White Paper – ClearSCADA Architecture

ClearSCADA has 3 major components or software applications; the ClearSCADA server, a windows client known as 'ViewX', and a web client known as 'Webx'. The software is designed for Master Station SCADA applications with wide area networks (WAN), telemetry protocols and remote radio telemetry devices (RTUs).
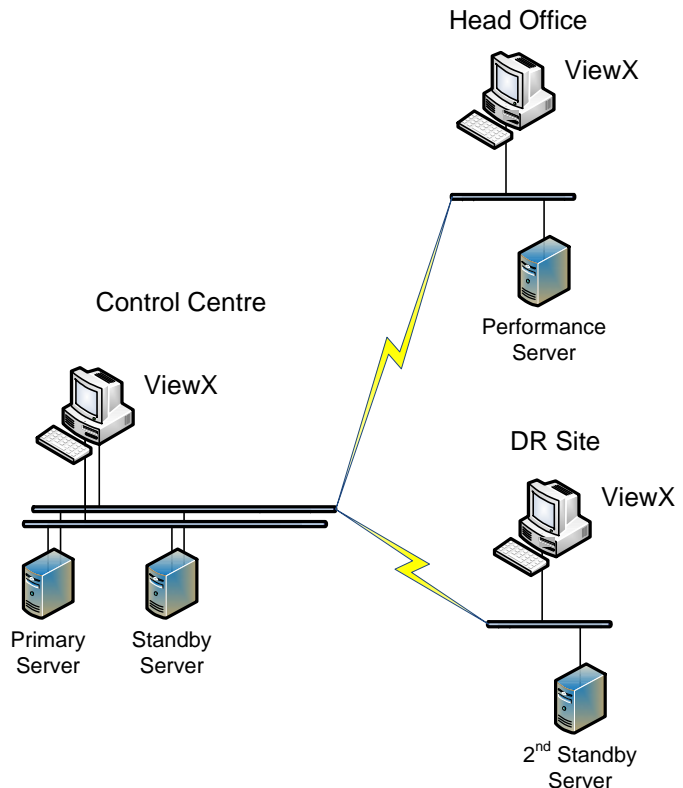
ClearSCADA Server

The server performs all of the SCADA functions with exception of operator interface, and runs as a windows service under the operating system. The supported platforms include Windows 2000, 2003, XP, Vista and 2008. The ClearSCADA server can be sized from 250 points up to 250,000 points and priced accordingly to provide best fit for any application. On systems larger than 75,000 points it is recommended that the ClearSCADA servers run on Windows 64 bit operating systems such as Windows Server 2003 x64 or Windows 2008 due to its increased RAM memory management.

For increased system reliability, multiple ClearSCADA servers can be configured in redundant arrangement, up to the limit of 6 servers per database. Each server in the redundant set is mirrored to the primary server and synchronizes the real-time database, active alarm page, event journal, historian, reports and configuration database.
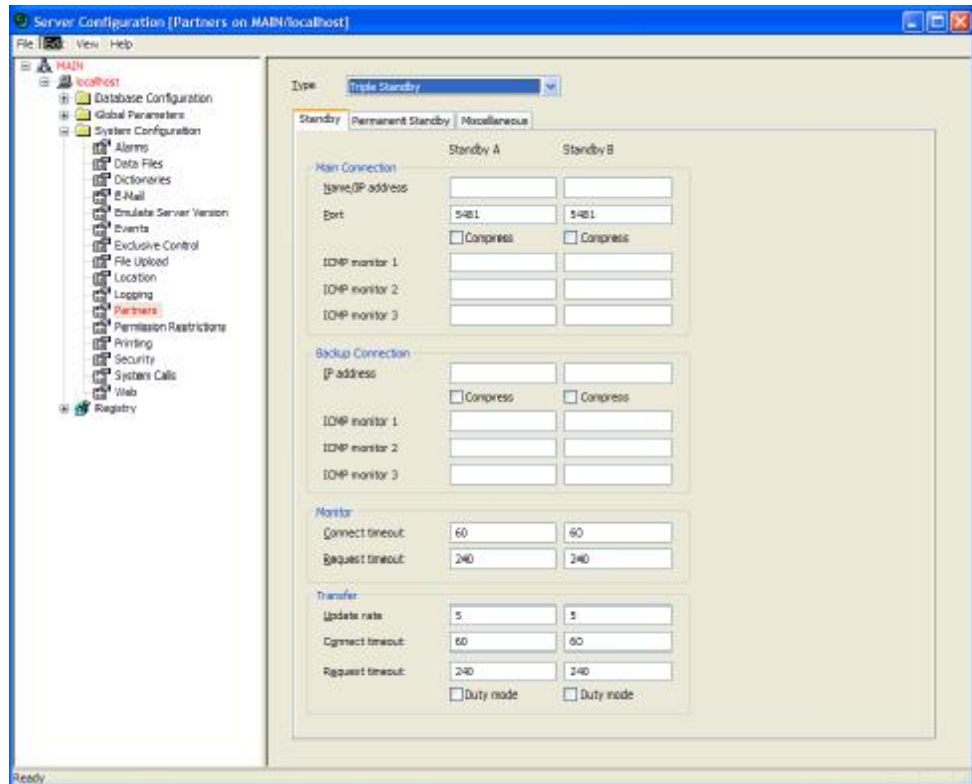
Backup servers can also be located at off- site location across wide area network (WAN) for disaster recovery (DR) requirements and data flow between servers use report-by-exception (RBE) and data compression to minimize network bandwidth. In addition redundant LAN / WAN paths can be configured if desired.

