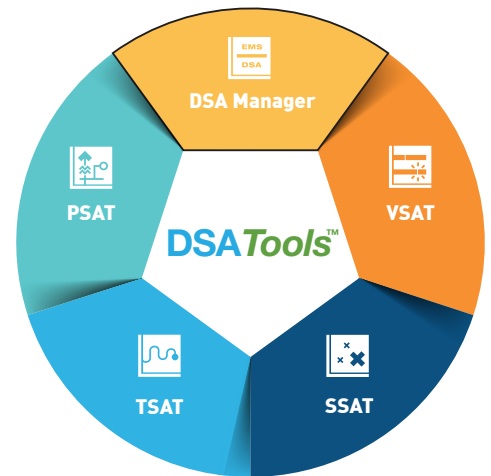


DSA Manager

DSA Manager offers a platform on which the dynamic security assessment (DSA) software is applied in an on-line DSA system, providing system security monitoring, prediction, alarming, control, and other advanced functions required in the operation of power grids.



Secure operation of power systems is of ultimate importance to the reliable supply of electricity, and this is also the central element in modern power grids. On-line DSA, which uses real-time system conditions obtained through SCADA/WAMS and state estimation in an Energy Management System (EMS), provides a viable solution.

APPLICATION SCOPE

An on-line DSA system based on solutions provided by DSA Manager can be used for the following applications:

- Monitor system security
- Determine stability limits
- Recommend remedial control actions
- Manage renewable resources
- Determine/verify special protection systems
- Mitigate congestion in a power market
- Determine active and reactive power reserves
- Complement PMU applications
- Serve as data sources for dispatcher training simulator (DTS)
- Help in scheduling equipment maintenance
- Calibrate and validate power system models
- Prepare models for system studies
- Perform system restoration
- Perform post-mortem analysis of incidents

SYSTEM OVERVIEW

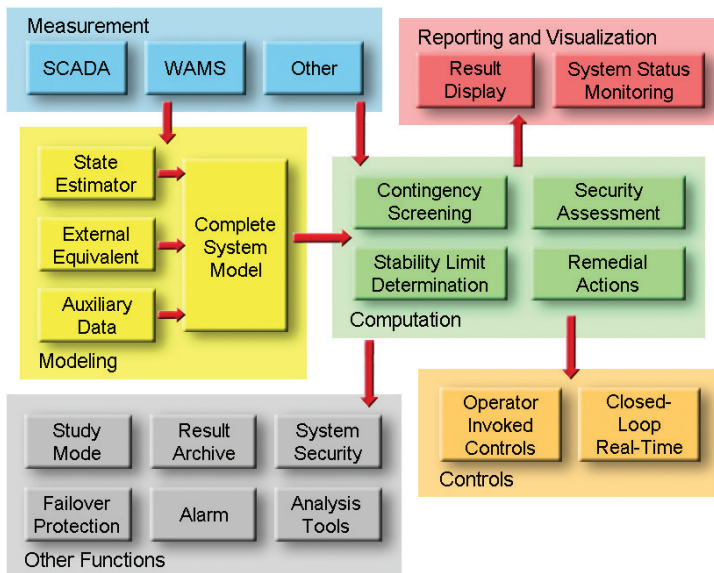
DSA Manager acts as an interface module in an on-line DSA system with five main functions covering the management of:

- **Security assessment modules:** computation clients and engines of each module (VSAT, TSAT, SSAT) are integrated and configured to perform the required analysis tasks.
- **Computation hardware:** all computation servers deployed are set up and scheduled to function properly.
- **Models, data, and analysis scenarios:** all models and data required are specified and maintained. In addition, analysis scenarios are defined for the target applications.
- **Result archiving and visualization:** computation results are saved and analysis cases archived for future use. Various result visualization tools are available, and direct access to more advanced output analysis via DSATools™ DSAOA module is provided.
- **System operation:** this includes a set of functions for system configuration, operation monitoring, system security, failover, and maintenance.

