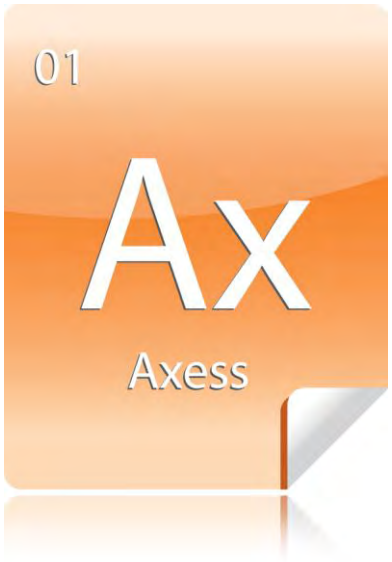

White Paper

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Overview

This paper describes how Statmon's premier software, ***Axess*** , fits into the myriad of system and facilities monitoring & control scenarios, and describes the positioning of ***Axess*** in the marketplace, outlines the major features of ***Axess*** , and describes some of the settings into which customers use ***Axess*** .

Axess Position in the Arena

Statmon has positioned ***Axess*** as a Systems/Facilities Monitoring & Control software suite, serving *telecommunications* (wireless and wire line), *broadcast* (television and radio) and *aviation* (navigation and airport systems management), with an eye toward *government* (infrastructure, emergency management systems monitoring), and *military* (infrastructure) applications.

The deepest penetration in these markets is in wireless and broadcast, while aviation is poised to grow. Government and military markets require partnering with mature players to gain entry to an admittedly difficult playing field.

Axess is not primarily *IT Network Management System* software; there are others who do that from the Enterprise-level on down. While ***Axess*** utilizes sophisticated network features, it is not *exclusively* about collecting network metadata. ***Axess*** works over IT networks to monitor and control the systems and devices that IT and other kinds of networks depend upon for transmission, content management, power, environmental considerations, and physical security; the infrastructure area of systems as well as specialized non-IT communication systems. That said, ***Axess*** does have SNMP Manager and Agent functionality and can perform many IT network monitoring chores.

Axess can report to and task from "manager of manager" systems, as well as be a "manager of managers" in certain layouts. The less IT-centric the requirements, the stronger Axess can play the "manager of managers" role, as appropriate.

Axess can manage an autonomous monitoring and control network, linking to other autonomous networks for data collection and reporting.

Axess Topology

From a single local site with one remote monitoring point to national or international networks with regional or distributed NOCs overseen by a central NOC managing thousands of sites, ***Axess*** scales to meet the design.

Network Topology

There are several models of network topology into which ***Axess*** has been applied:

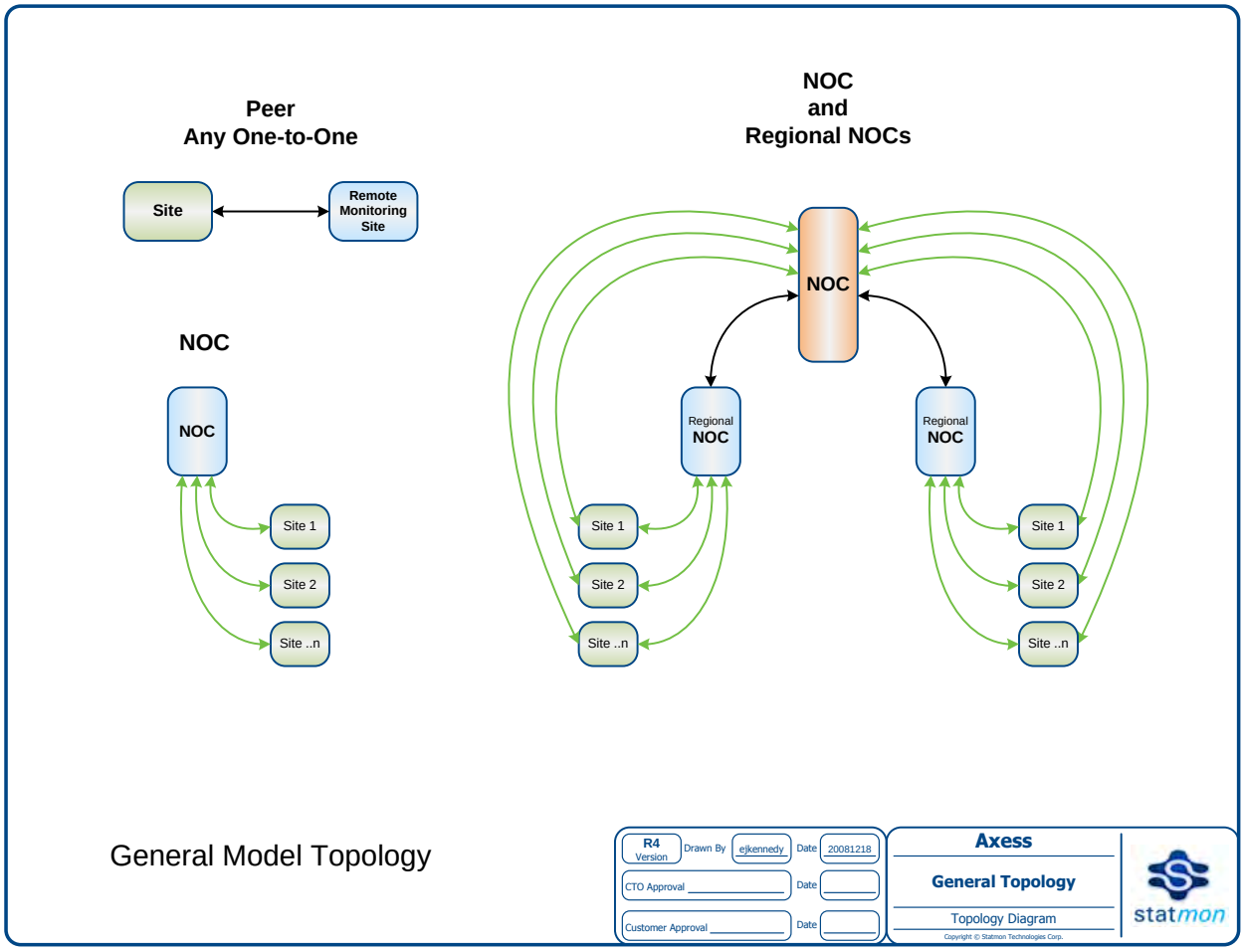

FIGURE 1

In the General Model Topology in *FIGURE-1*, ***Axess*** is shown operating in a single site instance, in a Network Operations Center (NOC) managing directly a number of sites, and in a NOC overseeing regional NOCs. In the last case, the ***Axess*** central NOC can manage all the sites, through the regional NOCs or ***directly*** to each site.

Each site, Regional NOC and Central NOC would have one or more instances of ***Axess*** running to perform data collection, aggregation, reporting, and other functions.

