SECTION 23 09 24 – GRAPHICAL USER INTERFACE

PART 1 - GENERAL

1.1 RELATED WORK

A. Section 23 09 01 – Control System Integration

B. Section 23 09 23 - Direct Digital Control (DDC) System for HVAC

1.2 SYSTEMS DESCRIPTION

A. The Airport's "EIOS" system uses Tridium Niagara 4 which carries the responsibilities of communicating with field devices (JACES), managing data, and passing alarms. Additionally, the N4 platform provides an Enterprise platform for user access, graphics presentation, alarm management, and cross-system operations.

B. There are no Operator workstations associated with the EIOS systems. System servers are installed in the Owner's Virtual Machine server farm. Access to the servers is granted to approved users using remote access software tools. Operators and system users access the web-page presentations of the systems via web-browsing software while connected to the DFW Network.

C. The EIOS server shall host all graphic files for the campus control system.

1. All control logic/code shall reside in a process level controller. Server(s) shall not be required to maintain process control or system integrity, nor shall any functional logic reside within the server nor any control function whatsoever be integral to the server(s).

D. Any control vendor that must provide additional BAS server software shall be unacceptable. Only systems that utilize the browser based Tridium Niagara Framework shall satisfy the requirements of this section.

E. Scope includes but not limited to:

1. Data collection
2. Database generation
3. Graphics generation
4. Global control strategies generation and implementation.
5. Scheduling generation
6. Permanent trending and storage of all points for 7 years.
7. Alarm generation and management (include Alarm Suppression Logic)
8. Web Page Development
9. Report generation
10. Coordination of integration activities

PART 2 - PRODUCTS

2.1 SERVER HARDWARE

A. Owner shall provide access to the EIOS Application Server for operator control/monitoring of building control systems.

B. System databases will use the existing database structure of the current EIOS system.

2.2 USER INTERFACE GRAPHICS

A. Graphical displays shall include alarm displays, scheduling displays and trending displays. Data associated with an active display shall be no more than 30 seconds outof-date.

B. Graphics shall include floor plans with representation of equipment and selected realtime operational data. Icons will provide links to graphics for the individual equipment. Equipment graphics will be consistent with similar graphics in use in the current system.

C. Operator web access Graphical User Interface (GUI) shall be interactive, fully prompted, menu driven and shall provide the following functionality as a minimum:

1. HVAC Systems:

    a. GUI shall allow for graphical representations of systems, access to realtime data for each system, ability to override points in a system, and access to all supervisory monitoring and control functions.

2. Alarm and Event Management:

    a. Alarms will be configured and prioritized.
    b. Web interface shall provide visual means of alarm indication. Alarm presentation shall follow the alarm schema implemented in the EIOS system.
    c. Web interface shall provide log of alarm messages. Alarm log shall be archived to the hard disk of the web server. Each entry shall include a description of the event-initiating object generating the alarm. Entry shall include time and date of alarm occurrence, time and date of object state return to normal time and date of alarm acknowledgment and identification of operator acknowledging alarm.
    d. Alarm Notification and Routing: Software shall be configured to provide alarm notification and routing functions consistent with the Alarms protocol in EIOS.

        1) Generate a display on the alarm console of designated workstation monitors. The pop-up display shall include identification of the alarm, date and time of the alarm, alarm message, and current value/status of the alarm point. Alarms shall be capable of being acknowledged from the popup display by operators with sufficient permissions. Popup displays shall be displayed until acknowledged.
        2) Capable of sending a text message to user’s cell phone. The text message shall contain a scripted message and all alarm data. The text message recipient and scripted message shall be user configurable for each alarm route.
        3) Capable of sending an e-mail message via simple mail transfer protocol (SMTP; RFC 821). The e-mail shall contain a scripted message and all alarm data. The e-mail recipient and scripted message shall be user configurable for each alarm route.

e. Scheduling:

1) Web interface shall show all information in easy-to-read daily format including calendar of current month and next. All schedules shall show actual ON/OFF times for day based on scheduling priority.
2) Schedules shall be provided for individual HVAC system Occupied/Unoccupied operation.
3) Operator shall be able to change all information for a given schedule if logged on with the appropriate security access.

