



APEX Turbine®

Testing Technologies



20 EXP
YEARS



2020
PRODUCT CATALOG

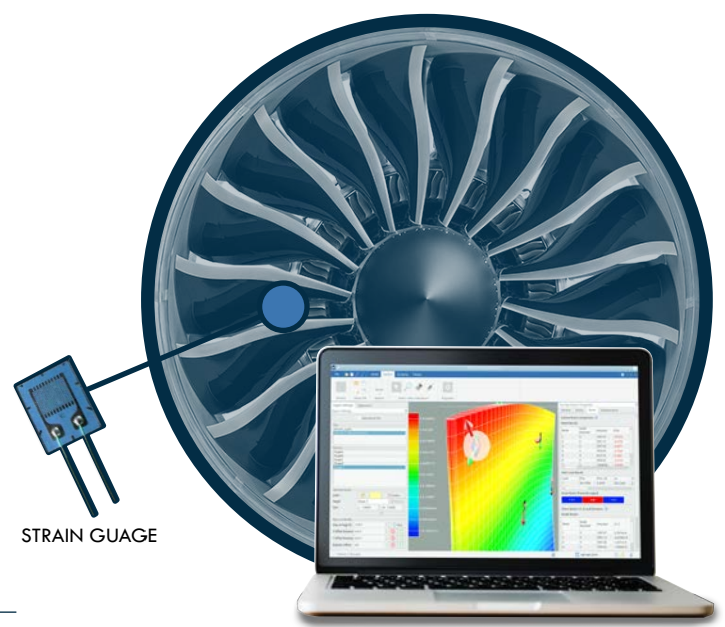




Apply strain gages and accelerometers to your finite element model independent of the mesh anywhere you want, or let Gagemap do it for you.

APEX Sensor Placement & FEA Analysis

- Compute optimum sensor placement based on a variety of user-selectable criteria using an advanced genetic algorithm. Criteria include maximizing measurable strain/displacement, maximizing strain vector orthogonality between modes for mode identification, minimizing error due to sensor misplacement and more.
- Create/edit virtual strain gages, displacement sensors, and tip timing sensors. Edit sensors locations and orientations using drag and drop technology.
- View a variety of structural information such as displacement, stress, and strain and animate normal modes analysis results.

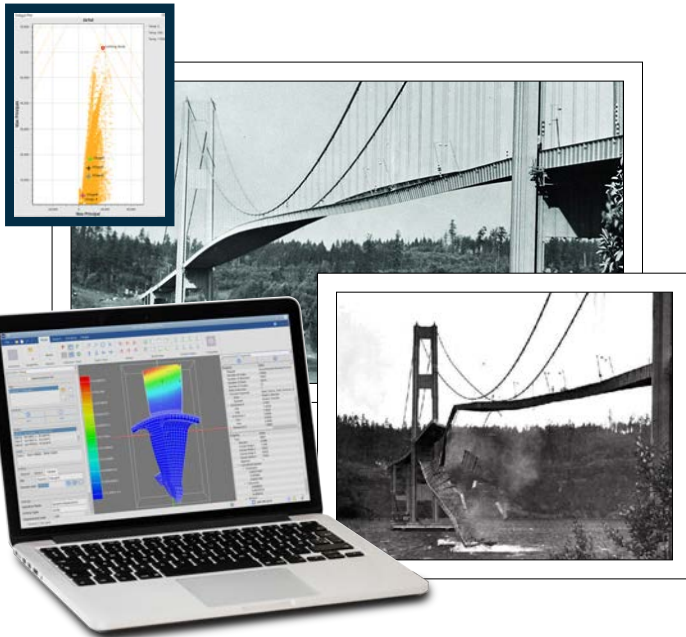


STRAIN GAUGE

Interface directly with:

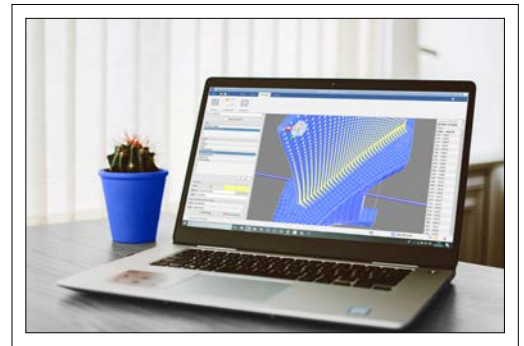


MSC Nastran



Fatigue Analysis

Perform High Cycle Fatigue (HCF) assessments based on test data. Fatigue model supports location dependent material properties and temperature dependent material properties.



Sensor Grouping

Focus the analysis based on geometry grouping. Groups can be created interactively, or by import from the finite element model data. Combine groups based on Boolean operators.



Onsite Training

We've moved much of our know-how to the real time environment where we help guide critical test decisions and get a head-start on the final analysis.



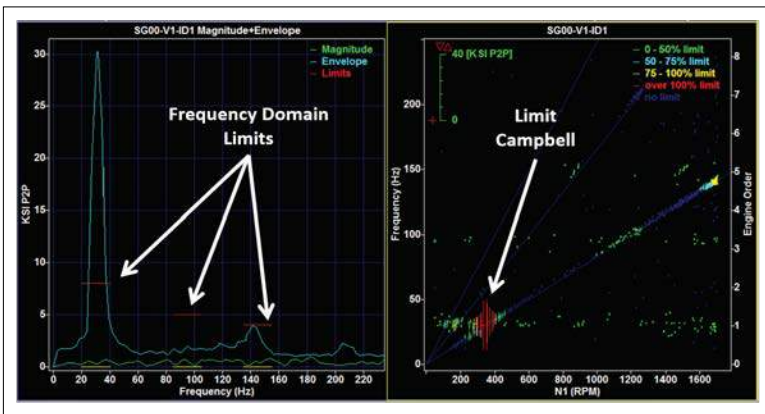
The link between your finite element analysis and test preparation and data analysis

- Validate finite element models based on strain gage data or scanning laser vibrometry data. Analytical and experimental data are compared directly in the sensor coordinate system.
- Perform many of these features and more using the GageMap scripting module which allows finite element analysis results and GageMap specific results to be wrapped into advanced analysis scripts such as dealing with “hot/cold” geometry correction, determination of limits based on modal superposition, or application of advanced success criteria.

