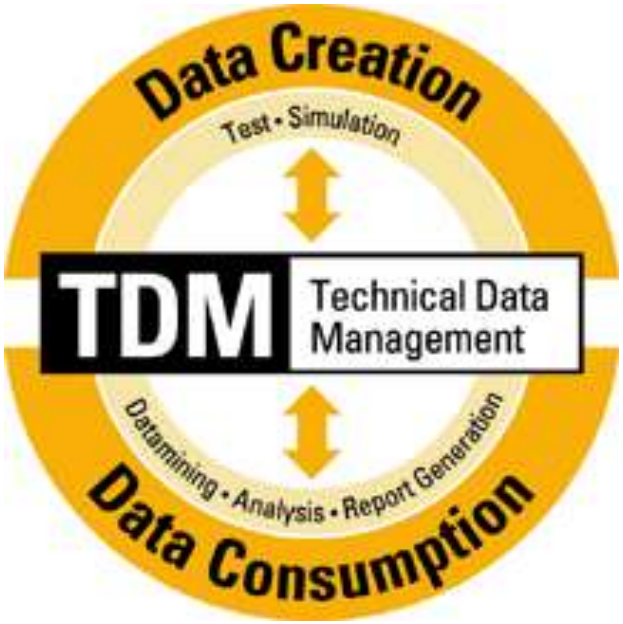
NIDays09

WORLDWIDE GRAPHICAL SYSTEM DESIGN

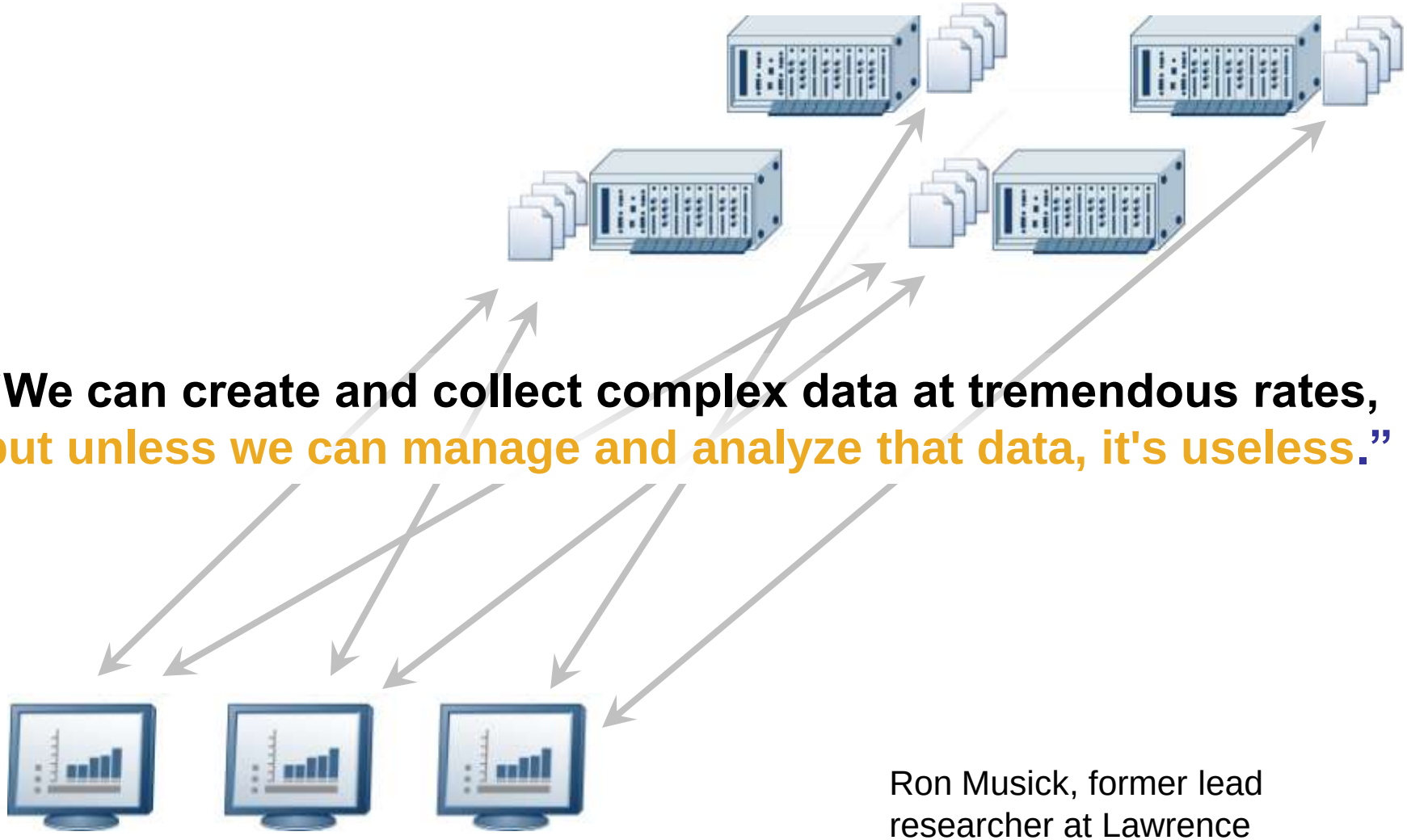
CONFERENCE

NATIONAL INSTRUMENTS




# Raw Data to Results:
# Proper Data Management Techniques

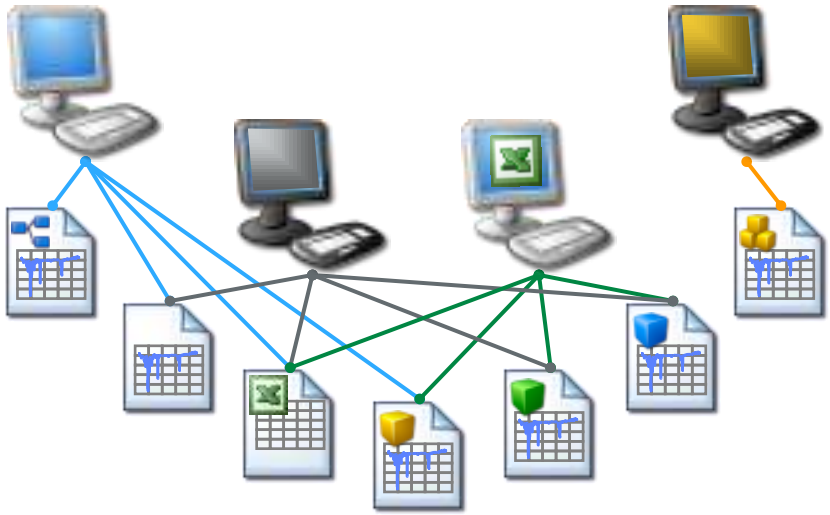
# The Data Challenge



**“We can create and collect complex data at tremendous rates, but unless we can manage and analyze that data, it's useless.”**

Ron Musick, former lead researcher at Lawrence Livermore National Laboratory

# Traditional Reactions to the Data Problem



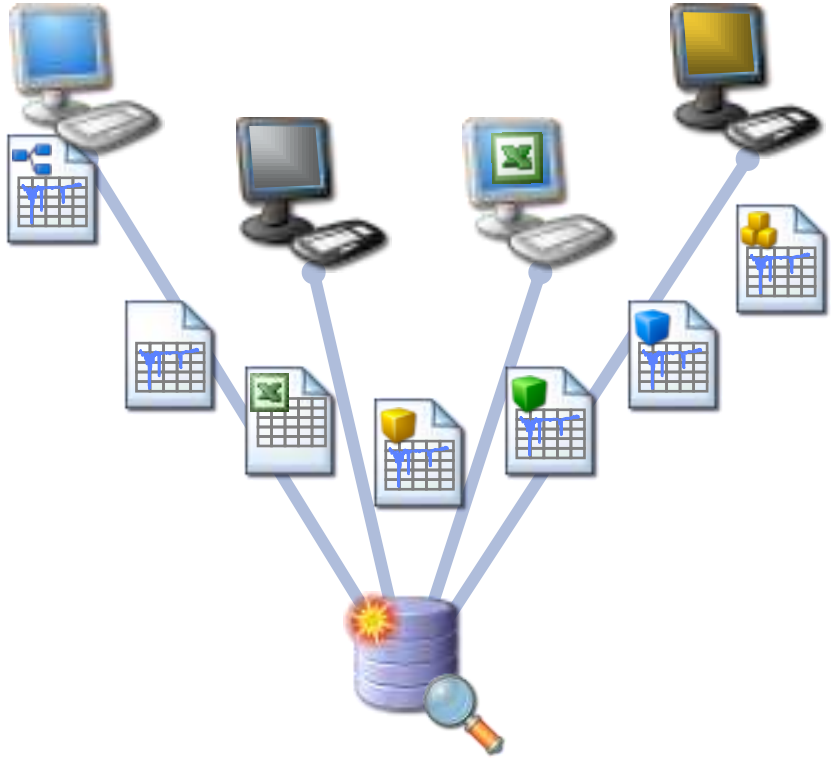
"Every man for himself"

