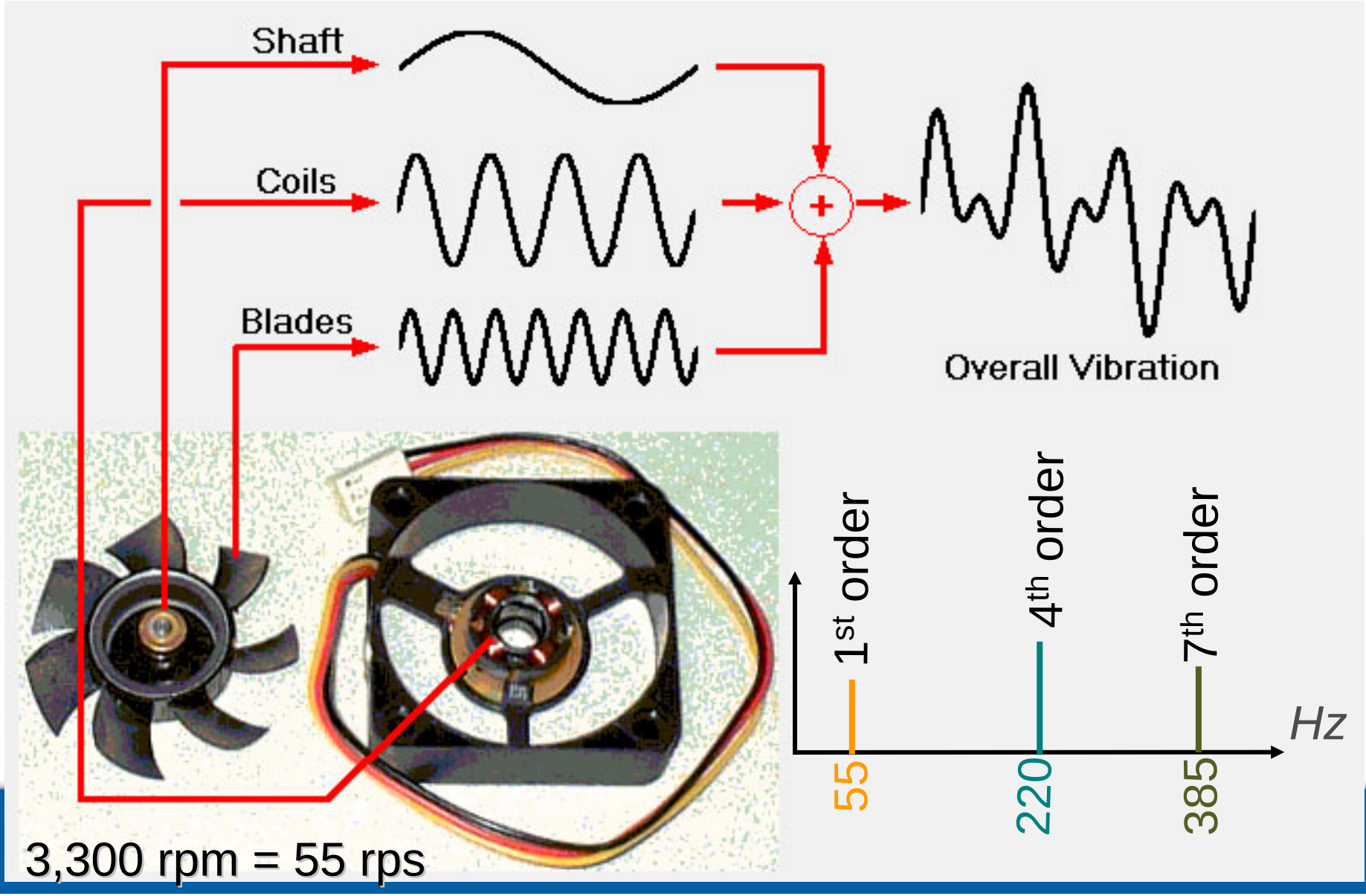
# NI Sound and Vibration Assistant

Acquisition & Analysis

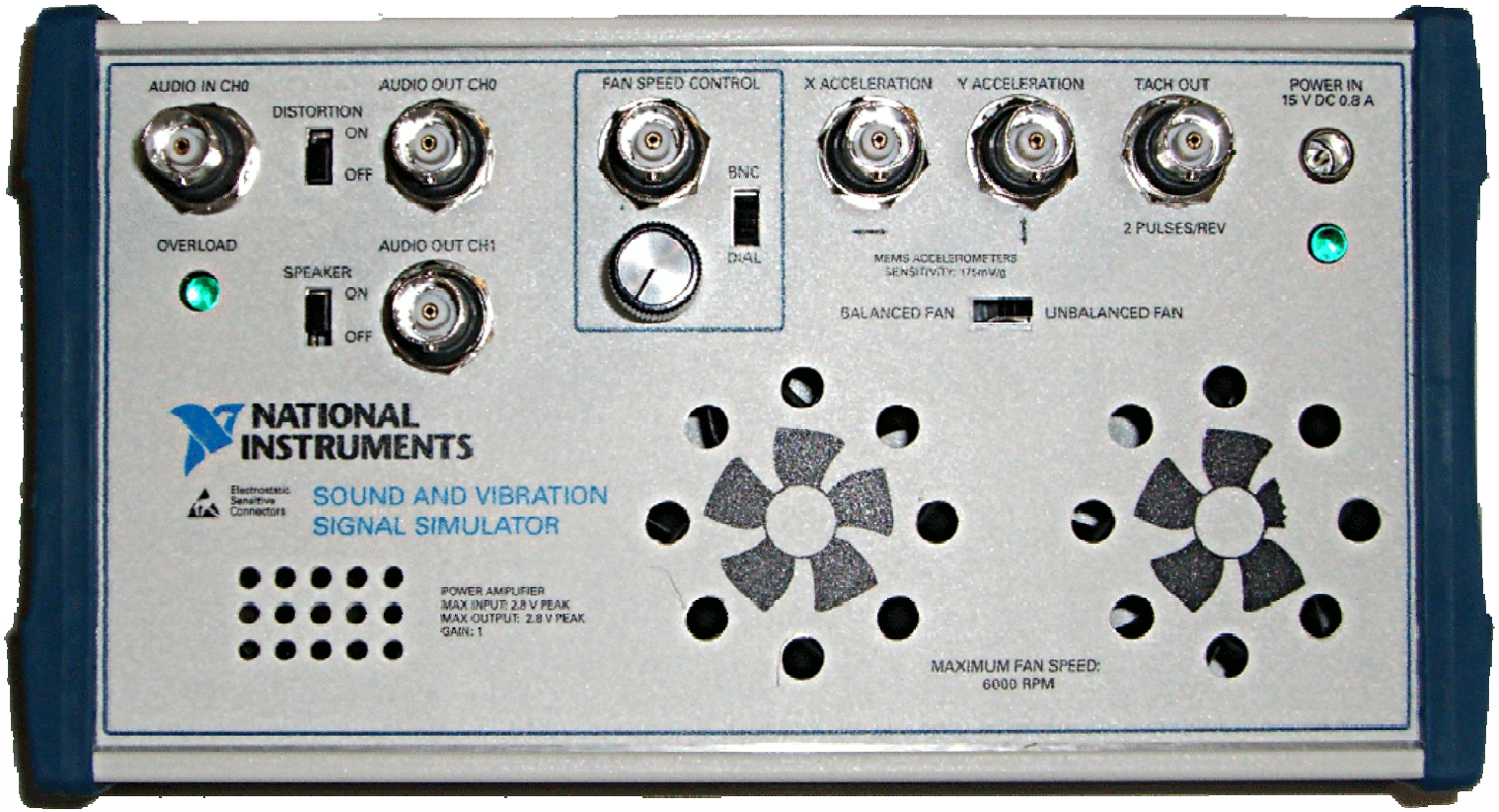
- Spectral Analysis, Zoom Power Spectrum, Frequency Response
- Sound Level & Vibration Level
- ANSI & IEC Octave Analysis
- Audio Measurements – THD, SNR, SINAD, Dynamic Range



# Using Order Analysis to Identify Components



# DEMO


AUDIO IN CH0
DISTORTION
ON
OFF
AUDIO OUT CH0
FAN SPEED CONTROL
BNC
DIAL
X ACCELERATION
Y ACCELERATION
TACH OUT
2 PULSES/REV
POWER IN
15 V DC 0.8 A
OVERLOAD
SPEAKER
ON
OFF
AUDIO OUT CH1
MEMS ACCELEROMETERS
BALANCED FAN
UNBALANCED FAN
NATIONAL INSTRUMENTS
Electrostatic Sensitive Connectors
SOUND AND VIBRATION
SIGNAL SIMULATOR
POWER AMPLIFIER
MAX INPUT: 2.8 V PEAK
MAX OUTPUT: 2.8 V PEAK
GAIN: 1
MAXIMUM FAN SPEED:
6000 RPM