Why manually update your coordination timings every three years when SCOOT® updates every four seconds?

As the volume of traffic on highways and roadways continues to grow at a greater rate than our roads can accommodate the effect of traffic congestion will become an ever increasing burden on city infrastructure. Cities need more effective tools to improve traffic flow and minimize disruptions caused by incidents and special events. We need a solution that is cost-effective, reliable and flexible. One solution is an adaptive system using real-time signal control to optimize signal timings and minimize delays.

Customized control
Using a network of detectors SCOOT® continuously monitors approaching traffic and provides a customized response to each individual intersection. SCOOT® provides individual algorithms for cycle, offset and split allowing for a more calibrated adjustment of timing plans. SCOOT® automatically recognizes opportunities for double cycling minor intersections when traffic is light enough, a feature unique to SCOOT®. Using upstream detection and customized response to each intersection demand, SCOOT® is able to handle a more complicated network of traffic configuration with increased benefits in traffic management.

Adaptive signal times have been proven to reduce congestion in complicated networks, reduce stops and delays 20%, travel time 31%, carbon monoxide emissions 4% and fuel usage by 6%.

Performance you can see
Features and benefits of Siemens SCOOT® and ACS Lite Adaptive Signal Coordination software

SCOOT® times are continuously updated eliminating the need for a signal timing plan. SCOOT® can even be programmed with limits to ensure that no approach gets excessive time allocation even under unusual circumstances.

• 20% reduction in stops and delays
• Up to 31% reduction in travel time
• 4% reduction of carbon monoxide emissions
• 6% reduced fuel emissions
When managing traffic situations such as conventions, sporting events or unexpected traffic delays due to accidents or construction, SCOOT® provides a significant increase in benefits through a reduction in delay, stops, queue length and travel time. Benefits of the system increase with the complexity of the network application making this type of adaptive control the ideal choice in for both single arterial streets and complex grid networks.

Use with Transit Priority
In applications where Transit Priority is in use SCOOT® has proved even more beneficial. SCOOT® reduces transit delay with minimal impact on surrounding traffic. In a simulation based study in Salt Lake City a nine-intersection corridor was analyzed both with and without the use of Transit Priority. With Transit Priority in use delay was reduced 27% versus only 5% when Transit Priority was not in use.

Benefits of SCOOT®
There are many advantages to implementing an adaptive control system, not only for traffic in the town or city, but also for the local economy and environment.

SCOOT® allows systems integration and commonality of hardware across the range of traffic management and control systems. This in turn reduces maintenance requirements and provides more opportunities for implementing a range of ITS solutions:

- World-leading adaptive control;
- Increased standardization within traffic control centers;
- Customized congestion management tool kit;
- Reduced equipment and maintenance costs;
- Real IP communications;
- Maximized network efficiency;
- Improved access to management data;
- Reductions in delay of over 20%;
- Ease of use for new users;
- Simple installation and migration.

Communications
A new communications interface has been implemented within SCOOT®. This enhancement will allow current and future users to make much better use of all modern communications systems, even those that were previously unavailable to SCOOT® systems.

A major benefit of the new communications interface is that it can absorb inconsistencies and delays in data delivery with less impact on the system. This reduces dependency on traditional leased line communications techniques, making for a much more optimized, cost-effective infrastructure.

Handling pedestrian traffic
SCOOT provides improved control of intelligent pedestrian facilities.

Using the traffic signal controller and special detectors, pedestrian crossings are monitored and the data is fed into the SCOOT model. Having this information allows SCOOT to optimize both the vehicle and pedestrian signals. When no pedestrians are present, vehicle signals will stay green longer. Likewise, an increase in pedestrian traffic will trigger longer green cycles in the pedestrian signals. The result is much less wasted time for walkers and drivers alike.

Part of a larger solution
ITS is the keystone of urban traffic management and Siemens offers a variety of solutions ranging from a single system to a comprehensive integrated package including on-street equipment and complementary adaptive, central and regional systems networked together.

SCOOT® operates as part of a larger solution, working in tandem with other Siemens advanced transportation management systems (ATMS). The ATMS provides traffic management and control, and prepares the controller’s timing plans for interaction and adjustment by SCOOT®.

Benefits for public transport
Public transport priority is increasingly seen as crucial in maintaining the effectiveness of buses and light rail systems as viable alternatives to the private car.