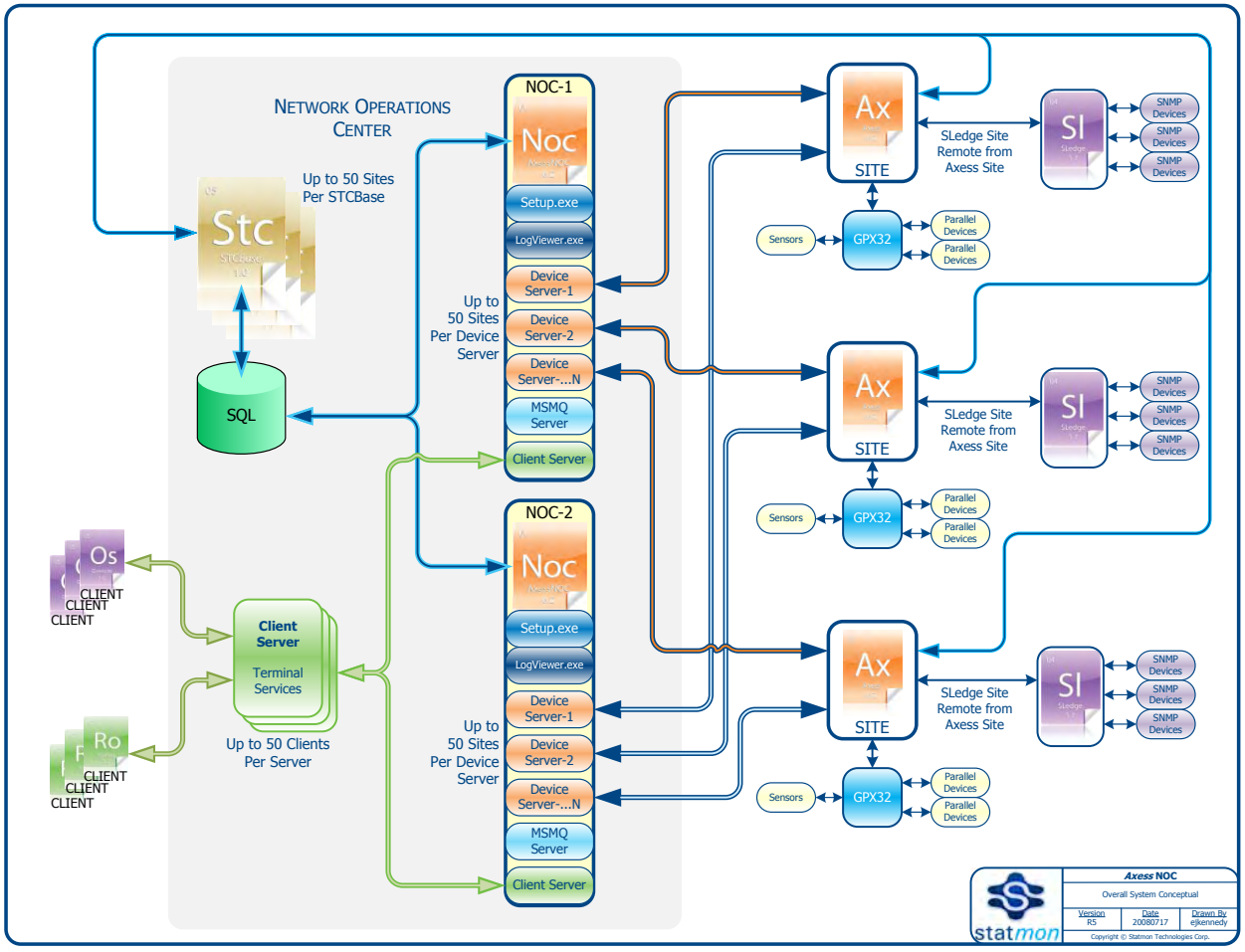

FIGURE 2

In the case of a NOC managing a large number of sites, directly or through Regional NOCs, the ***Statmon StcBase*** database at the NOC may run on its own separate servers, as shown in ***FIGURE-2***. As well, the SQL database may utilize a SQL Cluster or other methodology. Monitoring workstations in the NOC and management offices, as well as off-site on-call staff, may utilize ***Statmon rOVIng*** clients, rather than full Axess licenses, saving cost and workstation overhead.

Whether the NOC facility is a standalone facility, or part of a larger facility, separate instances of ***Axess*** may also be running local facility (physical site) management, monitored by the NOC room.

With the **Broadcast Model Topology**, in **FIGURE 3,** the addition of a *Master Control Room* (MCR) monitoring site adds another layer to the model.

