Product Type: *ACS/Lite*

Overview

ACS Lite is an arterial-based adaptive control software application that has been developed for use with on-street master systems under contract to the FHWA Research, Development, and Technology Traffic Operations program.

ACS Lite was originally designed to adapt the splits and offsets of signal control patterns/plans in a closed-loop system, using arterial masters. Econolite now offers the *ACS Lite* software as an optional module for *Centracs* ™ Advanced Transportation Management System (ATMS) software, without the necessity for field hardened *ACS Lite* masters. *ACS Lite* still operates on an arterial basis, but now does not require on-street masters. *ASC Lite* is now resident on a server at central, and utilizes *Centracs* communications channels to manage and monitor the arterial controllers.

Changes to cycle time are handled on a Time-of-Day (TOD) schedule basis just like traditional traffic control systems. When active, at each optimization step, which occurs about every 10 minutes, the *ACS Lite* system changes the splits and offsets by small increments (e.g. 2-5 seconds) to accommodate changes in traffic flows. Initial field testing of *ACS Lite* has shown significant improvement in arterial travel times, significant reduction in stops, as well as significant reductions in delays at side streets and left turns, compared to traditional arterial coordination. The *ACS Lite* 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 stop bar and advanced detection commonly found at fully actuated intersections.

The *ACS Lite* application downloads new splits and offsets for the currently-running traffic plan (cycle-offset-split pattern) every five to fifteen minutes, while continuing to run the currently active cycle length as determined by the traffic engineer and implemented by the *Centracs* TOD scheduler . During each cycle, the local controller software manages the duration of each split using gap-out and coordination logic, as designed by the traffic engineer. If communications between the *ACS Lite* application and the local controllers is interrupted, the local controller still maintains full coordinated operation of the intersection using the preexisting plans stored in the controller.

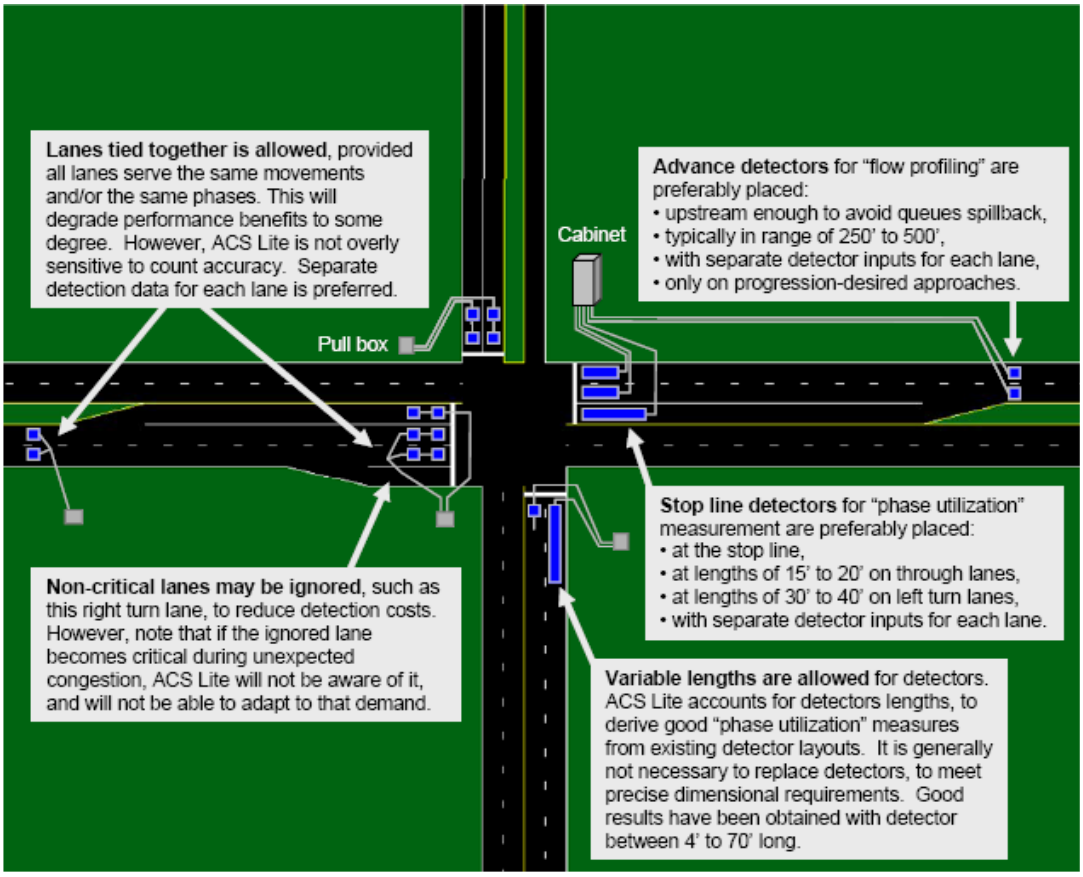
The *ACS Lite* application performs its optimizations by polling each local controller for custom *ACS Lite* NTCIP detector and phase status data once per minute. This allows the system to easily poll up to 32 controllers on one arterial (depending on communications interconnect). *ACS Lite* takes these minute-by-minute polls and matches the volume measured on each detector with the red and green intervals of each phase that the detector serves. This allows *ACS Lite* to assess whether or not traffic is arriving on a green (used for tuning the intersection offset), and whether or not traffic is using all of a phase's split time (used for split adjustment), based upon occupancy.

