

ACS Lite

Table of Contents

1. Introduction	3
2. Functional Requirements	3
3. User Setup and Interface	4
4. Communications.....	4

1. Introduction

- 1.1 The ATMS software shall provide an optional arterial based adaptive control module that modifies coordination parameters for designated intersections in response to current traffic conditions as determined by intersection detectors. This adaptive control module (hereafter referred to as *ACS Lite*) shall be based on the adaptive control system algorithms and software developed under the *ACS Lite* research sponsored by the FHWA Research, Development and Traffic Operations program. The ATMS supplier shall be able to show that they have been licensed to use the *ACS Lite* software that is provided with the system.
- 1.2 The optional *ACS Lite* module shall be able to simultaneously support multiple arteries or zones of intersections running under the control of the *ACS Lite* algorithms. The *ACS Lite* software shall run on the system's core server(s). Use of multiple field computers or masters to implement *ACS Lite* control shall not be acceptable. The user interface to the *ACS Lite* module shall be incorporated into the system's workstation client software and shall not require the use of a separate software package or web browser.

2. Functional Requirements

- 2.1 The *ACS Lite* module, when enabled for a zone, shall be able to adjust splits and offsets in real time at each of the intersections assigned to the *ACS Lite* zone. A maximum of 32 intersections shall be assignable to an *ACS Lite* Zone. The initial split and offset values for each intersection in the zone shall be determined by the current coordination plan in effect, as determined by the ATMS, at the time that *ACS Lite* becomes active for the zone. The cycle length shall remain constant at the value programmed for the coordination plan in effect; only the split and offset values shall be modified by *ACS Lite*. It shall be possible to change to a new cycle length by selecting a new coordination plan through the ATMS time-of-day schedule, traffic responsive or manual plan selection. When a new coordination plan is selected by the ATMS the *ACS Lite* module shall immediately implement the new cycle, offset and split values defined by the new coordination plan at each intersection and then begin optimizing the offset and splits using the *ACS Lite* algorithms as developed in the *ACS Lite* research noted above.
- 2.2 *ACS Lite* shall adjust split values for an intersection based on phase utilization data gathered from lane-by-lane stop bar detector data. Phase utilization data shall be averaged over a number of cycles to determine the degree of saturation of each phase in use at the intersection. The *ACS Lite* split algorithm shall then attempt to balance the degree of saturation on all phases by adjusting splits; moving time from phases with a lower degree of saturation to those phases having a higher degree of saturation within the constraints of the controller configuration. The user shall be able to set both the maximum split increment allowed for each incremental change of the split and maximum overall change or deviation that will be allowed.
- 2.3 Offset values shall be adjusted by developing a cycle based flow profile using data from lane-by-lane advanced detectors on the coordinated phase(s) and correlating vehicle arrival to the coordinated phase interval (Green, Yellow, Red). The *ACS Lite* offset algorithm shall determine the optimal offset to capture the greatest number of vehicles arriving on the green interval of the coordinated phase(s). The offset algorithm shall be able to determine optimum offset values using vehicle arrival data from advanced detectors located within 250-500 feet of the stop bar of the coordinated phase(s). The user shall be able to set both the maximum offset increment allowed for each incremental change of the offset and maximum overall change or deviation that will be allowed.
- 2.4 *ACS Lite* adjustments to the splits and offset of the current coordination plan in effect shall occur in user adjustable steps and be downloaded to each intersection in the *ACS Lite* Zone at intervals of 5, 7.5 or 10

minutes as determined by the *ACS Lite* algorithm and user inputs. When *ACS Lite* is disabled or releases control of the intersections the preprogrammed coordination plan values for the intersections in the affected zone(s) shall be restored.

- 2.5 Detectors used for computing offset and split changes shall be monitored for failure. The *ACS Lite* module shall monitor these detectors by requesting detector diagnostic data from the local controllers during normal polling periods. If a detector is reported as failed (max presence, erratic counts or no activity) *ACS Lite* shall stop making adjustments to the coordination values for the affected intersection until the detector fault condition is cleared.
- 2.6 It shall be possible for each controller to be individually enabled or disabled to respond to the offset and split changes being requested by *ACS Lite*. In addition, at the system level it shall be possible to enable or disable *ACS Lite* control on a time-of-day basis.

3. User Setup and Interface

- 3.1 *ACS Lite* shall be easily configured through a user interface that is compatible in style and layout to that of the ATMS. The user interface shall be part of the ATMS client software. The use of separate third party programs or web browsers to interface to the *ACS Lite* module shall not be acceptable.
- 3.2 Configuration data required by *ACS Lite* shall be uploaded directly from the local controllers. Any supplemental configuration data entries requiring user input shall be kept to a minimum. After uploading configuration data, the user shall be able to configure links, detector assignments/configuration easily through the supplied user interface.
- 3.3 The *ACS Lite* module shall include status screens that allow easy selection of the following status information for any intersection under *ACS Lite* control:
 - 3.3.1 Phase Timing
 - 3.3.2 Phase Utilization
 - 3.3.3 Flow Profile
 - 3.3.4 Pattern History
 - 3.3.5 Detector Data

4. Communications

- 4.1 The system shall be able to support *ACS Lite* zones using both serial and Ethernet communications. A minimum data rate of 9600bps shall be supported for serial communication channels. All *ACS Lite* related communications to the intersections shall be processed through the ATMS system's standard communications server(s). Use of dedicated *ACS Lite* application or communications servers or separate *ACS Lite* communication applications shall not be acceptable.
- 4.2 All communications shall utilize NTCIP. *ACS Lite* required data shall be gathered using a combination of standard, *ACS Lite* specific and manufacturer specific (as needed) NTCIP objects. Polling for *ACS Lite* detector and phase status data shall occur at a minimum of once per minute.
- 4.3 If communications is lost during *ACS Lite* control, the local controller shall continue to maintain coordination but shall revert to the pre-existing coordination plan data stored in the controller's database.