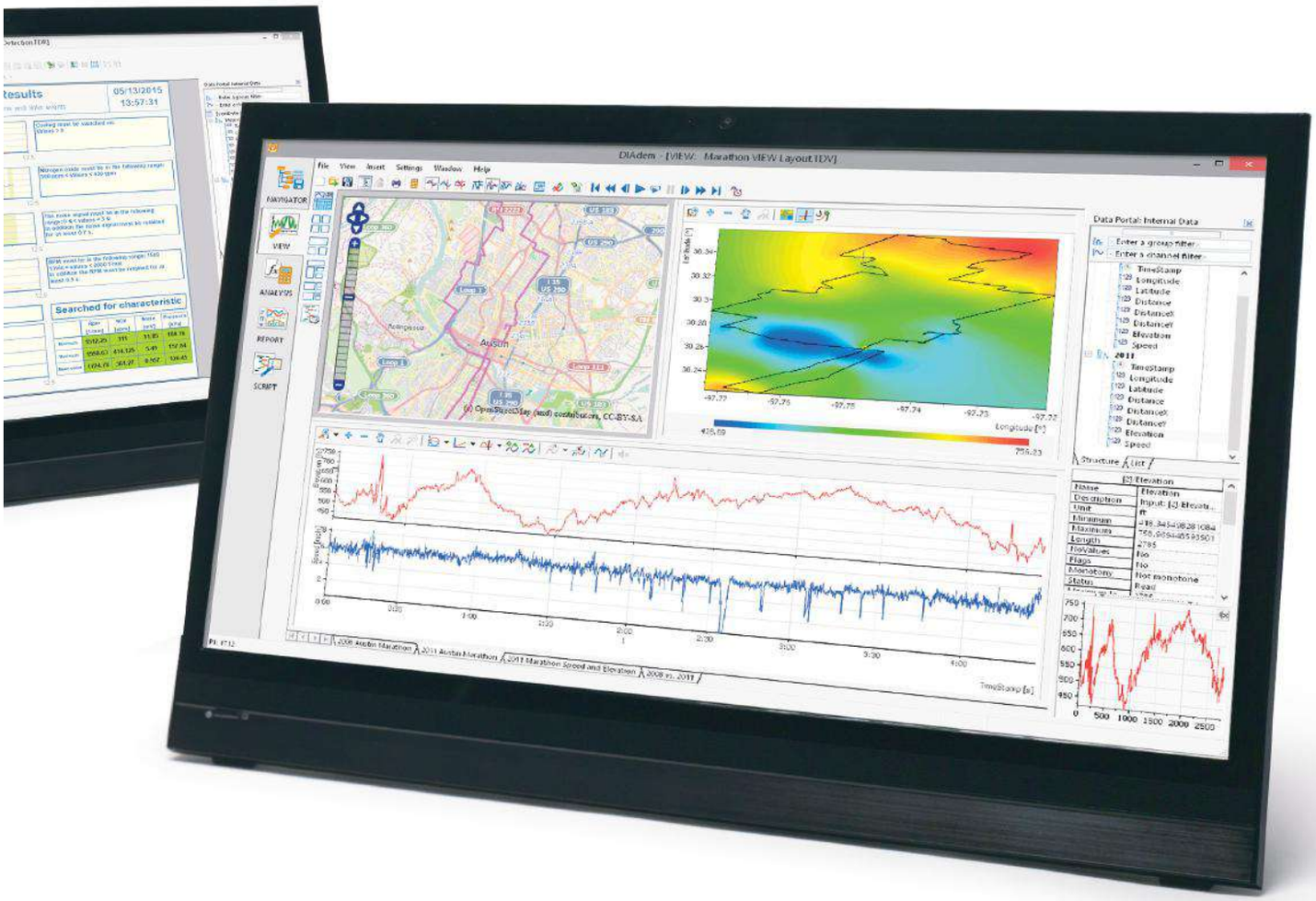
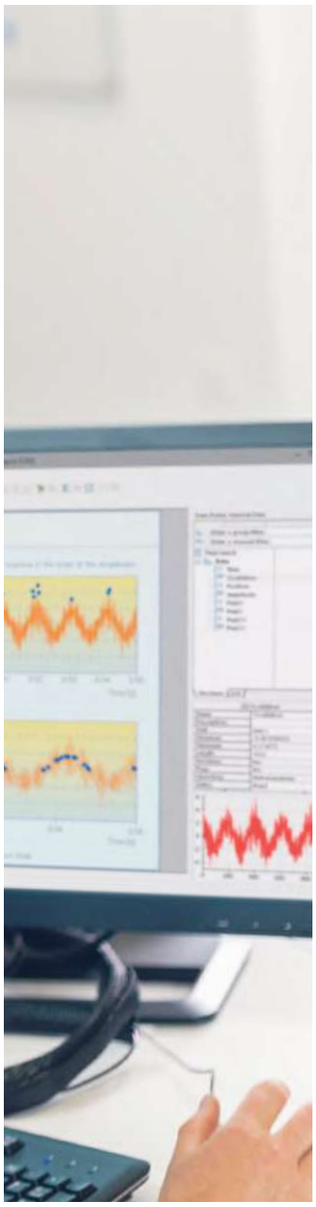
NATIONAL INSTRUMENTS

