

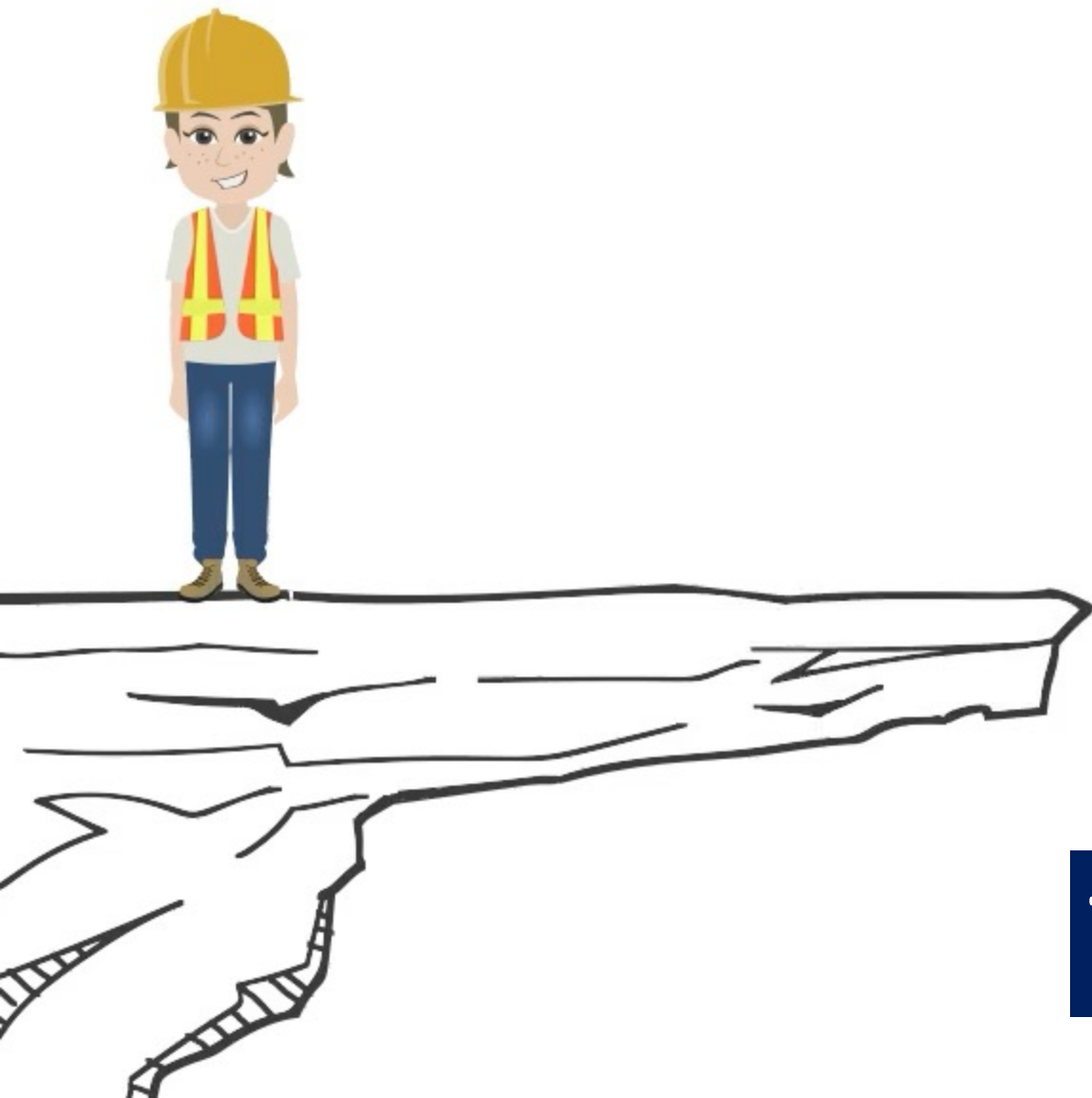


The Present Day



The Present Day: What is Possible





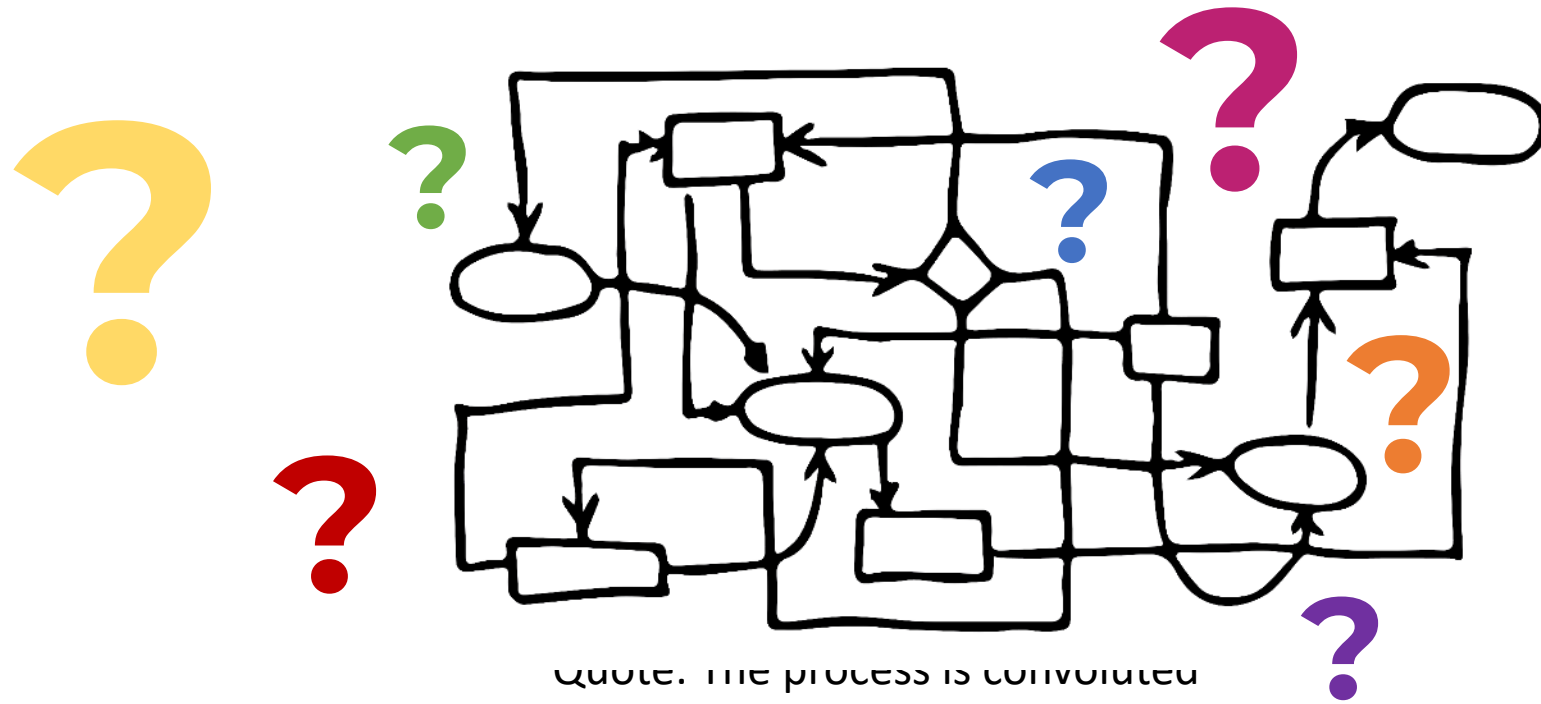
The Problem

90% of Traffic Signals NOT OPTIMIZED

...to the 2007 National Traffic Signal Report Card.
This is not surprising; given the impact of the recent economic downturn that has affected funding priorities at all levels of government and especially at the local level in some hard hit parts of the country. This will continue to affect funding cycles in most jurisdictions making it difficult to incorporate significant changes from a budgetary perspective. The low score demonstrates the continued need for attention and additional resources for traffic signal management and operations.
Although the overall improvement is small, agencies operating more than 150 signals have an overall letter grade of C (73). This is an indication of larger staff resources assigned to traffic signal programs as well as a balance of resources compared to the relative complexity and size of the traffic signal system. Even with difficult budgetary choices, the national score improved overall and agencies that operate larger signal systems are performing better than the national average.