How do YOU create safety limits for testing?

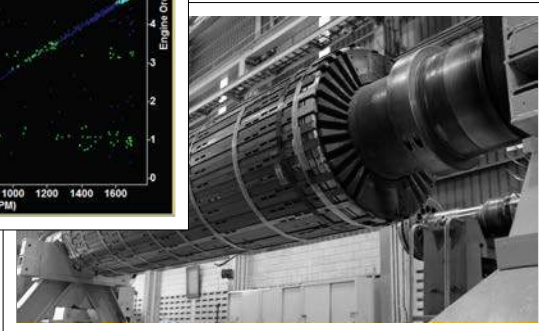
Getting data from your finite element model that you can compare to your test data is challenging. Complex geometry, cyclic symmetry, complex strain fields, location dependent material properties, and anisotropy all make figuring out the strain at a particular point in a particular direction very difficult. Not to mention it can be difficult to even mount the strain gage. And, how about resolving the measurement in the direction of the sensor? Is the sensor large compared to the finite element mesh? What about averaging?

GageMap was designed to handle all these problems so that you can spend time working on the test.



Sensor Limits

Prepare mode-based and parameter based (centrifugal stiffening, for example) sensor limits, using the fatigue module. Export sensor limits for use in other APEX products. Minimize measurement error by remapping sensor locations within application tolerances based on validation data.



SENSOR PLACEMENT



FATIGUE ANALYSIS



MODEL VALIDATION



SENSOR LIMITS



MODEL ANIMATION



SENSOR GROUPING



TASK AUTOMATION



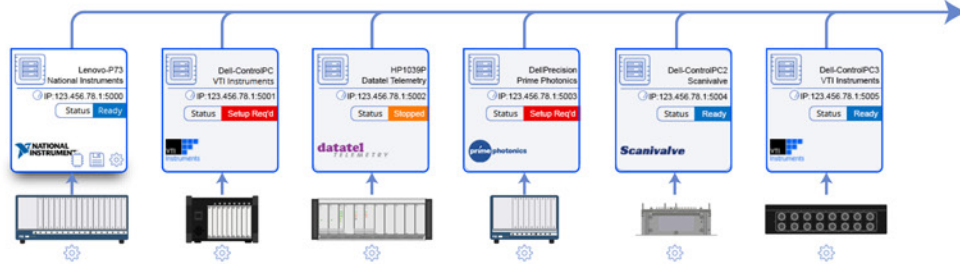


The Next Generation of Data Acquisition, Control, Setup and Online Analysis



Reliably Acquire Time-synchronized Data From A Network Of Digitizers, Regardless Of Sample Rate Or Sensor Type

Works with products from industry-leading brands you trust like Dataltel, National Instruments, VTI Instruments/Ametek, Prime Photonics and Scanivalve

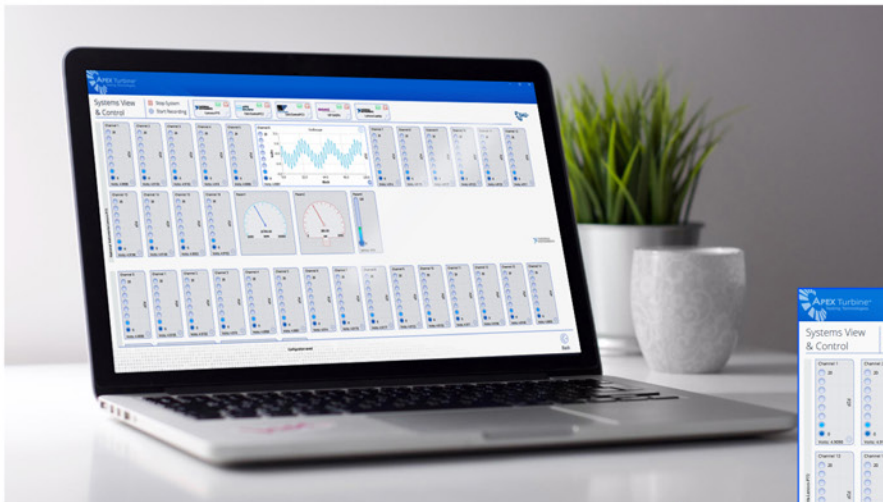


Simple, Intuitive, Graphical Setup & Control Interface

- 1 Choose Chassis
- 2 Choose Digitizer Cards
- 3 Configure Cards
- 4 Save Setup

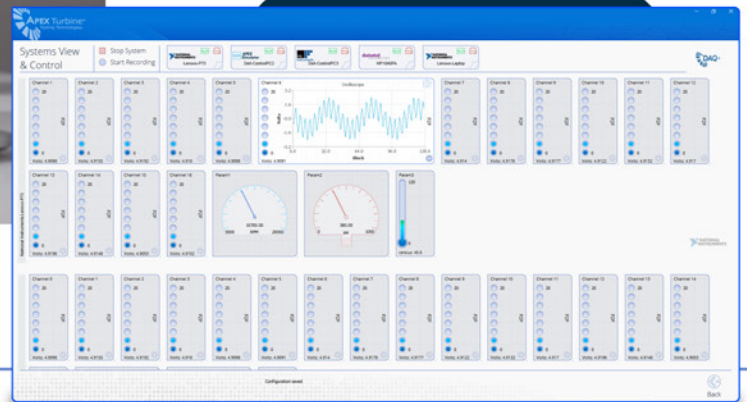


Both the data acquisition and online analysis portions of DAQ+ utilize a network discovery technology to easily locate, configure, record, and analyze data streams from a variety of hardware simultaneously



