EcoStruxure Geo SCADA Expert

(previously ClearSCADA)

Software for Telemetry and Remote SCADA Solutions

Design Guidelines

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Schneider Electric

Contents

Introduction

This document provides some guidelines for the successful and efficient design of EcoStruxure™ Geo SCADA Expert software deployments. To provide some context to the guidelines within this document, some background information on the operation of EcoStruxure Geo SCADA Expert (subsequently referred to as 'Geo SCADA Expert') software is first provided as a foundation upon which to build.

Checklists are provided at the end of this document to rate your system against these guidelines.

Example Projects

An application example is included within the Example Projects to provide a foundation for development of a real-world Wastewater Lift Station. This example leverages the close integration of the SCADAPack™ E Smart RTU objects and includes sample IEC 6-1131 logic for the SCADAPack 334E Smart RTU. This project will be used as the basis for examples of topics discussed within this document.

	This icon is used to provide a demonstration of the current topic within the Geo SCADA sample database.

Further Information

Further information is available with the Geo SCADA Expert software Resource Center:

https://tprojects.schneider-electric.com/telemetry/display/CS/Home

	This icon is used to link directly to a relevant article within the Geo SCADA Resource Center.

Scope

In addition to the Geo SCADA Expert software background information, the guidelines within this document will focus on the following areas:

- System Design
- Mimic Design
- Server Performance
  - Historic Storage
  - Use of Logic
- Client Performance
  - Use of Mimic Cache
  - Mimic Scripting

Background Information

Server Operation

The Geo SCADA Expert software server's operation can be broken up into two main parts: the core database process and the individual driver modules, as follows:

- Core Database Process
  - This process is executed as a single multi-threaded executable (DBServer.exe) which is operational whether the server is Main, Standby, or Permanent Standby.
  - DBServer runs as a service under the typical service account (name depends on operating system installed on)
  - This process is responsible for the main operation of the Geo SCADA Expert software database, including:
    - Database management
    - Database synchronization between partners
    - Database logging
    - Local ViewX access
    - Web server
    - Writing the database configuration, history, event journal, configuration changes logging and alarm summary (if enabled) to local Hard Disk Drive
    - Query Processor (for connected clients)
    - Alarm Processor (when operating as the Main server)
    - Logic execution (when operating as the Main server)
  - The separate working threads of the DBServer process can be monitored within the "*General -> Threads*" page within the Server Status application. Geo SCADA Expert software will usually launch a DBServer thread per CPU core thread; therefore, if there are two CPU cores each with 4 threads available then Geo SCADA Expert software will activate 8 individual threads of the DBServer process. Each of these is visible as a separate 'Server Worker Thread' when monitored within the Server Status application as indicated above.
  - Geo SCADA Expert software prioritizes these threads in ascending order so that Server Worker Thread 1 is utilized first, then Server Worker Thread 2, and so on, hence the execution count of the different worker threads can be monitored to determine how often the server requires the service of the available threads. If all threads are consistently in use, it is suggested that CPU hardware is upgraded to include more threads, or Hyperthreading should be enabled.
  - The [SVRTHR] and the corresponding [SVRADVTHR] threads are threads handling the data being sent to and from the connected clients and support up to 16 connections for each thread, with additional threads being created to handle additional client load as required. The current link usage can be seen

under "*Server → Links*" and *"Server → Advises"*, the first column indicating the thread and 'slot', i.e. 3:12 would mean the client is connected through [SVRTHR] 3 and using slot 12 of the possible 16. Note that clients like ViewX will make multiple connections to the server, i.e. at least 5 at start-up and create additional connections when performing actions such as displaying mimics.

- Individual Driver Modules
  - These processes are installed as required and include optional features such as:
    - DNP3
    - Modbus^{TM}
    - Crystal Reports
    - OPC
    - ODBC
    - NTP, etc
  - Each of these individual driver modules are run as a separate driver module executable (e.g. DriverDNP3.exe) and are run only when the server is running as Main, however also have a DLL module loaded by DBServer at start-up time which defines the objects for that driver.
  - These drivers are each responsible for the implementation of their specific objects within the database. When these objects are used to interface with equipment external to Geo SCADA Expert software, these modules are also responsible for the implementation of the required protocol, and therefore the connection of the internal database objects to the associated field devices.

These separate drivers can be monitored within the Windows^{TM} Task Manager's Process tab, as each driver will be listed when it is operational.

Server Hardware Requirements

A Geo SCADA Expert software server with more than 10,000 points should always be placed into production on a 64-bit server-class Operating System (OS) such as Windows Server. A desktop-class OS (Windows 7, Windows 8 or Windows 10) contains specific limitations of the IP stack reducing the ability of the Geo SCADA Expert software server to simultaneously handle multiple outstation connections.

The Geo SCADA Expert software Online Help contains information on recommended computer specifications for both servers and clients. Browse the contents for *Getting Started → Installation → Geo SCADA Expert → Geo SCADA Expert Server Requirements*, or search for "Geo SCADA Expert Server Requirements".