Low initial cost, but low productivity

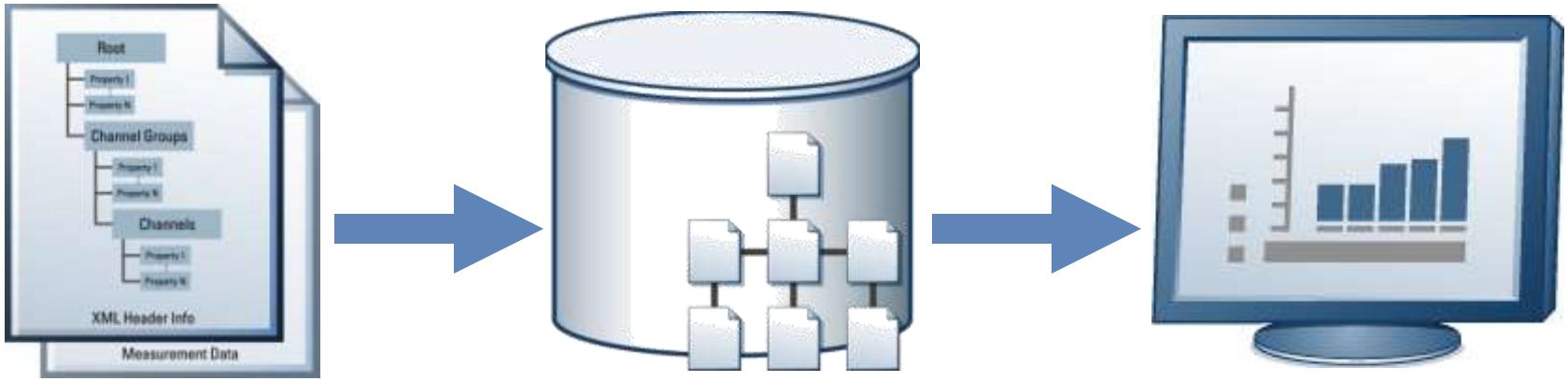
# Traditional Reactions to the Data Problem

## Top-Down Approach

High cost and debatable productivity



# The NI Technical Data Management Solution




**TDM data model for data import**

**NI DataFinder for indexing**

**NI DIAdem with search interface**

# Determining Your Storage Format

When determining the appropriate storage format for your data, consider the following:

1. What will you do with your data once you acquire it?
2. Will you write and read data with the same application?
3. How much data will you acquire?
4. At what rate will you acquire data?
5. Will you need to exchange data with another program?
6. Will you need to search your data files?