Simple, Clear, Concise, Signal Monitoring & Diagnostic Tools For Easy Sensor Troubleshooting

Records time-domain data in open file format

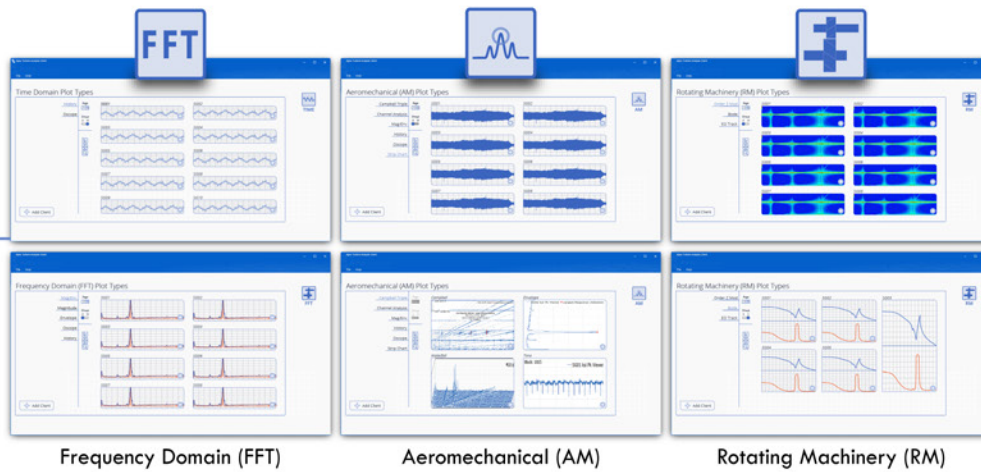




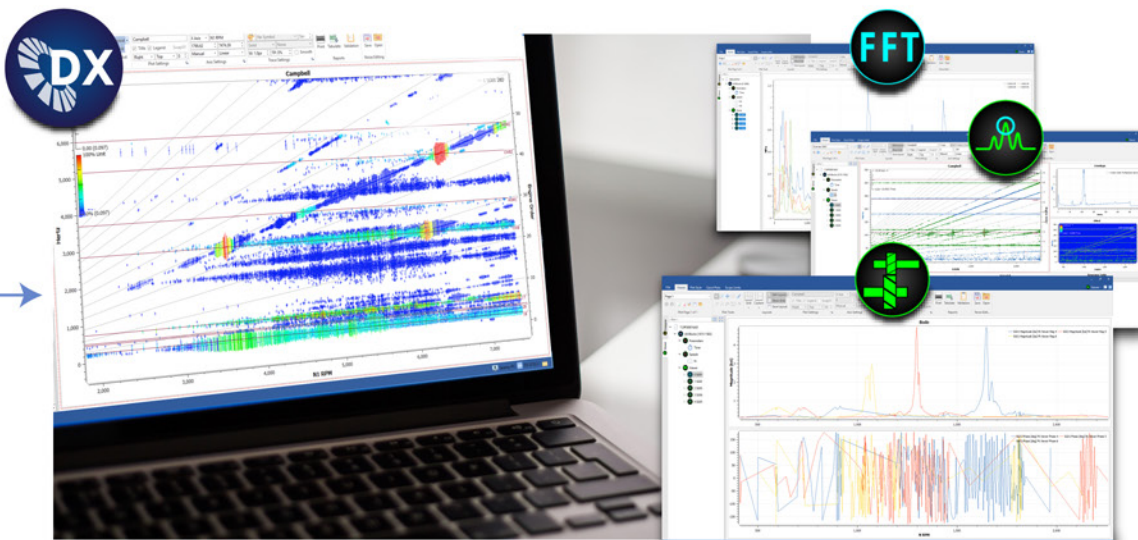
SIMPLE DATA ACQUISITION COUPLED WITH INDUSTRY-LEADING DATA ANALYSIS

Add Online Data Processing Modules For Enhanced Online Monitoring And Storage

Quickly and easily subscribe to data streams through simple discipline-specific clients with plots such as ZMOD, waterfall, Campbell diagram, history, Bode and oscilloscope plots making visualizing your data easy and effective



All data acquired using the DAQ+ software can be seamlessly opened, analyzed and processed offline using APEX DX - an easy to use, graphical, signal processing environment that simplifies analysis and reporting



Based on 20+ years of APEX software development experience using same robust, mature software library as our DS and DR acquisition and online monitoring products.