Technical Data Management





Overcoming the Pain Points of Data Management

The amount of data generated by sensors and DAQ nodes is more than doubling every year. Data growth of this magnitude is fundamentally challenging to current data management practices. Ideally, having more data should lead to faster, more accurate results. However, managing data that comes from multiple sources and lacks documentation makes it difficult to identify and analyze the data content.

Many engineers and scientists acknowledge that they have a working yet inefficient data management solution; their manual and repetitive processes decrease efficiency and introduce errors. Current data management solutions simply do not scale or provide additional insights, which is critical for staying ahead of the competition.

With over 30 years of experience in data management for test and measurement applications, NI is a leader in providing comprehensive data management solutions specifically for sensor data. NI technology integrates with legacy and existing processes, data files, and databases for a complete data management solution that can scale from an individual all the way to the enterprise.

If you cannot extract information from data in time to guide your decision making, your process lacks added value and wastes your time and resources.

You cannot use data if you do not know it exists or where to find it. Unstructured, unorganized data requires more sorting time to find desired information.

The Technical Data Management Solution

Document

- Keep in mind that data is only as valuable as the metadata saved with the raw data
- Use the TDM data model to save metadata at multiple levels within your file

Index

- Use DataPlugins to access any data file
- Use DataFinder to index metadata from any file
- Scale from an individual PC all the way to a global enterprise-level indexing solution

Search

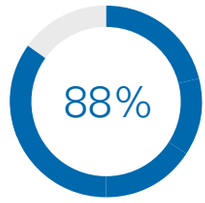
- Spend less time finding the data you need to analyze by using text or conditional queries
- Return results at a file or individual channel level
- Load data from multiple sources into a single analysis tool

Many companies spend considerable time and money designing and implementing their DAQ systems but often fail to thoroughly plan for data management. If you invest heavily in acquiring your data, you should also invest the time and money you need to manage your data effectively.

To solve the common challenges associated with effective data management, NI has identified four key pieces to the data management puzzle: a flexible and organized data model, a way to convert existing file formats to this universal data model, a comprehensive data index for advanced search capabilities, and a data retrieval and post-processing environment. As a result, the NI technical data management (TDM) solution consists of four components:

- A universal data model for storing descriptive information with your data
- DataPlugin technology to map any file format to a universal data model
- DataFinder technology for indexing test data for search
- DIAdem and LabVIEW for searching, mining, analyzing, and reporting

Combining these components with an automated analysis and reporting routine reduces errors, improves efficiency, and allows you to make data-driven decisions confidently.



of Spreadsheets Contain Errors

Get More Value From Your Dark Data

It is estimated that only 5 percent of all data collected is analyzed. Are you missing out on key insights because you are using the wrong tools?

