

CITY OF BELMONT

C/CAG TAC Meeting – Dec. 2022

Ralston Avenue

**Adaptive Traffic Control
System (ATCS)**

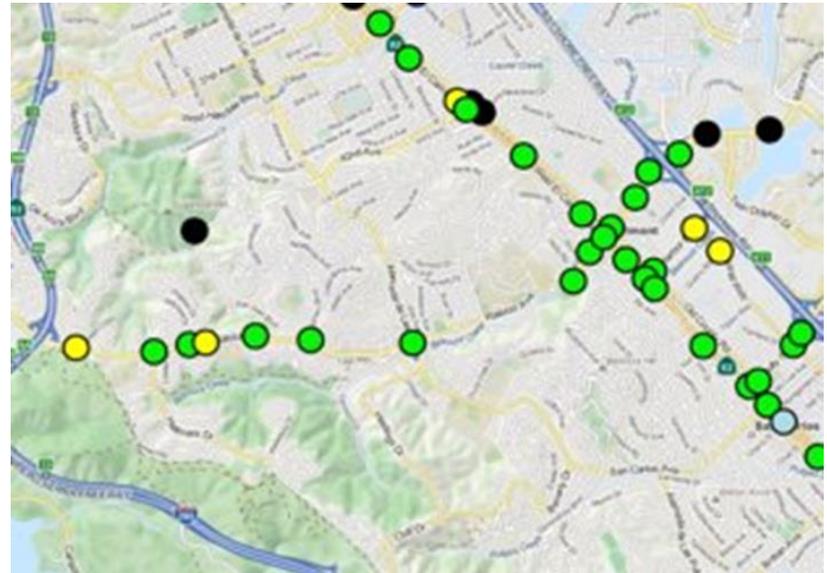


RALSTON CORRIDOR

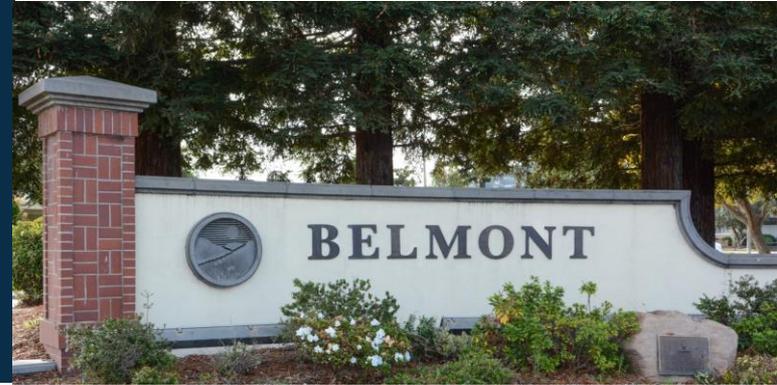
12 signals along Ralston Ave between Christian Drive and Hiller Avenue



- Deploy an adaptive system along corridor
 - 9 City signals, 3 Caltrans signals
- Funded with TFCA C/CAG Funds
- Major East-West arterial between US-101, SR 82 (El Camino Real), & SR 92/I-280 – major thoroughfare through Belmont and SM County
- Ralston Middle School, Notre Dame High School, Notre Dame de Namur University, and Merry Moppet Pre-School located along corridor
- High variability of traffic volumes due to above conditions



PROJECT GOALS



- Adjust signal timing to real time traffic conditions – timing more appropriate for actual conditions:
 - Reduce congestion, improve access to schools/jobs, decrease intersection dwell time
 - Reduces intersection delays, reduces pollution and GHG's by decreasing vehicle engines running time
 - Improves health by providing improvements to bicycling and pedestrian modes of transportation which encourages physical activity

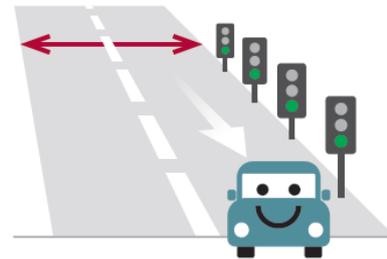
Kimley Horn

WHY KADENCE?

