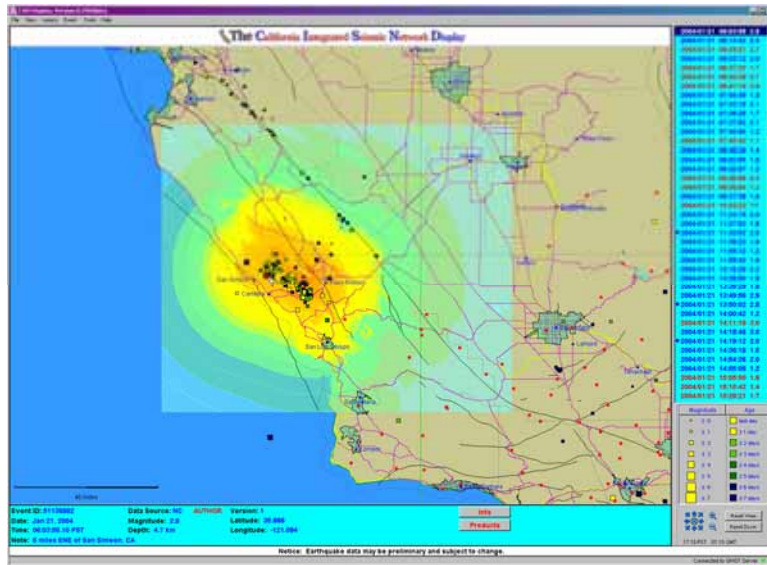




CISN Display Installation and User's Reference Guide



Welcome to the CISN Display earthquake information system: *a real-time, interactive graphical user interface (GUI) monitoring seismicity and earthquake hazards information for the 24/7 operations center.* The California Integrated Seismic Network has collaborated to develop this next-generation notification and display system. This program suite is expected to provide emergency managers, and other decision makers, with the information and tools necessary to effectively deploy limited personnel and resources in support of recovery efforts after a major earthquake. This effort is expected to help fulfill the CISN's mission to disseminate earthquake information in support of public safety, emergency response and loss mitigation.

Fig. 1 CISN Display with San Simeon M6.5 ShakeMap overlay.

This document is meant to assist CISN Display users with installation and operation of the latest software client, and also provide familiarity with a number of application functions and features. Additionally, installation and setup of the QuakeWatch relay-server is also covered in this manual, allowing the application to scale to large numbers of internal users within an organization. As further enhancements and updates are made to the CISN Display client and QuakeWatch server software, this document will change to reflect the application's new utilities. For up to date information, please contact your organizational CISN representative, or one of the CISN member organizations (CGS, USGS, Caltech, USB or OES) for assistance.

Minimum Recommended Software/Hardware Requirements

Listed below are the recommended/necessary items needed to operate the CISN Display application:

- ◆ Java Runtime Environment 1.4.X or higher (available from Sun at <http://java.com/en/index.jsp>)
- ◆ Pentium-III, 1GHz CPU speed (or comparable hardware with same or faster processing speed)
- ◆ 384 Mb RAM or more
- ◆ IP Address (private or public)
- ◆ Access to the Internet on ports 80 & 443 without a "proxy server", or alternatively ports 39977 & 39988
- ◆ CISN Display software

The Java Runtime Environment 1.3.X should work¹, however not all operating systems platforms have been tested to date². The appropriate JRE for your operation systems should be automatically selected for you at the Sun Website, select yes to accept the legal conditions for download, and follow the remaining installation procedures as outlined. If users require technical assistance, they are encouraged to first contact an organizational IT expert for assistance. Frequently, many difficulties arise from lack of administrative privileges, or an improper Java Runtime Environment installation; most of these cases can be resolved locally.

¹ On some machines it may be necessary to upgrade to the latest Java version (1.4.X). Also, on Windows XP it may be necessary to remove any previous Java environment, and begin the installation of the JRE on a clean slate.

² Thus far the CISN Display has been tested on the following operating systems: Windows 98/2000/XP, Mac OS X v10.2, Solaris v2.8, and Red Hat Linux 7.3/9.0.

Only hardware specifications have been provided for Intel-based PC hardware, but this application will also run on other hardware platforms, though detailed specifications are not provided for all. The CISN Display is a graphics-intensive program, thus better performance can be expected with more memory and a faster CPU.