3. Trending & Data Archiving:

a. Trend logs are not to be server based using polling. Trend logs are to be initially stored at the BAS controller and periodically uploaded to the Web Server data historian for long-term storage.
b. Store data according to Universal Time Code. Timestamp all data.
c. Users logged into the system shall not have direct access to any of the raw trend data located in the BAS controllers or Web Server data historian.
d. Trend log files shall be appended with new sample data, allowing samples to be accumulated. Systems that write over archived data shall not be allowed, unless limited file size is specified.
e. Web interface shall provide ability to graphically view trend data using twoaxis (x,y) graphs that display up to ten object types at the same time in different colors. Graphs shall show object values relative to time.
f. Operator shall be able to change trend log setup information if logged on with the appropriate security access. This includes the information to be logged as well as the interval at which it is to be logged. All input, output, and value object types in the system may be logged.
g. Trend data must be visible up to the most recent time interval.

4. Report Generating:

a. Web Server Software shall be provided with commands to generate and format reports for displaying on current Workstation, printing, and storing on disk.
b. Reports shall be stored by type, date, and time. The destination of each report shall be selectable by the operator.
c. Dynamic operation of system shall not be interrupted to generate a report. The report generation mode, either automatic or requested, shall be operator assignable. The report shall contain the time and date when the samples were taken, and the time and date when the report was generated.
d. Software shall be capable of saving reports to a file. If the file format is not in a format compatible with standard Microsoft Office software, Control Contractor shall provide a means to export or convert the file to a compatible format.
e. Software shall allow for automatic or manual generation of reports. For automatic reports, the operator shall be able to specify the time the initial report is to be generated, the time interval between reports, end of period, and the output format for the report. The operator shall be able to modify or inhibit a periodic report.
f. Manual report generation shall allow for operator to request at any time the output of any report.

5. Activity Logging:

a. System shall maintain a historical file logging all activity of the system.
b. This file shall maintain, as a minimum, a record of all operators logged onto the system, alarm acknowledgments, commands issued and all database modifications. Passwords shall not be logged.

c. Activity log shall be maintained at the web application server hardware. System shall automatically provide a mechanism for archiving the log files for long term record storage.
d. System shall maintain a minimum of 2 years of log files.

D. User Access Security:

1. Web Application Server Software shall manage user information and shall recognize at least 100 separate users and have at least 3 levels of user permissions. User permission levels (from most restrictive to most permissive) shall include:

a. Guest (View-only) access level shall have the ability to perform the following tasks:

1) View Data
2) View Trends

b. Operator access level shall have the ability to perform the following tasks:

1) View Data
2) Acknowledge Alarms
3) View Reports
4) Override Points
5) Change Setpoints
6) View Trends
7) Edit Schedules

c. Engineer access level shall have the same access as Operator level with the ability to perform the following additional tasks:

1) Add Devices
2) Address Changes
3) Create Applications
4) Download Applications
5) Configure ASCs
6) Setup Trends
7) Setup Reports
8) Modify Alarm Settings
9) Create and modify System Graphic Displays

2. Passwords shall not be displayed.
3. System shall provide an Auto Logout Feature that shall automatically logout user when there has been no keyboard or mouse activity for 5 minutes. Time period shall be adjustable by system administrator. Auto logout may be enabled and disabled by system administrator. Operator terminal shall display message on screen that user is logged out after Auto Logout occurs.

E. Graphics and Controls:

1. Graphics shall be configured for “point-and-click” operation to allow user to navigate through the building systems with ease. The user shall be able to define the action of control buttons configured on the graphics.
2. Building systems and equipment drawings can be created from built-in image library or may be imported from a scanner, the Internet, CAD drawing, or other files such as bitmap (.BMP), JPEGs or Icon files.
3. All symbols used by the Contractor in the creation of graphic pages shall be saved to a library file for use by the Owner. Provide additional copy of library file on CD.
4. Graphic Editor: The graphic editor shall enable the user to create, modify, and delete displays and graphic symbols. The primary use shall be for adding and modifying graphic

displays, status displays, system summaries, and system directories, as new controllers, points, data, and other necessary changes are made.