Visualize

- Interactively overlay multiple test runs and visually correlate the results
- Synchronize data with video, 3D models, sound playback, GPS map displays, and more

Analyze

- Analyze test data interactively using hundreds of built-in engineering-focused analysis functions
- Create custom analysis routines
- Call existing .m or LabVIEW analysis routines

Report

- Design report templates in a drag-and-drop editor
- Make data-driven decisions confidently as a team

Manage and Analyze Your Data

DIAdem is an interactive tool used to quickly search, load, visualize, analyze, and report sensor data collected during acquisition or simulation. It is designed to meet the demands of today's testing environment, which require you to access, process, and report on large volumes of scattered data in multiple file formats to make informed decisions.

DIAdem uses DataPlugin technology to access any data file. DataFinder, which installs with DIAdem, can then index the metadata from the files so you can run text-based or conditional queries using an interactive user interface to find the data you need to analyze.

"We have reduced our reporting and analysis time by 95 percent and achieved our goal of replacing the current multistep process with a one-button DIAdem solution."

Jim Knuff, Raytheon

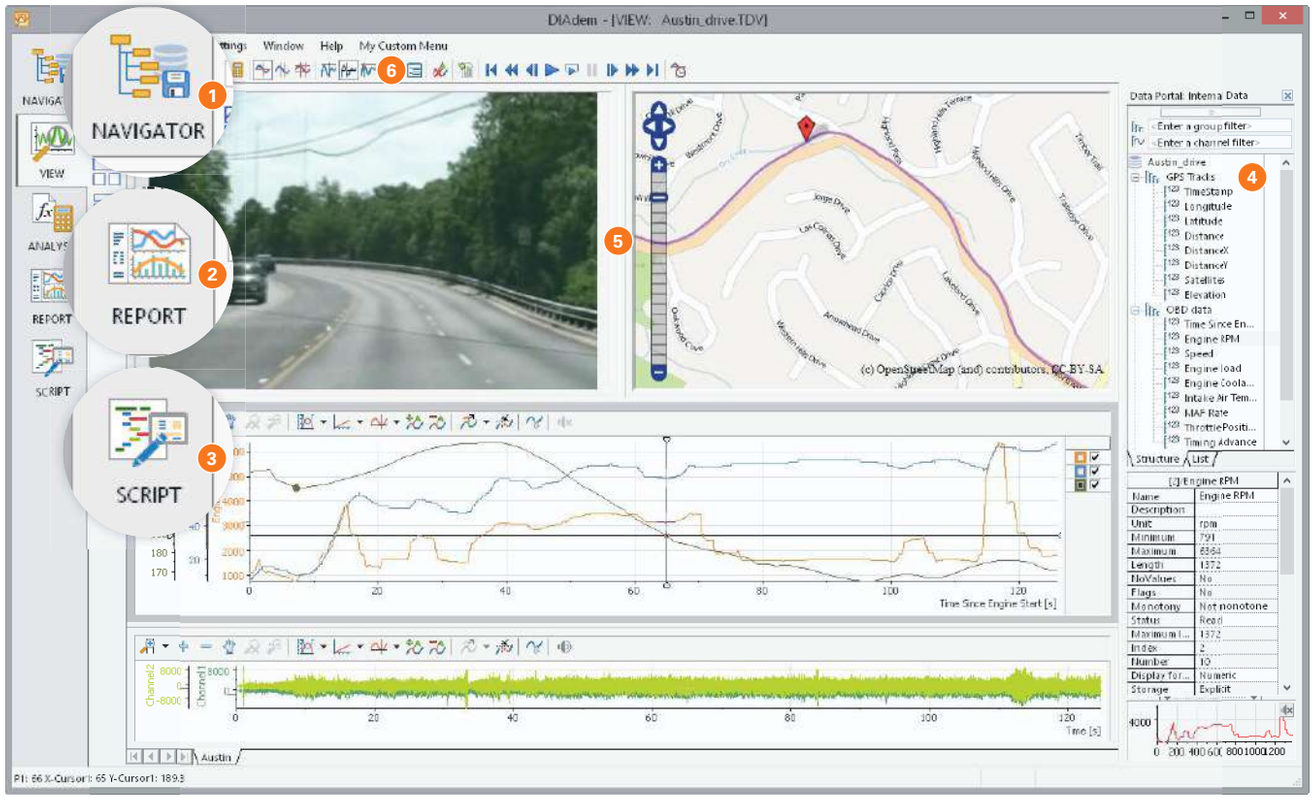
DIAdem

DIAdem helps you analyze more of your data, which holds valuable information. With its hundreds of built-in, configuration-based engineering functions, DIAdem can help you focus on the analysis process instead of the low-level formula details. You can also add your own custom analysis formulas and integrate existing analysis routines from LabVIEW or .m files.

1 Find the Data You Need in Seconds