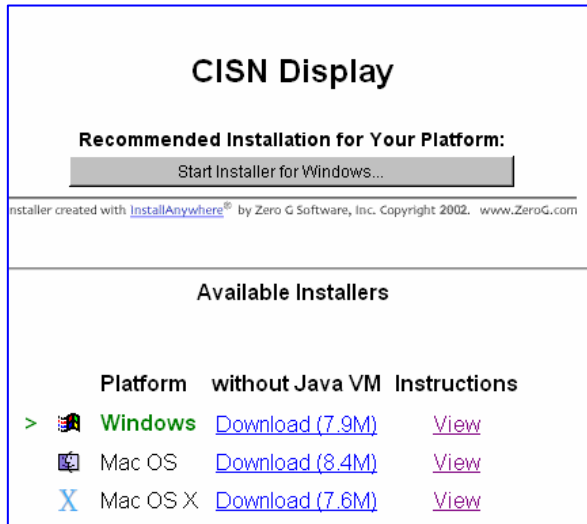


Fig. 2 CISN Display auto-download window.

Installation Procedures

Once the Java Runtime Environment is confirmed installed, the next step is to download and launch the install-shield for the CISN Display program. The client software is available from two sites located at <http://qws2.gps.caltech.edu:8080/qws/QWClient/> or <http://qws1.gps.caltech.edu:8080/qws/QWClient/>, select either URL to begin the download process.

At the CISN Display installation screen select the “Interactive cross-platform installer”, this will take you to a Web page similar to figure 2. If your Web browser accepts Java applets (most do) then a grey installer bar will appear under the CISN Display title; this is the preferred method. Otherwise you may choose to download the compressed (zip) file to a directory, and then execute the self-extracting folder. In both instances follow the steps as outlined in the installation-shield.



Fig. 3 Creating a CISN Display shortcut icon for the Windows desktop.

Once installation of the client software is completed, users are suggested to create a desktop shortcut for easy access. In windows this can be simply done by clicking on “Start” > “Programs” > “CISN Display” then the CISN Display executable button (fig. 3). By right-clicking on this button users can select “Send To” > “Desktop (create shortcut)” (fig 3), thus creating an icon on the desktop for quick access.

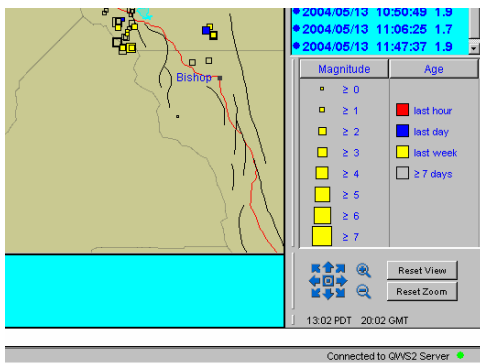


Fig. 4 Lower-right corner with link status indicator.

Running the Application

Having completed installation of the latest client version, users should launch the program, read through the legal disclaimers, and select the desired display format, CUBE/REDI or Simpson Map³. Once the application is open to the statewide map, users should ensure they are indeed connected to one of the QuakeWatch (QW) Servers. This is indicated by a green status light in the lower right-hand corner of the display window (fig. 4). If however, connection failures to the server occur, they will be followed by a dialog box indicating a communications malfunction, or some other possible error. In such instances check all physical network connections, and ensure the computer has a valid IP address with direct access to the Internet without the use of a Web-proxy.

³ The CUBE/REDI format is the color schema native to the computers running the CUBE/REDI program. The Simpson Map format is the color schema found on the Recent Earthquake maps available on the Web. These settings can easily be switched later.

The first time the client connects to the QuakeWatch server, it will attempt to download any missed earthquake messages going back about three days. These event messages are stored locally in an archive⁴ and will be available for viewing even if the client-to-server connection is later lost.

