JACOBS

ACS Lite and SCOOT

A Brief Comparison of Adaptive Control Technologies

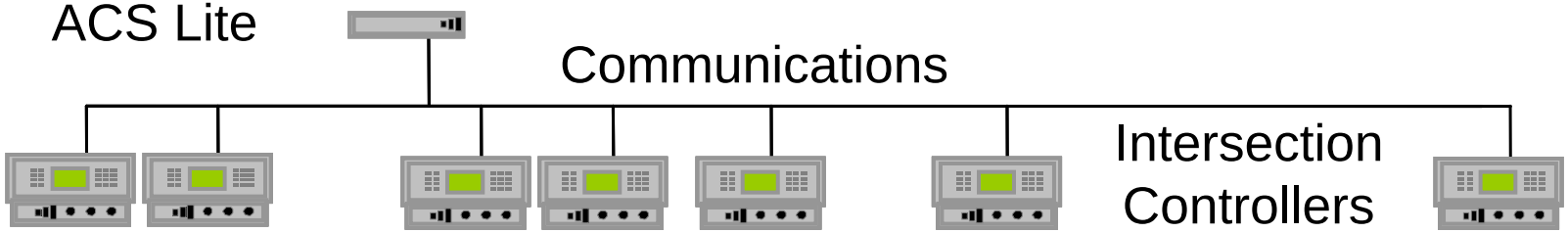
BRTB Traffic Signal Forum
May 25, 2011

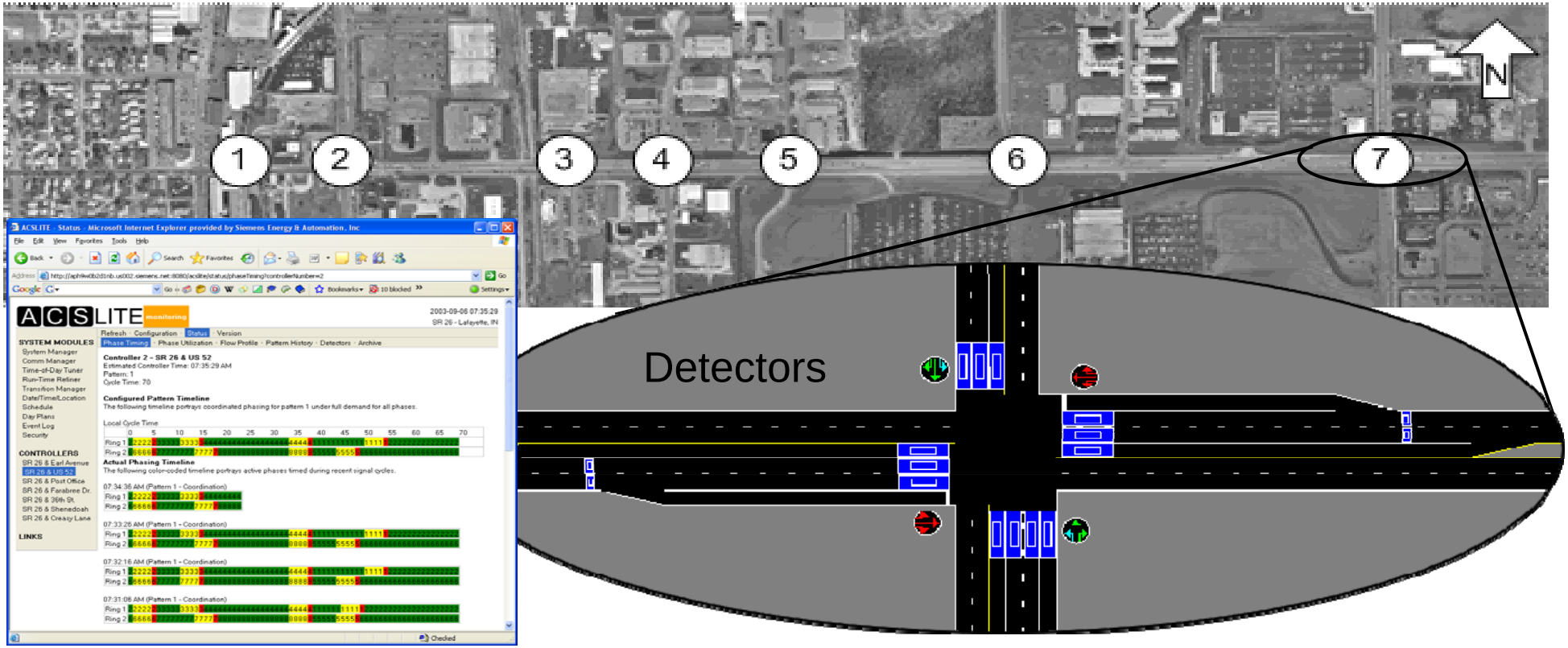
Goals of ACS Lite

FHWA research project to develop a way for agencies to implement adaptive control

- Low Cost Design - Make it easy
- Leverage existing infrastructure
- Standard US-style actuated controllers and logic (rings, phases, splits, barriers, gap-out/extension, etc.)
- Typical agency detector layouts
- Typical communications
- Use NTCIP
- Promote efficiency

The ACS Lite System





JACOBS

How Does it Adapt

- Designed for basic dual ring 8-phase operation
- Split / Offset adjustments - signals share same cycle time
- Controller still use normal coordinated timing plans
- No second-by-second control
- Actuated logic not overridden
- Adjust timing plan parameters every 5 to 10 minutes