PRODUCT FEATURES:

- *Common platform to integrate DSATools™ with Energy Management System (EMS)*
- *Static and dynamic security assessment including stability limit calculations*
- *Flexibilities in handling real-time and fixed data*
- *Comprehensive analysis scenario definition capabilities*
- *Security violations, stability limits, and alarms reported in simple colour-coded display*
- *Visualization of system security trends vs. time*
- *Study mode for analysis of history and future cases*
- *Software/hardware failover and bad data detection/correction functions*
- *Parallel, distributed computations for scalable performance*

DSA Manager



SECURITY ASSESSMENT OPTIONS

DSA Manager can be configured to interface with any or all of the security assessment modules in Powertech's DSATools™ suite:

- Voltage Security Assessment Tool (VSAT).
- Transient Security Assessment Tool (TSAT).
- Small Signal Analysis Tool (SSAT).

All supported security assessment options in these modules can be enabled for on-line DSA, including:

- Base case security analysis with various security criteria.
- Transfer analysis to determine stability limits.
- Remedial action analysis to recommend preventative and/or corrective control measures when required.

Such analyses are done for the specified contingencies, power transfers, and other models supported by DSATools™ and defined in DSA Manager.

In the real-time mode, analysis scenarios are set up in DSA Manager and an analysis cycle is triggered automatically when a real-time system snapshot (with other optional information) is passed from EMS.

In addition, all security assessment modules are also available through the study mode in DSA Manager for the what-if analysis of archived history cases or forecast future cases.

SYSTEM ARCHITECTURE

DSA Manager supports an on-line DSA system with an architecture consisting of the following components:

- A DSA Client on which all data and analysis tasks are managed. For improved reliability, dual Clients can be used and DSA Manager handles the Client failover.
- Multiple Computation Servers on which all calculations are done. Analysis scenarios are assigned to available servers by the built-in distributed computation feature.
- A Data Server on which input data, computation results, and analysis cases are stored.
- User Workstations on which current and history DSA results are displayed.

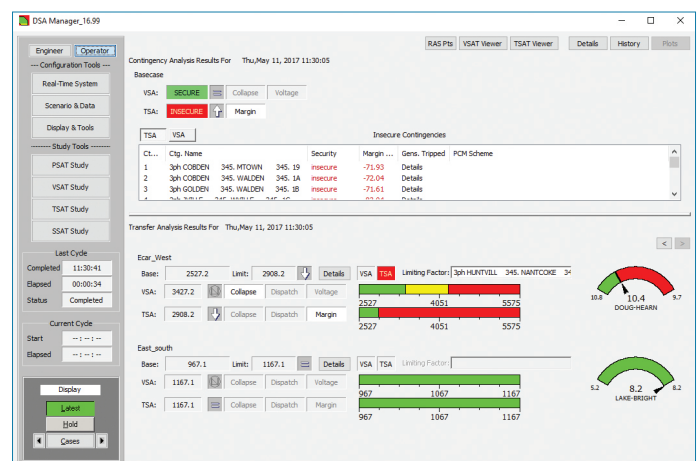
It is possible to set up multiple DSA systems in one network for production, backup, forecast, market, studies, development, QA, testing, etc. These systems can be coordinated with the following available functions:

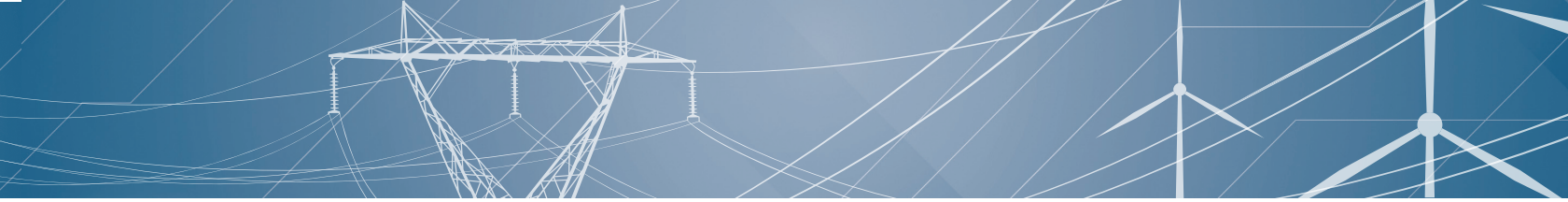
- Data sharing.
- Custom configuration of analysis tasks.
- Custom configuration of computation servers.
- System synchronization.