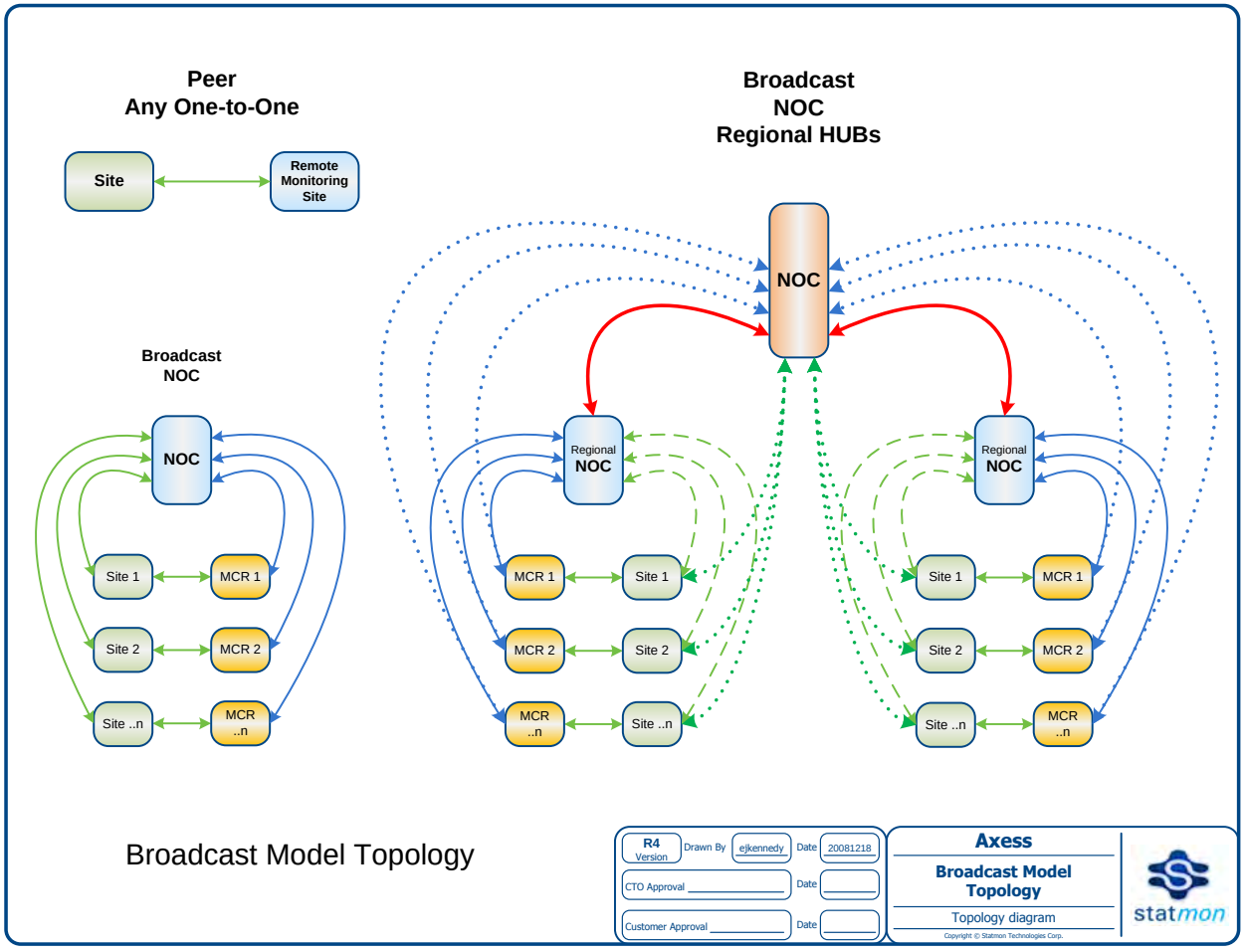

FIGURE 3

The MCR is, generally, also a content distribution point and has a direct interest in the condition and status of its associated broadcast transmission channels at local sites under its control. Because of these considerations, the MCR generally can be configured to operate in autonomous relationship with the sites under it, for monitoring and control purposes; especially should any NOC connections be lost.

As with the **General Model** ***(See FIGURE-1)***, the NOC and Regional NOCs in the **Broadcast Model** can manage through the hierarchy or ***directly*** to any ***Axess*** site.

Site Topology

Each *Axess* collection (*local*) and monitoring (*remote*) site may have unique configuration, based upon the combination or permutation of target equipment, communication links, reporting and notification requirements and the like. In *FIGURE-4*, we see a sample local site configuration, illustrating the many devices and connection types, communication links, and service provision for reporting and notifications possible with *Axess*.

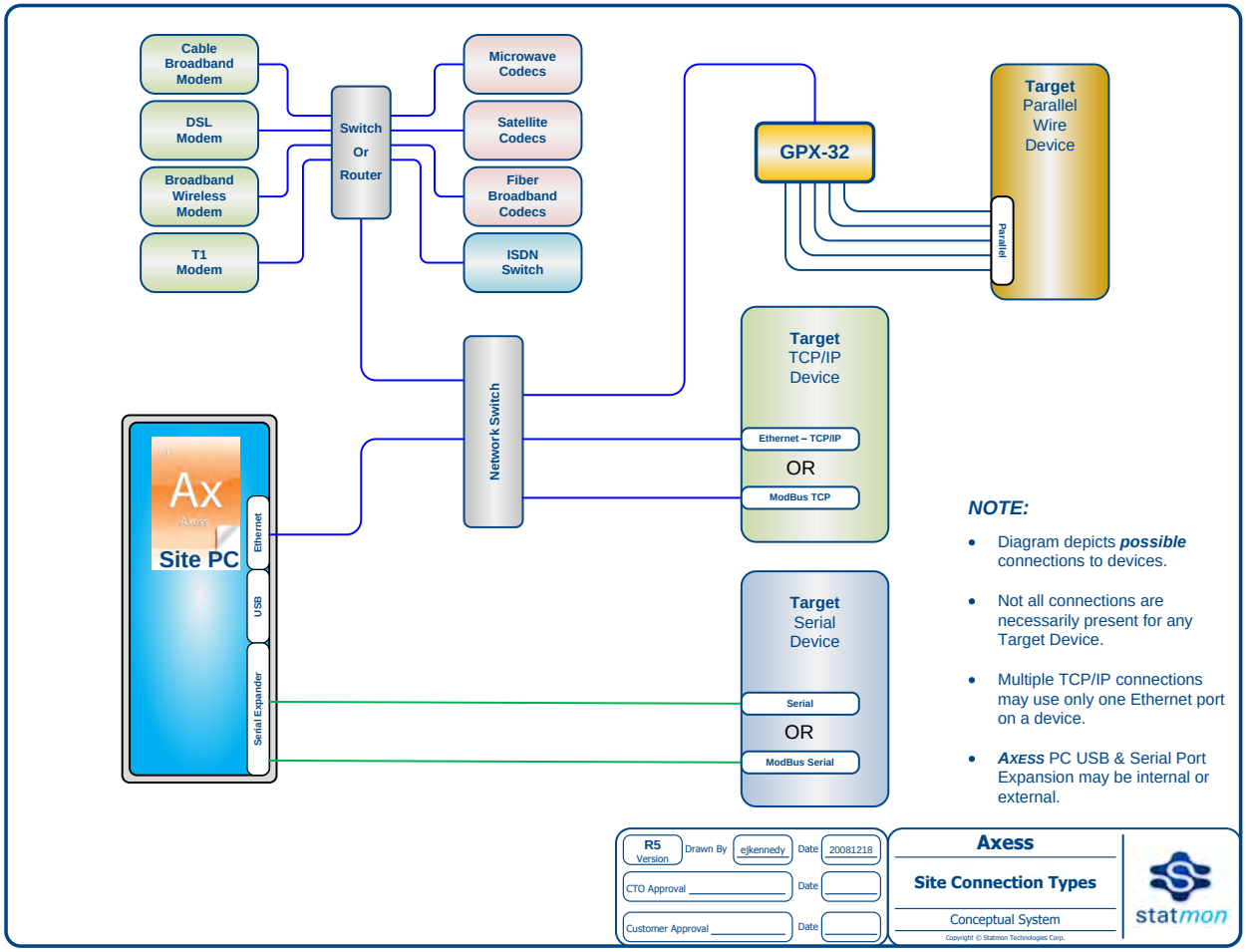

FIGURE 4

Please note that the local site example above shows *more* connections to a Target Device than are normally *actually* present or used. In most cases, one connection type per device is utilized. Occasionally two connections may be available, such as on transmitter, wireless transceiver devices or power generator set where both parallel and either serial or Ethernet connections are employed.

Local sites most often have a number of disparate devices connected on-site, as well as connection to the remote site(s). Apart from some occasional remote site environmental or physical security devices, remote sites are primarily connected to their associated local sites.

Site Relationships

An ***Axess*** local site performs like a server to one or more remote sites, establishing a local on-site database for collection, aggregation and transfer of data to remote sites. A local site is generally only aware of and has control over devices and connections established at that site.

An ***Axess*** monitoring site performs as a client to one or more local sites, establishing a monitoring site database containing data from all monitored sites. A monitoring site is aware of devices and connections at all monitored sites and can control all of those sites.

A local site does not require a monitoring site instance to perform its collection and aggregation functions; it is autonomous in that regard. If any or all monitoring site connections are lost or the local site taken *off-line*, for any period of time, ***Axess*** at the local site will continue to operate. Once monitoring site connection is restored, the local site will update the monitoring site(s). While generally not routinely operated as a stand-alone, ***Axess*** at a local site provides its full function and feature set to a local (on-site) operator.