- Integrated into the City and San Mateo County KITS ATMS Smart Corridor
- Fully integrated with City's current D4 controller firmware
- Fully integrated with Caltrans TSCP firmware
- Caltrans is also deploying Kadence along El Camino Real – provide cross coordination
- Full support with existing detection
- Cost effective
- Achieves the project goals and objectives

Kadence Meets a Variety of Objectives

1 MAXIMIZE Throughput on a Coordinated Route



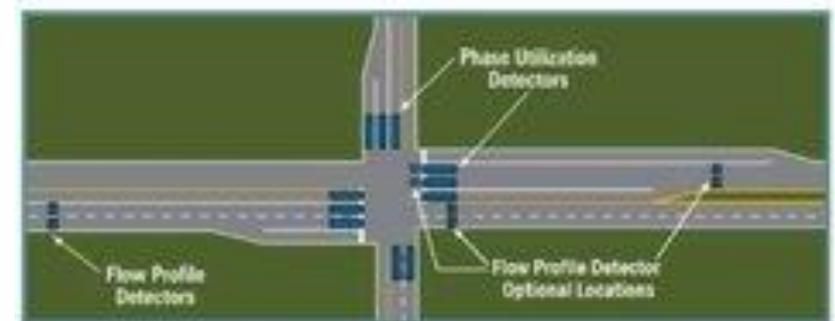
2 DISTRIBUTE Phase Times in an Equitable Fashion



3 MANAGE Length of Queues



4 OPTIMIZE Operation With Minimum of Phase Failures



Any type of detector is supported

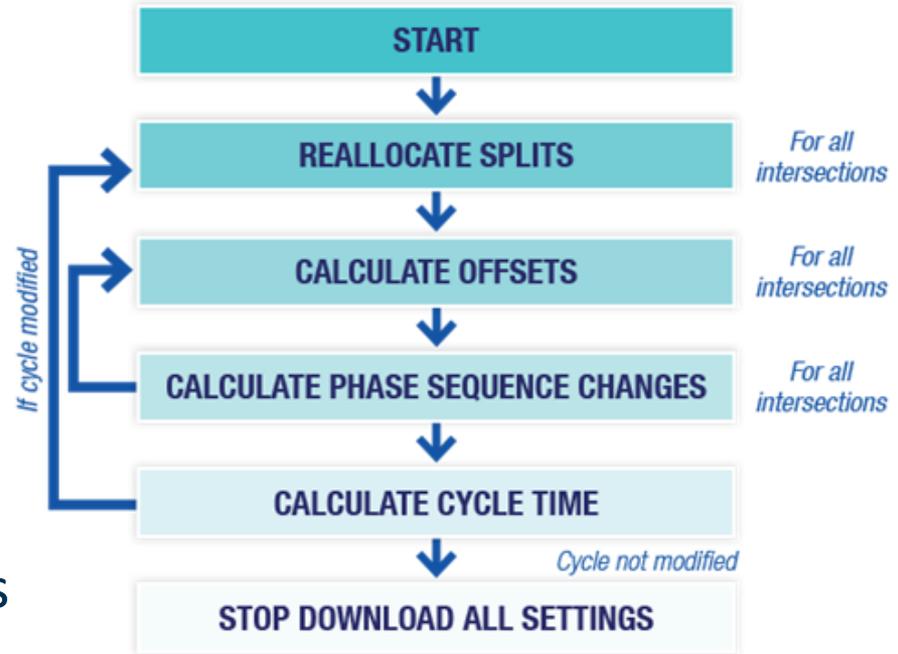
- Ralston and ECR is the bottleneck with the highest volumes
- School drop off and pick up = peak demand



Belmont already possessed KITS software system in our cabinets, thus deploying Kadence, Kimley-Horn's ATCS is cost effective and seamless