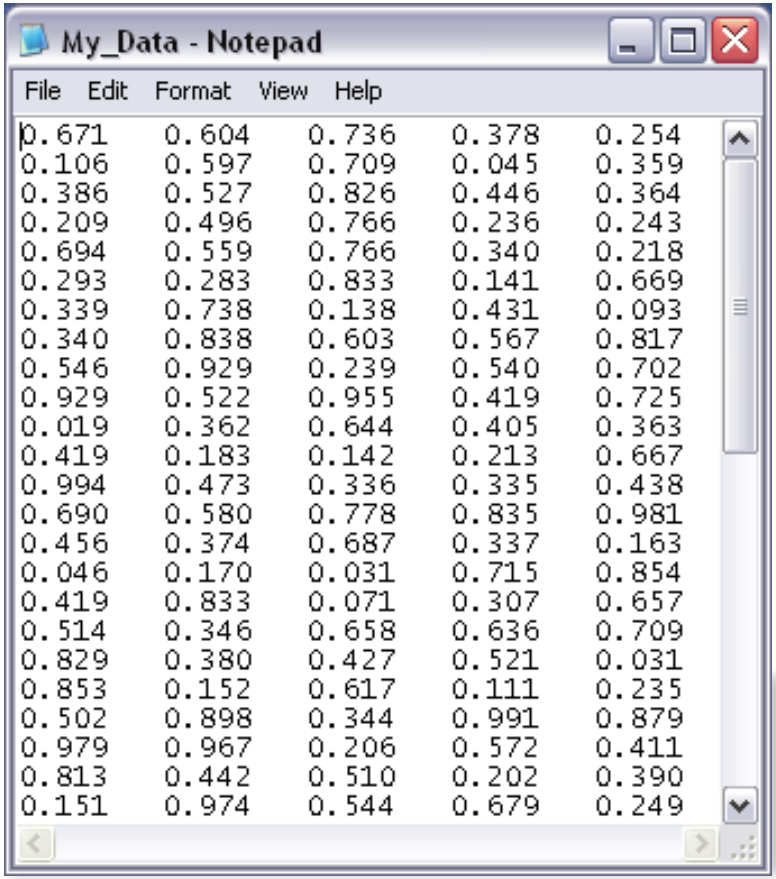
# ASCII Files

## Characteristics

- Human-readable
- Easily portable to other applications such as Microsoft Excel

## Considerations

- Significantly larger disk footprint
- Slow read and write



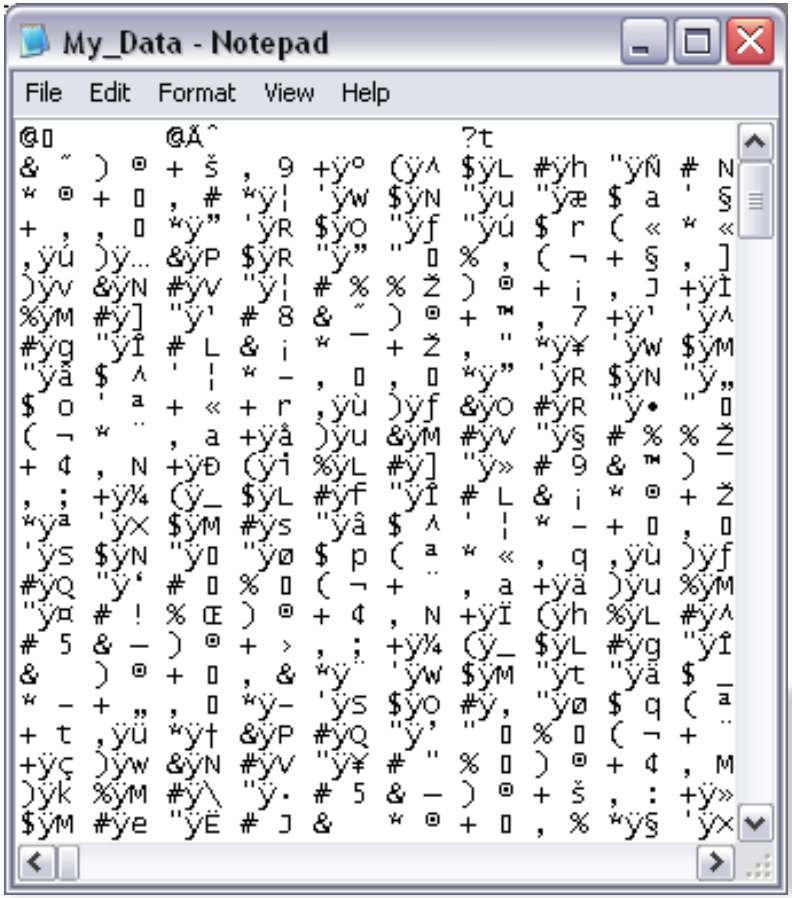
# Binary Files

## Characteristics

- Compact file size
- Fast streaming

## Considerations

- Not human-readable
- Not easily exchangeable



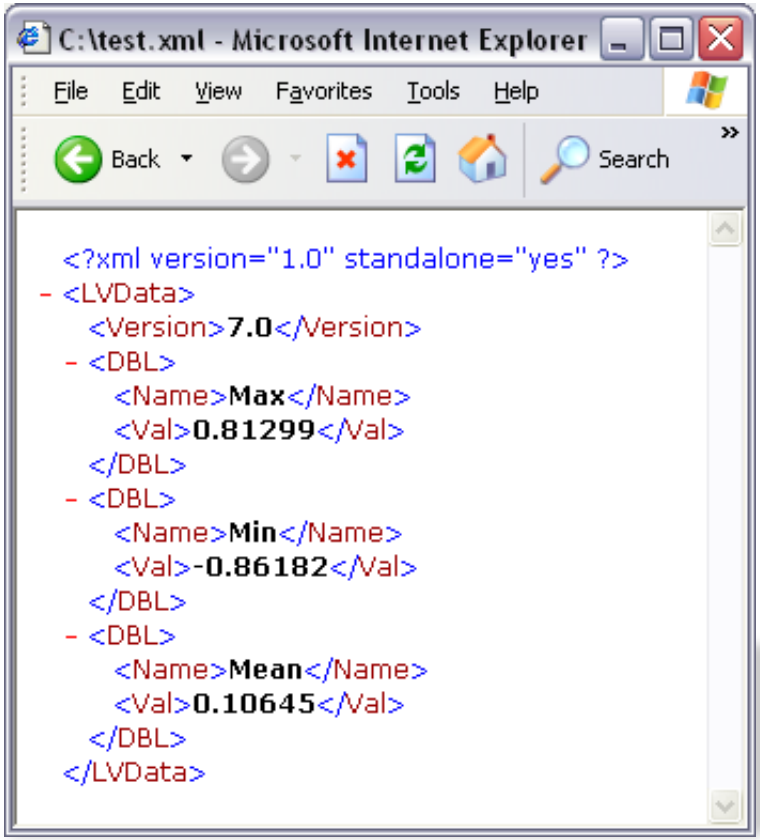
# XML Files

## Characteristics

- Stores complex data structures
- Shows display in a Web browser or in a text editor

## Considerations

- Even larger disk footprint
- Front-end schema design
- Does not stream



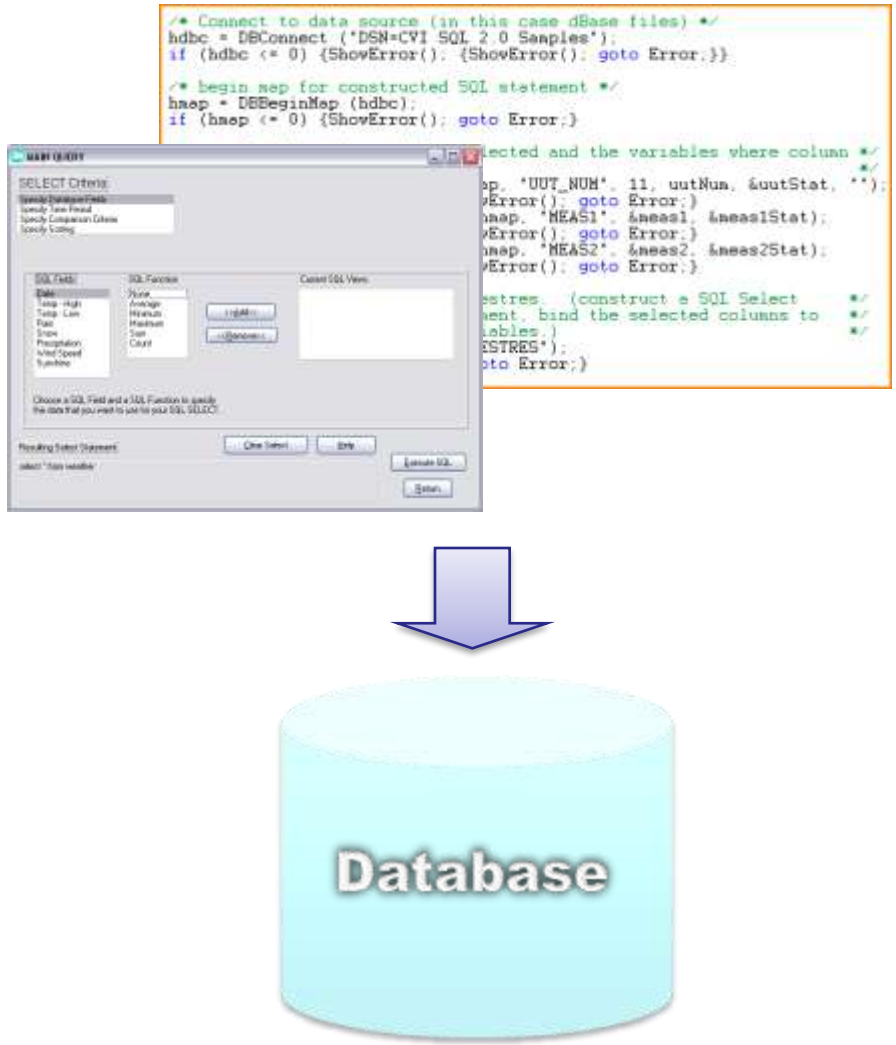
# Databases

## Characteristics

- Store data centrally
- Organize and query test results with Access or MySQL

## Considerations

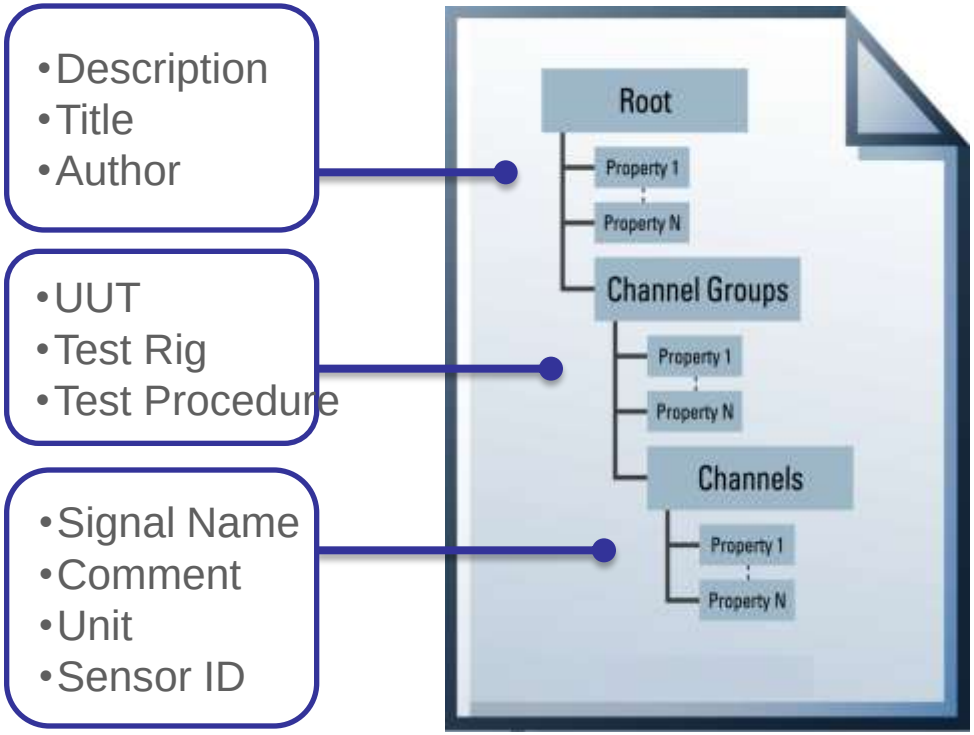
- Time-intensive programming
- Requires maintenance
- Potentially high cost
- IT