In the diagram on the right we have also added a 'Performance Server' at the Head Office which is used for local users and possible integration to corporate business systems. This capability minimizes network bandwidth on the corporate WAN links and provides best possible performance for local users.

The configuration of the server setup in a redundant arrangement is a simple matter to fill in the form as shown to the right. All that is necessary is to specify the Name/IP address for the servers and restart the application. Redundancy is an integral function of ClearSCADA without the need of 3rd party software.

Note the backup connection, data compression option and update rate for server to server synchronization.
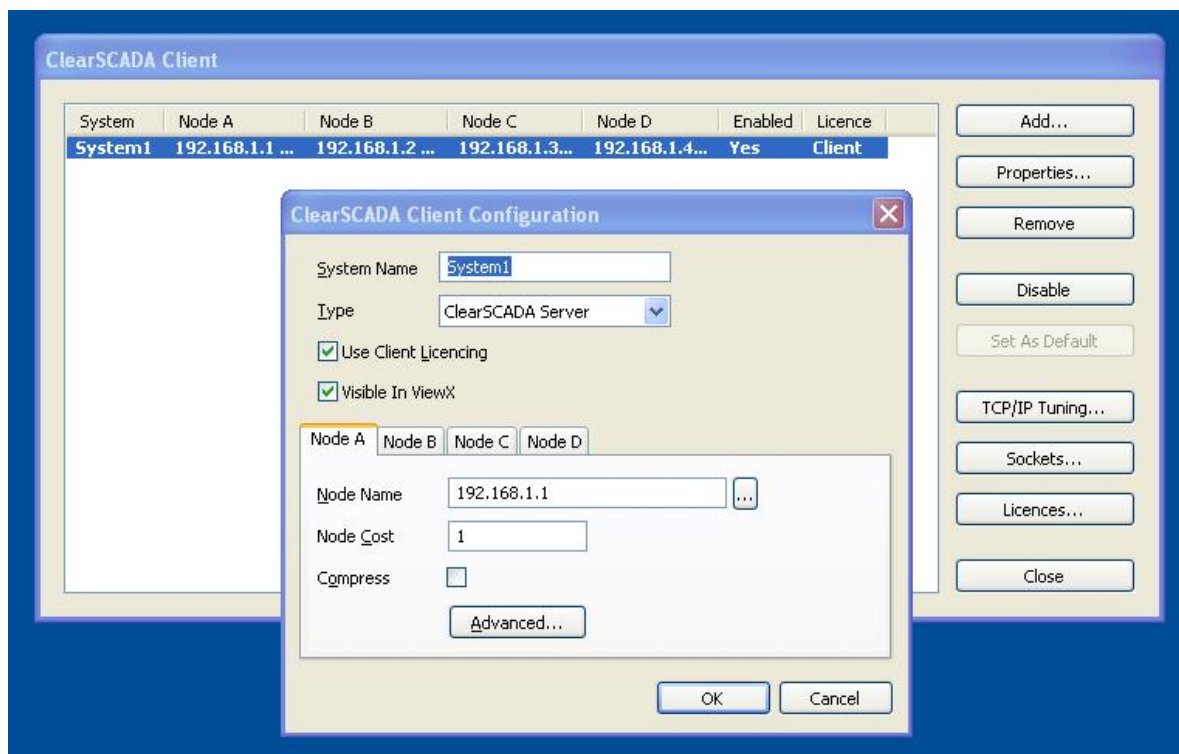

ViewX client

The 'ViewX' windows client application is the user interface for ClearSCADA and used by operators and engineers alike. The security logon for the user determines their database permissions and whether or not they can make configuration changes. The ViewX application has all of the tools necessary to build the database, display screens, reports etc. and all the engineer needs to do is walk up to any ViewX workstation, logon with his credentials and make database changes.

