

icons® Advanced Traffic Management System

Description

icons is an Advanced Traffic Management System (ATMS) that provides a centralized integrated platform for traffic signal system control, information management, and graphical data display. The system uses a client/server architecture and distributes processing to achieve a flexible and scalable design. Processing in the system is distributed across multiple processors so that system functions are accomplished most effectively considering cost, communication implications, security/redundancy, and network interface capabilities. National and international standard protocols are utilized so that the system can easily adapt to changes in technology and increased functionality.

User Interface

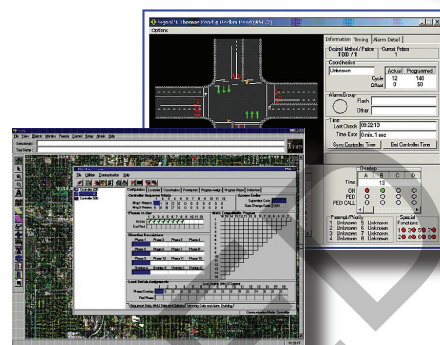
The system workplace in *icons* uses a map-based object-oriented graphical user interface. Each workstation user is presented with an on-screen map of the system area (a suitable aerial photograph or CAD drawing for use as the system map is employed as the background) as the main user interface with the system. Dynamics on the system map provide zoom and scroll features to reveal more or less detail for specific areas. The user can click on any device icon to bring up a separate, more detailed display or report associated with that field device.

In addition to control and surveillance, Graphical User Interface (GUI) screens, dialogs, and formatted data entry screens are provided to store and edit parameter data for various system elements. For example, traffic controller data screens are provided to present and allow easy editing of local controller parameters and to provide a mechanism for facilitating the uploading and downloading of these parameters to and from local controllers in the field. During system operation, user alerts are issued

through the GUI in the form of pop-up message boxes.

Hardware Architecture

The main server computer in *icons* provides for system-wide signal database control, communications, coordination and continuously monitoring system performance from the central location. *icons* is a PC-based system, based on standard Windows platforms.



Features

- Integrated, centralized hybrid control and management of up to 5,000 signalized intersections via an easy-to-use, map-based user interface
 - The GUI provides an easy-to-use, map-based display of system area or intersection-related data
- Windows-based GUI design provides ease of use, increased control, and assimilation of data, plus reduced user training time
- Open client/server architecture design includes NTCIP communications support for local controllers and other field equipment
- Support for both NEMA and 2070 local controllers
- Flexible communications architecture, including Ethernet
- Superior reporting capabilities include custom report generation, using the system's Structured Query Language (SQL) database

System Control

The system is designed for unattended operations 24 hours a day, seven days a week, without requiring an operator to be logged onto the system. *icons* has the capacity for continuously monitoring and exercising plan selection control for all controllers. *icons* also monitors the operation of local controllers and automatically reports detected failures and malfunctions.

icons distributes low-level traffic signal control responsibilities to the local intersection controller. Maintenance of coordination is handled locally and only requires that timing plan parameters be available at the controller and that the controller firmware keeps an accurate time base. Local time base clocks are synchronized with the central system periodically via regularly scheduled time/date update communications functions.

When operating under either the centrally selected Traffic Responsive (TR), Time-of-Day (TOD) or Manual modes, the communications system transfers to the local controller a plan number which specifies the selected plan of operation requested for that controller. Under TOD, Local (Plan 0) mode plan selection is handled locally by each controller's resident TOD/DOW schedule. Monitoring of local controller operations for malfunctions is

performed continuously by the central system for all controllers communicating with the central system (regardless of current plan selection mode).

icons provides the capability to monitor all intersections on a second-by-second basis, limited only by the capacity of the traffic management system network. The communications server functions poll each controller once per second and collect real-time data, which is then provided to the client workstations.

System Performance Monitoring

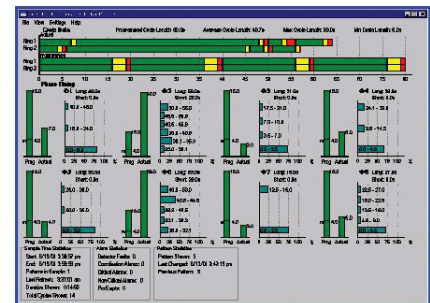
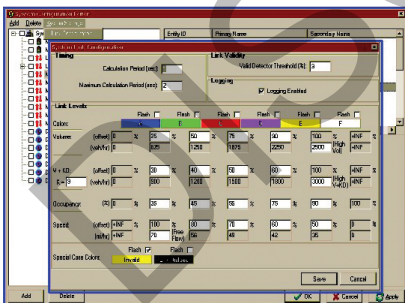
A Split Monitoring tool is provided in *icons* allowing the user to view intersection split data over specified time intervals. Phase data transition information, stored in the system database for the selected controller, is used to calculate the actual split usage. A histogram bar graph is drawn for each phase comparing the programmed phase splits with the average actual phase split times. The histogram allows a traffic engineer to see where phase time is being utilized and where it might be possible to shift some split time to improve operational performance.

The *icons* system provides the ability to display volume, occupancy, and speed detector data on a graphical map

display. Detector data is typically combined to form "links" which are then displayed on the *icons* system main map. The combining of detectors to form links is very flexible, offering the user many different options on how the data is aggregated. Detector weighting factors, data collection time periods, and the percentage of valid detector data used to create link data are all user-configurable. Link colors are defined based on volume, occupancy, speed and V+KO.

Once configured, links can be displayed on the main map of *icons*. These links can be easily toggled to show any of these Measures-of-Effectiveness (MOEs). Link colors change in response to changing MOEs. The user can double click on a link to pop up a window displaying detailed information on the MOEs for that link. This information includes graphs of the various MOEs over user-specified time intervals.

A Time Space Diagram tool is available to analyze progression and coordination along a defined route. It displays progression color bands from multiple intersections in coordinated operation allowing an operator to verify the level of optimization based on various parameters. The tool uses phase data transition information stored in the *icons* database for the selected controllers to generate the display.



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