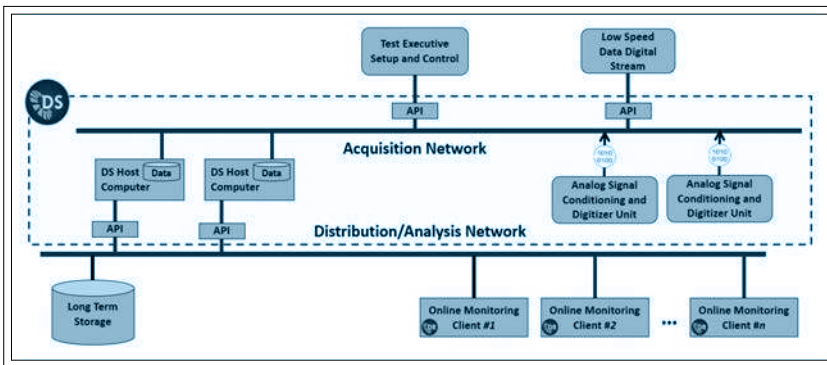


DS software provides set up and control of dynamic data acquisition systems (DDAS) from a variety of digitizer, signal conditioning and data acquisition hardware manufacturers.



APEX Data Acquisition- Complete Solutions

- We are experts at designing complete data acquisition solutions to meet a customer's specific needs
- DS is a complete fully-featured software toolkit for data acquisition, test setup and monitoring
- DS comes fully integrated with a variety of PXI, PCI, LXI, USB, and Ethernet hardware systems from established manufacturers like NI, VTI, Dewetron and General Standards
- Supports integrated or stand-alone signal conditioning from established manufacturers like Precision Filters, Scanivalve, VTI & Dewetron
- Monitor YOUR data the way you want with customized visualization and control on multiple pages, screens or monitoring stations
- Synchronize, store and visualize dynamic and low-speed (parameter) data in the same data file with the APEX network architecture
- Full frequency-domain data processing Open architecture (API) allows customers to write custom plugins for setup, control and custom clients.



Fully Scalable Solutions

Acquire hundreds of channels with simultaneous sampling and analyze the data in real-time



Customization

We can integrate with YOUR existing hardware or customize a solution using leading DAQ hardware suppliers.



Online Monitoring

APEX DR is an Online Monitoring Software. Interface to APEX DS Data Acquisition Software with subscription based monitoring on one or many monitoring stations.



Onsite Training

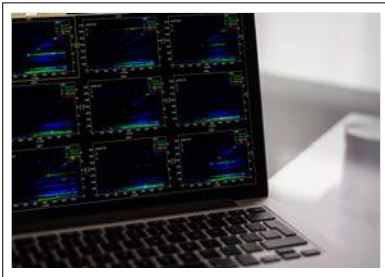
We've moved much of our know-how to the real time environment where we help guide critical test decisions and get a head-start on the final analysis.



DYNAMIC DATA ACQUISITION WITH REAL-TIME MONITORING

FROM 4 TO 400+ CHANNELS, DS CAN SUPPORT YOUR TESTING REQUIREMENTS!

- Networked architecture for flexibility and large channel counts. All channels can be synchronized. Multiple pages; multiple windows with no loss of plot data when changing pages.
- Calibration values can be entered or are automatically computed. Individual channels can be FFT processed. Choose a variety of spectral window functions such as FFT Scaling, FFT Overlap, and FFT Zoom for maximum flexibility. Store all acquisition setups and easily recall for future tests. Supports a variety of methods for calibration including NIST traceability



- Combine high and low speed data streams for enhanced online analysis and data storage. Interface to existing low speed data systems with a simple TCP-IP protocol.
- Synchronously records low speed, or “parameter” data with high speed signals (e.g., pressures, temperatures, speeds, geometry, etc.). Data is also available for real-time monitoring. Interface to existing low speed data systems with a simple TCP-IP protocol.

- Easy setup and interface to a variety of analog and digital devices.
- DS supports a variety of popular hardware platforms and suppliers so you can decouple hardware and software procurement decisions.
- Check signal health easily with color coded visual monitoring. Near over range signals are shown in yellow. Over range signals are easily identified with red.
- Data-Acquisition software is licensed on a per-channel basis, so you pay only for the amount of software you need. Channel licenses can be node locked or floating and support single device drivers or all device drivers.



MULTI-CHANNEL



LOW & HIGH SPEED



REAL-TIME ANALYSIS



DEVICE CONTROL



CUSTOM HARDWARE



SIGNAL MONITORING



FLEXIBLE LICENSE



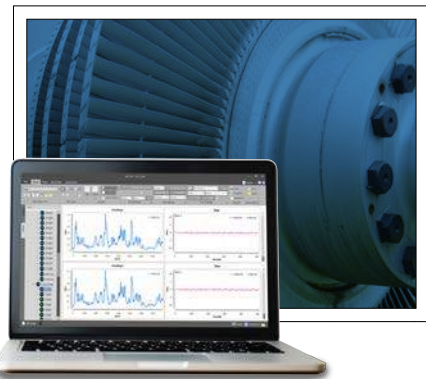


DX is an easy to use, graphical, signal processing environment that simplifies analysis and reporting of dynamic data. DX includes everything needed to process data for a variety of applications and industries in a very intuitive, drag-and-drop user interface. Generate fully-interactive engineering plots from one or more tests and create reports in just a few mouse clicks.