The local Main Screen and OVIs give an operator full access to the local user-configured display of all defined channels, logs, devices and connections. Thus, a local operator placing the site in *off-line* mode maintains full monitoring and control while disallowing control and changes from any remote monitoring site; this is useful during site technical maintenance, setup and testing times.

Axess -Functions and Features

Overview

Axess provides real-time control, alarm and status functions, with powerful notification and reporting functions. There are extensive logging features, the ability to handle multiple device connection types, and a very flexible user interface.

Axess Features

The ***Axess Main Screen*** gives the user access to all of the powerful features of ***Axess***. It is divided into multiple pages each with 16 control buttons (left column), 16 Status indicators (middle column), and 16 Analog indicators (right column), with default analog meters that can be changed to digital or graphing meters.

At the top left of the screen, the local ***Site Name*** is displayed as is the corresponding Site IP address, machine name and the current user logged on.

Only one page of controls, status indicators and analog meters can be viewed at a time. The current page being viewed is indicated by the blue color of the page button. The user can select the desired page by pressing the appropriate page number button below the columns.

On the right hand side of the screen is the **Menu Bar**, which includes all the commonly used functions as well as the Special Interface selectors. Pressing the ***Help*** button opens a window to the PDF file of the complete *Axess User Manual*.

FIGURE 5 **- Main Screen at initial setup**

From the **Menu Bar**, a user selects *Setup* to open the window to configure all ***Axess*** features: Devices, connections, channels, notifications, logging, reporting, users and the like. Selecting an item on the left screen pane opens a more detailed pane on the right of the screen.

The metrics for configuring a selected item are displayed, with properties in expandable menus. Except for the most obvious properties, such as "Name," each property has a description in the right screen bottom pane, to assist the user in entering proper configuration data.

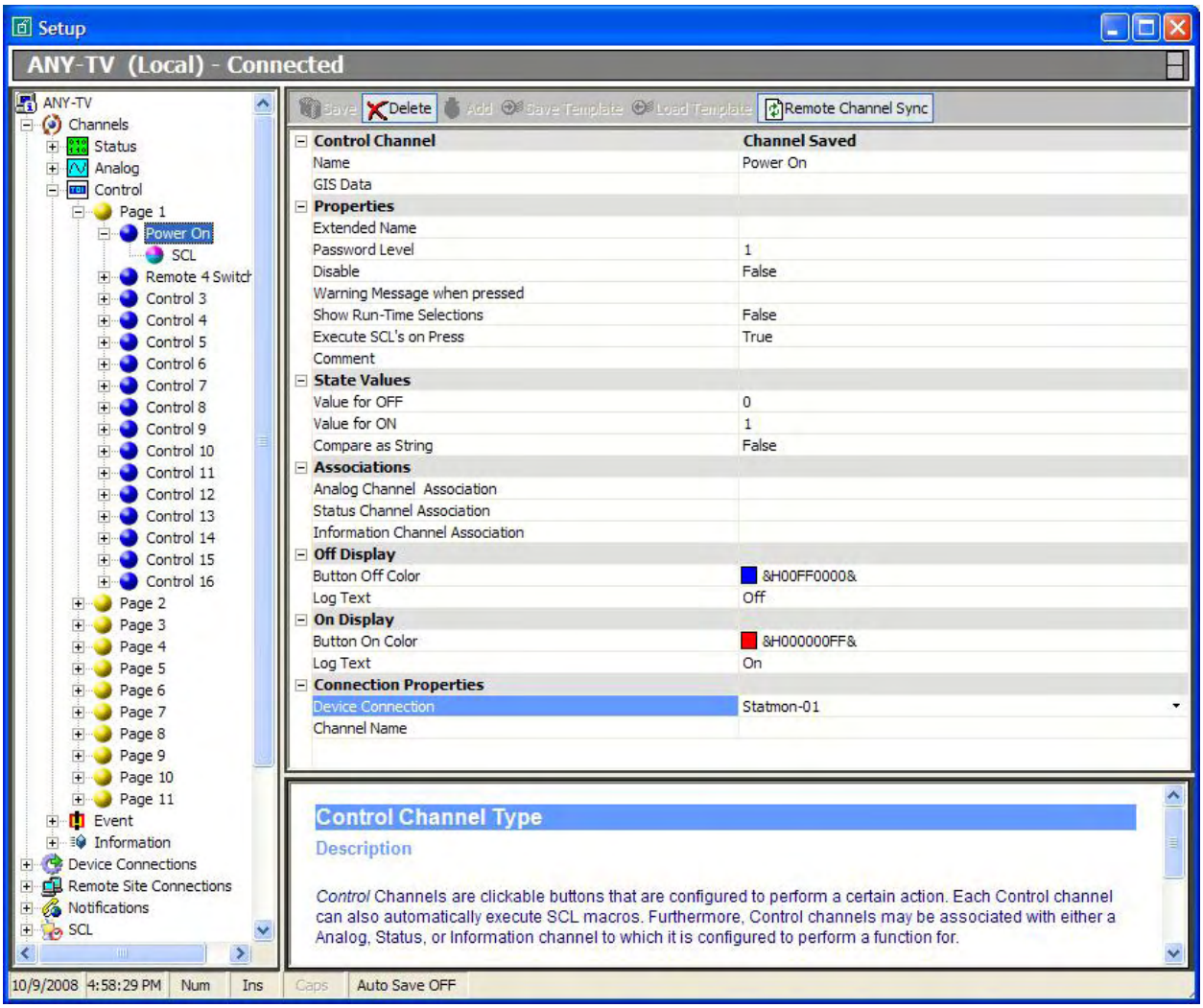

***FIGURE 6* - Screen for Control Channel Setup**

Axess monitoring sites may also be securely accessed through a *Web Browser* interface. Users must have their *User Name and Password* established on the site prior to connecting through this interface.

Although not as graphically rich as the **Main Screen** or **OVIs**, the *Web Browser* interface allows analog, status, information and event channel information to be viewed, in a table format, and allows control channels and **SCLs** to be operated.