Create simple and advanced queries to quickly find the data you need to analyze.

2 Simplify Reporting With Templates
Design and reuse a report template for the consistent delivery of information.

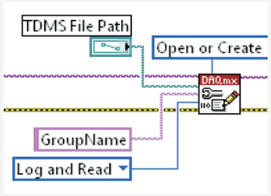
3 Automate Analysis Routines
Reduce mistakes and save time and money by automating your tasks.



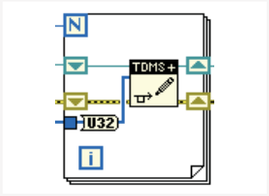
4 Load Over 1,000 File Formats
Save time using a single tool to perform data analysis on any file.

5 Use More Than Data to Make Decisions
Dive deeper into the meaning of your results by watching your data playback with video, 3D models, GPS maps, and more.

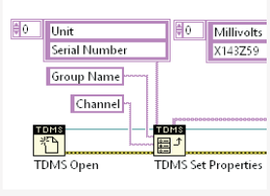
6 Leverage Flexible Software
Tailor the DIAdem environment to showcase the functionality you use most.



The Fastest Way to Stream Sensor Data to Disk
Stream data to disk and push the boundaries of high-speed sensor data collection with the TDMS file format.



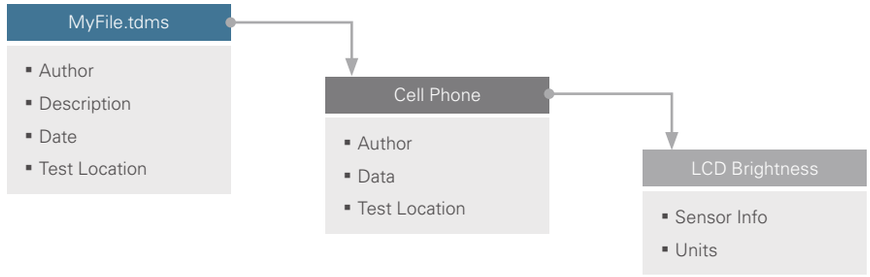
Low-Level Control of Advanced Streaming Functionality
Perform synchronous or asynchronous writes and reads or defragment large files to increase performance.



Focus on the Data, Not the Format
The TDM and TDMS files scale naturally with your application so you can add more channels or metadata anytime.

A Model of Efficiency

The TDM file format is optimized for saving sensor data to disk. The binary TDM data model is an easily exchangeable, inherently structured, high-speed-streaming-capable data model. When combined with the other technologies in the NI TDM ecosystem, this model becomes quickly searchable without the need for complicated and expensive database design, architecture, or maintenance. The data model is best used in the TDM and TDM Streaming (TDMS) file formats.