# File Format Comparison

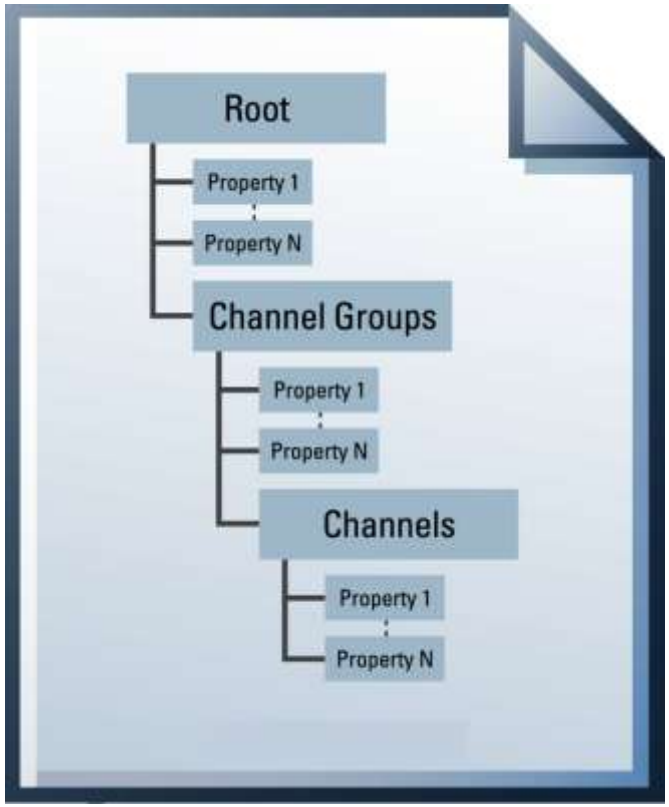
| | ASCII | Binary | XML | Database | TDM | TDMS |
|---|---|---|---|---|---|---|
| Exchangeable | ✓ | | ✓ | | ✓ | ✓ |
| Small Disk Footprint | | ✓ | | | ✓ | ✓ |
| Searchable | | | | ✓ | ✓ | ✓ |
| Inherent Attributes | | | ✓ | | ✓ | ✓ |
| High-Speed Streaming | | ✓ | | | | ✓ |

# The TDM Data Model




- Simple and flexible
- Three levels of hierarchy
  - root (file)
  - groups (test steps)
  - channels (signals)
- User-defined properties on each hierarchy level

# One Model, Two Formats




## TDMS

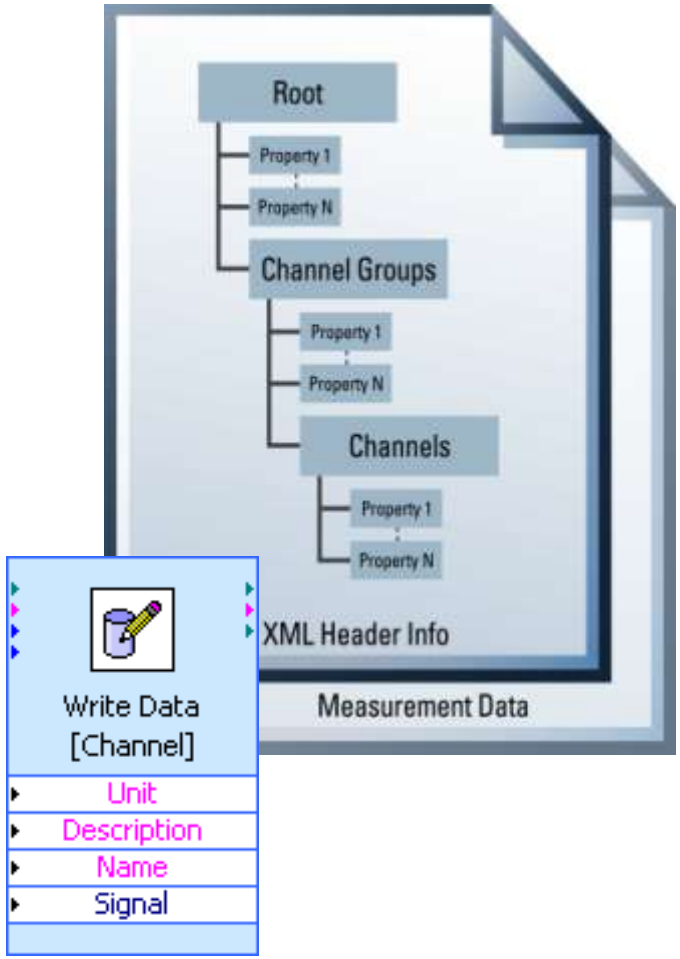
- Optimized for high-speed streaming
- Binary-based header
- Binary bulk data
- Single file for both header information and bulk data
- Supported on real-time software platforms

## TDM

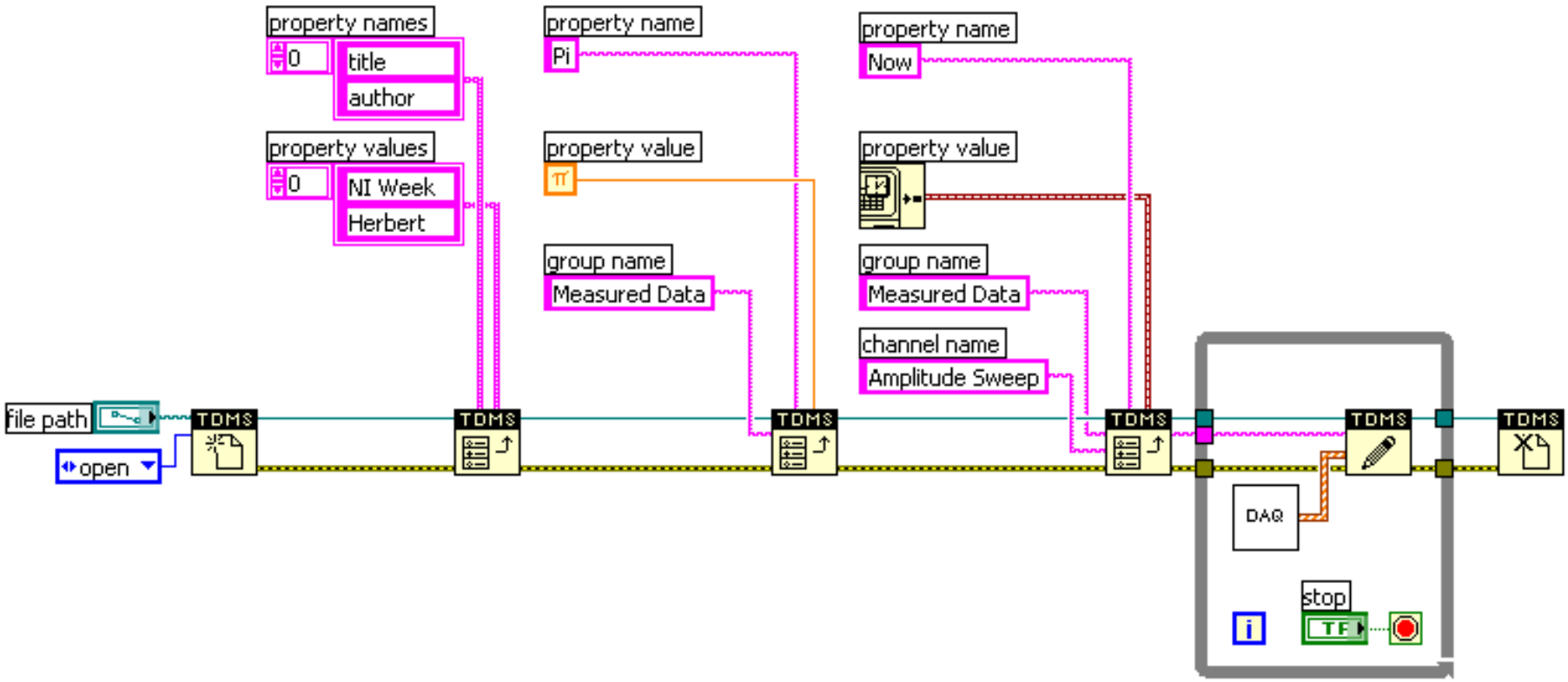
- XML-based header file
- Separate binary bulk data file