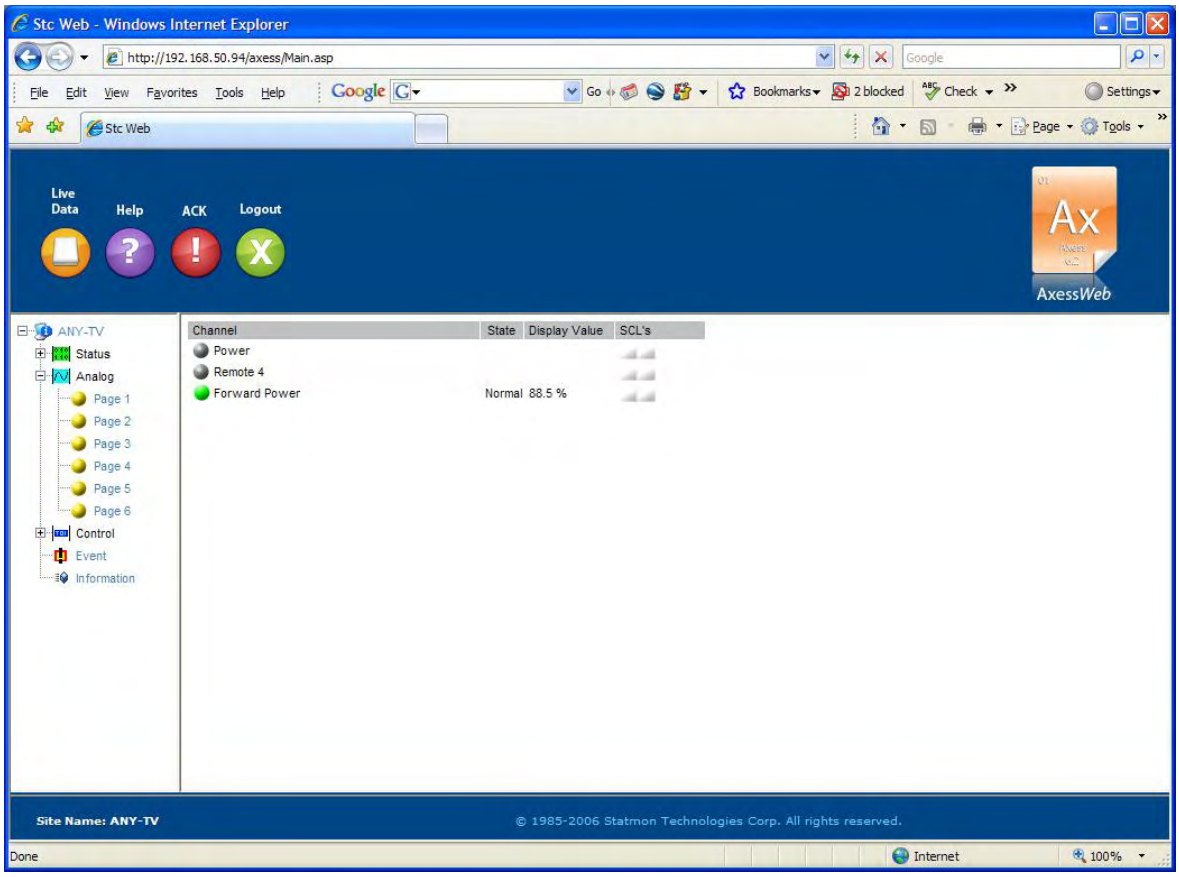

FIGURE 7

Operator Visual Interface (OVI)

While the ***Axess*** *Main Screen* is the standard user interface used to setup, monitor and control each ***Axess*** site, ***Statmon*** created the ***Operator Visual Interface (OVI)*** to allow users to create customized screens. OVIs can be used in conjunction with the *Main Screen*, or be used as the sole visual interface to operators.

In building OVI screens the user selects individual channels to display (i.e., Status buttons, Control buttons, and Analog meters), with various labels and graphic images to augment them.

Each OVI screen can contain status and readings from multiple ***Axess*** sites. In this way, an operator can monitor devices from several different sites on one summary screen.

Multiple OVI screens may be created and linked together via various *object types*, allowing an operator to ***'drill down'*** to greater levels of detail.

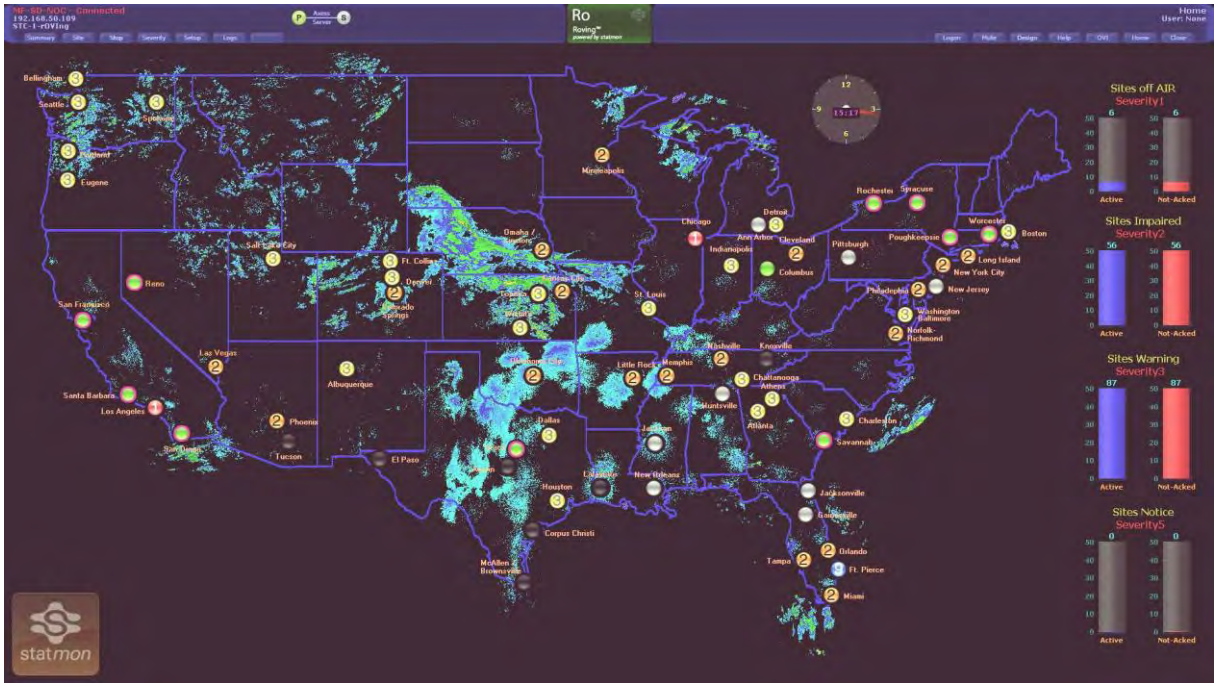

FIGURE 8

The highest level representation of this might be a simple map, with the remote Axess sites represented as colored icons in their appropriate geographical positions (Figure 8). The underlay screens in drill-down can take the operator, depending upon user permissions, down through geographical representations, to single site topology, and then to individual pieces of equipment, for analysis, maintenance or repair.

FIGURE 9

The above example (*FIGURE 9*) shows what a U.S. national map with weather radar overlay screen might look like. Each site icon could also be programmed to provide static or statistical data about the site in a revealed window when the operator highlights the site.