Table 8: Comparison of Report Card Scores and Scoring Mechanisms

Section	2011 Even Weighting	2011 Weighted by System Size
Management	D (64)	C (77)
Signal Operations	C (72)	C+ (79)
Signal Timing Practices	C (76)	B (81)
Traffic Monitoring and Data Collection	F (52)	D+ (69)
Maintenance	C (73)	C+ (79)
Overall	D+ (69)	C (77)



**LACK OF
DATA**

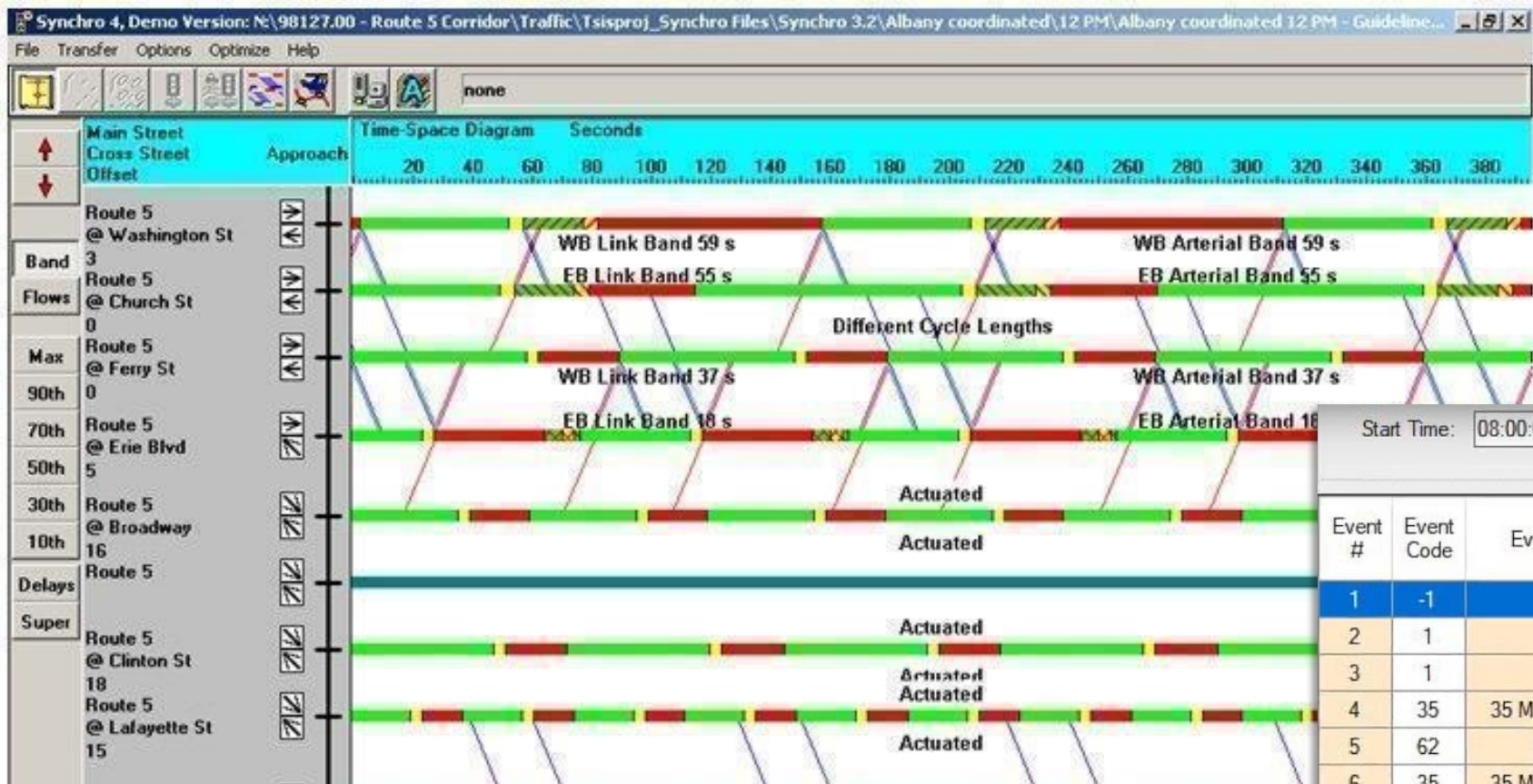


**CONVOLUTED
PROCESS**



1

DATA COLLECTION



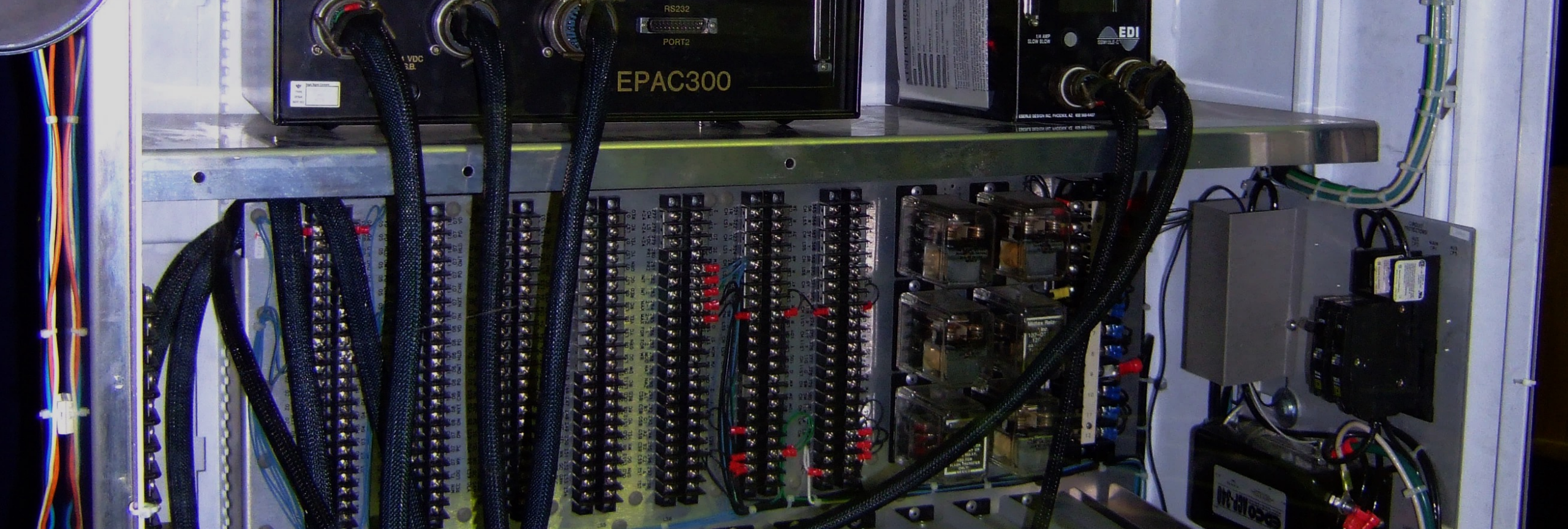
Event #	Event Code	Event Description	Comment	Interval Distance (Feet)	Total Distance (Feet)
1	-1			0	0
2	1	Stop Sign		173	173
3	1	Stop Sign		1366	1539