Guidelines

System Design

System Architecture

The Geo SCADA Expert software architecture chosen will be greatly dependent upon the requirements of the system, although the following attributes should be included in large systems:

- Redundancy for the main database servers (Main/Standby or Main/Standby/Standby)
    - Reduced storage of history and events (e.g. <= 52 weeks)
    - Client access by operational users only
- One or more Permanent Standby servers, based on specific requirements
    - Client access for bulk of users
        - non-operational users
        - data access / report users
    - Long-term storage of history / events (e.g. > 52 weeks)

Database Structure

While not directly impacting system performance, the database structure and design has a large impact on overall operability and user experience. The following database design guidelines are considered good-practice:

- Structure the database hierarchy based on physical or logical groupings of equipment, for example:
    - Asset Type (e.g. Water / Wastewater / Reuse / etc.)
    - Geographical Area (e.g. North / South / East / West)
    - Station Name or Identifier
    - Plant Area (e.g. Inlet Works / Sludge Dewatering etc.)
    - Equipment (e.g. Pump / Flow Meter / SCADA Equipment / etc.)
- Reduce the length of hierarchy names where possible. Operators will get used to shorter names quickly, and will appreciate clearer displays as a result
- Avoid repetition of the same word within an object's FullName;
    - E.g. "Water.Northern Region.**Pump** Station 1.**Pump** 1.**Pump** Running"
    - E.g. "Wastewater.Southern Region.Lift Station 1.Wet **Well**.**Well** Level"
- Avoid selecting a point name that describes a state of the point;
    - E.g. use "Pump 1.Run State" instead of "Pump 1.Running"
    - E.g. use "Peer.Communications State" instead of "Peer.Communications Fault"

Templates should be used within the database hierarchy to represent common equipment where possible, as this simplifies future maintenance and can assist with hierarchy design as the configuration (points, graphics, etc.) associated with a piece of equipment will be located within its template. Furthermore, instances of multiple templates can be combined as required within other templates which then represent complete sites or plant areas.

	For more information see: https://tprojects.schneider-electric.com/telemetry/x/ZIA3

	The Example Projects section is broken up by Industry (Electricity, Oil & Gas, Water/Wastewater), and then further by individual areas and/or sites.

Archiving

Archiving is a feature of Geo SCADA Expert software allowing users to create an external backup of historical data providing long-term offline storage. In summary, historic data and event messages are kept in the database only for a specified number of weeks after which time they are deleted. The total amount of time for which historic data and event messages are stored is referred to as the Keep Online time. To avoid losing data, you must ensure that archiving takes place before the end of the Keep Online time, configured within Server Configuration as shown below.