APEX Offline Signal Processing & Analysis

- High performance post-processing application for time, frequency, and order domain analysis
- Super-easy drag and drop user interface for sophisticated engineering analysis
- Create a repeatable, documented, easy to execute process with the unique “Process Designer” and “View Canvas” user interface
- Processes large amounts of data quickly and efficiently
 - Simultaneously process multiple files
 - Multi-threaded for maximum processing throughput
 - Utilizes memory mapped technology for near instant plotting of processed data

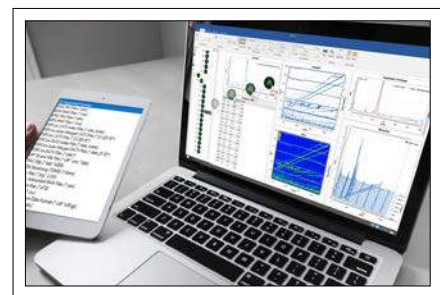
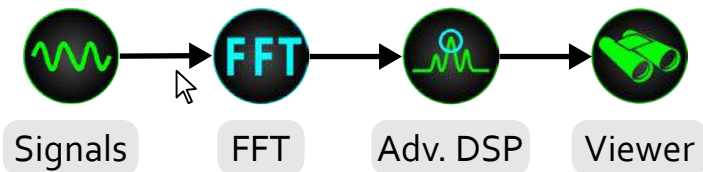


Digital Filtering

Includes IIR and FIR low-pass, high-pass and band-pass digital filters, and FFT-based filters

Automated Response Detection

Filter large data sets using APEX proprietary collection methods for “Big-Data” trending



Supports a wide variety of file formats

- APEX Data Acquisition .pkx, .rwx
- DATX Data Acquisition .datx, .datx_index, .cats
- Pacific Instruments .raw
- National Instruments .tdms, .tdm
- MATLAB Binary .mat
- Universal File Format 58& 58b .uff, .unv, .bin
- Sony Data Acquisition .BIN
- TEAC Data Acquisition .DAT
- ATEFX Data Format .atfx
- CDF Data Format .cdf

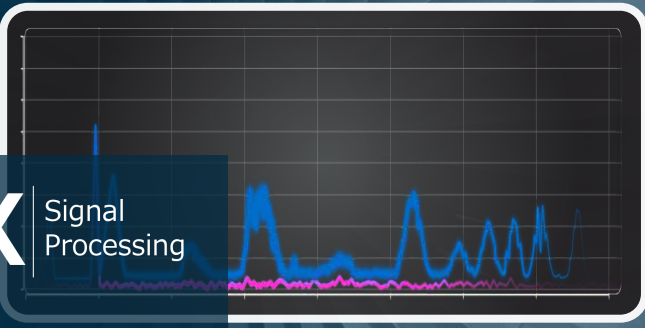
Process Driven – Same Results Every Time, From Any Engineer

Acquire hundreds of channels with simultaneous sampling and analyze the data in real-time

Analyze, Filter, Export dynamic data from one or multiple tests



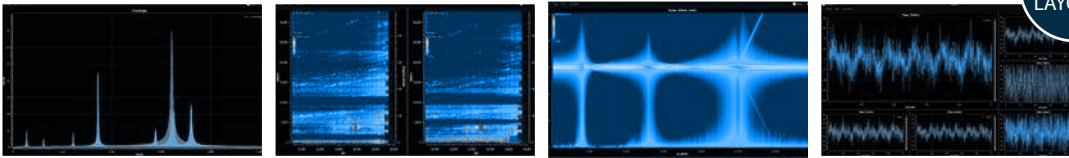
Signal Processing



NO PROGRAMMING REQUIRED!

The Easiest Way To Do Signal Processing And Analysis Of Dynamic Data.

- Once processed, all data can be viewed within the environment on a wide range of engineering plot types including oscilloscope, spectrum, spectrum envelope (peak hold), Campbell diagram, bode, z-mod, order z-mod, order tracking and history.



CUSTOM LAYOUTS

- All Plots are fully interactive and can be zoomed, and panned. Overlays are done seamlessly so that you can easily understand what has happened in the test.
- Link plot axes together for synchronized replay and to interactively zoom, pan, and interrogate data on any engineering diagram.
- Order domain analysis with Rotating Machinery Toolkit. Perform temporal (FFT) and spatial (Order) analysis. Accurately calculate phase and magnitude as it relates RPM.
- Create customizable, formatted engineering reports with 1-click. Export data to a variety of other formats for use in Matlab®, Excel, or the APEX DV free viewer.



Onsite Training

We've moved much of our know-how to the real time environment where we help guide critical test decisions and get a head-start on the final analysis.



Batch Processing

This type of processing allows for numerous simultaneous file processing.