Three Levels of Hierarchy
The TDM data model is structured using three levels of hierarchy: file, group, and channel. The file level can contain an unlimited number of groups, and each group can contain an unlimited number of channels.

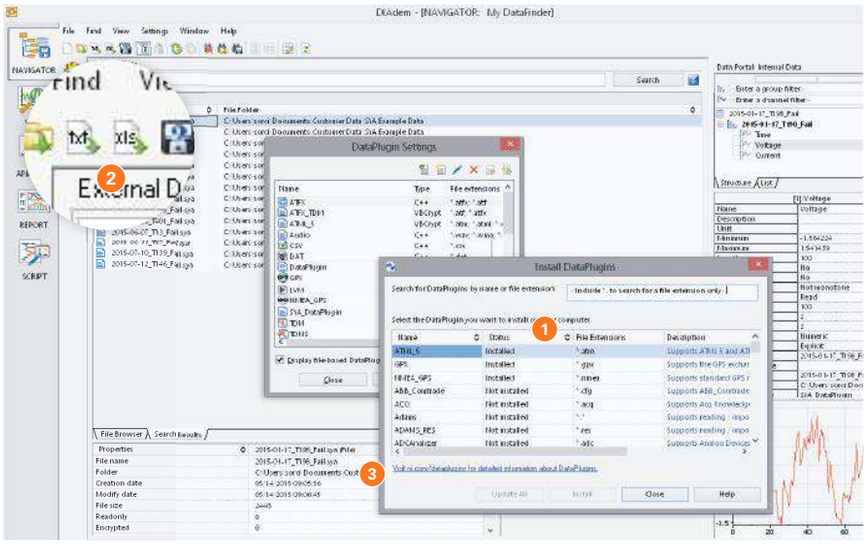
Unlimited Metadata
Each level—file, group, and channel—accepts an unlimited number of custom-defined attributes to achieve well-documented and search-ready data files.

NI Platform-Supported File Formats
All NI software development environments interface with TDM and TDMS files, so you can easily add descriptive information along with captured measurement or simulation data.

TDM Files in Third-Party Products
Use a variety of tools, such as the TDM C DLL, TDM Excel Add-In, documented internal structure, and so on, to develop applications that read, write, or view TDM files.

DataPlugins

Sometimes using the TDM or TDMS file format is not possible, such as when certain instruments automatically write data to a custom format. For this purpose, NI has created DataPlugins, a technology that you can use to provide a description of how to map any custom file format and corresponding metadata to the TDM data model. You can create DataPlugins using VBScript, LabVIEW or C++.



1 Search for DataPlugins
Browse published DataPlugins online at ni.com/dataplugins.

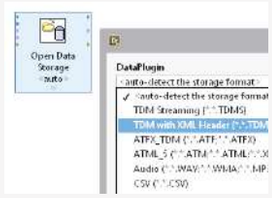
2 Walk Through the DataPlugin Wizard
Interactively create your own DataPlugin for text or Excel files using the five-step DataPlugin wizard.

3 Write Your Own DataPlugins
Use the VBScript Programmer's Reference Guide or LabVIEW Software Developer Kit to create your own DataPlugin to use and distribute.

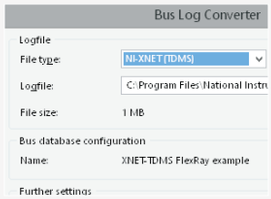
Extract Metadata From Any File Format

At ni.com/dataplugins, NI has published free downloadable DataPlugins for hundreds of the most commonly used data file formats.

- .tdms
- .tdm
- .csv
- .xls
- .xlsx
- .txt
- .mat
- .cfg
- .bin
- .dat
- .mf4
- .mdf
- .wdf
- .d7d
- .rec
- .edf+



Use DataPlugins in LabVIEW
Use the Storage/DataPlugin palette in LabVIEW to load any file format into LabVIEW.