# TDM File Format: Optimized for Data Storage and Search

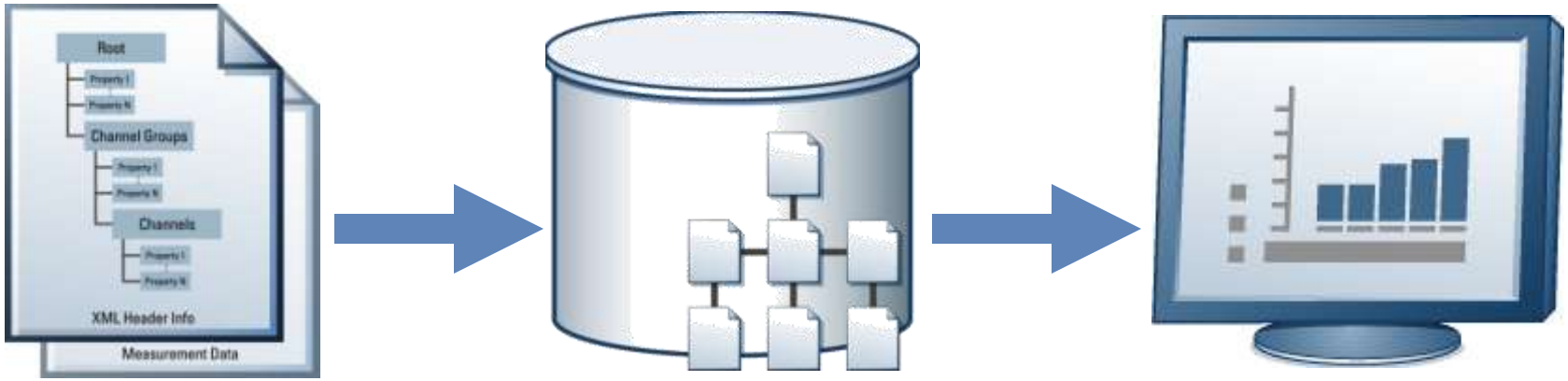
- **Simple:** Easiest approach for storing measurement data in NI software
- **Flexible:** Add custom attributes to every file, channel group, and channel
- **Fast:** TDMS is the TDM file for streaming applications
- **Open:**
  - Microsoft Excel and OpenOffice add-in
  - Public documentation
  - C DLL for creating files in third-party applications



# TDMS – Write Data and Set Properties



# The NI Technical Data Management Solution

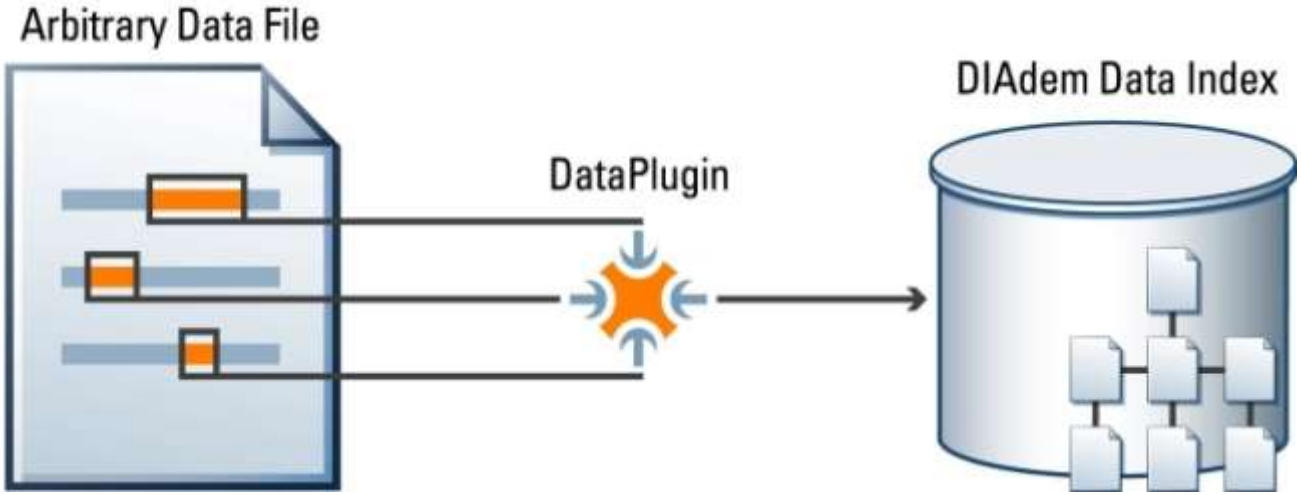



**TDM data model for data import**

**NI DataFinder for indexing**

**NI DIAdem with search interface**

# NI DataFinder

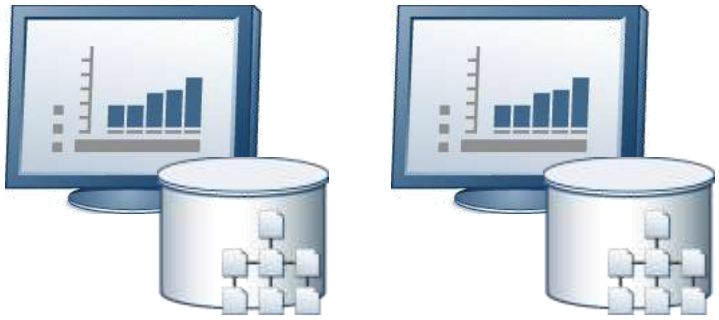



- Stores descriptive information from data files
- Works with **any** data file you have a DataPlugin for*
- Builds and scales automatically
- Requires no IT support to install, configure, or maintain

*visit ni.com/dataplugins

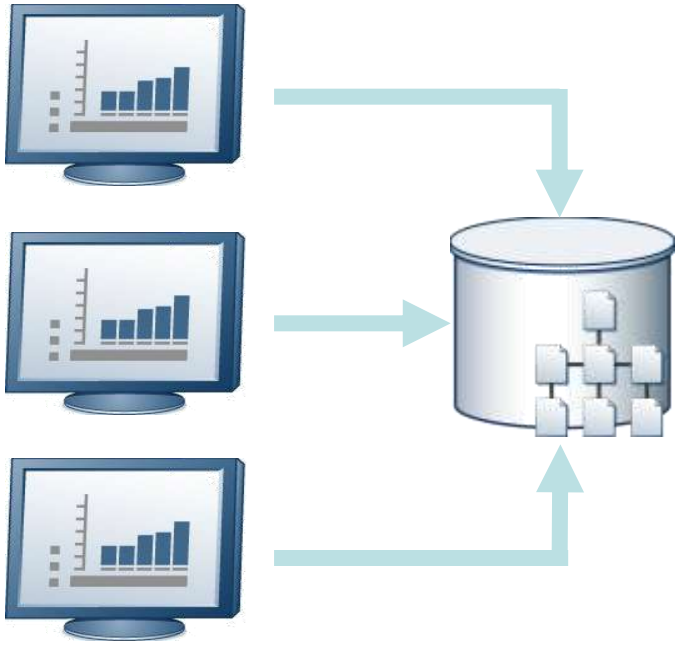
# Configurations for Individuals and Working Groups

NI DIAdem with integrated "My DataFinder"