HOW KADENCE WORKS

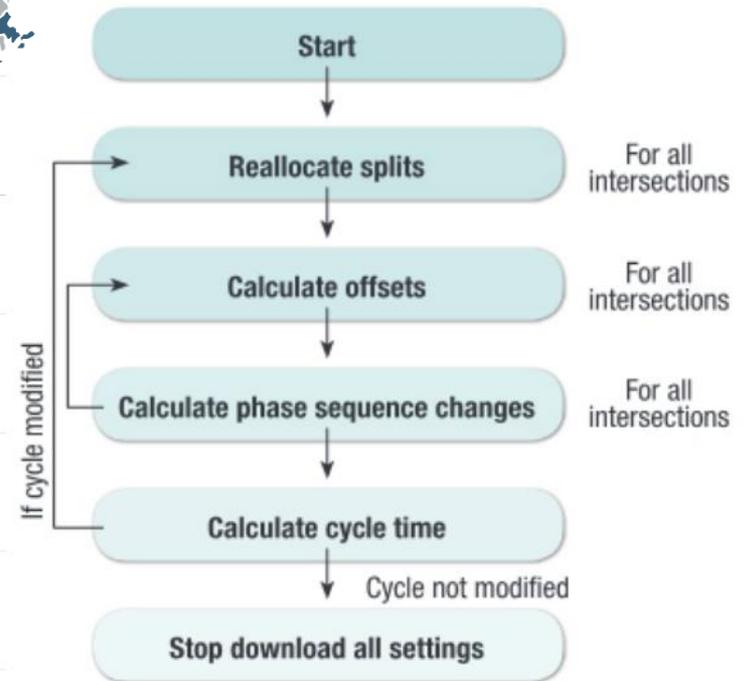
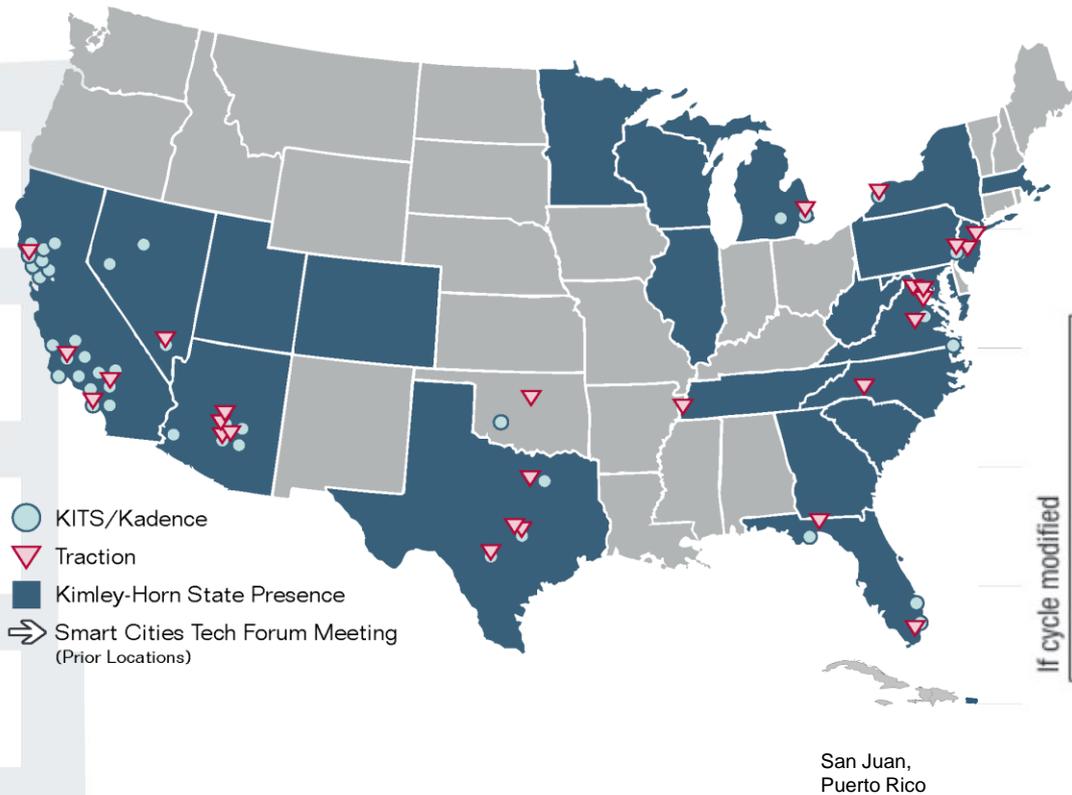
- Kadence modifies and adjusts pre-determined timing plans* based upon current traffic conditions
- Collects sec-by-sec data and makes as needed timing adjustments approx. every 5-6 minutes
- Adjusts phase times, progression settings, and cycle lengths to optimize timing in real-time using the last 3-4 signal cycle data/queues