MODEL AND DATA REQUIREMENTS

DSA Manager can be integrated with virtually any EMS system to exchange real-time and fixed data available in the following formats:

- DSATools™ native format.
- Common third-party formats (such as CIM/XML).





In addition, users can also define and maintain fixed data in DSA Manager. All data can be prepared with the equipment name concept, which ensures unique matching of real-time and fixed data for an analysis case.

For compatibility with off-line analysis, all models and data supported in the standard version of DSATools™ are available for on-line DSA.

The following additional features are available in DSA Manager to handle models and data:

- Certain data can be defined in both EMS and DSA Manager; users can specify the rules to merge data for the actual analysis.
- Certain data can be prepared in mixed formats. For example, the base network model can be prepared in bus/branch format for simplicity, while the node/breaker details can be added to the region of interest.
- Multiple data sets can be defined independently and matched with different analysis scenarios.
- File and case validation functions.
- Identical data editing interfaces to the standard DSATools™ modules.

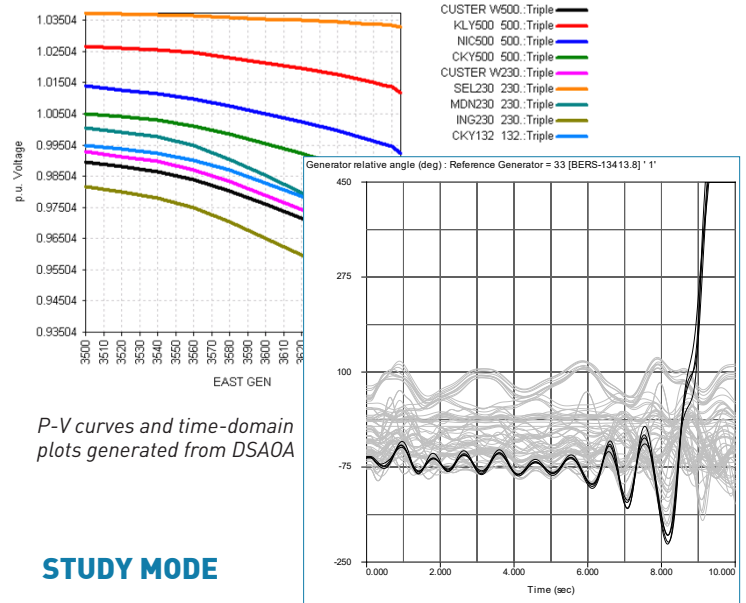
RESULT ARCHIVING AND VISUALIZATION

Each real-time case analyzed is archived. Such cases can be loaded back in DSA Manager and can also be loaded in DSATools™ modules. Results can also be deposited in third-party databases such as PI.

Various types of results are displayed in DSA Manager:

- Base case security status and unstable contingencies.
- Security violation details with remedial actions.
- One- or two-dimensional stability limits with limiting security violations and causes.
- Interface flow, generator group output, and low voltage monitoring.
- Histogram showing time-tagged history security results.
- Security violation alarm.
- Custom P-V, time-domain, and other plots from DSAQA.
- Wherever possible, results displayed are consolidated from all installed security assessment modules.
- Results of multiple systems.

Results in XML format are exported and can be used in third-party visualization tools.