Designed for individuals

NI DIAdem combined with NI DataFinder Server Edition



Designed for working groups

# DIAdem DataFinder

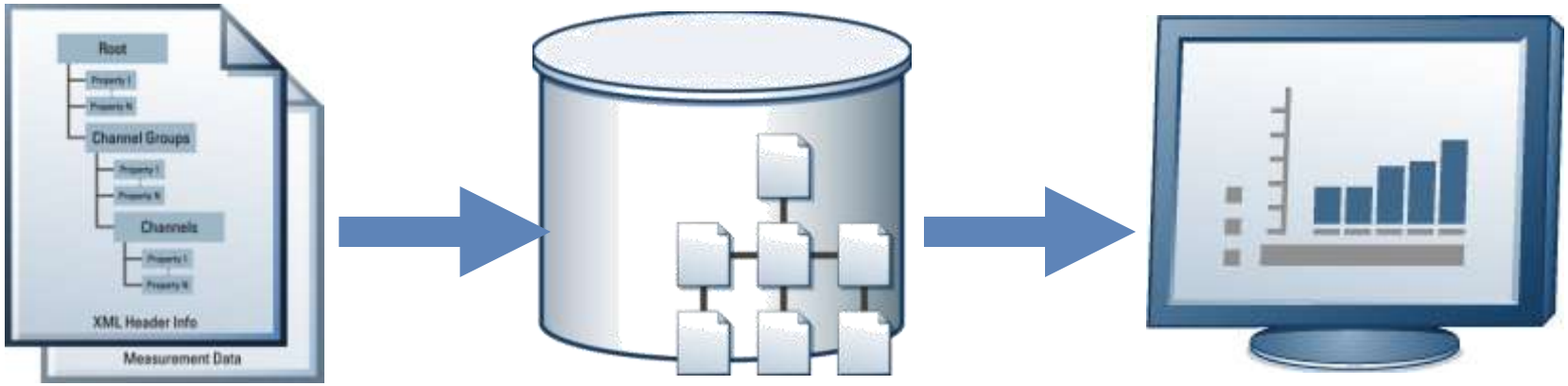
## Local Data Index for Individuals

# Extending Data Management to Large Test Groups

## NI DataFinder Server Edition

Centralized Data Index for Group Data Management

# The NI Technical Data Management Solution

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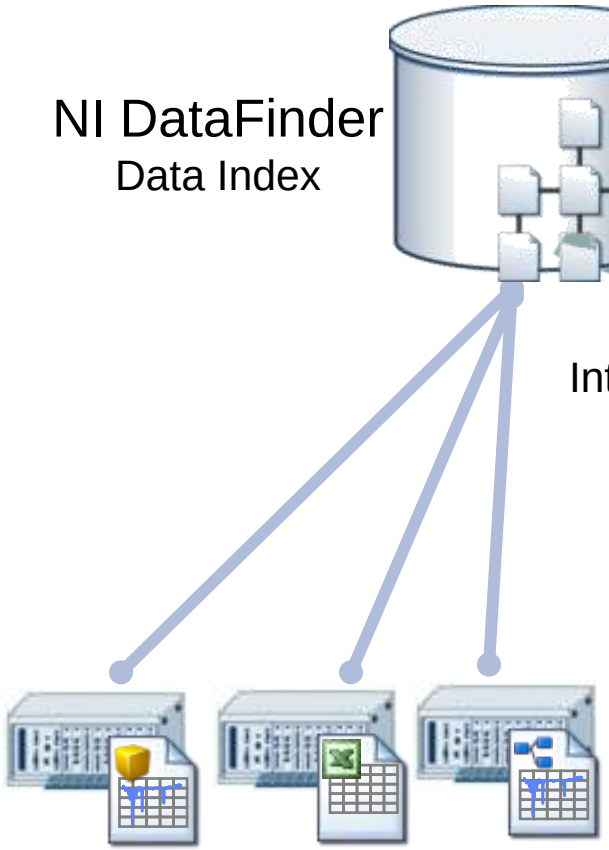
# DIAdem

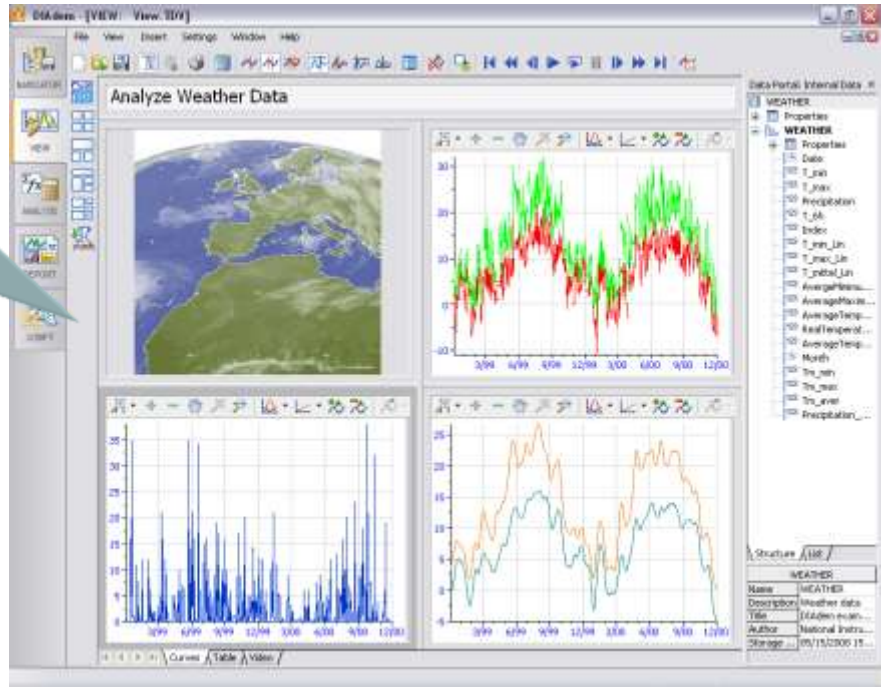
## Software to Interactively Manage, Search, Analyze, and Report Measurement Data