You may decide not to use Archiving features, and keep historic data online for a long period, thus relying on Geo SCADA Expert software to keep all the data you will need and relying on redundancy and backup facilities if recovery is needed. This could be on a Standby-Only server, with a shorter period for the Main/Standby servers. Geo SCADA Expert software servers keep an index for all historic files in RAM which is loaded when a server is started. This is acceptable providing you calculate the memory usage associated with each historic file (event, data, alarm summary etc), and ensure that the total multiplied by 100 bytes (approx.) does not exceed total RAM less that used for other purposes. You can lessen the memory used for historic data by setting the 'Index after' setting in the Server Configuration tool's Historic Data section. Please consult the documentation for further information.
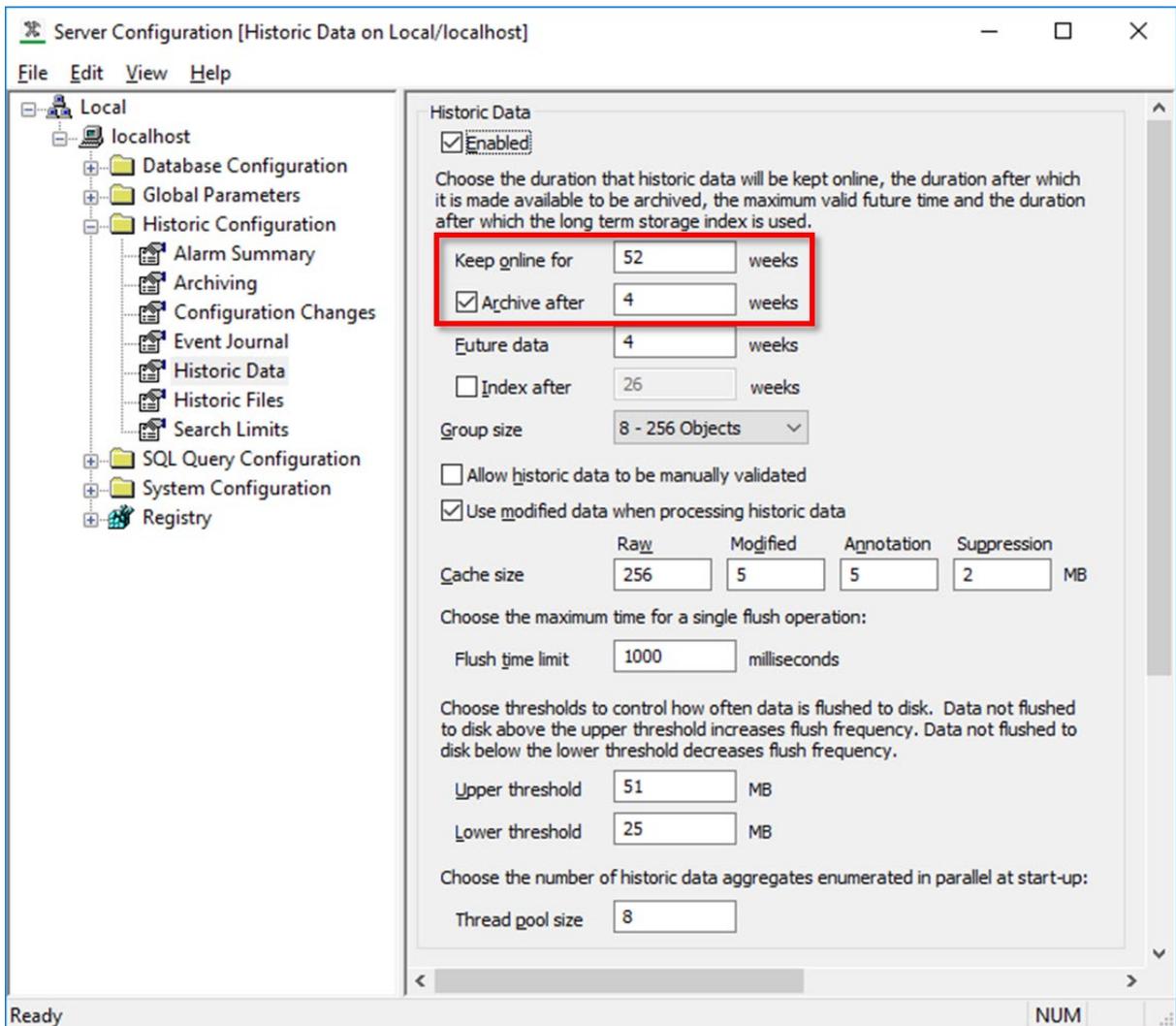
The archiving process will require effort on the part of Geo SCADA Expert software to process and copy the historic data, therefore archiving should be performed on a Standby server to ensure that the main server remains available at the highest performance for normal database operation.

The archive is a process that can be configured on a schedule to suit your needs, however the archiving process should be performed frequently (e.g. every other week) to ensure that the amount of data archived each time is kept manageable. It is recommended that each periodic archive is stored in a new location (identified by the archive date, for example) to allow for selective restoration of specific periods of historic data.

	For more information see: https://tprojects.schneider-electric.com/telemetry/x/LwMm

Alarm Banner Display

When an object within the database generates an alarm, the FullName of this object is used within the Alarm Banner as the source of the alarm. As the length of the object FullName increases, either by adding hierarchy levels or extending the name of each hierarchy level, the Alarm Banner source description is lengthened, and can become unmanageable. For this reason, care should be taken when designing the database hierarchy to keep hierarchy levels and length of names to a minimum.

As an alternative to the FullName, Geo SCADA Expert software supports configuration of an Alarm Source (within the 'Alarm' tab of configuration form). This property is then used in lieu of the FullName within the Alarm Banner display, if the Alarm Source is unique within the database.

Reuse of Common Configuration

In addition to the database hierarchy that represents the grouping of equipment, it is recommended to include also a configuration group which contains all common objects including templates, symbols, colors, scripts, reports, security configuration, etc. These common configuration objects can then be referenced as required within the rest of the database. Since this common group contains all important configuration items, it simplifies the implementation of database security as it can easily be hidden from view except for authorized users/groups.

It is useful to create and reference color objects within the database instead of explicitly configuring a specific color within the mimic design, as this provides the ability to quickly and easily adjust the database color scheme by reconfiguring a few color objects. Without the use of color objects, potentially each individual mimic would have to be re-configured to achieve the same result.

Time Synchronization

To ensure each Geo SCADA Expert software server has an accurate representation of time, synchronization should be implemented with an external source. This can be handled automatically by the Domain Controller within an Active Directory environment, although for remote or distributed architectures this is not always possible.

An alternative is to utilize Network Time Protocol (NTP) to manage the time synchronization, whereby the Windows™ Operating System is configured to synchronize with a networked NTP server. In this scenario Geo SCADA Expert software's NTP Monitor driver can be configured to monitor the accuracy of the time synchronization and generate an alarm if the local server time deviates too far from the NTP source.

Metadata

Geo SCADA Expert software includes the ability for additional fields to be added to configurable locations within the existing database tables and can be used to store links to other database items, lists, strings, check boxes, etc. that are specific to your system. Since Metadata fields need to have unique names within each database table, care should be taken to select names specific to your system.