FFT ANALYSIS



OPEN FILE FORMATS



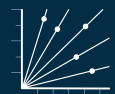
ROTATING MACHINERY



CUSTOM REPORTS



DIGITAL FILTERING



ENGINEERING PLOTS



FLEXIBLE LICENSE



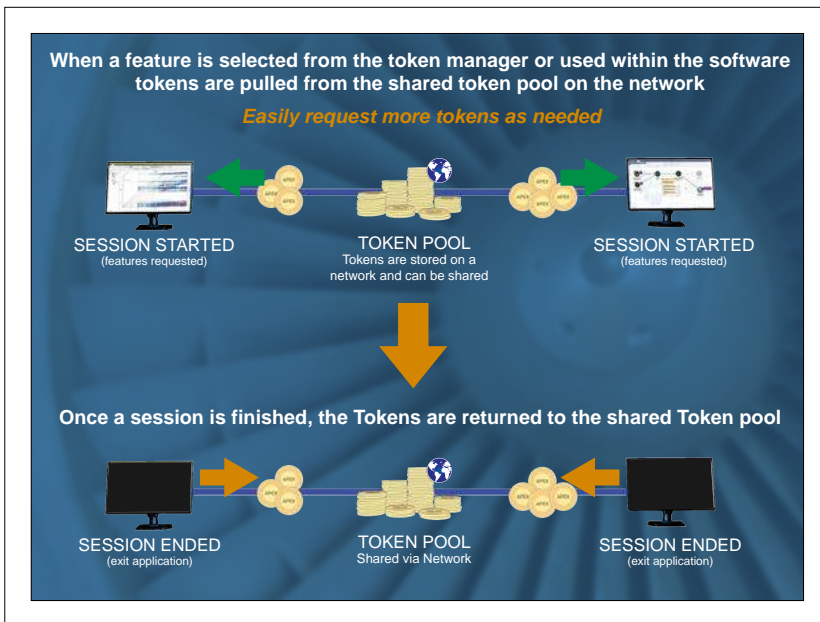


TOKEN BASED LICENSING



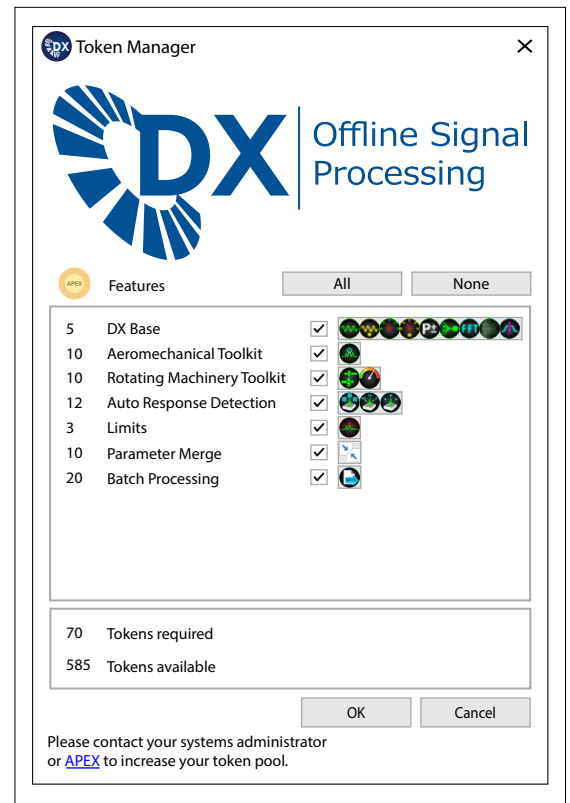
APEX FLEXIBLE TOKEN LICENSING MODEL

With token licensing, users share a pool of analysis tokens on their network. Analysis features within any of the APEX analysis products have token values assigned that are dynamically allocated when a user launches an application or uses one of the features. This means that all users have access to all features simply by using whatever features they want. Once a user finishes their session, the tokens are returned to the token pool for other analysts to use.



In addition to perpetual analysis tokens, APEX can also lease or provide token subscriptions. Either of these licensing models can be used to add tokens during high use or testing periods or on an as-needed basis. This also offers the potential to shift from capital expense (CapEx) purchases to operational expense (OpEx) purchases. APEX offers short-term and long-term options.

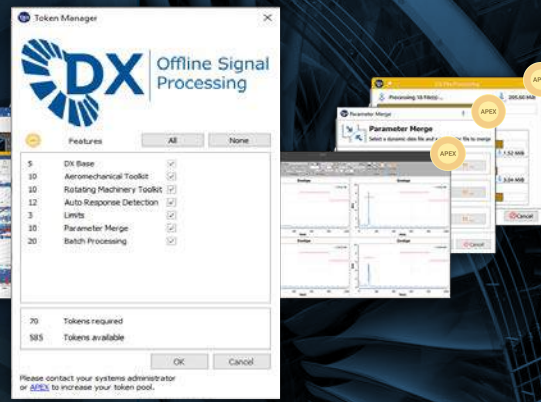
ACCESS THE TOOLS YOU NEED WHEN YOU NEED THEM!









Analysis Token Features

Analysis features in DX include basic time and frequency domain analysis, order processing, Aeromechanical analysis, limits, automated response detection (aka collections), batch printing, and parameter merge.

TOKEN BASED LICENSING



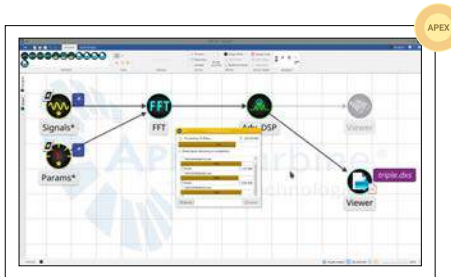
DX Offline Signal Processing Software Environment Features

- Aeromechanical Toolkit** - Activate advanced engineering plots like Campbell Diagrams, Waterfalls, Z-Mods, Strip Charts, Bode, Tracking Plot and Response Table as well as Peak Processing to improve magnitude and frequency accuracy. 
- Rotating Machinery Toolkit** - Activate order domain analysis and perform temporal (FFT) and spatial (Order) analysis. Accurately calculate phase and magnitude as it relates RPM. 
- Auto Response Detection*** - Efficiently process big data by extracting key responses using DX's powerful detection methods including Largest Peak, Grid Based, and EO Based. 
- Limits*** - Easily compare data to pass/fail criteria and present results in a variety of ways. 
- Parameter Merge** - Merge low speed parameter data into dynamic data for interactive plotting or for trending or statistical analysis. 
- Batch Processing** - Efficiently process large amounts of data into preformatted reports or response collections simultaneously. 