NI DataFinder
Data Index

Parametric and
Internet-Like Search
Interface



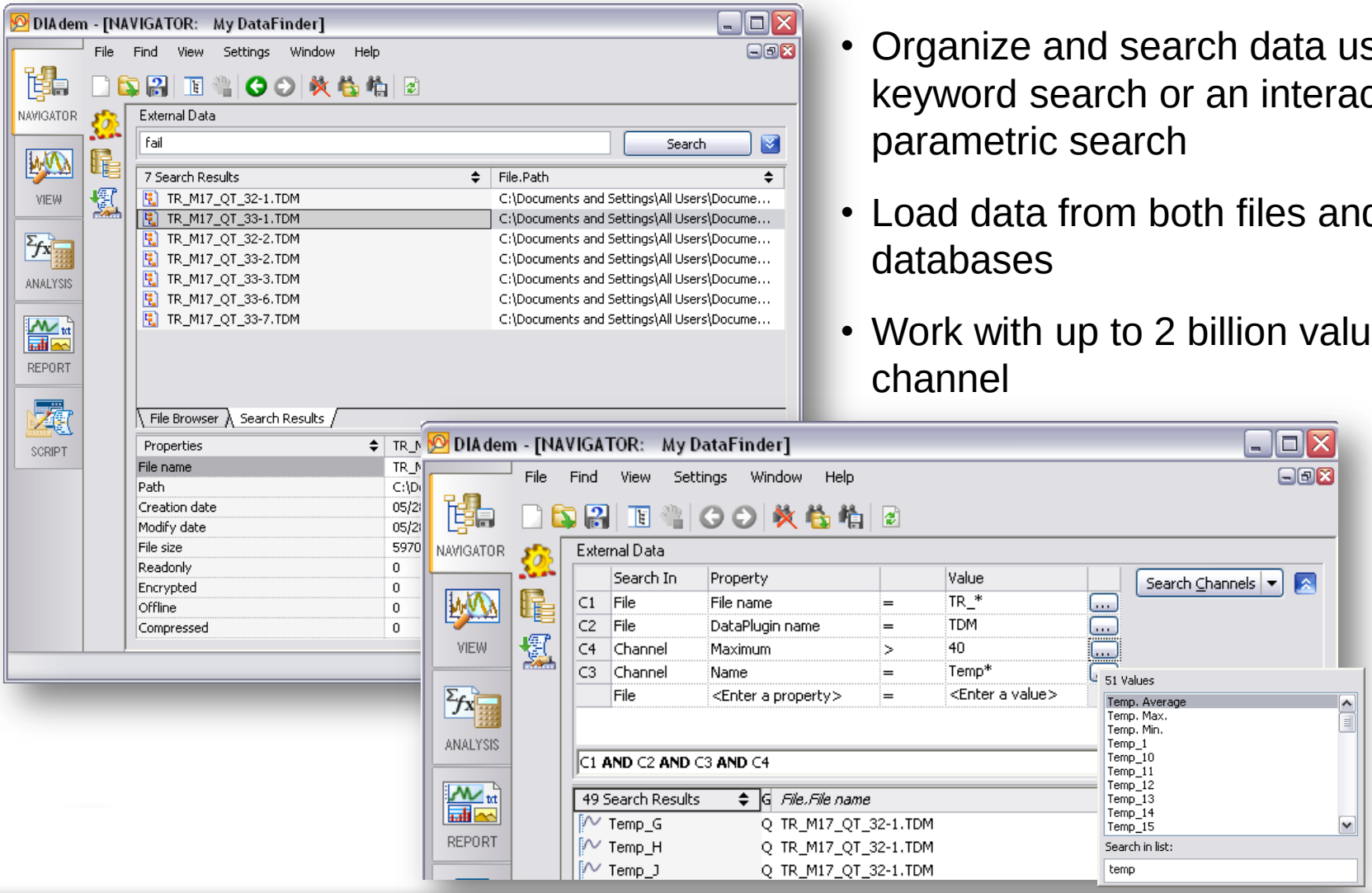
Measurement Data




Interactive Analysis and
Reporting on the Desktop

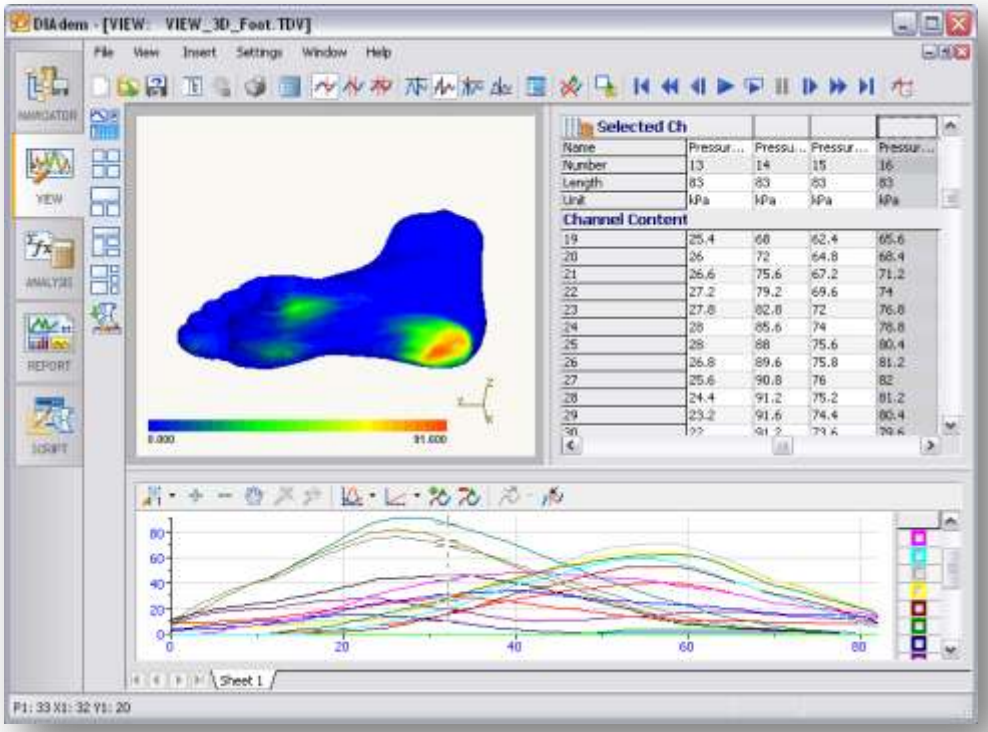
# Data Management and Mining

NAVIGATOR



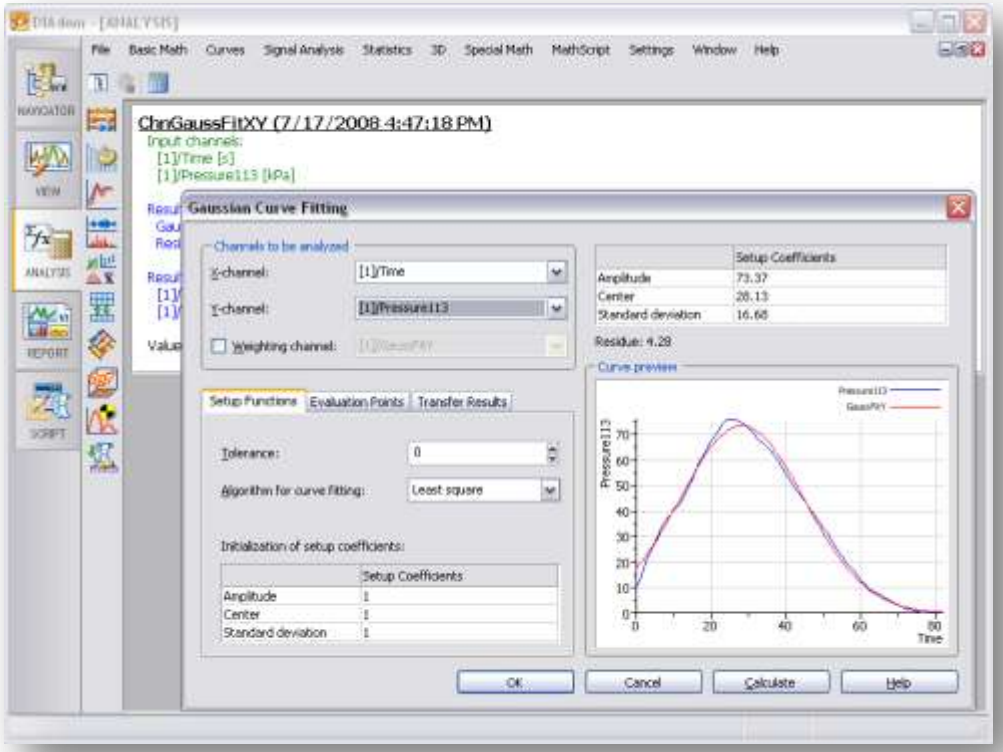

- Organize and search data using keyword search or an interactive parametric search
- Load data from both files and databases
- Work with up to 2 billion values per channel

# Data Inspection



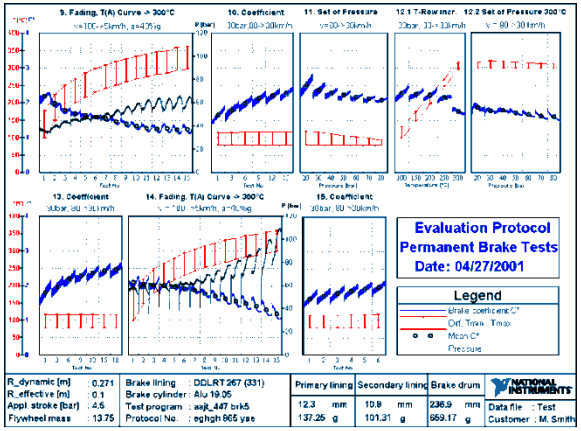

- Inspect data in graphs, tables, text, and images
- Zoom and pan into details
- Apply measurement cursors
- Use interactive functions
- Display data on 3D CAD objects
- Synchronize data with videos

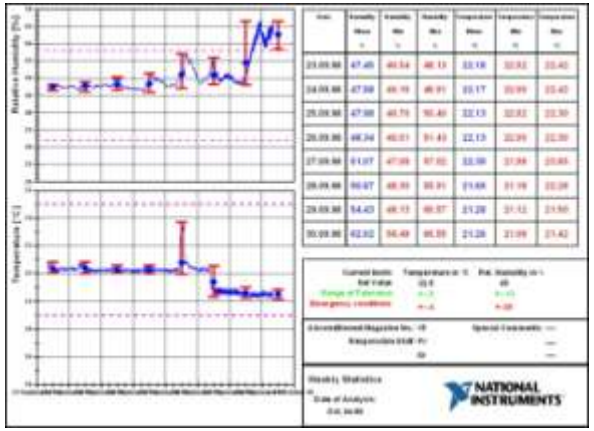
# Data Analysis

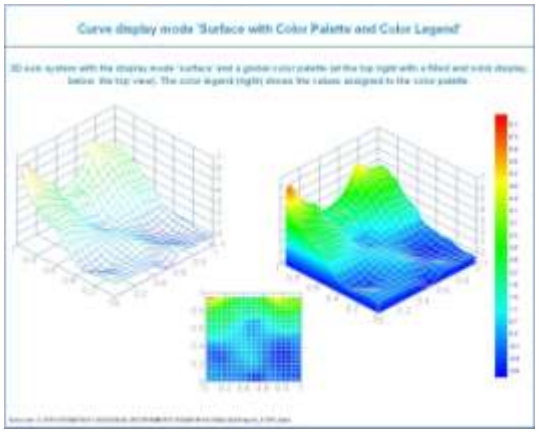


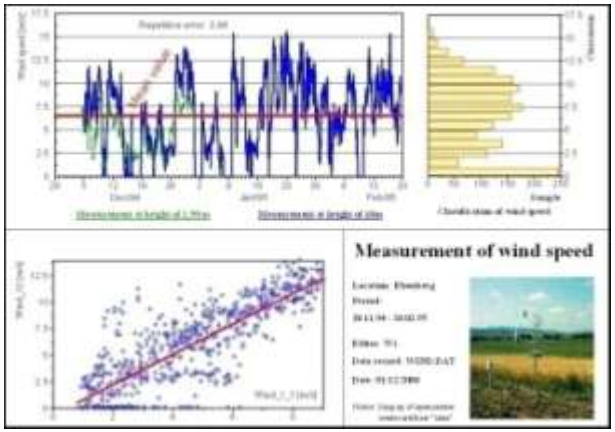

- Mathematical data analysis
- Channel functions
- Curve fitting
- Signal analysis, digital filters, and order analysis
- Statistical analysis and histograms
- 3D arithmetic
- Calculator