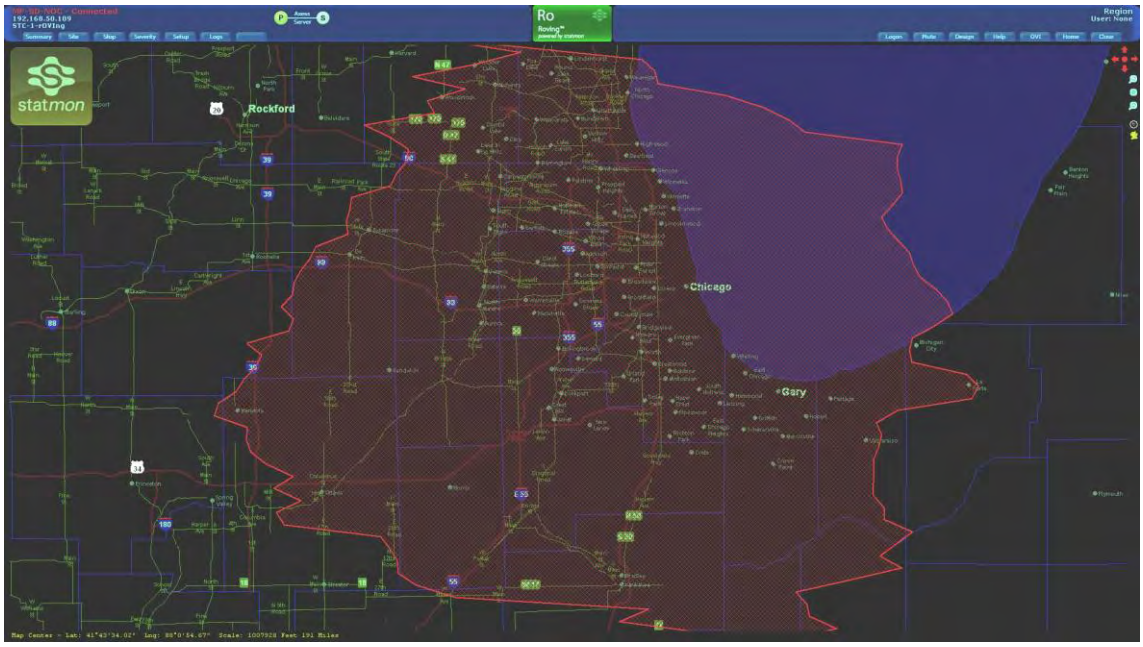

FIGURE 10

From a high-level profile screen, direct link (***drill-down***) to regions on the map (See *FIGURE 10*) or to the individual sites on other OVI screens can be set. If a site turns yellow or red, for instance, the operator will know that there is a problem and can simply drill down by *'double-clicking'* on the icon.

Such a *drill-down* screen might look like ***FIGURE 11*** below, an iconic flow diagram of a site. Objects on this screen might display device parameters when highlighted or clicked upon. A device in some fault mode might blink or change color, and status icons change color and/or text.

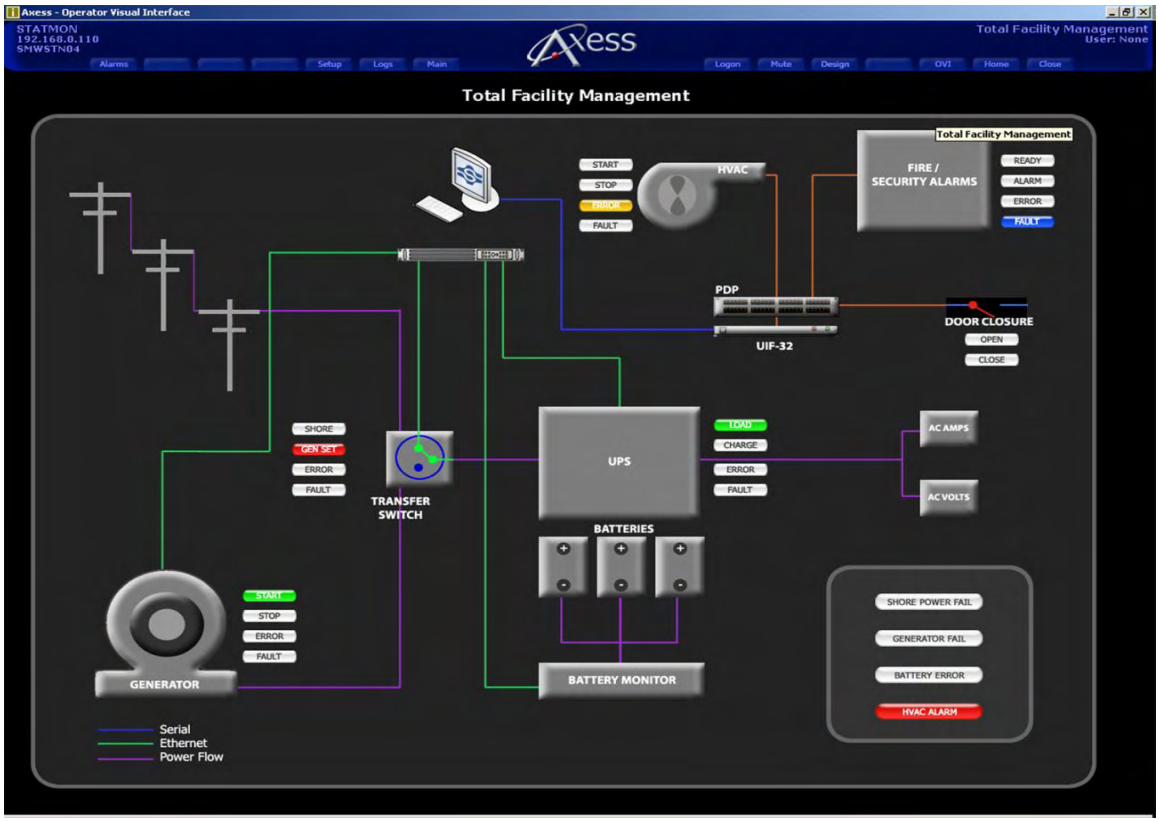

FIGURE 11

Some of the possible types of objects that can be placed on an ***AXESS*** OVI Screen are:

Analog Meter	Dynamic Picture	Label	Acknowledge Bar
Status Channel	Graph Meter	Radar Map	Detail
Picture	Information Channel	Acknowledge Bar	Channel Summary
Digital Meter	Video Feed	HTTP/Web Object	Severity Timer
Control Channel	Drill-Down	Flash Object	Severity Summary

An **OVI** screen may be exported to a file, and imported to other ***Axess*** systems. Multiple OVI screens may be exported to a Group file. This allows a user to create OVI templates on one ***Axess*** system for transfer to other ***Axess*** systems.

rOVIng Client

The ***Statmon rOVIng*** client software allows remote users to connect to a single ***Axess*** monitoring site (*rOVIng Primary Site*), using OVI screens customized to the client instance, to monitor & control sites managed by that *Primary Site*. The ***rOVIng*** client may import OVIs from a *Primary Site* or may create unique OVIs on the client. ***rOVIng*** conceptually is ***Axess*** without its own database. The client utilizes the monitoring site's database to populate its OVI screens with status and analog information, and to operate the relevant control channels of the monitoring site. The ***rOVIng*** software may be installed on any number of client computers, but <u>each</u> *Primary Site* must be licensed for one or more *concurrent* ***rOVIng*** users; the 'seat' concept.