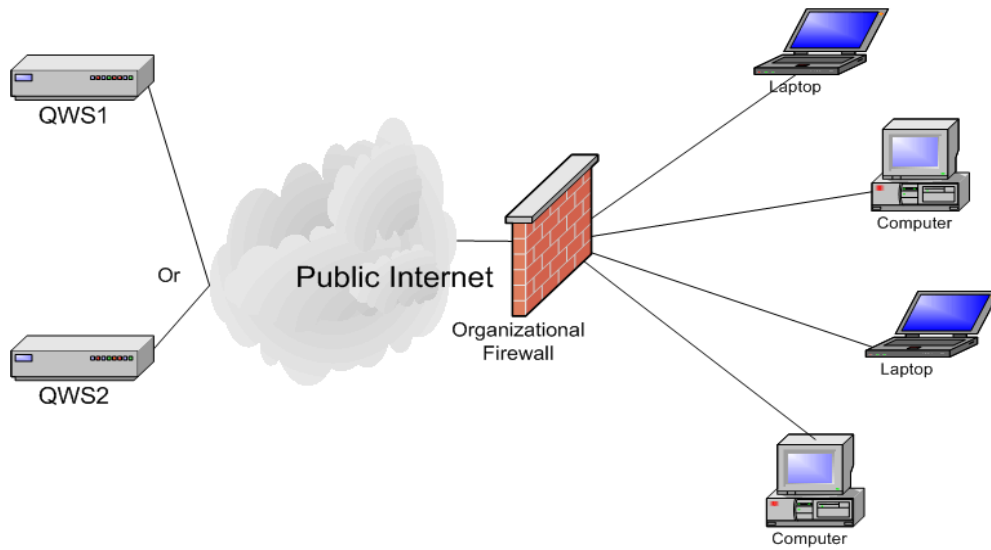


Fig. 5 Standard Client to Server connection using posts 80/443.

Standard Client to Server Connection

Option 1: Standard Client/Server Connection

The standard client-to-server connection (fig. 5) requires no additional software or configuration other than the client software, and the previously mentioned system requirements. In this scenario one of many CISN Display clients within an organization may initiate a call-out, to an available QuakeWatch server on port 443. A response is then issued back to the client (on port 443), by the QuakeWatch Server in the form of a unique “event channel” ID, the client then reconnects to the QWServer on port 80 using this unique ID, and begins listening (on port 80) for event messages. This connection type assumes that ports 80/443 are open, and that a Web-proxy does not sit between the clients and the public Internet.

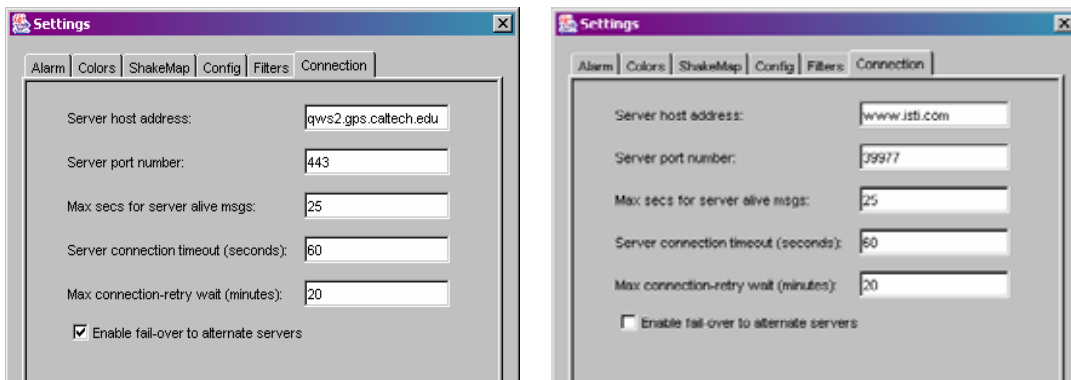


Fig. 5 Connection windows for standard QWServer (a), and alternate QWServer (b).

Alternate Client-to-Server Connections and Firewall/Security Concerns

Because network security is a high priority to most organizations, improvements were made to the client/server communications middleware to facilitate its migration onto private LANs. These changes include:

1. Communications to server on standard Internet ports: 80 (HTTP) and 443 (HTTPS), and communications service can handle DHCP, as well as NAT addressing

⁴ On Windows operating systems the default directory is C:\Program Files\CISN_Display\storage.

Even so, this will not resolve all networking-policy concerns where security is especially tight. As an alternative users may also try one of the two following options to allow this service on their corporate LAN.