Consider the scenario whereby a future version of Geo SCADA Expert software is expanded or a new driver installed which includes a database field that conflicts with one of your existing metadata fields but is used for a different purpose. Potential mass reconfiguration would be required within your database to rename and re-align all your references accordingly.

To avoid this consider prepending a project/customer acronym to the beginning of the field name, for example:

- "sePointReference" for a new point reference field as part of a Schneider Electric project.

Adding metadata fields does cause additional memory and CPU load to your system, so take care that you have configured only what is required, and those fields are constrained to the object types required. For example, add metadata to CDBPoint objects only, if they are not needed on all objects (CDBObject).

System Monitoring

Geo SCADA Expert software includes a variety of measures to monitor the operation and performance of the Geo SCADA Expert software system and its hardware which should be implemented to ensure correct operation and better diagnose potential causes of underperformance.

- **Performance Monitor**

The Performance Monitor driver (sometimes referred to as NTMon) is used to monitor various aspects of server performance on a Geo SCADA Expert software system. This is best implemented to monitor Operating System metrics including:

- CPU Usage
  - Overall (DBServer.exe) and process specific (e.g. DriverDNP3.exe) monitoring available.
  - It may be pertinent to monitor the DBServer application and the most commonly utilized communications driver.
- HDD Free Space
- RAM Usage (Available Virtual Memory / DBServer memory usage)
- Page File Usage
- Network Usage
- System Uptime

At certain times, it may be useful to record additional metrics due to specific behaviors of your system, for example if you're noticing occasional disk performance issues you could monitor the disk queues.

	Performance Monitor points have been implemented within the Diagnostics page of the Geo SCADA Product Life Cycle presentation. These points currently monitor CPU usage, available RAM, free disk space and average bytes per disk write.

- **Geo SCADA Expert software Status (via OPC)**

Operation of the Geo SCADA Expert software server can be monitored via OPC points within Geo SCADA Expert software. Monitoring can be performed of any network-connected Geo SCADA Expert software server, and therefore can include all partnered servers in a redundant architecture. Monitoring of Geo SCADA Expert software server operation should include:

- Server Name
- Server State (Main / Standby)
- Server State Change Time
- Server Type (Lone Server, Dual/Triple Standby, Permanent Standby etc.)
- Standby Server Synchronization Status (of Configuration, Data, History, etc.)

	The Diagnostics page of the Geo SCADA Product Life Cycle presentation monitors the status of the local server via OPC, although since this is only monitoring of the local server the information is available directly from the OPC database explorer and no database points are required. Currently monitored are server name, server state, server type, and time when the server came online.

- **SNMP**

The Simple Network Management Protocol (SNMP) is a simple protocol for managing devices on an IP network, and should be used to monitor the status of important networking devices including routers, switches, printers, UPS' (uninterruptable power supplies), as well as internal server components including HDD's and RAID adapters.

Geo SCADA Expert software's SNMP driver supports SNMP version 2.

- **ICMP**

Geo SCADA Expert software's ICMP Driver can also be used to determine the connectivity of critical network components within an IP network including routers, printers, operator workstations, etc.

SNMP polls should be implemented to capable devices in lieu of ICMP if this is not permitted within the SCADA network.

- **Performance Statistics Database Table**

The Geo SCADA Expert database contains a database table with performance counters. You can query this table for second-on-second counts and accumulated counts. For example, use:

*SELECT * FROM CPerformanceStats*

Mimic Design

Efficient Mimic Design

Geo SCADA Expert software provides a comprehensive set of features for graphical user interface design. If used poorly they can potentially cause performance problems, therefore excessive use of the following features should be avoided. What constitutes excessive cannot be quantified definitively and each situation may be different, but suggested quantities are added in parentheses to some items.

- Use of Indirect Referencing
    - Avoid using Indirect References with embedded mimics using the 'Shared' mimic feature
- Use of graphical enhancements:
    - Transparent or semi-transparent animation
    - Gradient shading
    - Fast Update feature
    - Excessive object movement
- Excessive use of polylines (>100), particularly where many separate lines are used where a single segmented line or curved line could be used to create the same effect.
- Large number of objects (>1000) within the mimic.
- Images (jpg, png, bmp) embedded directly into mimics.
- Large number of embedded mimics (>100), including:
    - Number of parameters for each embedded mimic
    - Whether embedded from individual instance/group or common symbol
    - Multi-level embedded mimics (embedded mimics containing embedded mimics containing…)
    - Any of the above graphical enhancements implemented within the embedded mimics
    - Many embedded trends (>10) on mimics
- Excessive use of tooltips (>10), especially those that implement complex calculations from database items.

- Hidden objects or layers.
  - Layers or objects that are hidden are still loaded into memory on mimic load, which increases the load time even though they may not be immediately displayed.
- Mimic_Navigate or Mimic_Load scripting that performs database calls.

In summary; as the overall complexity of the mimic increases, so will the load time, therefore the aim of the designer should be to balance mimic functionality with complexity.

	The Wastewater Application uses simple, non-gradient fill colors to match the relevant process color – in this case wastewater. The embedded mimics are limited to one 'level' where possible, and only two levels elsewhere to simplify the implementation (the well, for example).

