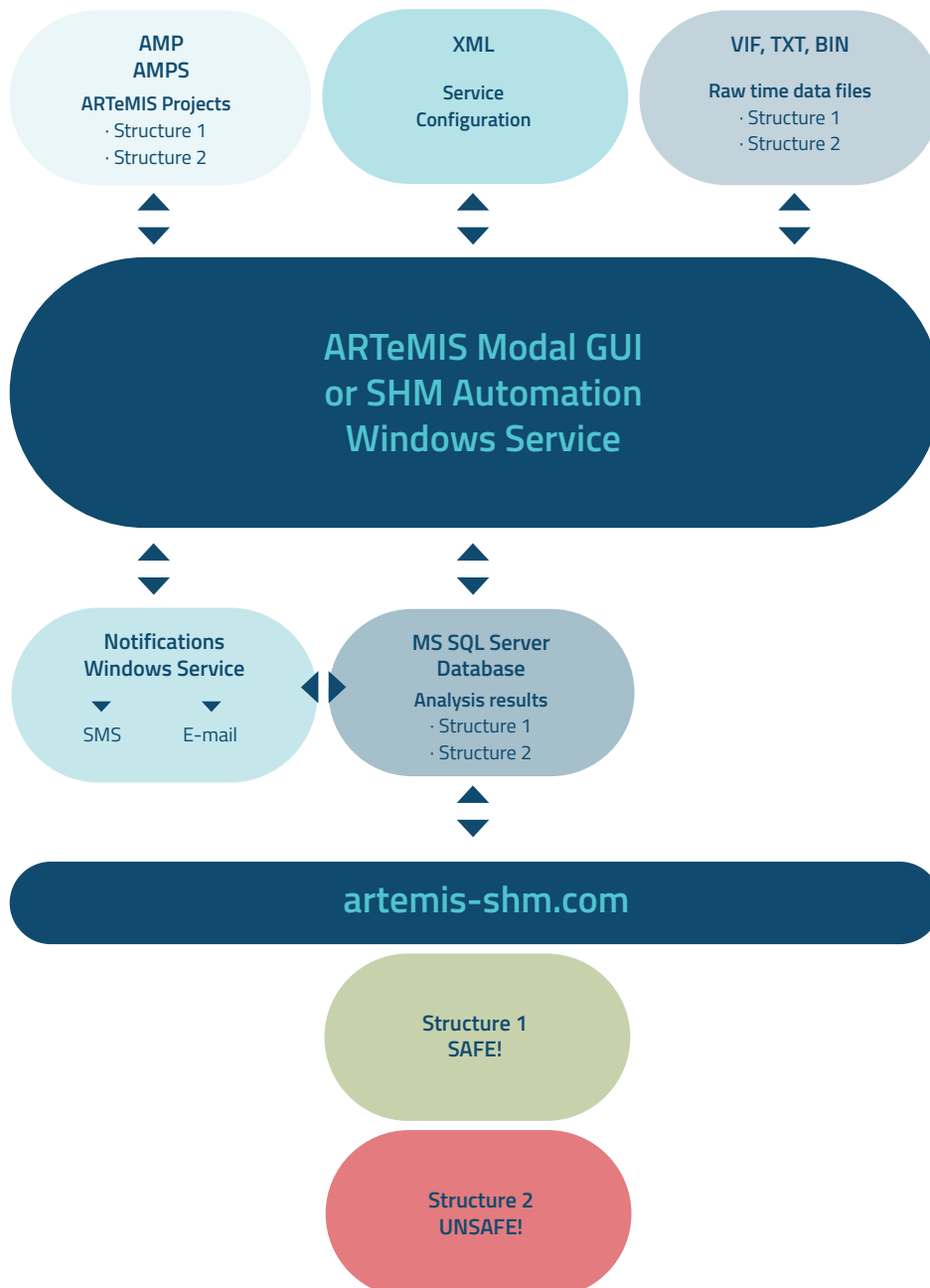


The ARTEMIS-SHM solution leverages on the ARTEMIS Modal Pro platform, that has been the state-of-the-art reference software in Operational Modal Analysis for more than two decades. The solution is centered around ARTEMIS Modal Pro but consists of several other components.





Data Input

Input to the system is the raw time series measurements. These measurements are typically store in fixed length recorder files (e.g, 5-10 minutes files). We support a wide range of file formats used by major hardware vendors. Currently, more than 20 files formats are supported. Some specific formats are:

- MiniSEED files exported from Guralp Systems Ltd., and GeoSIG AG
- EVT files exported Kinemetrics Inc.
- VIF files exported from a variety of hardware suppliers.
- Text files where channels are stored column-wise, with or without header information.