2. Connect to an alternate QuakeWatch server using ports 39977 & 39988
3. Run a QuakeWatch relay-server locally
4. Modify firewall rule-sets to allow these connections

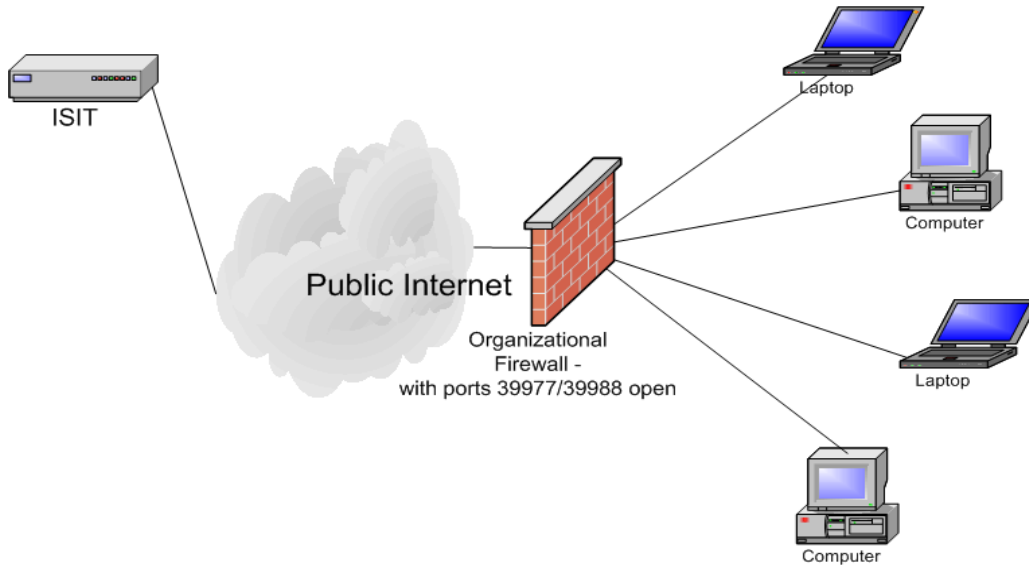


Fig. 6 Alternate connection to QuakeWatch server using ports 39977 & 39988.

Option 2: Alternate QW Server

Ports 80 & 443 were originally chosen for client-to-server communications because they are commonly available and open for Web applications. However due to the prevalent use of Web-proxies on ports 80/443, the CORBA messaging-middleware we have employed will not work with these devices. The reason is that Web-proxies were only intended to handle HTTP traffic, and not other application-layer protocols. So while many CISN Display users may be tempted to run the client through a Web-proxy on their local network, the communications traffic will likely be blocked. Users should contact their local network administrators to find out if they use Web-proxies on their network. If this is the case, and the local admins are unable to provide a different route around a Web-proxy to the public Internet, then option 2 may provide users the ability to connect to the messaging service on a set of ports (39988 & 39977) that circumvent Web-filtering devices.

For these users, it's recommended they connect to an alternate QuakeWatch Server⁵, and configure their client with the settings described in figure 5(b). To do this click on "Tools" > "Settings" > "Connection"; in the parameters titled "Server host address" enter the alternate server: www.isti.com (IP addresses: 24.97.13.228). In the section titled "Server port number", enter port number 39977. Users should note that these port numbers (39988/39977) were chosen so as to not interfere with other IP-ports organizations may be employing on their local network. If however there are a locally-allocated, alternate set of ports available, the CISN could make changes to its notifications service to take advantage of these port numbers. For such a request please contact you CISN organizational representative, and inform them of their availability.

Option 3: Run relay-QuakeWatch server

Another option is the availability of the relay-QuakeWatch server package. This server software is available for download, and provides organizations with local control, and scalability to host as many clients as they deem necessary. It features nearly the functions of a public QuakeWatch server hosted by the CISN, but in a modified configuration to allow easier setup and configuration. Furthermore, this option has the advantage of requiring only a single-pair of open ports in the firewall to allow the relay-QW server to connect to a public-QW server. All subsequent CISN Display clients on the private LAN can then connect to the relay-QW server and

⁵Soon the alternate set of ports (39988/39977) will also be available on the main QuakeWatch servers: QWS1/QWS2. Thus only the port numbers will need to be modified.

receive earthquake notifications. Without this relay server, each client must initiate its own port opening through the firewall to the public server. Thus the relay server option can enhance network security by limiting the number of firewall openings to the Internet. Lastly, it may be isolated from the rest of the network on a separate subnet, or DMZ, to further limit exposure from possible outside attacks. The relay-QuakeWatch server software is currently available at:

http://qws1.gps.caltech.edu:8080/qws/QWClient/QWRelay/QWServer_v0.435Beta_dist.zip