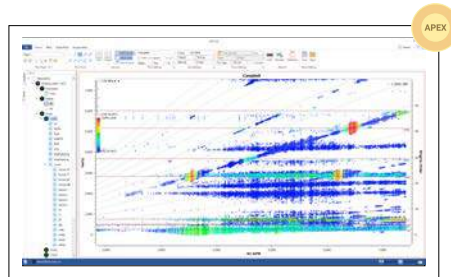
*Requires aeromechanical tool kit

DV Free Data Viewer Premium Features

- DATX replay** - Replay .datx files recorded outside of APEX products
- Multiview** - View DV on multiple screens.
- Save Projects** - Saves plot setup display and project infor preferences.
- Disable Ads** - Disables the APEX product banner within the DV Free Viewer.



DX-BATCH PROCESSING



DX-AUTO RESPONSE DETECTION



FFT ANALYSIS



ROTATING MACHINERY



LIMITS



ENGINEERING PLOTS



BATCH PROCESSING



DATX REPLAY



MULTI-VIEW



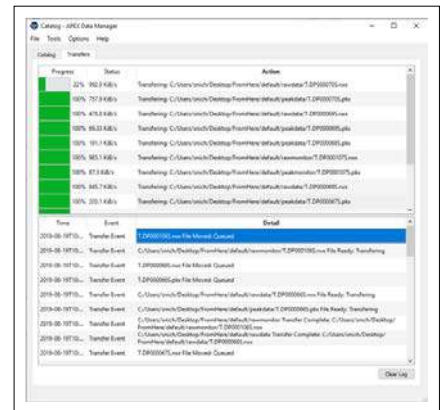


DM is a data management application which provides safe backup and directory management through a dedicated client server utility.



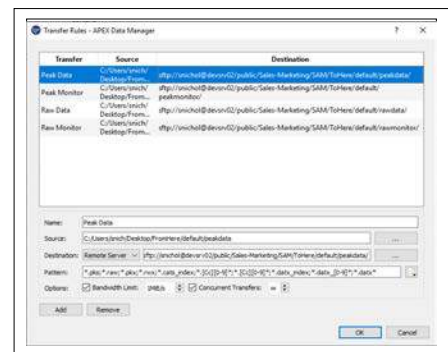
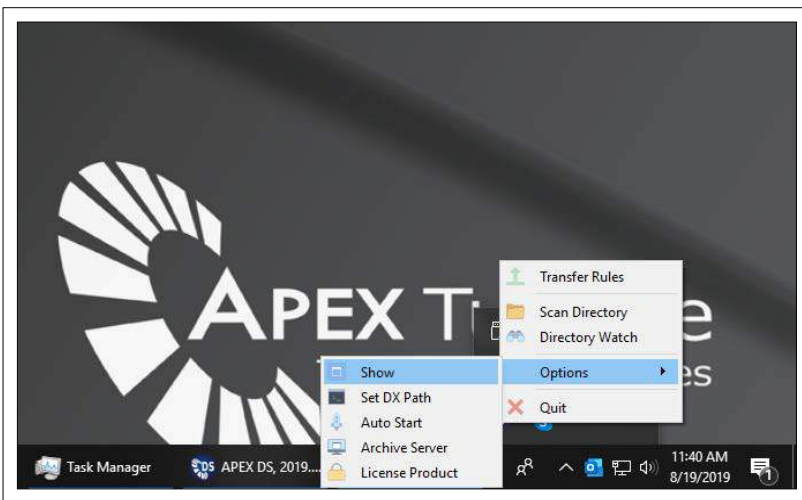
APEX Data Management

- DM copies data from multiple data acquisition machines to any storage location on the network.
- Automatically add files to the transfer queue.
- Files can be added one or many at a time.
- View and sort queue list by several attributes.
- User is informed when disk space is too low for queued transfers.
- Schedule file transfers for any future time.
- Can be controlled remotely using published API.



Safe Managed Backups

Filter large data sets using APEX proprietary collection methods for "Big-Data" trending



Works Completely In The Background, Point-to-Point

Monitors directories on network machines. Client establishes priority, queue transfers, monitors progress among storage devices.

Complete Control Over Your Data

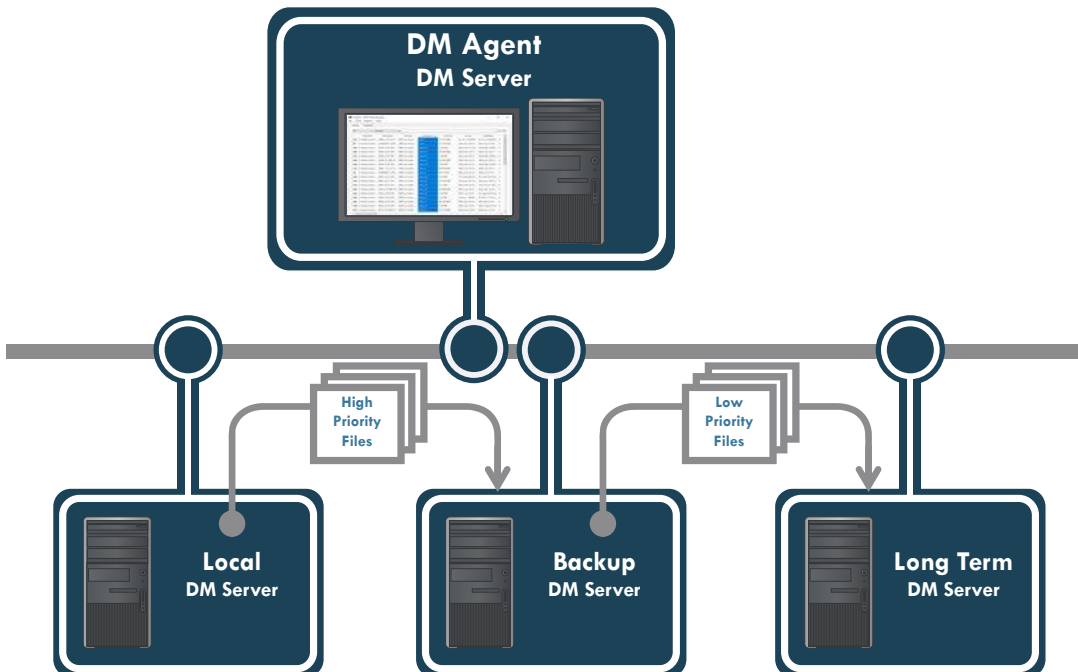
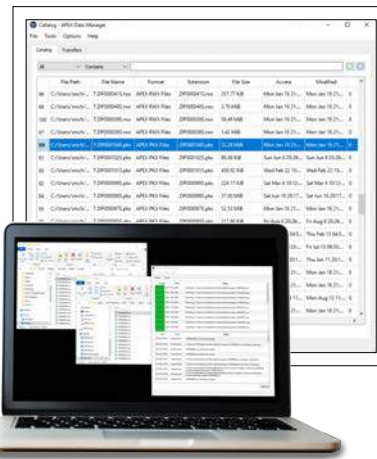
Adjust the bandwidth available to DM. If network connection is dropped DM picks up right where you left off.