PART 3 - EXECUTION

3.1 GRAPHICS PROGRAMMING

A. Graphic Programming will be performed on owner provided/existing BAS server. It is the responsibility of the contractor to perform a backup of the server data base prior to any work performed and provide to the owner. Any new buildings or systems added to the graphic server, it is the control contactors' responsibility to ensure other buildings/systems are not affected.

B. Navigation Scheme: System graphic displays of HVAC and electrical systems and points shall be hierarchical displays using a building-to-equipment point-and-click navigation scheme. Each display shall show the building/Area name and number. Graphics will follow Navigation Schema established in the EIOS system.

C. Program color graphic displays for each system as described herein. Graphic displays shall consist of pictorial presentations with text description, system schematic, or picture; alarm fields; and database fields for associated points, including dynamic input values, output values, set points, gains, time schedules, etc. D. Make use of color to highlight system components.

1. Color and texture meanings shall be consistent across all displays. Components of similar type shall be of same color for graphics (example: dampers shall be purple, valves yellow, etc.). Alarm fields shall be flashing black letters on red background. Affected component shall also turn red whenever alarm status is indicated. Database fields shall be dynamically updated and re-displayed on screen by periodically polling database points not less than once every 30 seconds. Each display shall clearly distinguish between the following point data types and information:

    a. Real-time data
    b. User-entered data (setpoints)
    c. Overridden or operator-disabled points
    d. Devices in alarm (unacknowledged)
    e. Out-of-range, bad, or missing data

2. State indication shall be determined by status indicating equipment such as current sensing switches, auxiliary contacts, or position switches. Commands to field devices shall be shown separately.

D. Graphics shall be configured to automatically update values without any action by the operator.

E. All standard graphic features, such as title block, navigation buttons, etc., shall always be located in the same general area on each Graphic. For example, the navigation buttons shall always start at the left frame of the graphic. The Home, Charts and Alarm buttons shall always start in the upper right corner of the graphic.

F. A description of a point shall be included on the Graphic next to the object's value whenever there is any ambiguity about the value's meaning. For example, when status and command points are both shown on a Graphic, they shall both be labeled with separate identifying descriptions. If a description of a point in a point block is not adequate, then a separate note may be added to the Graphic Background near the point block clarifying function or purpose. This shall prevent any confusion about what a value represents.

G. Display all control loop and alarm setpoints on respective system graphic. Provide ability to change control loop setpoints, alarm setpoints and start/stop equipment from system graphic, provided user has appropriate access. If system graphic seems too cluttered, provide separate, text-based, System Overview page.

H. Display time, date, outside temperature and humidity on each display in same location on each graphic. Provide command to direct specific displays without accessing main menu. Provide means of displaying directory of screens. Arrange displays by group and type.

I. Graphic displays shall be designed to be easily understood. When display screen is too cluttered due to size, limit information to important monitoring data. Provide

J. Each graphic shall have a shortcut to the main menu graphic and to previous graphic.

K. Main menu graphic shall be automatically displayed when user logs on to system.

L. Graphics shall include, but not be limited to:

1. Site Plans, including each building, building name, and status of exterior points such as lighting, etc.
2. Overall building plan. Indicate location of mechanical rooms and areas served by each air handling unit.
    a. Provide link from building plan to individual building floors and mechanical rooms.
3. Overall HVAC floor plan of each Area/Floor with indication of individual space temperatures, humidity, occupancy status, equipment status, equipment locations and alarm status for displayed values. Include room names and numbers for all spaces on floor plan graphics.
    a. Provide link from displayed values and equipment to associated equipment graphic.
    b. Provide link to overall building plan.
    c. Label equipment and displayed values according to mechanical floor plans and BAS program.

M. No portion of the provided programming, configurations or graphics will be subject to copyright. Owner will have full access and usage rights and will retain all intellectual property rights developed from this installation.

END OF SECTION