4	35	35 MPH Speed Limit Sign		401	1940
5	62	Narrow Bridge		254	2194
6	35	35 MPH Speed Limit Sign		1385	3579

2 TIMING PLANS

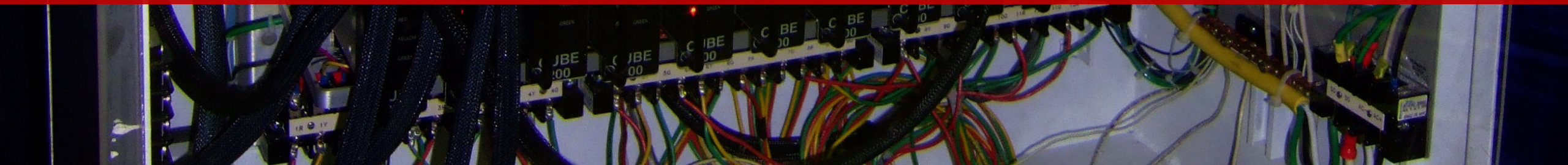
14	45	45 MPH Speed Limit Sign		1583	8927
15	24	School Zone		639	9566
16	45	45 MPH Speed Limit Sign		1263	10829
17	52	Signal Ahead		690	11519
18	35	35 MPH Speed Limit Sign		151	11670
19	35	35 MPH Speed Limit Sign		771	12441
20	35	35 MPH Speed Limit Sign		796	13237



3 CONVERT



4 FIELD-DEPLOY





5 TWEAK



**Current Signal Timing Process
is **BROKEN****



**Vehicle Detection/Data Technology
IS OUTDATED**



Background





IMAGINE...