# Report Generation



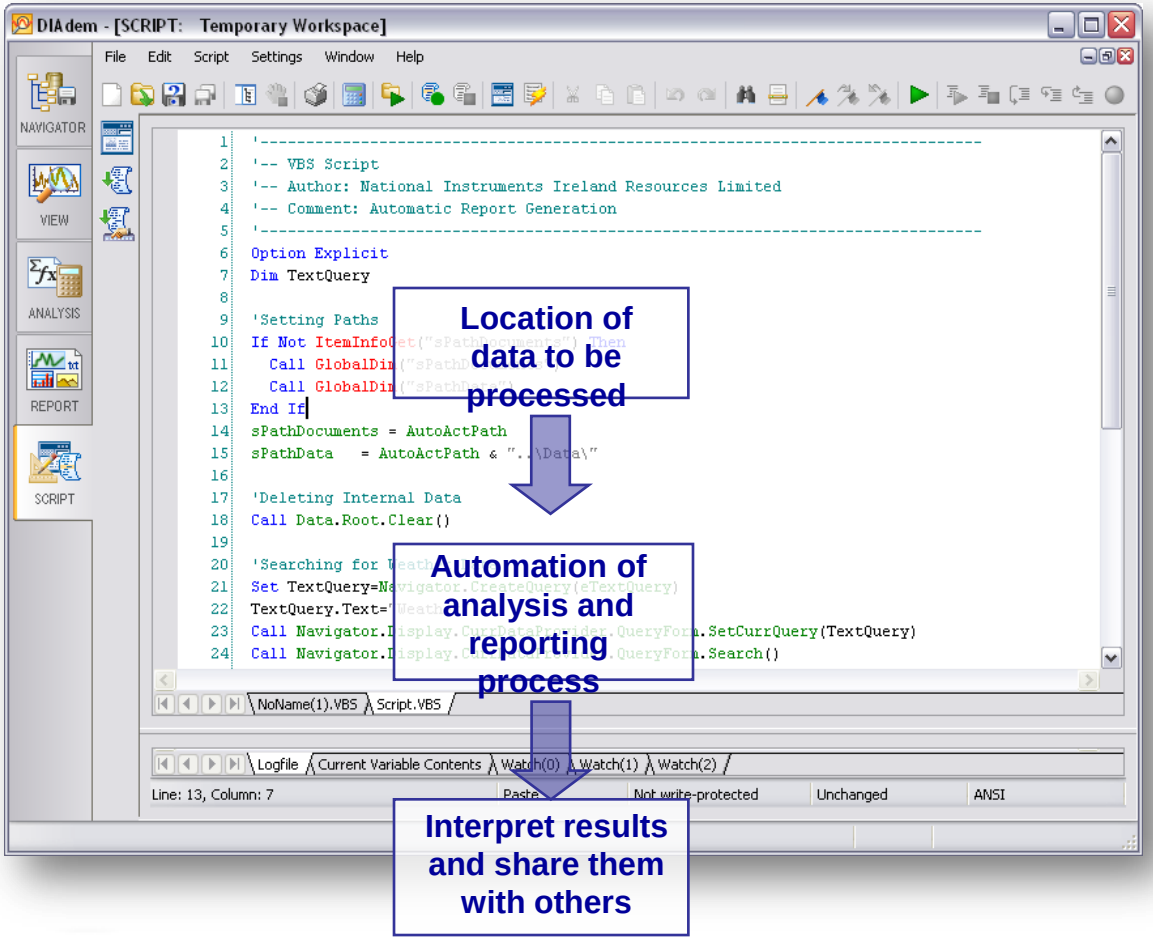








- Design dynamic, reusable, multipage report templates
- Integrate 2D and 3D graphs, tables, images, text, variables, and commands
- Export to image files (JPG, TIF, GIF), HTML pages, or PDF documents

# Automation and Customization



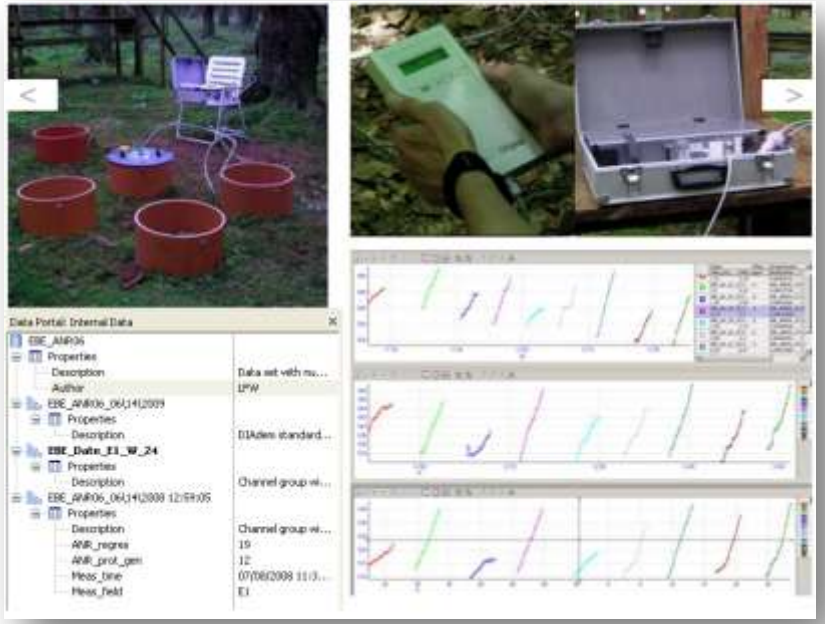

- Automate analysis tasks and standard processes using Visual Basic Script
- Macrorecording mode
- Create application specific dialogs in a graphical editor
- Interface to third-party software via ActiveX
- Customize DIAdem standard menus and icon bars

# Evaluating Climate Data: The DIAdem DataFinder Moves You from Separate Solutions to an Overall Evaluation System

**Application:** Collecting, analyzing, and reporting climate-related meteorological and hydrological data in the Bavarian Forest for preventive environmental protection

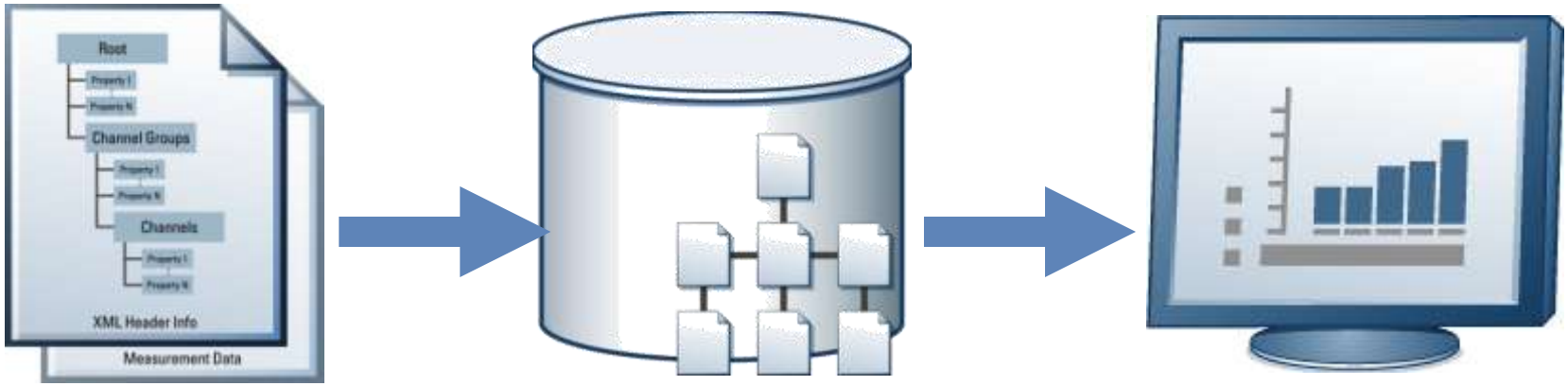
**Challenge:** Designing a data management system to handle large amounts of data, from multiple test stations, written in different formats

**Technology:** NI DataFinder, DIAdem, TDM file format, NI DataPlugins



*" … DIAdem and the DataFinder have achieved an integrated data organization solution that guarantees a high degree of data security and continuous monitoring of the measurement stations."*

# The NI Technical Data Management Solution

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# Additional Resources

- ni.com/diadem
- ni.com/tdm
- ni.com/datafinder
- ni.com/dataplugins