STRESS-FREE DATA MANAGEMENT

Manage, transfer and catalog data easily, efficiently and securely.

- No database to manage
- Catalog from any Windows or network directory
- Supports all Apex DX analysis software supported file types
- Easy data mining with search & select functions based on metadata
- Log files provide data security
- Efficiently retrieve archived data from anywhere on the network
- Store, back-up and retrieve mission critical data in background
- Establish priority and queues, then monitor transfer progress
- Manual or fully automated operation



SAFE BACKUPS



POINT-TO-POINT



AUTO-TRANSFER



PRIORITIZE DATA



DATA CATALOGING



ONLINE CONTROL





CUSTOM DESIGNED TEST SOLUTIONS

For over 20 years, APEX has offered comprehensive turbine testing solutions from highly experienced designers and integrators that benefit turbomachinery OEM's around the world.



We design industry leading testing solutions world-wide!

Not Just a Supplier, But a Partner

- We are turbomachinery experts, allowing us to provide clients with software and COTS hardware components that have been customized for their needs
- We work together with our clients to understand their specific dynamic data acquisition needs, then we recommend a customized solution consisting of the perfect integration of our software and an appropriate commercial-off-the-shelf hardware platform
- We then source all required components, integrate them and deliver a turn-key product
- The result is an effective, reliable dynamic data acquisition system for stress-free testing



Open Source Means Flexibility

Unlike many of our competitors, APEX systems are "open", meaning our data format is non-proprietary, public, documented and network interfaces to real-time data streams are provided. Open architecture (API) allows customers to write custom plugins for setup, control and custom clients. APEX offers a complete set of APIs that include C-libraries, example source code, and documentation.



One Software; Your Choice of Hardware

Our software integrates seamlessly with a variety of commercial off the shelf hardware solutions providing flexibility and maximizing Return on Investment. Seamless integration of dynamic data and SDAS data. Learn one interface regardless of hardware selection or testing application.



Seamless Hardware Integration

We offer on-site training and can mold our systems to satisfy a variety of testing requirements

“They have made it clear that they will tailor their development to their customer’s needs and they are willing to work with us through the development process.”

-PROPULSION CUSTOMER



WORLD CLASS SUPPORT

“Knowledge of Turbine Testing realities and focus on getting customers the information they need.”

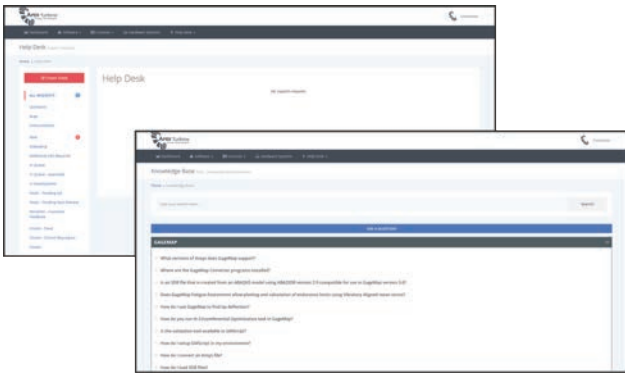
-INDUSTRY PARTNER

Best in Class Customer Service & Support



Comprehensive Customer Support Portal

Our extensive customer support portal offers a wide range of features and is available to all customers under a valid maintenance agreement, at no additional cost.



With our customer support portal you can access:

- FAQs
- Technical Library
- Request Features
- Report Problems
- Ask Questions
- Delivery of software packages
- License management
- Hardware System Management

Available When You Need Us

We make it easy for you to reach us in various ways. Our Customer Support Portal lets you open and track online support requests anytime of day. In addition, we offer 24x7 problem phone support during your most critical tests. We also have experienced engineers available for on-site test setup and support.

Maintenance Support

We provide product and maintenance releases with the latest software upgrades, patches and fixes to keep your system current with the latest APEX technology.

New releases can be easily and securely downloaded from the APEX Customer Support Portal.



OPEN SOURCE API



TESTING PARTNER



WORLD-WIDE SUPPORT



CUSTOMER PORTAL



HARDWARE INTEGRATION



CUSTOM SOLUTIONS





2020 PRODUCT CATALOG

DATA ACQUISITION SETUP & CONTROL
ONLINE DATA MONITORING & ANALYSIS
POST-PROCESSING & ANALYSIS
FILE MANAGMENT

CONTACT US

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