The ViewX application is a windows thick client, however once installed on the PC there is no maintenance because it doesn't store any part of the SCADA database on the PC, the entire configuration is stored on the ClearSCADA server(s). In run-time the graphic screens are cached on the ViewX client therefore only when they change are they reloaded from the server maximizing network bandwidth.

The ViewX application uses client-server technology and uses report-by-exception data transfer from the server. The steps involved for communication start with an operator initiating or pulling up a display; the Server checks if the display has changed since last time and if not ViewX will load the display graphic from its cache, at the same time the server will send the real-time data to the client and update when changes occur. This technology makes for the most efficient possible and is ideal if the ViewX workstation is remote from the server across a wide area network (WAN) link.
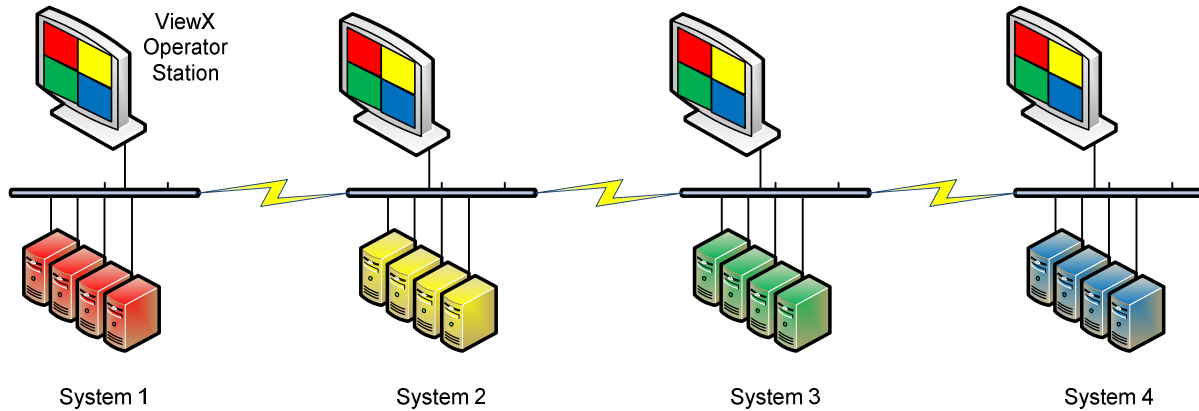
The ViewX client can be configured to connect to a single ClearSCADA server, redundant servers, or even multiple systems with different databases. During the installation of ViewX, a program is added to the Windows Control Panel known as the 'ClearSCADA Client Configuration'. This program is used to setup the ViewX client connection to the server(s). The picture below shows that the ViewX workstation is connected to System1 which has 4 ClearSCADA servers. Each server has its own Name/IP address and would be entered under Node A,B,C and D etc. The Node Cost field is a number between 1 and 10 where the lower the number gives priority for that client connection to the server. If that server fails then the client will automatically switch to the next assigned server based on node cost.

Note if server is remote from local station and uses low bandwidth link then you can optionally enable 'Compress' data for increased performance.

The previous section described how a ViewX workstation is connected to the ClearSCADA server or a set of servers if in a redundant arrangement. This concept can be further extended by connecting the ViewX workstation to multiple systems or databases, a term we call 'clustering'. All that is involved to do this is add another entry in the ClearSCADA Client Configuration program for each system that you wish to connect to.

As an example the following diagram shows 4 independent systems with each ViewX workstation connected to all systems simultaneously. The ClearSCADA Client Configuration program now has 4 entries, one for each system or database. When an operator or engineers logs on to the system, they can log on to all systems simultaneously with single sign on (SSO) provided each system/database has the same user account object.