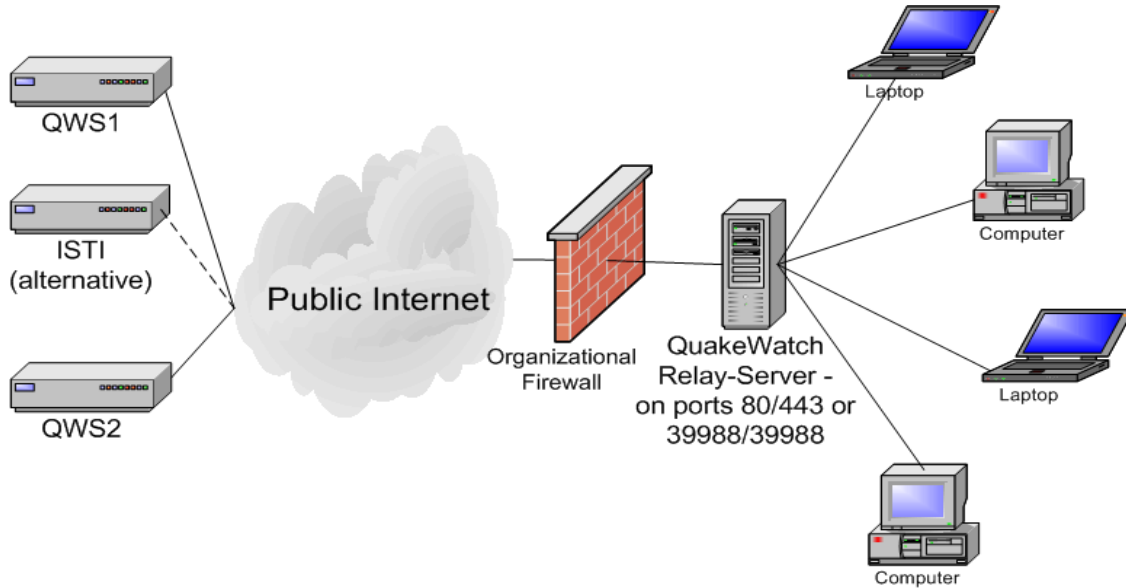


Fig. 7 “Relay”-QuakeWatch server hosting clients locally.

Complete installation and setup procedures for the relay-QuakeWatch server are available in Appendix A, as well as online at: <http://qws1.gps.caltech.edu:8080/qws/QWServer/QWServer.html>. Users who download and install the relay-QW server software should notify CISN support personnel, so they may be kept updated on new and improved software releases.

Modifying Interface Settings

Changing Interface Colors

Changing the interface colors affects the text and background color for items such as the map legend, the information panel, and the epicenter colors. Motives for modifying the interface and map colors go beyond cosmetic reasons. In many instances screen colors can vary widely between traditional CRT monitors, and flat-panel LCD screens. Also, many organizations with 24/7 operations centers project their CISN Display applications onto wall screen displays. This often has the effect of washing out the color intensity and making the information difficult to read. Thus allotting for color changes can enhance the application’s usability and effectiveness.

The color editing window can be found under “Tools” > “Settings” > “Colors” (fig. 8). Here entire epicenter colors schemas can be modified by selecting either the CUBE/REDI or Simpson Map options. To edit a single color, users need to select the button to the right of the item descriptor. This opens an editing window with several tabs, (fig.9) with options for standard or custom colors. When done editing, click “OK” to effect the color change on the display; these changes are persistent. Note that selecting “Reset” or “Default” buttons will only affect the selected window tab.



Fig. 8 Settings menu for Interface colors

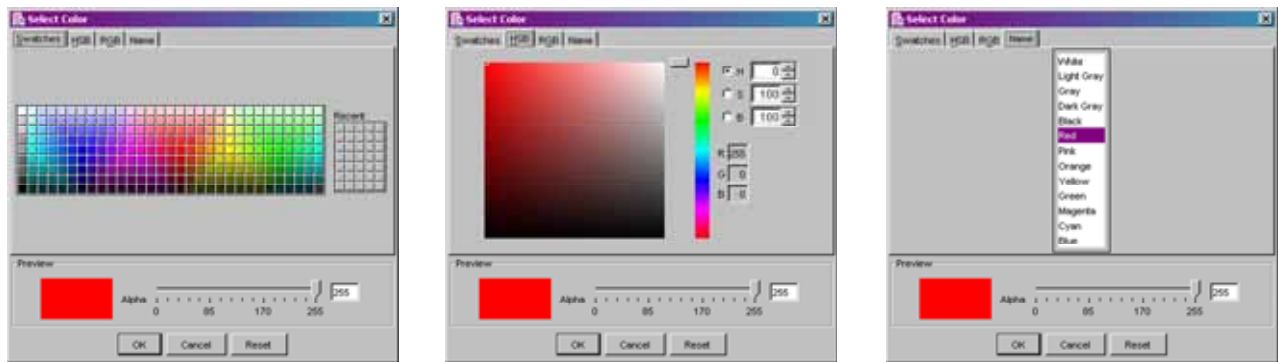


Fig. 9 Three color editing windows featuring an available swatch collection, the hue palette, and eight standard primary colors.