	The Schneider Electric logo and other illustrations are all created as vectorised graphics, instead of embedded images, as these are stored and accessed much more efficiently.

	The faceplates are instantiated from a default template to inherit common configuration, and contain a combination of embedded mimics to display the data as required. Each transmitter and pump faceplate contains a link to an associated Historic Data Access faceplate. These faceplates exist within a common area and are linked to with parameters to populate their configuration, rather than existing pre-configured in every single template instance as would otherwise be required.

	Trends are not directly embedded onto the main overview mimic. Instead links are used to provide quick access from the Mimic Header and within each Faceplate. In this way, the trend is only displayed when requested and doesn't impact mimic load time. The trend buttons provide a dynamic list of trends, so that as new trends are added to the database they will automatically appear in the list the next time it is accessed.

Embedded Mimics

The use of embedded mimics is recommended wherever multiple copies of the same symbol are required, rather than separately managing multiple copies independently. There are two main implementation strategies for embedded mimics:

- Creating animated symbols within templates and embedding these as required on mimics, or

- Embedding parameterized symbols directly onto the mimic and animating as required.

The first method is simpler to maintain, as parameters are not individually set each time an embedded mimic is used.

	The Mimic Header is embedded from a common symbol whereas the Site Menu section (buttons Alarms, Events, Notes, Trends, Reports) is separately embedded from a template instance. This is because it needs to be located within the site hierarchy for the links to work properly.

	The Pumps and Transmitter symbols are embedded directly from common symbols to reduce mimic disk cache use.They have "Shared with Other Embedded Mimics" unchecked as they include hover actions which would otherwise not animate properly (and hence are separately loaded into the embedded mimic cache).

Server Performance

Logic Programs

Logic is run as a single-threaded core process and requires the database to be static during each the read and write steps of execution. For this reason, temporary locks are applied on the database in conjunction with the execution of logic applications. This is usually seamless and goes unnoticed by the user if the logic application executes quickly, however complex logic programs (those containing loops, SQL queries, nested execution etc.) can cause noticeable periods of server 'pauses'. To avoid unnecessary repeated executions, logic programs should, where possible, only be executed "On Input Processed" rather than executed periodically on a short specific interval such as 1 second. The default period is 1 second for most new Logic programs.

Ensure that any actions performed within "On Input Processed" logic programs do not write to any of the associated input variables of that program; else an infinite logic execution loop will be created. This includes "Refresh" actions which update variables.

When implementing logic programs within templates try to use 'On Input Processed', but where 'On Interval' is required, separate the executions of Logic in each instance by configuring a different offset time. It is possible to use a Template Expression to do this if part of the template full name is numeric.

	For more information see: https://tprojects.schneider-electric.com/telemetry/x/twJG

	Within the Wastewater Application the Trio™ Data Radio VSWR (Voltage Standing Wave Ratio) calculation is performed using logic. This logic is configured to run "On Input Processed" i.e. only when one of the inputs has changed.

Historical Storage of History and Events

Having an historical record of past system events and operations is arguably one of the most valuable tools provided by SCADA systems, second only to the real-time operational ability it provides. While the capturing of history is of value, users should be careful not to store excessive amounts of historical data as this can compromise the operational performance of the system.

It is strongly recommended that each database point is limited to a maximum sustained rate of 4 historic records per minute.

The length of time which history and event data can be kept online can vary between different Geo SCADA Expert software servers, allowing for Permanent Standby / Performance servers

to store large amounts of historic data for long-term and reporting access, while not consuming resources on the Main/Standby servers.

Systems with storage of important historical information should utilize the Archive feature, configurable within the Server Configuration application. The "Archive after" setting is disabled by default. It allows historic data to be considered read-only after the configured time and synchronized more efficiently to Standby servers.

(information icon)	For more information see: https://tprojects.schneider-electric.com/telemetry/x/YIA3

Server Logging

The Geo SCADA Expert software server includes built-in logging of all server actions to ensure complete traceability in the event of any server problems. There are multiple logging streams within Geo SCADA Expert; one for the main server process, and one additional stream for each separate driver module. These logs are enabled by default, although are usually insufficient for production installations. The logs for each stream are generated in a FIFO-type arrangement where the oldest log file is removed and replaced with the new one when the maximum number of log files is reached.

It is recommended that the number and/or size of log files for each stream is increased (as required for your system) to be capable of spanning at least 2-3 days to ensure that events occurring over the weekend, for example, remain within the active logs for review if required. Consideration needs to be given to the capacity of the logging location used for large production environments as the server log files can be generated quickly which could potentially require hundreds of MBs of storage.