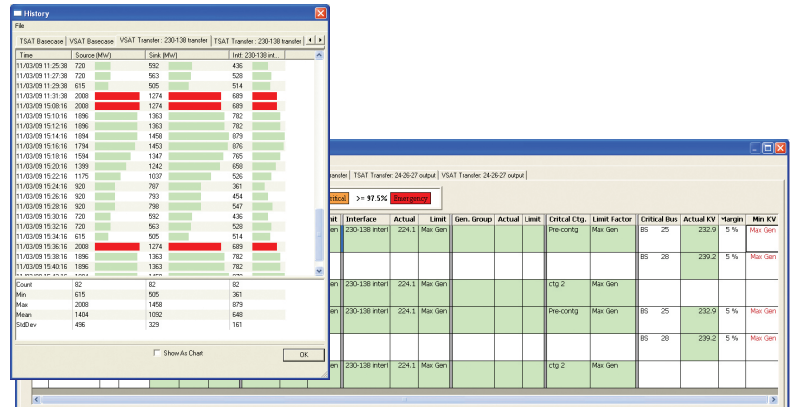
STUDY MODE

DSA Manager supports two study modes:

- **Study mode for history cases:** all real-time cases analyzed and archived can be loaded into off-line version of DSATools™. Users are free to make modifications on models, data, and analysis scenarios. All features in the off-line version are supported.
- **Study mode for future system conditions:** this is supported with a special version of DSA Manager (referred to as ST DSA Manager). Under this mode, future study cases (next hour, next day, etc.) can be submitted and processed in batch.

In addition to the features available in DSA Manager, ST DSA Manager supports:

- Custom user profile, so each user can maintain unique analysis scenarios.
- Case queuing so that multiple study cases can be submitted simultaneously for parallel processing.

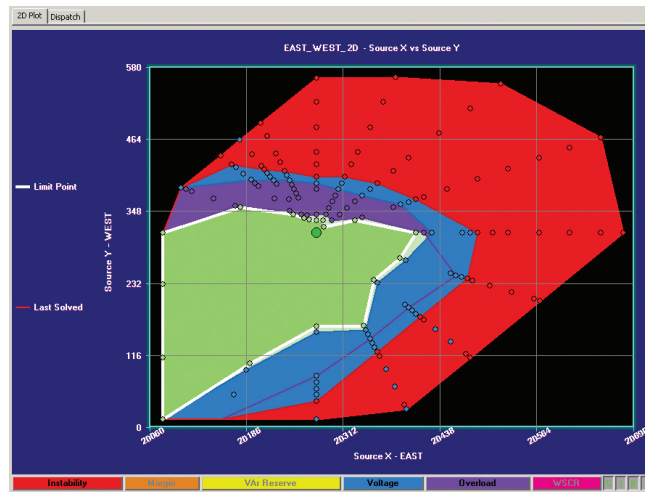


DSA Manager

OTHER FEATURES

DSA Manager includes other features:

- Detection and correction of deficient real-time data and system condition during analysis.
- Handling of high-priority real-time cases.
- Real-time powerflow case re-conditioning.
- Lookup table for fault clearance time.
- Rule-based conversion of VSAT contingencies to TSAT format.
- Contingency grouping for specific transfers.
- Ability to process forecast cases, in addition to real-time cases, in real-time mode.
- Perform remote system configuration with the DSA Console module to meet cyber security requirements.



- Data auditing.
- DSA client, server, and analysis cycle monitoring.
- Daily message logs.
- Runs on MS Windows 7/10/server 2012 R2/server 2016

OTHER POWERTECH SERVICES

- Licensing of the power system analysis software package *DSATools™*
- Licensing of other software products for utility applications
- Implementation of on-line dynamic security assessment (DSA) systems
- Development of custom software systems
- Development of models for use in power system analysis
- Generator field testing, model development and validation
- Training
- Technical consultancy studies including
 - Development of power system base cases
 - System planning and operation studies
 - Facility (including renewables) interconnection studies
 - Compliancy studies (such as NERC TPL, CIP, UFLS, etc.)
 - Post-mortem analysis of system disturbances

ABOUT POWERTECH LABS

Powertech Labs Inc. is one of the largest testing and research laboratories in North America, situated in beautiful British Columbia, Canada. Our 11-acre facility offers 15 different testing labs for a one-stop-shop approach to managing utility generation, transmission and distribution power systems.

Outside of the utilities industry, Powertech provides routine testing capabilities, product development, research and consulting services to support an array of industrial-type operations, electrical equipment manufacturers and automotive original equipment manufacturers.

www.powertechlabs.com

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