Editing Map Layers

At the heart of the CISN Display’s graphical interface is a GIS mapping engine. The OpenMap GIS program is capable of plotting many common GIS vector-formats⁶, thus allowing users to customize their application to meet their organizational needs. For instance, assets such as roads, railways, or power plants may be plotted on the display to help Emergency Managers evaluate seismic hazards information with respect to their critical infrastructure. This is a giant leap forward in the graphical monitoring of earthquake activity; no previous application allowed users this level of GUI customization and interactivity.

The GIS engine also provides a user interface to edit map-layer colors, and to add or remove layers. These features are all accessed through the “Layers” drop-down menu (fig. 10). The drop-down list represents all the available GIS layers ready for display. A checkmark to the left of the layer name indicates an active map layer; deselecting it removes it from the map but leaves it available for viewing later.

This drop-down window is also the entry point for adding, editing or the deleting of GIS layers. To edit an existing layer select the “Edit Layers” option and a “Layers” window appears listing all active and non-active layers present (fig 11). An “illuminated” light bulb indicates if the layer is presently appearing on the map.

Users should note that the vertical arrangement of names in the “Layers” window represents their relative hierarchy on the display map (fig. 10). For instance the layer “CA Towns” appears above the “Earthquakes” layer (fig. 11). This means that the mapping engine will always draw the text-names for CA Towns above that of Earthquake epicenters. This may be desirable since a larger earthquake can produce many hundreds of aftershocks in a short period of time. This tight cluster of epicenters on the map could make it difficult to read the city names or other infrastructure information if the epicenters were on top. To modify the stratum order, highlight the desired layer and click on the “up” or “down” arrows to move the layer one step at a time. To push the layer all the way to the “top” or “bottom”, click on one of the double-arrow buttons (fig. 11). This will move the selected layer to either extreme; thereafter incremental adjustments can be made by using the single up or down arrows.

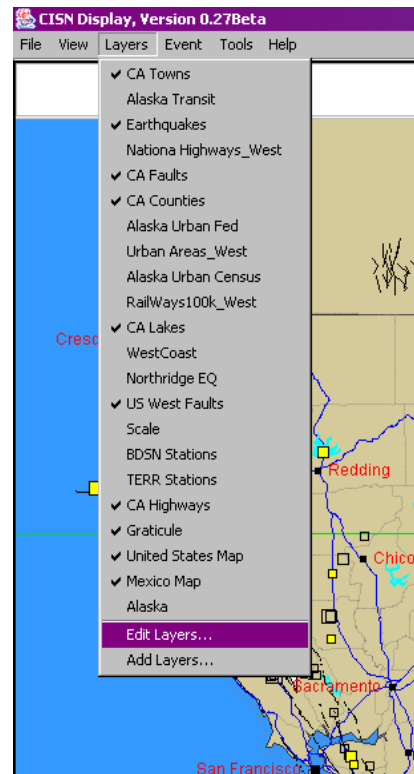


Fig. 10 Layers’ drop-down menu

⁶ The OpenMap program plots many standard formats, including ESRI Shape files, NIMA’s RPF, VPF, DTED and also CSV (comma separated values). However, at present the mapping engine only displays vector-based graphics and not Raster images (i.e. GIF, JPG, TIFF, PNG etc.). Also, the program only supports geo-referenced (lat/long.) coordinates and not Universal Transverse Mercator (UTM) projections. If user interest warranted these limitations may be addressed.

