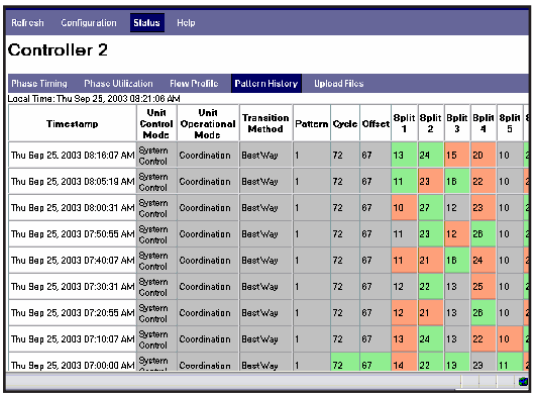
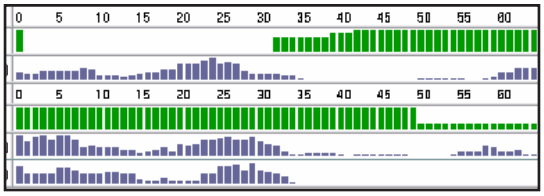
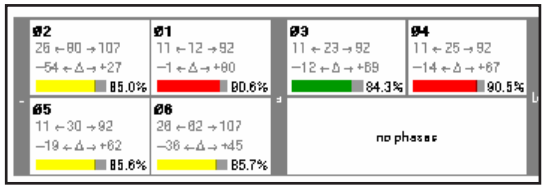
ACS-Lite



Adaptive Pattern History Status Screen



Offset Performance Display Screen



Split Performance Display Screen

ACS-Lite is on-street master adaptive control software designed to adapt the splits and offsets of signal control patterns/plans in a "closed-loop" system, with changes to cycle time handled on a time-of-day schedule like traditional traffic control systems. At each optimization step, which occurs about every 10 minutes, the system changes the splits and offsets a small amount (e.g. 2-5 seconds) to accommodate changes in traffic flows.

ACS-Lite downloads new splits and offsets for the currently-running pattern every 5 to 15 minutes, maintaining the same cycle length as determined by the traffic engineer and implemented by the Time-of-Day scheduler. During each cycle, the local SEPAC controller software manages the duration of each split using gap-out and coordination logic, as designed by the traffic engineer. If communication is interrupted, the local controller still maintains full operation of the intersection.

ACS-Lite performs its optimizations by polling each local controller for custom NTCIP detector and phase status data once per minute, allowing the system to poll many local controllers (up to 12) at 9600bps, with up to 32 controllers supported at higher communication rates. ACS-Lite takes these minute-by-minute polls and matches the occupancy measured on each detector with the red and green intervals of each phase that the detector serves. This allows the software to assess whether or not traffic is arriving to a green light (used for tuning the intersection offset), and whether or not traffic is using all of a phase's split time (used for split adjustment).

After computing these measures of phase/split utilization and determining how effective the offset is at each intersection, optimization algorithms are run to reallocate split time from phases that are not using all of their split to other phases that need more time and to determine whether an earlier or later offset would be more effective for traffic progression. Then, ACS-Lite downloads the new values to each controller in the system. Since the changes to the split and offset values are only very small (2-5 seconds), transition from the current settings to the new settings is typically completed within one cycle. The frequency of optimizations and the maximum amount of split and offset to be added or subtracted from the current values is controlled by the traffic engineer.

Adaptive master control software

SIEMENS

Advanced adaptive optimization for closed-loop systems.

Field tests
Initial field testing of the software with Siemens control equipment in Houston, Texas has shown 5-25% improvement in arterial travel times, significant reduction in stops, and 5%-50% improvements in delays at side streets and left turns. This approach to adaptive control has been designed to provide a significant amount of benefit for a minimum amount of agency investment in additional infrastructure, training, and maintenance by using existing stop bar detection and advanced loops.

Browser-based user interface
ACS-Lite is easy to configure through an HTML browser-based user interface. 75% of the configuration data is uploaded directly from the local controllers, with no additional user data entry. After uploading this configuration data, the user configures links, ring sequences, and detectors through the browser and then the system is ready to use for adaptive control. As the system is running, web pages are updated each cycle to provide status of each intersection performance and track the changes made to the splits and offsets. In addition, the software archives its performance measures and decisions to a data store for future analysis and retrieval.

Browser-based access to operations is available not only locally, but also via the Internet if the master is equipped with an IP-addressable cellular modem.

Technical requirements To upgrade or convert an existing Siemens closed loop system the following is required:

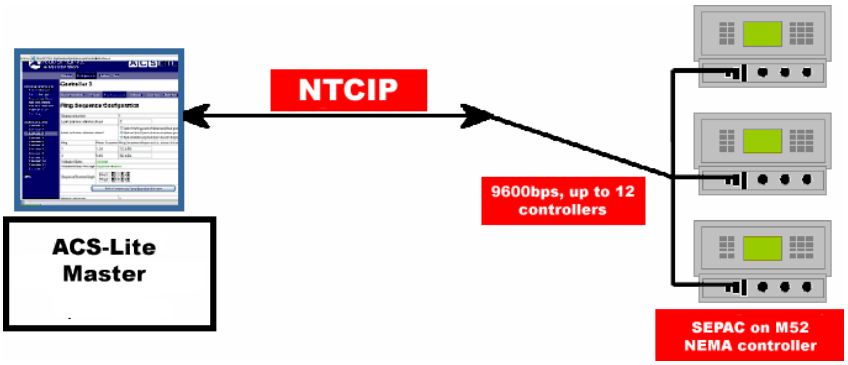
- Replacement of the master controller with a SafeSuite enabled master controller
- 9600bps (or faster) serial modems or IP communications at each local intersection
- Replacement or conversion of existing controllers to SEPAC 4.02 (or later) NTCIP running on 2070, or M50 series hardware
- Conversion of signal control plans from SEPAC vendor-specific format to NTCIP format
- At least one detector for each phase at the stop bar (any detector length is supported and any detection technology) for each intersection needing tuned splits
- At least one advanced detector on each coordinated phase (any detection technology including loops, video, and radar at typical standard placements 150ft+ from stop bar) for each intersection needing tuned offsets

Technical recommendations To upgrade or convert an existing Siemens closed loop system the following is recommended:

- Individual detector lead-in cables and amplifier cards/channels/zones for each lane
- Installation of IP-addressable GPRS/CDMA modem for upload/download of controller databases (with Siemens NextEdit or Siemens ACTRA), and remote management/support from Siemens

Future features In line with the Siemens policy of product improvement, the following features will appear in future releases:

- Real-time cycle-time tuning
- Tuning of pattern switch times (e.g. when PM peak pattern parameters should start)
- Saving of effective time-of-day splits, offsets, and cycle times to track seasonal and day-of-week traffic patterns
- Estimation of link travel times
- C2C link



ACS-Lite System Architecture

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