After computing these measures of phase/split utilization, and determining how effective the offset is at each intersection, *ACS Lite* runs optimization algorithms. This process reallocates split time from phases that are not using their entire splits to other phases that need more time and determines whether an earlier or later offset would be more effective for traffic progression. Then, the *ACS Lite* application downloads the new values to each controller in the system. Since the changes to the split and offset values are small (typically 2-5 seconds), transition from the current setting to the new setting is usually completed within one cycle. The traffic engineer controls the frequency of optimizations and the maximum amounts of split and offset time that is added or subtracted from the current values.

Product Type: *ACS/Lite*

Detector Requirements

ACS Lite is fairly flexible with respect to the size, location and capability of the local detectors used to provide the data needed to adjust offsets and splits. Any detection technology can be used (*Autoscope*®, loop detectors, etc.). The figure below illustrates various detector layout approaches that can be used. These approaches are compatible with most typical detector schemes used with fully-actuated intersections.



ACS Lite Detector Requirements

User Interface

ACS Lite is easy to configure through a graphical user interface (GUI). Much of the configuration data is uploaded directly from the local controllers, with minimal additional user data entry. After uploading this configuration data, the user configures links, ring sequences, and detectors through the GUI. After the configuration is completed the system is ready to use for adaptive control. As the system is running, the *Centracs* database is updated to provide status reports of each intersection performance and track the changes that *ACS Lite* makes to the splits and offsets. In

addition, *Centracs* archives *ACS Lite* performance measures and decisions to a database for future analysis and retrieval. *ACS Lite* also has the ability to record trends and shifts in traffic demand.
Access to *ACS Lite* operation is available not only locally, but also via the Internet (if *Centracs* can be accessed through a VPN connection).

Hardware Architecture

ACS Lite has been designed to coexist on the *Centracs* core server with the other software modules. This also allows the system to be fully controlled by *Centracs*.

Centracs continues to communicate normally with the local controllers using *Centracs* system (NTCIP) protocol. The *ACS Lite* application can then take adaptive control of the local intersections based on its configuration settings and current traffic conditions. Once *ACS Lite* determines that changes need to be made to the local operating offsets or splits, it communicates those changes to the affected local controllers over the *NTCIP* communications channel. Each of the local controllers can be individually enabled or disabled to respond to the changes being requested by the *ACS Lite* application. This allows the user to easily override *ACS Lite* at any time from *Centracs* or to establish when (by local TOD schedule) adaptive control will be allowed. When *ACS Lite* is released from control of the local intersection, *Centracs* automatically restores the original offset and split values so that the controller database remains unaffected.

Communications

ACS Lite has been designed to work with the types of communications systems that are found in typical *Centracs* systems (twisted-pair copper, fiber optic cabling, radio/wireless, etc.).

Local Controller Requirements

All local controllers used in an *ACS Lite* controlled system must be capable of NTCIP communications with support of the *ACS Lite* functionality. Currently only the *ASC/3* controller meets this requirement for use on *Centracs*.