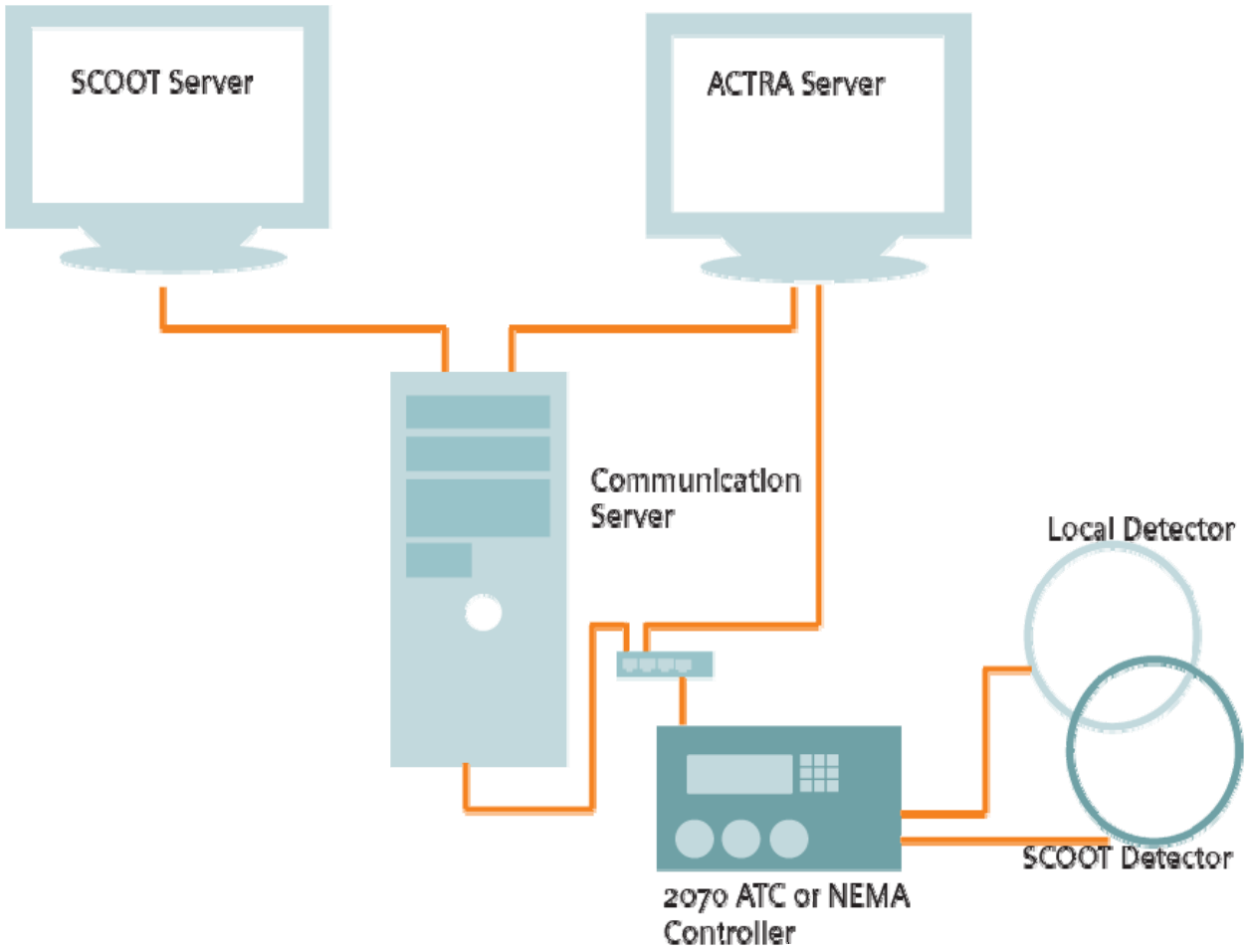
ACS Lite Operational Conditions

- No Cycle length adjustment – avoid totally erratic flows
- No phase sequence changes or overlaps
- No diamond interchange or 2 closely spaced intersections controlled by a single controller
- Overly saturated conditions – avoid
- Avoid heavy pedestrian, preempt, or transit movement
- TOD Schedule Operation – moderately predictable flows
- ACS Lite does not operate under free or flash

SCOOT (Split Cycle Offset Optimization Technique)

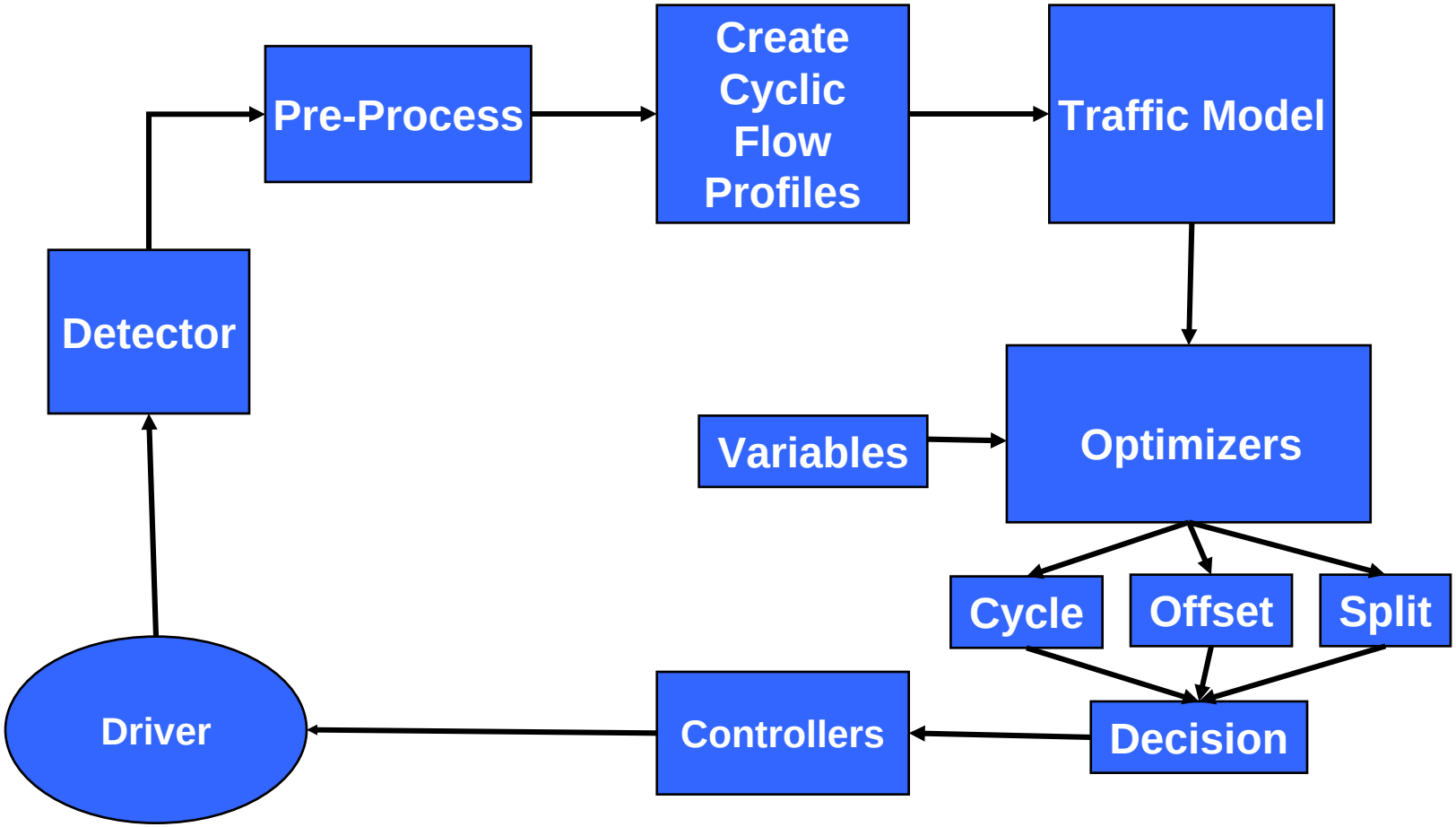
- Developed by TRL and distributed by Siemens
- 200+ worldwide deployments, 30 yrs continuous development
- Adjusts cycle, offset, and split as needed
- Continuous small adjustments avoids disruption
- Quick to respond to sudden changes in traffic
- Effective for arterials and grids, unsaturated and saturated
- Many advanced features:
  - Automatically join or separate groups
  - Performance data collection and presentation
  - Automatic recognition and alerting of disruptive traffic events
  - Option to gate (meter) traffic into a congested area
  - Option for bus priority