***Timing plan** – a coordination plan for a specific time of the day and traffic condition (AM, school, PM, etc.)

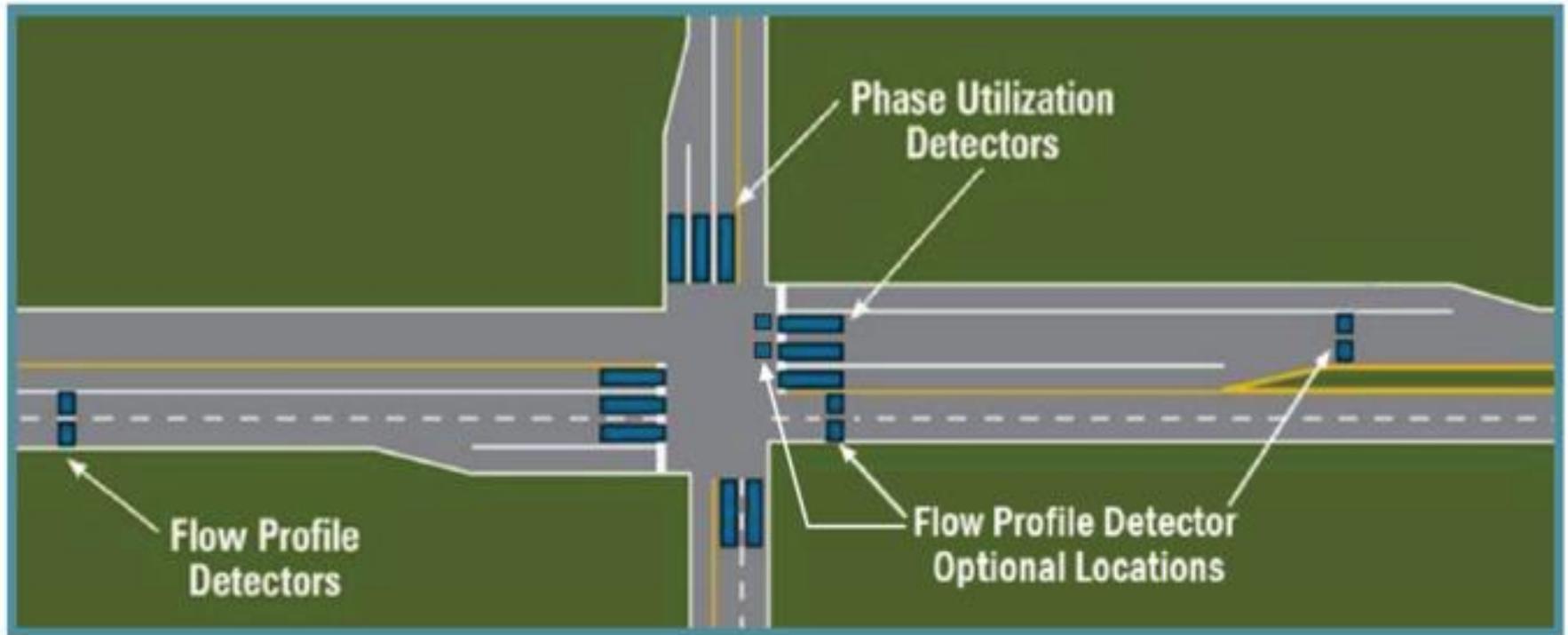
State of the practice technology

How Kadence Works



Kadence algorithm computation process

Detection



Any type of detector is supported

SYSTEM DISPLAYS - MONITORING

Timing Values - 292: King Rd&Tully Rd

Status	Operation	Plan	Cycle Offset	
Online	Central	31	Database	150 52
Master	Local	Time	Previous	150 52
7	105	14:15:07	Current	106

Ring 1	2-WBT	1-EBL	3-SBL	4-NBT
Database	53	27	26	44
Previous	53	27	20	48
Current	36	0	26	44
Veh. Phases				
Ped. Phases				
Veh. Calls				
Ped. Calls				

Ring 2	5-WBL	6-EBT	8-SBT	7-NBL
Database	23	57	51	19
Previous	23	57	42	26
Current	23	13	31	39
Veh. Phases				
Ped. Phases				
Veh. Calls				
Ped. Calls				

SYSTEM DISPLAYS - MONITORING

Phase Util - 293: Quimby Rd&Tully Rd

Phase Util Chart Phase Util Graph

Drag a column header and drop it here to group by that column

Time	Pattern	Cycle	Offset	Split1	PU1	Split2	PU2	Split3	PU3	Split4	PU4	Split5	PU5	Split6	PU6
7/9/2018 2:21:40 PM	31	150	112	40	38	51	51	25	48	34	81	46	100	51	66
7/9/2018 2:19:10 PM	31	150	112	46	30	55	55	12	20	37	81	46	67	61	45
7/9/2018 2:16:40 PM	31	150	112	29	39	51	64	34	37	36	75	46	32	40	67
7/9/2018 2:14:10 PM	31	150	112	45	32	56	50	19	41	30	56	46	94	61	52
7/9/2018 2:11:50 PM	0	140	112	44	35	48	57	14	24	34	75	43	91	55	75
7/9/2018 2:09:20 PM	32	150	112	30	66	51	84	34	44	35	87	40	20	41	88
7/9/2018 2:06:50 PM	32	150	122	46	27	51	60	18	41	35	87	46	47	57	47
7/9/2018 2:04:20 PM	32	150	122	46	45	56	56	14	20	34	34	46	52	62	60
7/9/2018 2:01:50 PM	32	150	122	45	70	63	38	15	27	27	53	46	38	68	54
7/9/2018 1:59:20 PM	32	150	122	45	38	60	53	15	27	30	68	40	55	71	35
7/9/2018 1:56:40 PM	0	160	122	32	74	55	55	34	41	39	94	6	0	87	41
7/9/2018 1:54:10 PM	31	150	122	45	35	56	52	18	31	31	65	35	17	66	48
7/9/2018 1:51:40 PM	31	150	112	44	21	54	58	21	51	31	62	41	100	63	24
7/9/2018 1:49:10 PM	31	150	112	38	65	54	41	24	58	34	65	41	100	57	52
7/9/2018 1:46:40 PM	31	150	112	46	70	54	37	15	27	35	75	41	100	65	50
7/9/2018 1:44:12 PM	31	148	112	45	32	59	45	17	34	27	53	41	48	69	30
7/9/2018 1:41:52 PM	0	140	112	30	54	50	68	29	68	31	75	38	37	48	45
7/9/2018 1:39:22 PM	32	150	112	45	27	54	59	19	41	32	62	30	44	69	45
7/9/2018 1:36:52 PM	32	150	122	37	18	49	79	34	37	30	71	36	68	56	41
7/9/2018 1:34:22 PM	32	150	122	33	60	49	47	34	48	34	62	36	88	52	42