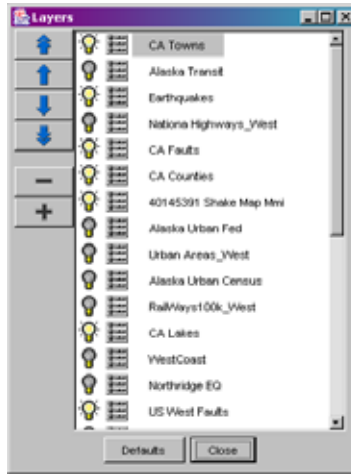


Fig. 11 Layers editing window

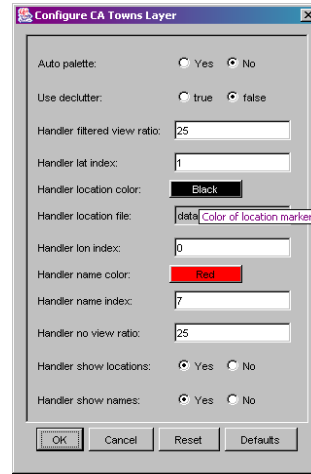


Fig. 12 Color configuration window

Changing Layer Colors

Editing the map-layer colors is done through the “Layers” window (fig. 11) accessible through the “Layers” drop-down menu. To edit a map layer, select the square icon just to the left of a layer name; a second window opens with a variety of buttons for “Line”, “Fill” as well as “Text” colors (fig. 12). These configuration windows will vary slightly depending on the editable attributes of each map layer. Selecting one of the colored buttons will open up yet another window, the same as those previously shown for editing interface colors (fig. 9). Users can then modify the selected color for each layer.

Adding a New Map Layer

Returning to the “Layers” drop-down menu (fig. 10), users may choose to add new map layers to the CISN Display. These layers may represent public facilities such as roads, schools or hospitals, as well as private structural inventories. Once added these additional layers can be edited just the same as others. The following steps assume that additional layer files are available for uploading, and the GIS formats are compatible with the OpenMap software.

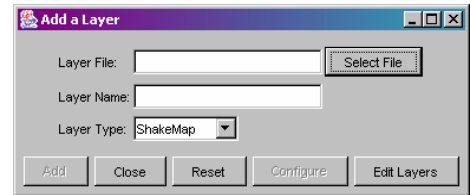


Fig. 13 Add a Layer window

To add a new layer, select “Add Layers” from the drop-down menu (fig. 10). An “Add a Layer” box appears; from here click the “Select File” button (fig. 13). This opens a local directory window to the folders in the default CISN_Display file (fig. 14). Locate a desired GIS layer in a local folder, and select it for uploading to the CISN Display. To simplify the uploading of new layers, users may consider storing all GIS files centrally in “gdata”, or some other folder within the CISN_Display directory. Having selected the GIS file, the user may change the layer name or leave it as is. If not already chosen select the layer type, and click “Add” to see the layer appear on the display map. Here too, users can choose to edit a layer by selecting the “Edit Layers” button.

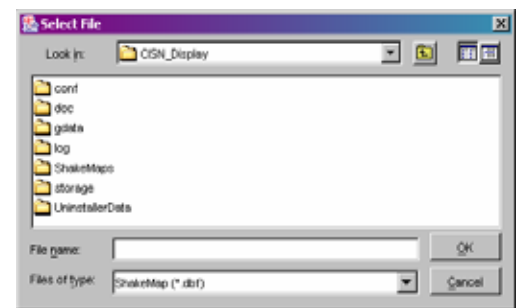


Fig. 14 Window showing the CISN Display folder

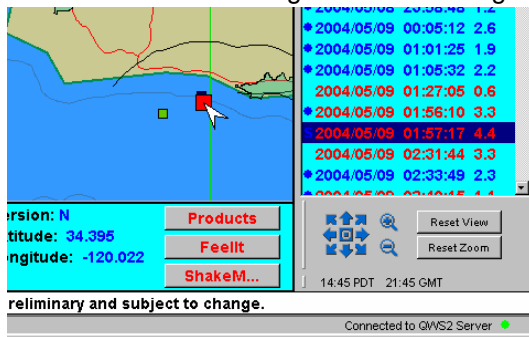
Functions and Features

Real-time Earthquake Monitoring

Primary to the CISN Display’s operation is its active monitoring of near real-time seismicity and earthquake hazards information. Once connected to a QuakeWatch server, the client begins to monitor seismic data messages, and posts updates as they are received. This behavior requires no interaction from the user, aside from the initial client setup. Other functions may be activated by the user to sound an audible beep as well as centering each epicenter on the map every time an earthquake message arrives. Additionally, an alarm threshold may be configured to trigger a group of audible beeps, as well as a visual flash, for earthquakes above a given magnitude. These options may be configured through “Tools” > “Setting” > “Alarm”.