SCOOT System Architecture

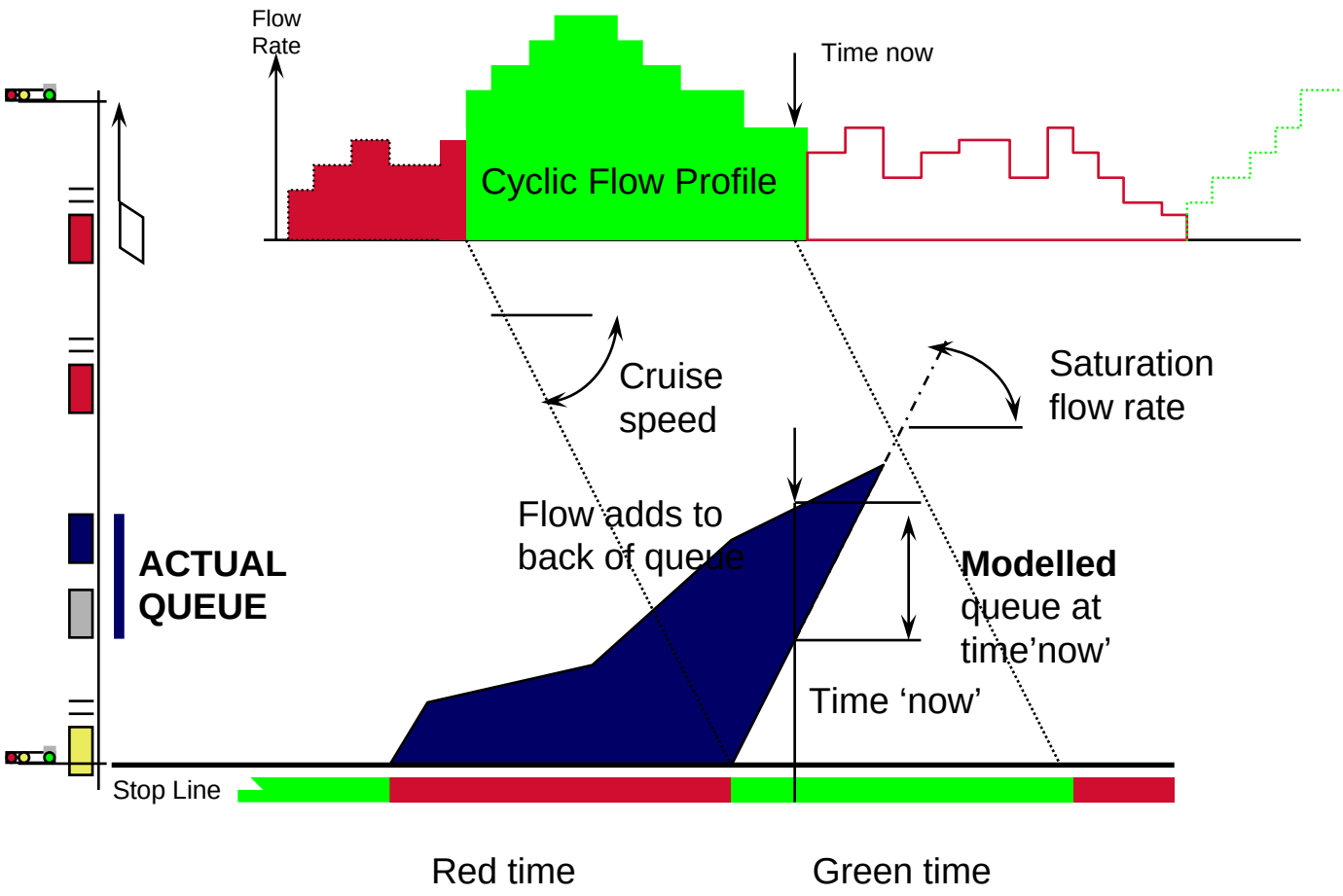


JACOBS

SCOOT Principles



SCOOT Model



JACOBS

SCOOT Timing Changes (Typical)

Optimiser	Frequency	Change values (seconds)
Split	Every phase change	+4, 0, -4 (temporary) +1, 0, -1 (permanent) (typical)
Offset	Once per cycle	+4, 0, -4 (typical)
Cycle time	Every 2.5 minutes	+4, 0, -4 (32-64) +8, 0, -8 (64-128) +16, 0, -16 (128-240)

Which Timing Adjustment Method to Use?

Environment	TOD Pattern Selection	TR Pattern Selection	ACS Lite	SCOOT
Traffic changes at predictable times?	Yes	No	No	No
Rate of traffic flow change	Any	Slow	Moderate	Very Fast
Traffic flow beyond design levels?	No	No	Yes	Extreme
Road network	Any	Arterial	Arterial	Any
Count detectors available	Any	Some	More	Many
Architecture	Any	Closed-loop Central	Closed-loop Central	Central

SCOOT / ACS Lite Detailed Comparison

Consideration	ACS Lite	SCOOT
Cost	$	$$$
Optimizes	Split, Offset in steps	Split, Cycle, Offset
Detection	Can use existing stop bar and advance detectors on arterial – per-lane is best	Upstream per-lane detectors all approaches
Responsiveness	Slow – every few cycles	Very fast - each phase change
Application	Arterials	Grids, arterials, all combinations

SCOOT / ACS Lite Detailed Comparison (Cont'd)

Consideration	ACS Lite	SCOOT
Communications	Once per minute	About once per second
NTCIP	Uses NTCIP	Not currently - future
Signal Groups	Fixed group up to 16 signals	Flexible groups, and any number of signals
Controllers	Siemens, Econolite Peek , McCain	Any Siemens
Central Software Replication	One instance per group	One instance for all
Feature Set	Limited but growing	Very rich - bus priority, gating, incident detection