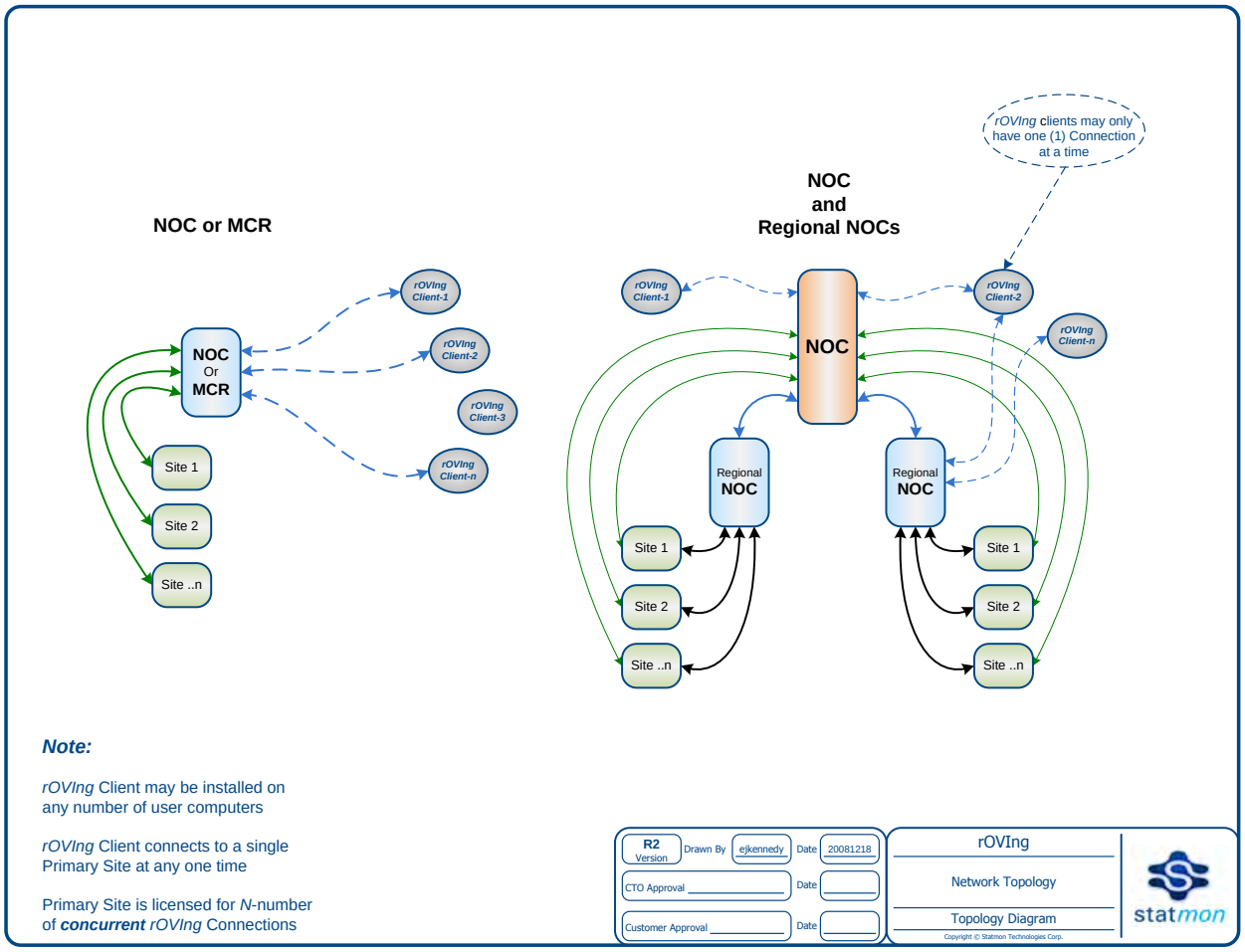

FIGURE 12

The ***rOVIng*** topology, *FIGURE 12*, illustrates the various scenarios of use. The *NOC or MCR* layout at the top shows three (3) concurrent ***rOVIng*** users licensed for and accessing the *Primary Site*, while four (4) or more ***rOVIng*** client users are registered users. So, ***rOVIng*** Client-3 cannot connect until another ***rOVIng*** client logs off that *Primary Site*.

The ***NOC/Regional NOC*** layout (***FIGURE 12***) illustrates three (3) *possible* scenarios:

***rOVIng* Client-1**

This client has, as a *Primary Site,* a NOC, managing Regional NOCs or MCRs that in turn manage a number of sites. The ***rOVIng*** client can see and connect with all that the NOC sees and connects to, through the Regional NOCs, and to each and every site.

***rOVIng* Client-2**

This client is registered with two (2) *Primary Sites*, but can access only one at a time. When accessing the NOC it has the same circumstance as Client-1 above. When accessing the Regional NOC/MCR, the ***rOVIng*** client can only see and connect with the sites that regional NOC/MCR *Primary Site* manages; it cannot access any other Regional NOC/MCR.

rOVIng* Client-*n

In the third client example, the only *Primary Site* is a Regional NOC/MCR, so the ***rOVIng*** client can see and connect with only those sites managed by that Regional NOC/ MCR.

An ***Axess*** *Primary Site* must have client parameters for each ***rOVIng*** client to be associated with it registered in ***rOVIng*** *Access* under *Setup*. Parameters include the Media Access Control (MAC) address of the ***rOVIng*** machine, setting to allow or disallow use of controls, alarm acknowledgement, etc., and whether connection to this ***rOVIng*** client is *Reserved*. A *Reserved* connection uses up one concurrent ***rOVIng*** license, assigning that 'seat' to one MAC address only, until the *Reserved* connection configuration is released.

When enabled, ***rOVIng*** security can limit areas of change or control a User can perform, by logon name. It also reports all functions carried out by a logged on User in the log file. Once logged on, all actions taken by a User will be logged under the respective *username*.

A ***rOVIng*** User's password authority (permissions) on the connected *Primary Site* ***Axess*** machine will determine what modifications to the system the User will be able to make as well as control level capabilities. A ***rOVIng*** user can be required to enter Username and password whenever a *Control* button is pressed.

OVIs can be created on ***rOVIng*** or ***Axess*** systems, and imported from or exported to other ***rOVIng*** clients and ***Axess*** systems.

Axess Functions

Connections

Through a rich suite of connection device plug-ins, ***Axess*** manages multiple system devices with, but not limited to, SNMP, TCP/IP, serial, parallel, and ModBus protocols. The suite consists of generic and custom device-specific *plug-ins* that can be mixed into the ***Axess*** site configuration, tailored to site requirements. As devices or service features are added or changed out, the appropriate *plug-ins* can be loaded and unloaded, keeping connections and communications optimized without onerous configuration changes.