Product Gateway

What distinguishes the CISN Display from other graphical earthquake information tools is its exploit of the QDDS⁷ add-on message. These messages allow the client to automatically associate specific earthquakes to



products and services produced by CISN member organizations, and made available on the Web. These URLs appear on the CISN Display client as soon as the products become available (fig. 15), providing decision makers with quick access to earthquake information on the Internet. A residual benefit to using the QDDS add-on feature is that it can provide users with national as well as worldwide earthquake information. Since other seismic regions as well as NEIC⁸, use QDDS to distribute QDDS to distribute earthquake information, users may be updated on seismic activity in Alaska, the Pacific Northwest, the East Coast and the New Madrid region.

Fig. 15 URLs appear for this earthquake event.

URLs providing analytic data for delivery to the CISN Display are:

- ShakeMaps shape files, Hazus input files, and ShakeMap station-lists
- Digital Waveforms (northern and southern CA)
- Community Internet Intensity Maps (CIIM), or 'Felt Reports'
- First Motion Mechanisms/Moment Tensor Solutions
- Aftershock Forecasts/Earthquake Commentaries
- Tsunami Warning Messages

Automated Download and Display of ShakeMaps

A recent addition to the CISN Display is the automated download and display of ShakeMap and station-lists overlays⁹. The ShakeMap overlays are treated as GIS files, and can be modified similarly to other map layers. When ShakeMap information is joined with other map layers depicting critical infrastructure and urban census information, they combine to form a comprehensive picture of the earthquake's aftermath. This level of situational awareness can provide decision makers with the key information necessary to allocate limited personnel and resources in recovery efforts, and restoration of public lifelines after a major earthquake.

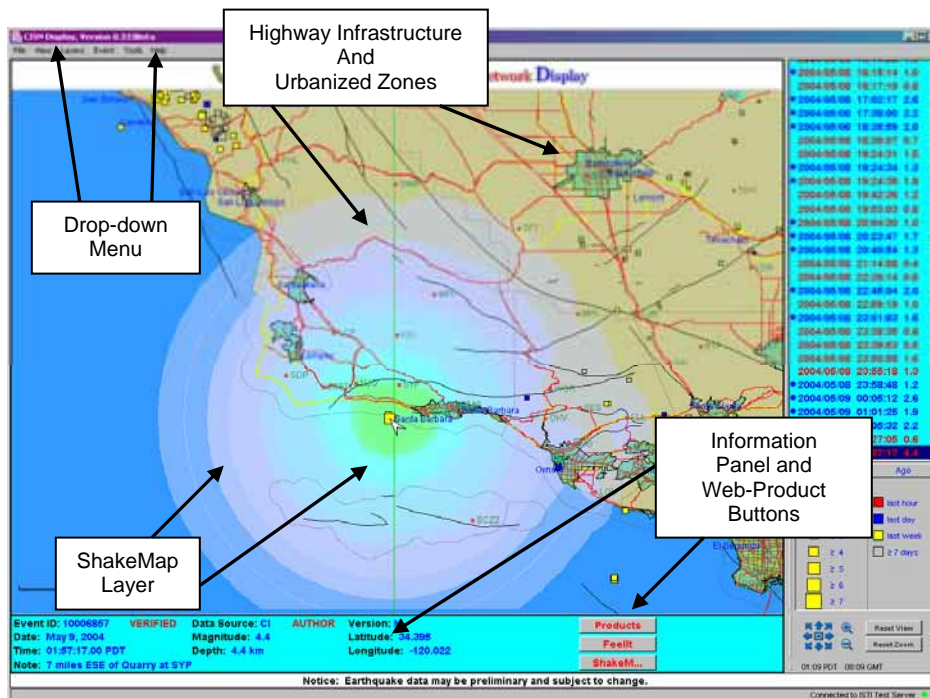


Fig. 11 The CISN Display with a recent offshore earthquake south of Malibu with ShakeMap overlay. Plotted on the map are active layers of faults, major roadways, population centers, county lines, and the maximum measured shaking intensity.

⁷ The Quake Data Distribution System provides a method for seismic network operators to distribute earthquake data among each other.

⁸ The National Earthquake Information Center (NEIC) determines the location and size of all destructive earthquakes worldwide, and rapidly disseminates this information to concerned agencies, scientists and the general public.

⁹ The station-list represents the group of sensors that contributed to the solution of the ShakeMap shaking intensities