The following image shows the Server Configuration options, highlighting those that we recommend should be increased as required for your system.
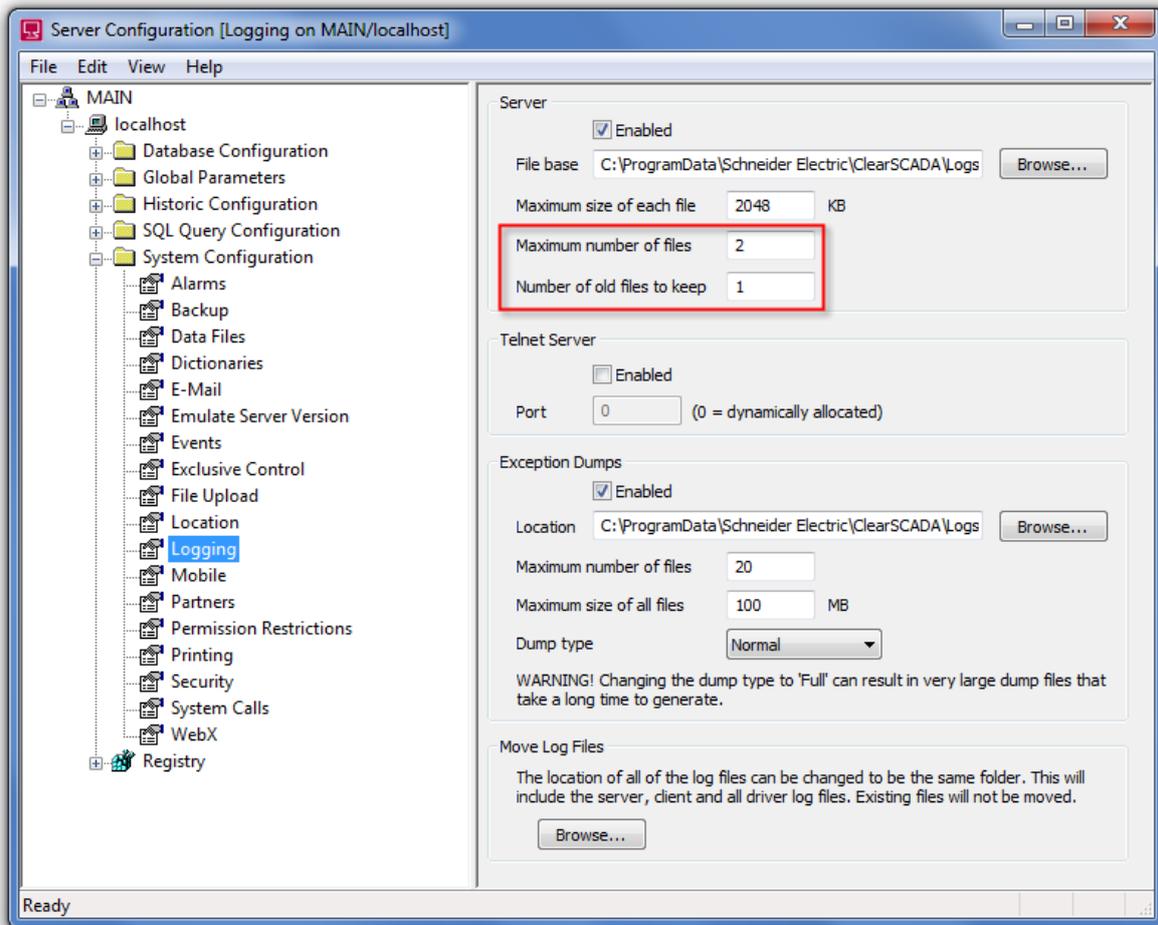
Note that additional logging options within the Geo SCADA Expert software Server Status application (not demonstrated here) should not be modified except under direction from a Schneider Electric Geo SCADA Expert software Support Engineer.

	For more information see: https://tprojects.schneider-electric.com/telemetry/x/O4Lo

Client Performance

Embedded Mimic Cache

ViewX contains an embedded mimic cache which is maintained for each session of ViewX only. The cache is purged when ViewX is shutdown. When a mimic that contains an embedded mimic is displayed, the embedded mimic is loaded into memory on the client PC (into the embedded mimic cache). The cache for that embedded mimic can then be accessed locally by any other mimic that contains the same embedded mimic.

Embedded mimics that do not have the "Shared with other embedded mimics" option checked will not be stored within the common cache, but instead each embedded mimic object will occupy a separate area of memory. The memory for each of these 'non-shared' embedded mimics must be separately loaded and unloaded each time the main mimic is displayed. The embedded mimic cache size can be managed via the Tools → Options dialog box within ViewX.

To help minimize potential loss of performance, Geo SCADA Expert software will attempt to remove unused embedded mimics from the cache if the amount of memory being used reaches the defined cache limit. When the limit is reached, Geo SCADA Expert software will remove the embedded mimic files for any embedded Mimics that are not currently on display, starting with the oldest files first. However, Geo SCADA Expert software can only remove the files for embedded mimics that are not currently being displayed on mimics.

When making changes to the size of the embedded mimic cache, you can examine the effects by using the View feature for the embedded mimic (available on the Options window). This allows you to see whether embedded mimic files are being loaded in and out of the cache.