Statmon Control Language (SCL) scripts (see Scripting-Automation below) may be configured to run when a device connection timeout condition is reported. The first SCL runs when a data timeout is reported, the second runs when a transition back to normal occurs. The SCLs can automatically execute alarms, notifications (see Notifications below), or other corrective/ protective actions.

Data Acquisition, Modeling and Display

With proper connections to devices, ***Axess*** manages device dataflow (acquisition), parsing input data into the ***Axess*** logical, and physical data model ***(****See* FIGURE-13***)***. Once into the database, ***Axess*** synthesizes (models) the aggregate data into user-configurable screen displays, reports and messages (notifications). This concept applies to both collection (local site) and monitoring point (remote site) instances of ***Axess.***

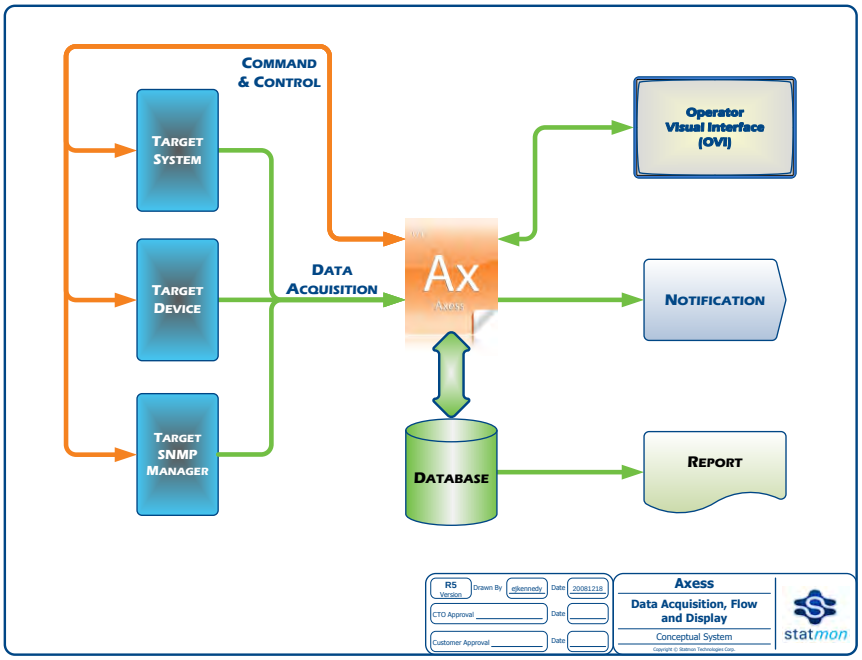

Figure 13

Notifications

Axess offers several methods of notification: *e.g., E-mail, Paging and Voice/DTMF*. Notifications can be made to a single User, phone, paging number, or e-mail address; additionally e-mail and pager notifications can be configured to *Groups* of Users (*User Groups* of up to 15 members). Each method is configured separately, and may notify different *Users or User Groups*.

E-mail Reports

This function allows Users to create preset log reports that can be filtered, sorted and constrained by user/system-defined filters, then automatically sent to an individual *User or User Groups*, either in the e-mail text body or as an attachment.

User Accounts

Users

Axess maintains a list of Users to enforce the security features of the system. Individual accounts are setup with permission level and other user-specific information assigned. With *passwords enabled*, each User must have appropriate permissions to control and setup Axess. User accounts are also needed for access to the local sites from the remote monitoring site(s).

User Groups

From the list of individual Users, various *User Groups* may be defined. An individual User may be a member of more than one Group or no Group at all.

User Groups ease communication with multiple users, e.g., distributing e-mail reports or sending alarm notifications.

Permissions

Each Control function within Axess can be set to one of nine (9) levels. These levels allow differentiation of access to setup and control by User or User Group. The highest, or most powerful, is Level 1, while the lowest, or least powerful, is Level 9. A Control with a permission level of 5 would allow Users with permissions 1-to-5 to access that function, while Users with levels 6-9 would be denied.

Logging

The *Logging* function allows the user to monitor system operation and generate official measurements for record keeping purposes. ***AXESS*** creates regular log entries with readings from every configured *Analog Channel*, with user-determined frequency and purge intervals.

The *Audit Log* is automatically generated by ***AXESS*** to track incremental settings changes for the local site. It aids in the synchronization of system settings across multiple connected sites.

Scripting – Automation

Statmon Control Language (SCL)

Axess allows a user to write script-like programs (SCLs) to automatically or manually execute. The program may be set to execute immediately, or with delay, or upon a pre-determined trigger (*e.g.*, alarm condition, channel transition to normal, analog value change), and perform a chain of events. The events can include executing a control button, triggering alarms, sending e-mail or other notifications, or running other SCLs.

From the ***Main Screen*** under *Setup*, the ***SCL*** is built with commands and statements created to form a logical IF/AND/OR/ELSE style operation (See ***FIGURE 14*** below). Thus, it is possible to cross check other status indicators prior to executing automatic operations. The combination of events can be almost limitless, and a unique set of events can be executed on transition to abnormal, transition to normal, or both.

SCLs may be written to operate controls, load applications, load OVIs, log all analog channels, run virtual ***SCLs***, send out e-mail, phone and pager notifications to individual or group users, among other things.

Line	Command	Parameter 1	Parameter 2	Parameter 3	Parameter 4
1	If Status	ANY-TV	25 - TX-1 On Air	Normal	
2	Set Control	ANY-TV	29 - TX-1 Off	Momentary	
3	Set Control	ANY-TV	30 - TX-2 On	Momentary	
4	ExitSCL				
5	EndIf				
6	If Status	ANY-TV	27 - TX-2 On Air	Normal	
7	Set Control	ANY-TV	31 - TX-2 Off	Momentary	
8	Set Control	ANY-TV	28 - TX-1 On	Momentary	
9	EndIf				

FIGURE 14 **- Simple Example of SCL to switch between transmitters On-Air**

An actual ***SCL***would necessarily involve more steps, and other control, status and analog channels to do this operation.

VBScripting

Axess uses Microsoft Visual Basic Scripting (**VBScript**) to create **MultiChannel** scripts and **OVIs**.

MultiChannel

The ***MultiChannels*** feature allows a *Status* or an *Analog* channel to simultaneously link to multiple inputs of its type. This provides a method for conserving system channels while at the same time providing detailed monitoring capabilities. Status or Analog inputs selected for the ***MultiChannels*** combination are logically joined by ***VBScript*** logical expressions (such as, "and", "or", and "not") or mathematical expressions (for example, "+", "*", "-", "/", or "Avg" and others) that allow the combination to trigger status conditions based on a single fault or on multiple faults from among the status group, or alarm conditions based on a calculated value from among the analog group.

MultiChannel Function Sample Syntax

```
Function MultiChannel

      MultiChannel = Device("2|1|1").Value
End
```

OVI

Objects in the ***OVI*** screen have the ability to be controlled with ***VBScript***. Once an object is added to the ***OVI*** screen, you may add ***VBScript*** to control how the object looks and behaves on screen. The object can be made to change color, animate, change graphic form, blink or flash, and the like.

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statmon