Siemens provides effective priority through SCOOT®, allowing public transport vehicles to adhere to their schedule while minimizing the disruption to other vehicles. Recent developments in SCOOT® have enhanced the provision of public transport priority, reducing delay to buses while also minimizing the effects on normal traffic.
Traffic Management that adapts to current traffic situations in real time

As the volume of traffic on highways and roadways continues to grow at a greater rate than the capacity of the road network, the effect of traffic congestion is an ever increasing problem in towns and cities throughout North America. Adaptive Systems provide continual updates to signal timings and respond to congestion levels in real time.

Field tests
Following the introduction of SCOOT®-based systems, ‘before-and-after’ studies have shown substantial reductions in both journey times and delays. Vehicles are detected on all approaches to each junction under SCOOT® control, measuring occupancy every quarter second. This creates a profile for each link, which the SCOOT® model uses to predict queue behavior at each stop line. This in turn is used in the optimization calculation. The model also predicts delays and the build-up of congestion as part of the efficiency index.

SCOOT® models traffic detected on-street to adapt three key traffic control parameters continuously: the duration of green for each approach (Split), the time between adjacent signals (Offset), and the time allowed for all approaches to a signalled intersection (Cycle time). As a result the signal timings evolve with the changing traffic situation.

Congestion supervisor
SCOOT® introduces a number of key new features which provide invaluable assistance to the traffic manager in maximizing the efficiency of traffic flow. A new Congestion Supervisor feature provides early warning of congestion, as well as providing recommendations for action to reduce congestion as a result of repeatable, predictable conditions which occur within the network.

The Congestion Supervisor feature continuously monitors the SCOOT® network, evaluating overall performance levels and identifying congestion and wasted capacity. When congestion levels exceed a defined threshold, the system automatically investigates the likely cause. It looks for the critical link and follows the congested route through the network, analyzing reasons for the degradation in performance and suggesting changes to system configuration to improve efficiency.

The Congestion Supervisor feature uses information already available within the SCOOT® system and does not require any additional equipment or detection. Having diagnosed a congestion problem, the recommended action will then be reported to the user either directly from SCOOT® or through an integrated ATMS. Overall, the SCOOT® Congestion Supervisor feature aims to target regularly recurring congestion rather than congestion caused as a result of incidents.
ACS Lite Adaptive

ACS Lite is a simple, cost-effective solution for arterial adaptive control management.

Commuting to work is taking less work. In Fulton County, Georgia, through a five-intersection corridor, drivers experienced up to 32% reduced travel time while driving to and from work and 14% reduced travel time coming home. Adaptive systems can offer dramatic improvement in reduced travel times and queue length, even when traffic volume stays the same.

ACS Lite is an adaptive control software application that was developed by Siemens under contract to the Federal Highway Administration (FHWA) Research, Development and Technology Operations Program to upgrade or replace legacy closed-loop systems with adaptive control capability. The purpose of the project was the provide a more accessible way to implement adaptive control.

Siemens identified four criteria for the project:
• Make it easy
• Utilize existing infrastructure
• Make it cost-effective
• Maximize efficiency

Ideal for arterial applications

The ACS Lite software is designed to adapt the splits and offsets of signal control patterns/plans along an arterial application. ACS Lite optimizes splits and offsets resulting in reduced delay, stops and fuel consumption. ACS Lite also has the flexibility to be deployed as an on-street master or as a centralized system.

Initial field testing of ACS Lite with Siemens control equipment in Houston, Texas, produced remarkable results. In the eight-intersection corridor along Highway 6 results showed:
• 35% less delay;
• 29% fewer stops;
• 7% less fuel consumption;
• First year benefits of $577K;
• Benefit-cost ration of 8:1 in the first year.

Travel time was also calculated along the corridor. Comparing times before and after implementation a reduction of times was indicated across the board in each study.

Since then, additional sites including Tyler, Texas, and Pickerington, Ohio, have since deployed the system and realized remarkable benefits.

ACS Lite performs its optimizations by polling each local controller for custom NTCIP detector and phase status data once per minute. 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 the detector serves. This allows the software to assess whether traffic is arriving to a green light (used for tuning the intersection offset), and whether traffic is using all of a phase’s split time (used for split adjustment).