PU Color Coding: < 10 < 20 < 30 < 40 < 50 < 60 < 70 < 80 < 85 < 90 < 95 >= 95

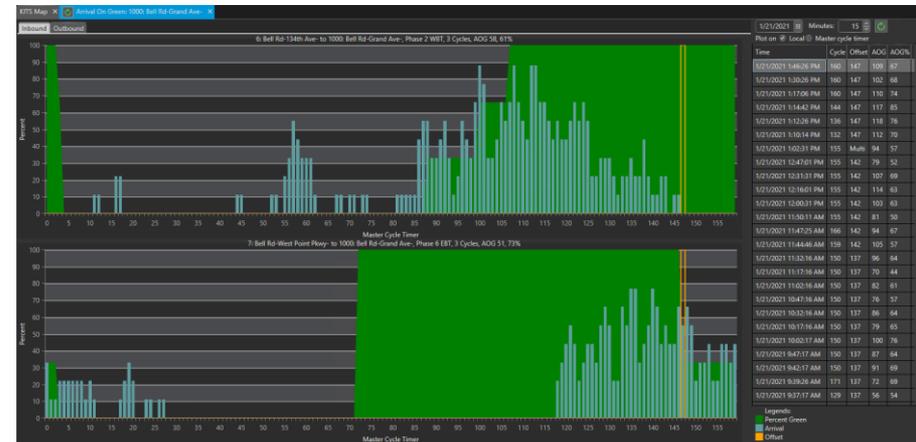
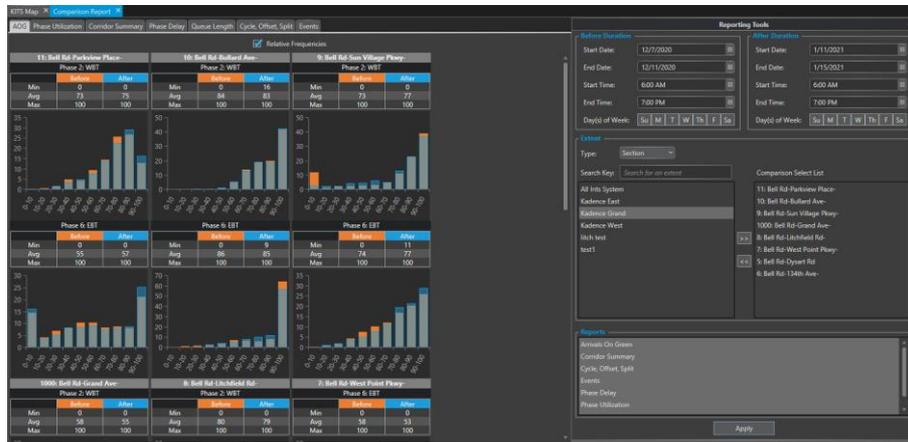
PERFORMANCE METRICS

ENHANCED SYSTEM GENERATED METRICS – COLLECTED 24/7

- Log of timing adjustments
- Cycle/phase failures (phase utilization)
- Arrivals on green
- Estimated queue lengths
- Estimated delay

BEFORE/AFTER COMPARISON

ARRIVALS ON GREEN



Ralston Ave Adaptive Traffic Control System

- Project budget: \$255k
- \$30k of which is Measure I local match

Big thanks to our funding partners at C/CAG and the TFCA – BAAQMD!

Start date July 2021, Completed October 2022, Full integration with CalTrans November 2022

Questions?

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