We recommend that you only change the embedded cache size if specifically advised to do so by a Schneider Electric Geo SCADA Expert software Support Engineer.

Mimic Disk Cache

The ViewX client manages a mimic cache on its local disk to reduce network load between the server and the client. The first time a mimic is loaded from the server is stored in the local cache, and all subsequent requests for this mimic are retrieved from the local cache after confirming that no recent changes have been made to the server copy.

The following occurs each time a ViewX client requests a mimic from the server (including all embedded mimics):

- Read version of the mimic from the server
- Check server version against local cached mimic version
- If mimic doesn't exist in cache or version incorrect, read mimic from server into local cache
- Uncompress cached mimic and load into ViewX

It's important to remember that Geo SCADA Expert software maintains a local copy of each mimic object within the disk cache; this includes all symbols and mimics instanced within templates. Because of this, complex mimics which contain many embedded mimics require more effort to load as each individual embedded mimic first needs to have its version checked against the server copy (and transferred if the server copy has been updated) before the main mimic can be displayed. As the number and/or complexity of embedded mimics grows, so does the load-time for these mimics, especially when accessing the Geo SCADA Expert software server via high-latency and/or low-bandwidth links.

Mimic Scripts

The Geo SCADA Expert software client-side Visual Basic (VB) scripting interface allows users to create scripts that provide useful functionality specifically tailored to their requirements, for example; implement navigation features, display dialog boxes, create user interface forms etc.

While Geo SCADA Expert software gives users the flexibility of placing script behind each mimic, or even within the configuration of a mimic button itself, this can often result in duplication of code which quickly becomes difficult to maintain. It is recommended that script libraries are implemented where possible to allow re-use of common code within the entire Geo SCADA Expert software database, ensuring that any required maintenance or upgrades are as simple and cost-effective as possible.

It should be noted that mimic scripts access the Geo SCADA Expert software server via the Geo SCADA Expert software web services port (default port 80 or 443 if secure connections are used), not the standard ViewX port. If you are experiencing issues with client-side scripting, check that the web services port is not in use by another application and available for use by Geo SCADA Expert software, visible with the Server Status application. Also check that your clients are not waiting for CRL (Certificate Revocation) when using the HTTPS connection. The following image shows an invalid configuration where Geo SCADA Expert software is unable to use the http web port, therefore scripts will fail to execute.

	For more information see: https://tprojects.schneider-electric.com/telemetry/x/fQJG
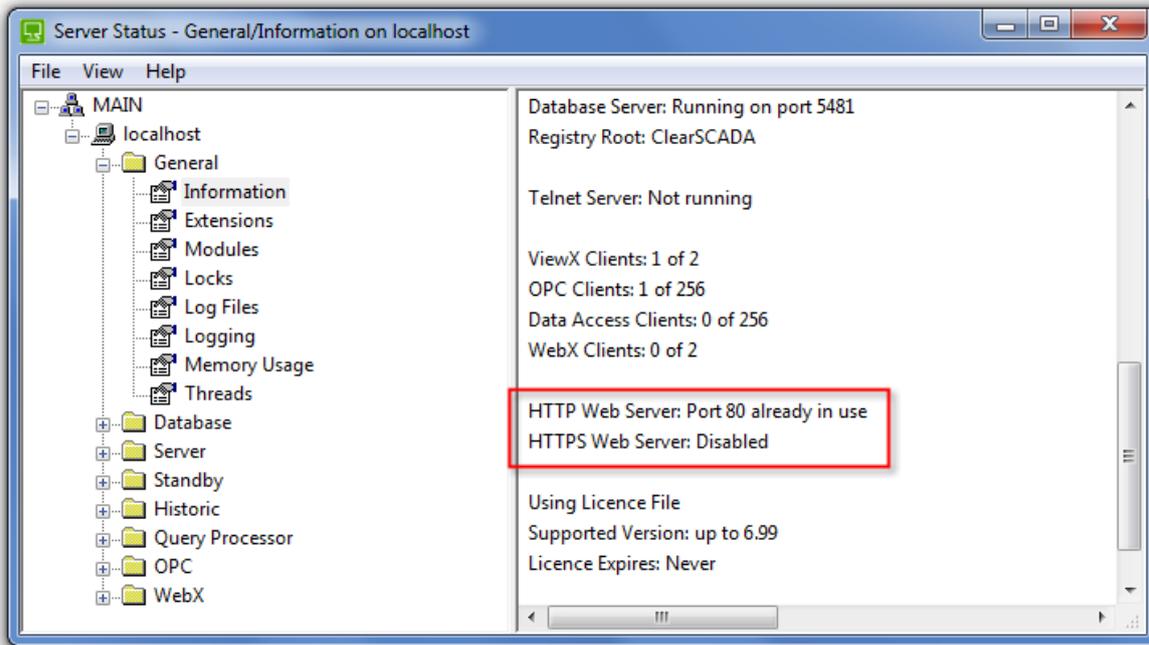
More Information

The Geo SCADA Expert software Online Help is a great first resource and contains information on resolving common system problems. Browse the contents for *System Administration* → *Server Status Tool* → *Common System Problems*, or search for "Common System Problems".