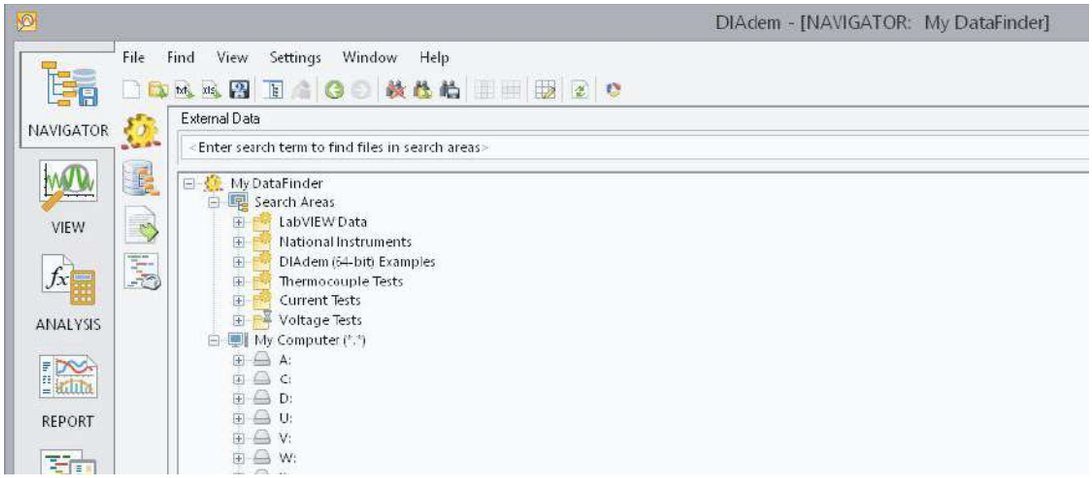
Read in CAN, LIN, and FlexRay Data
Use the Bus Log Converter to convert logfiles from CAN, LIN, and FlexRay buses to the TDM data model.

```
Option Explicit

'Custom Binary DataPlugin

Sub ReadStore(File)
  'Create Block.  This is a binary fi
  Dim Block : Set Block = File.GetBin

  'Add four channels to the block.
  Dim Channel1 : Set Channel1 = Block
  Dim Channel2 : Set Channel2 = Block
  Dim Channel3 : Set Channel3 = Block
  Dim Channel4 : Set Channel4 = Block
```

Request a Custom DataPlugin
Email dataplugins@ni.com if you don't see the DataPlugin you need, and NI's DataPlugin team will write one for you. Include a sample file and a description of how you use the data.

My DataFinder

My DataFinder provides an out-of-the-box utility for mining test data. DataPlugins allow DataFinder to index metadata from any file format. A local My DataFinder index installs automatically with DIAdem and the LabVIEW DataFinder Toolkit. Once it is installed, you can configure My DataFinder to index your entire hard disk, but you also can identify or exclude specific locations on the disk where you expect test data to be located.



Self-Maintaining Database
As soon as a valid data file is created, deleted, or edited, My DataFinder automatically indexes the properties of this file.

Data Management for an Individual
My DataFinder was designed for an individual who needs to search and analyze data located on a single computer or network drive.