Files are read by ARTEMIS Modal Pro which is the data analysis engine of the system and possibly merged to longer recordings for improved analysis results. The data files can be read from any network accessible location like Network Attached Storage, FTP or from the cloud.

Analysis Engine

The analysis engine of the system is ARTEMIS Modal Pro, and optionally with additional SHM plugins enabled. For setting up the projects the graphical user interface of ARTEMIS Modal Pro is used. Once the project and the various analysis methods are configured, then the project is managed by the SHM Automation Service that is a Windows Service.

SHM Automation Service

The SHM Automation Service can analyze multiple structures sequentially using a single ARTEMIS Modal Pro license. What structures that should be analyzed is configured using the ARTEMIS Modal Pro desktop application. Through the application an XML file is created that contains all necessary instructions for the Windows Service to run. The analyses and the storage of results is made automatically and completely transparent without user interaction.

Storage of Results

Results are stored in a Microsoft SQL Database that can be located anywhere on the network. The database support storage of results of multiple structures. Results stored are:

- Geometry and channel information
- For each analysis session, i.e., the analysis of a specific measurement file, the following information is stored.
 - Analysis session information, including references to the measurement files and notifications related to the specific analysis. This includes warnings and errors.
 - Channels statistics: Maximum, Minimum, RMS, Median, Mean, Variance, Skewness.
 - Modal results of any of the Stochastic Subspace Identification methods available in ARTEMIS Modal Pro: SSI-UPC, SSI-CVA, SSI-PC, SSI-UPCX (Used default).
 - Modal results stored for each method are: Mode shapes and mode shape complexity. Natural frequencies (mean + standard deviation). Damping ratios (mean + standard deviation).
 - Damage indicator results of any of the damage detection methods available in ARTEMIS Modal Pro: Modal Damage

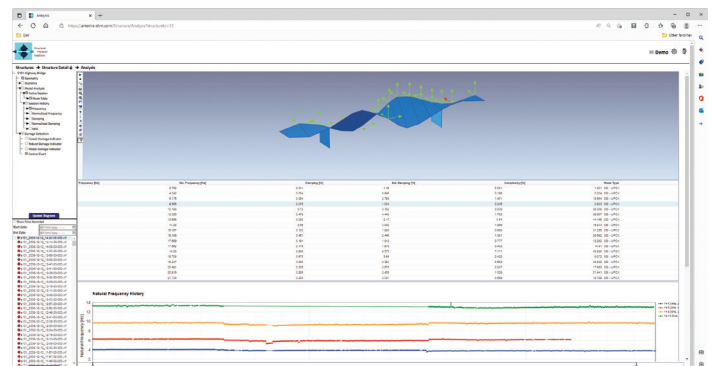
Detection, Classic Damage Detection, Robust Damage Detection, Control Chart for joint damage indicator presentation.

- SHM overview status values per mode tracked mode and per damage indicator.
- Overall health status value (Global Weight Ra;o):
100% >= **Safe** > 90% >= **Critical** > 50% >= **Unsafe** >= 0%.
- Ground motion values for any channel registered as a ground channel: Peak Ground Displacement (PGD), Peak Ground Velocity (PGV), Peak Ground Acceleration (PGA), Katayama Spectral Intensity (kSI), Arias Intensity (Total), Normalized Arias Intensity, Significant Duration of the shaking (D_5_95), The mean period extracted in the frequency range between 0.5 Hz and 20 Hz (Tmean), Modified Mercalli Intensity (MMI), Response Spectrum, Fourier Spectrum.

For all analysis sessions the following information is stored:

- Mode tracking of reference modes over all analysis sessions.
- Thresholds for critical and unsafe levels of the following: Channel statistics. Relative interstorey drift ratios. Tracked modes. Damage Indicators. Control Chart Values.

The results can be viewed at www.artemis-shm.com simultaneously by multiple users.



Notification Services

Users can be notified either by SMS or e-mail or both. The notification is configured through an administration back-office per user and per structure in an organization, and the users can be notified when:

- A new measurement record has been analysis and new results are available.
- A structures overall health status changes from being safe to critical or unsafe.
- Errors or warning are detected during the analysis.

The notifications will link to a report with information related to the notification type. These reports can be configured through an administration back-office.