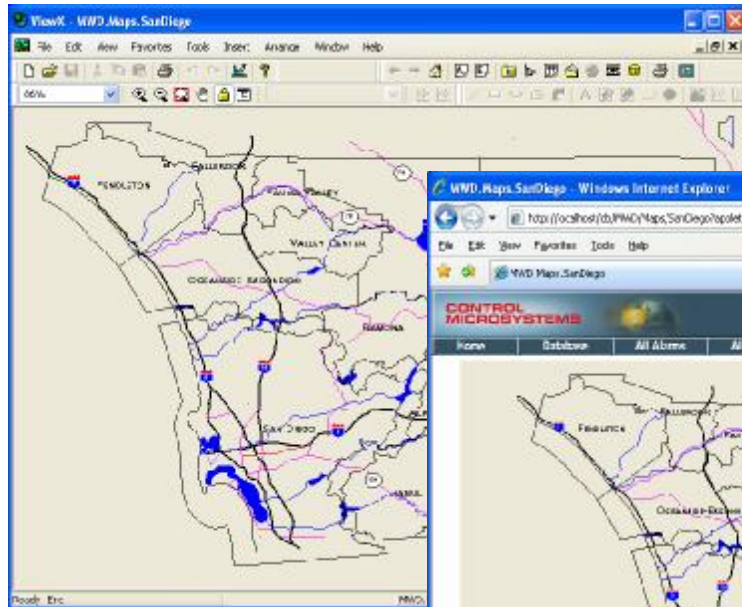| System	Node A	Node B	Node C	Node D	Enabled	Licence
System1	**192.168.1.1 (1)**	**192.168....**	**192.168....**	**192.168....**	**Yes**	**Client**
System2	192.168.1.10 (1)	192.168....	192.168....	192.168....	Yes	Client
System3	192.168.1.20 (1)	192.168....	192.168....	192.168....	Yes	Client
System4	192.168.1.30 (1)	192.168....	192.168....	192.168....	Yes	Client

The ability for ClearSCADA server to be sized up to 250k points, multiple servers for redundancy and that operator workstation can connect to multiple systems simultaneously provides virtually unlimited scalability for ClearSCADA.
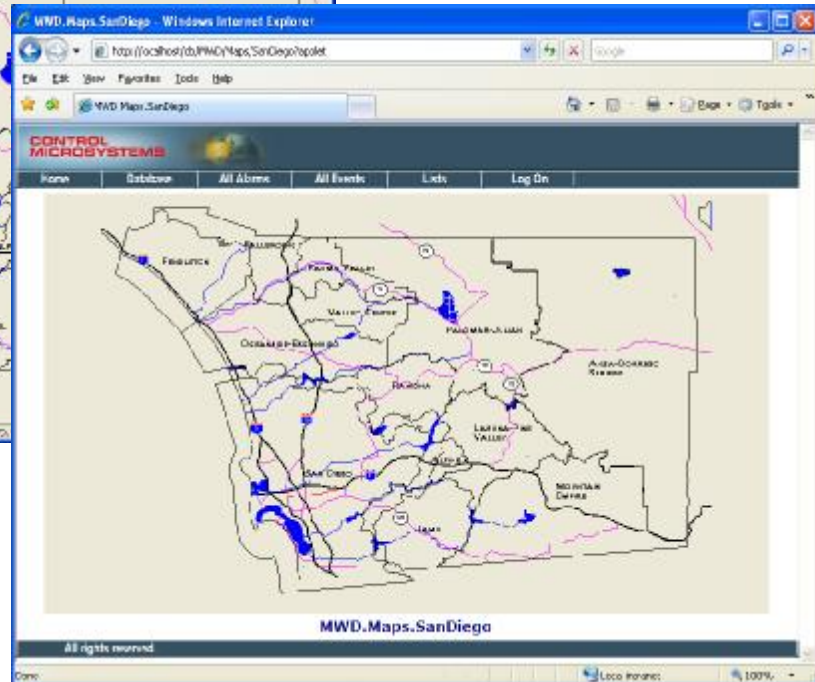
Webx client

Webx is ClearSCADA's Web client designed for Microsoft Internet Explorer (IE) browser. It is an ActiveX plug-in which loads from the ClearSCADA server the first time it is used. It is a full function application with graphics, alarm page, trend viewer, SQL lists and diagnostics. Operators can view, control, acknowledge alarms, execute reports etc. in the same way as the ViewX workstation, the only difference is that you cannot modify the configuration database or edit graphic displays.

The other significant difference is that the Webx client is based on concurrent or floating licensing, meaning that the ClearSCADA server manages the number of concurrent or simultaneously users that can access the system. This provides an ideal solution for casual or intermittent users as the customer only purchases the number of licenses they believe they need at any given time.

The Web server is an integrated part of ClearSCADA without the need to install / setup or purchase an additional 3rd party web server. All of the graphic displays that are built using the ViewX application for operators are automatically available on the Webx client without any further development or translation.

The left display is the ViewX client application and the display below is the same graphic in Webx client.

The ClearSCADA Web server defaults to the IP address of the ClearSCADA server and supports XML and/or html with optional secure sockets (SSL) for added security if necessary.

The Web server option is available on any ClearSCADA server and for larger systems it is common that customers will dedicate a performance server for web access.