“ACS Lite achieves significant reductions in vehicle delay, stops and fuel consumption. In addition, Bradenton, Florida saw $787,000 in benefits after one year of operation.”
Currently, each ACS Lite installation can manage up to 16 intersections in a loop. 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. ACS Lite then downloads the new values to each controller in the system.

Since the changes to the split and offset values are small (2-5 seconds), transition from the current settings to the new settings is typically completed within one cycle.

**Browser-based user interface**

ACS Lite is easy to configure through an HTML browser-based user interface. With no additional data entry 75% of the configuration data is uploaded directly from the local controllers. After uploading this configuration data, the user configures links, ring sequences and detectors through the browser, then the system is ready to use for adaptive control.

Web pages are updated each cycle providing information regarding intersection performance. 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.

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### Toronto Project

Toronto’s Metro Adaptive Traffic Control System was the first SCOOT® implementation in a major metropolitan area in North America. Results were impressive. Over 75 intersections in the system showed a reduction of 260,000 gallons of gasoline, 11.2 tons of hydrocarbons (HC) and 72.1 tons of carbon monoxide (CO).

The study showed proof positive that the SCOOT® Adaptive Control system offers a distinct advantage at managing traffic in complicated grid networks.

<table>
<thead>
<tr>
<th>City</th>
<th>Year</th>
<th>Field trial/ Simulation (Agency)</th>
<th>Compared to</th>
<th>Delay</th>
<th>Stops</th>
<th>Travel Time</th>
<th>Emission (Fuel, Hydrocarb., Carbon Mon.)</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>London, UK</td>
<td>1985</td>
<td>Field Trial (Greater London Council)</td>
<td>Fixed-time (TRANSYT)</td>
<td>8%</td>
<td>19%</td>
<td>5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worchester, UK</td>
<td>1986</td>
<td>Field Trial (Transport Planning Assoc.)</td>
<td>Fixed-time (TRANSYT)</td>
<td>7-20%</td>
<td>3-11%</td>
<td>0-6% Fuel</td>
<td></td>
<td>83,000 veh-hour/year GBP 360,000</td>
</tr>
<tr>
<td>Beijing, China</td>
<td>1989</td>
<td>Field Trial (Beijing Res. Inst. of Traffic Engineering)</td>
<td></td>
<td>2-16%</td>
<td>19-32%</td>
<td>31%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Santiago, Chile</td>
<td>1993</td>
<td>Field Trial (Univ. Católica de Chile)</td>
<td></td>
<td>0.98-125.4-210.4 FYRR ($ benefits / $ investment)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toronto, ON</td>
<td>1993</td>
<td>Field Trial (Toronto Metro Transport)</td>
<td></td>
<td>22%</td>
<td>17%</td>
<td>8%</td>
<td>6% Fuel 4% HC 5% CO</td>
<td></td>
</tr>
<tr>
<td>Salt Lake City, UT</td>
<td>2003</td>
<td>CORSIM - Simulation (Univ. of Utah)</td>
<td>Fixed-time (actuated/ coord., fully act.)</td>
<td>11-14%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Simulation Based Studies in Salt Lake City (Univ. of Utah, 2003)

#### Incidents

<table>
<thead>
<tr>
<th>Network Type</th>
<th>Simulator</th>
<th>Compared to</th>
<th>Incident Duration</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Delay</td>
<td>Stops</td>
</tr>
<tr>
<td>28-int. (SLC CBD) and 15-int. (Fort Union)</td>
<td>CORSIM</td>
<td>SYNCHRO fixed-time</td>
<td>15 min.</td>
<td>28%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>30 min.</td>
<td>28%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>45 min.</td>
<td>28%</td>
</tr>
</tbody>
</table>

#### Transit Priority

<table>
<thead>
<tr>
<th>Network Type</th>
<th>Simulator</th>
<th>Compared to</th>
<th>Incident Duration</th>
<th>Benefits (delay reduction)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>With Bus Priority</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Non-Bus Delay Reduction</td>
</tr>
<tr>
<td>9-int. (SLC corridor)</td>
<td>VISSIM</td>
<td>SYNCHRO fixed-time (actuated-coordinated)</td>
<td>43 min.</td>
<td>16%</td>
</tr>
</tbody>
</table>
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