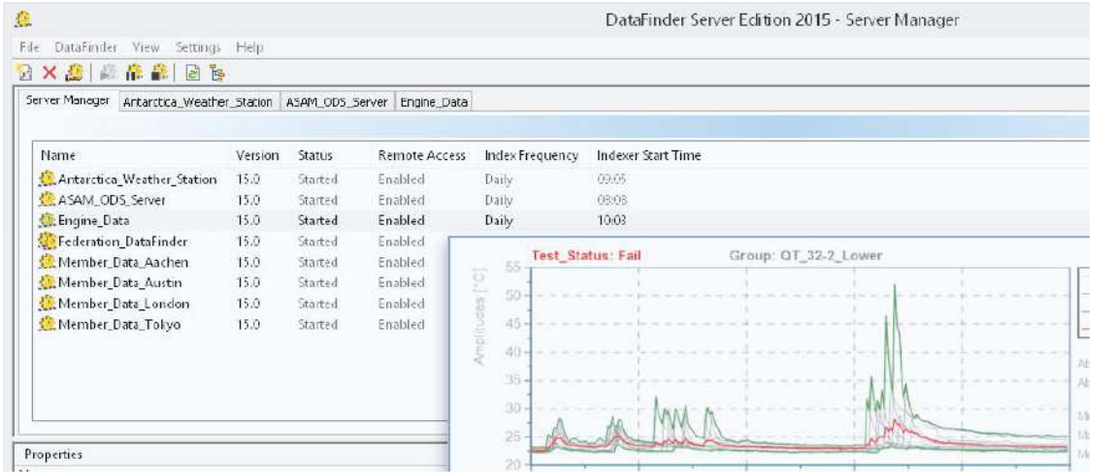
Queries to Find Data Quickly
The properties once indexed by My DataFinder become instantly searchable from within the DIAdem or LabVIEW DataFinder Toolkit environment.

"As test requirements evolve and the need for tighter safety tolerances increases, we collect more data, have greater processing requirements, and, as always, look to reduce costs. DIAdem meets all of these needs by helping us rapidly process our test data and providing tools to quickly respond to user changes and requests."

Steve Armstrong, Autoliv

DataFinder Server Edition

DataFinder Server Edition builds on the concept and technology of My DataFinder by hosting the index on a server machine, which monitors all configured test data locations even if they are distributed globally. DataFinder Server Edition allows engineers to concurrently and securely access data, ensures consistent search results among all query requests, and integrates seamlessly into archiving systems.

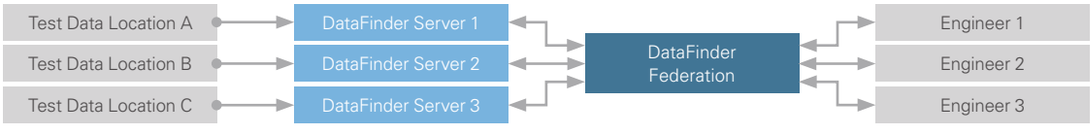


Data Management for the Enterprise
Allow multiple DataFinder servers to communicate with each other regardless of location. When you perform searches, results are aggregated from all worldwide locations.

ASAM ODS Compatibility
Access indexed data using DataFinder Server Edition, which complies with ASAM ODS standard requirements.

Server-Side Analytics
Clean up data by mapping names, correcting offsets, adding units, or running a customized analysis routine on any new data that is added to a specific search location.

DATAFINDER SERVER EDITION



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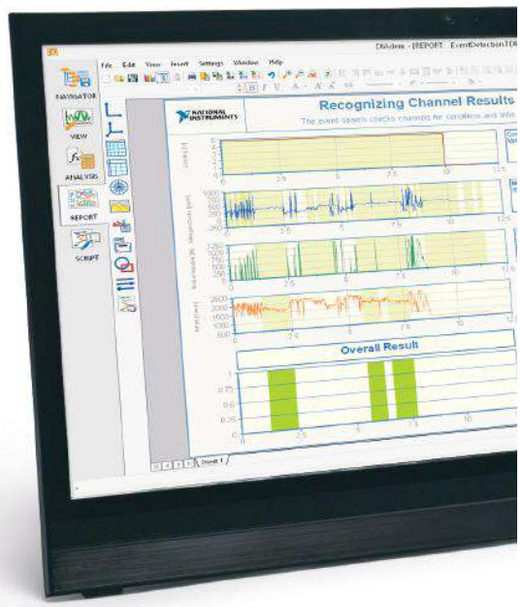
Technical Resources
Access volumes of self-help information at ni.com including application tips, example programs, and developer communities.



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