Further information is also available with the Geo SCADA Expert software Resource Center: https://tprojects.schneider-electric.com/telemetry/display/CS/Home

Checklist

System Design

Guideline Number	Guideline	Adherence to guideline
SD1	Implement server redundancy for production environments.	☐
SD2	Implement Permanent Standby servers to remove ViewX / web client load from the Main/Standby servers.	☐
SD3	Limit excessive storage of history on the Main/Standby servers; instead implement long-term storage in the Permanent Standby servers only.	☐
SD4	Structure the database hierarchy based on physical or logical groupings of equipment.	☐
SD5	Avoid repetition of the same word within an object's FullName.	☐
SD6	Avoid selecting a point name that describes the state of the point.	☐
SD7	Use templates within the database hierarchy to represent common equipment to simplify maintenance.	☐
SD8	Create common configuration objects within a central configuration area and reference as required. These common objects should include templates, symbols, colors, scripts, reports, security configuration etc. Reference color objects instead of explicitly configuring colors directly within mimics.	☐
SD9	Implement Time Synchronization (e.g. via Domain Controller or NTP) within the Geo SCADA Expert software servers to ensure that each server has an accurate clock.	☐
SD10	Ensure added Metadata field names are very specific so as to reduce likelihood of future conflict with additional drivers/modules.	☐

SD11	Implement system monitoring to track system operation, including:
	  o System Performance Monitoring
	  o Geo SCADA Expert software Status (via OPC)
	  o SNMP
	  o ICMP
		☐

System Design score:	/ 11

Mimic Design

Guideline Number	Guideline	Adherence to guideline
MD1	Do not use Indirect Referencing.	☐

MD2	Limit the use of the following graphical enhancements:
	   o Transparent or semi-transparent animation
	   o Gradient shading
	   o Fast Update feature
	   o Moving animations
		☐

MD3	Limit the use of tooltips which reference values of multiple database items.	☐
MD4	Limit the use of polylines.	☐
MD5	Ensure that polygon shapes are simple, using as few segments as possible.	☐
MD6	Ensure that imported vector graphics are simplified as much as possible.	☐
MD7	Ensure that single segmented lines or curved lines are used in place of separate lines.	☐
MD8	Reduce, as far as possible, the number of objects on the mimic.	☐
MD9	Create common symbols and reference these multiple times within each mimic, instead of creating multiple copies of individual objects.	☐
MD10	Where possible, ensure that all embedded mimics have "Shared with other embedded mimics" checked.	☐
MD11	Where possible use embedded mimics that are sourced direct from a common symbol and animated with appropriate parameters, instead of creating graphic(s) within a template and embedding the graphic from each instance onto the mimic.	☐
MD12	Reduce the number of 'levels' within embedded mimics (a mimic embedded in a mimic embedded in a mimic…).	☐
MD13	Configure common visibility settings for a specific layer and place relevant objects on this layer, instead of individually controlling visibility on multiple objects.	☐
MD14	Use vectorized graphics in lieu of embedded images (jpg, png, bmp) directly onto the mimic. If images are required use remote images hosted by Geo SCADA Expert software's web server.	☐

Guideline Number	Guideline	Adherence to guideline
MD15	Do not display unbounded queries from large datagrids that reference updating database variables.	☐
MD16	Avoid Mimic_Navigate or Mimic_Load scripting that performs database calls.	☐

Mimic Design score:	/ 16

Server Performance

Guideline Number	Guideline	Adherence to guideline
SP1	Limit the use of FOR or WHILE loops within logic programs.	☐
SP2	Limit the use of chained execution (program A calls program B, which calls program C…) of logic programs.	☐
SP3	Where possible, execute logic programs "On Input Processed" rather than on interval.	☐
SP4	When implementing SQL queries within logic programs; check that all queries are appropriately bounded and will execute within (say) 100 milliseconds. It is a good idea to use the QueryPad tool to do this.	☐
SP5	Avoid implementing SQL queries within logic that reference either the historical or event database. The volume of data in these stores grows quickly when in operation. These can cause extended delays to the execution of the logic.	☐
SP6	Avoid implementing logic with heavily instantiated templates.	☐
SP7	Implement historic compression or significant change dead-bands to restrict logging for historic points to below absolute maximum of 4 records per minute for each point.	☐
SP8	Increase maximum number of server log files to allow spanning of minimum of 2-3 days to allow historic review of server operation.	☐

Server Performance score:	/ 8

Client Performance

Guideline Number	Guideline	Adherence to guideline
CP1	Consult a Schneider Electric Geo SCADA Expert software Support Engineer to adjust the mimic cache size (within the guidelines) to suit the requirements of your system.	☐
CP2	Limit the use of "Shared with other embedded mimics" when using embedded mimics, where possible.	☐
CP3	Implement Script Libraries where possible to enable re-use of common VB script code.	☐

Client Performance score:	/ 3

Contact Information

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