COLLECT DATA
24/7/365

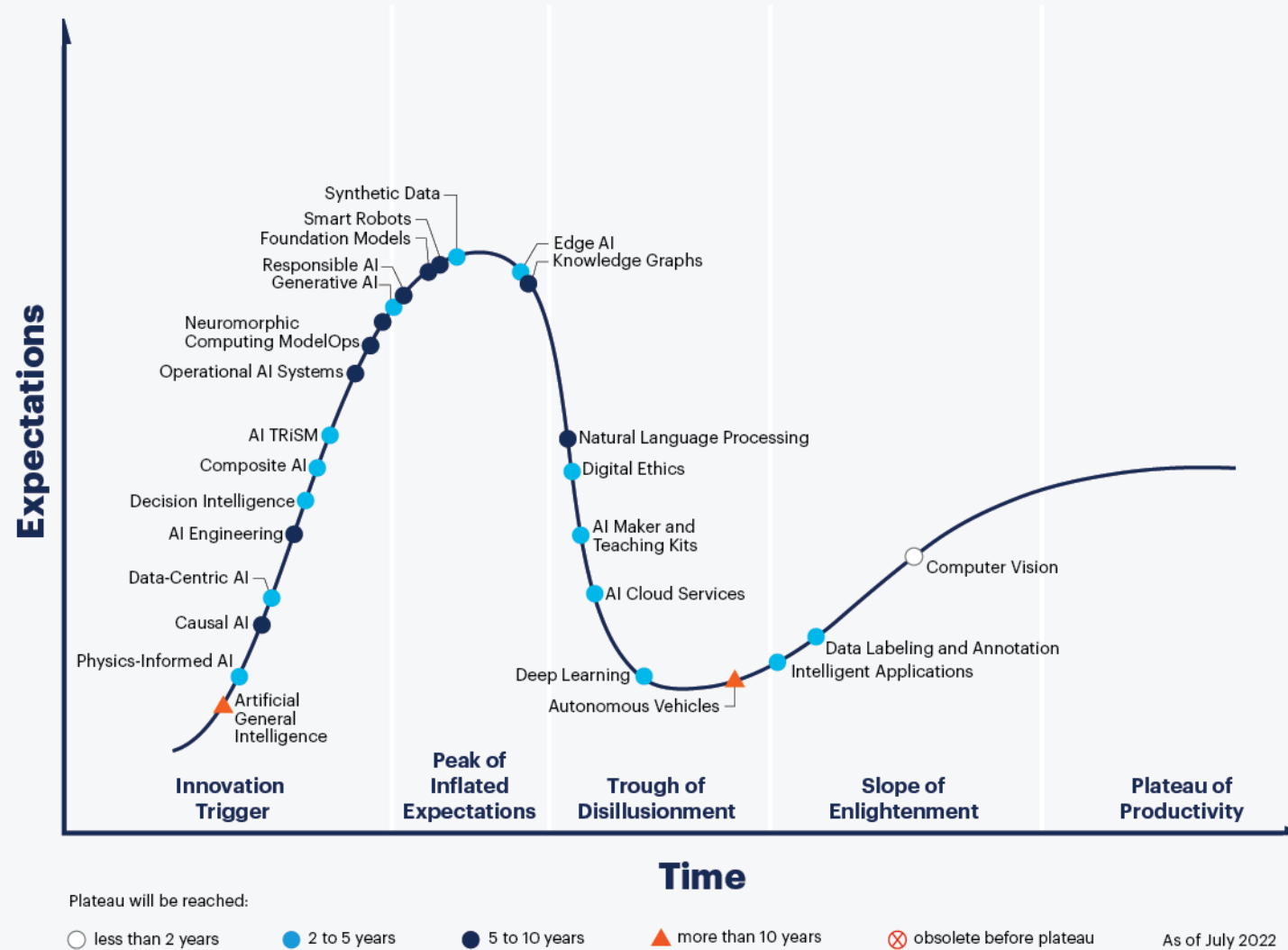


CREATE
TIMING PLAN



FOR EVERY DAY
OF THE WEEK

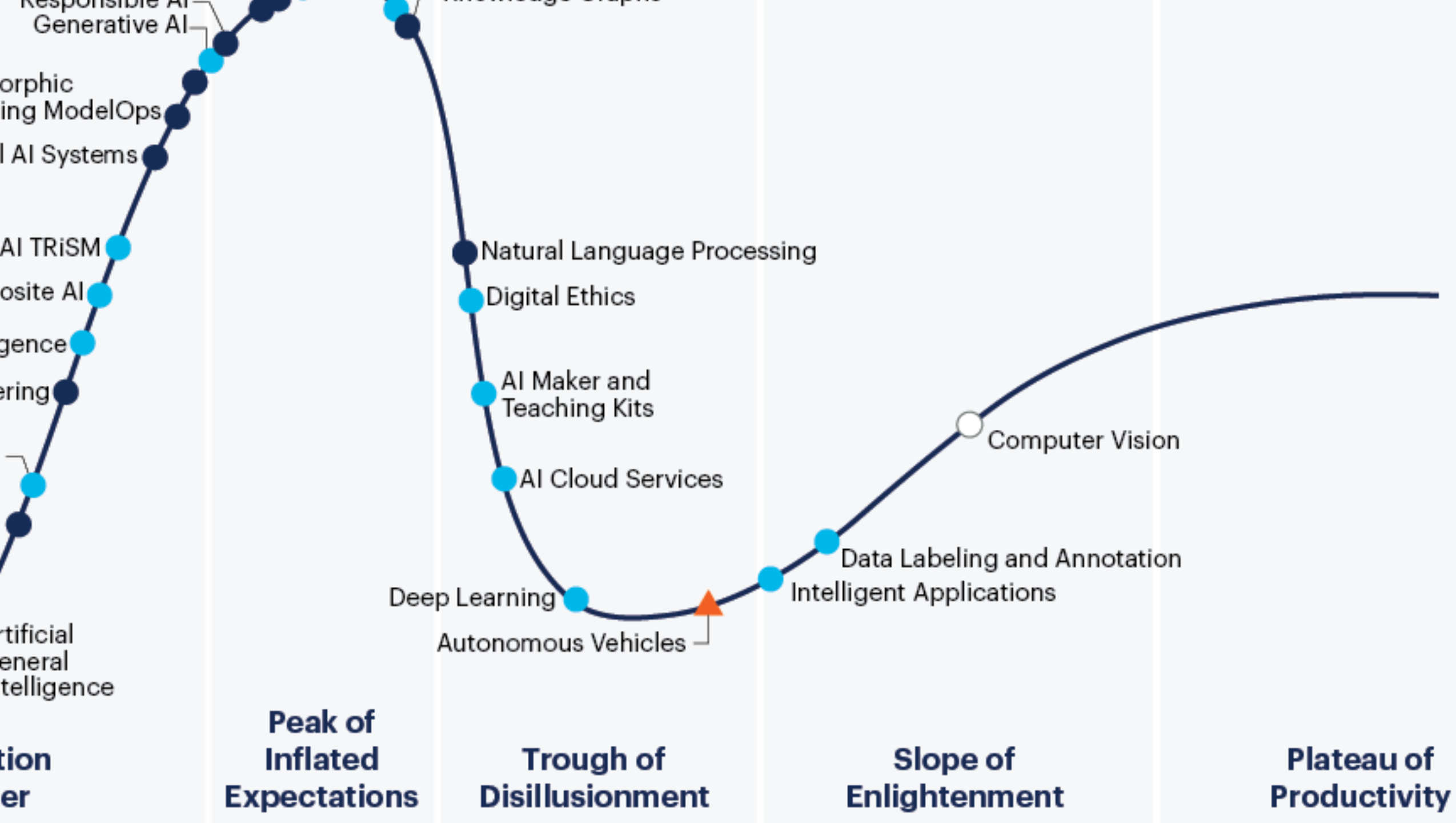
Hype Cycle for Artificial Intelligence, 2022



[gartner.com](https://www.gartner.com)

Source: Gartner
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Gartner



NEURAL NETWORKS



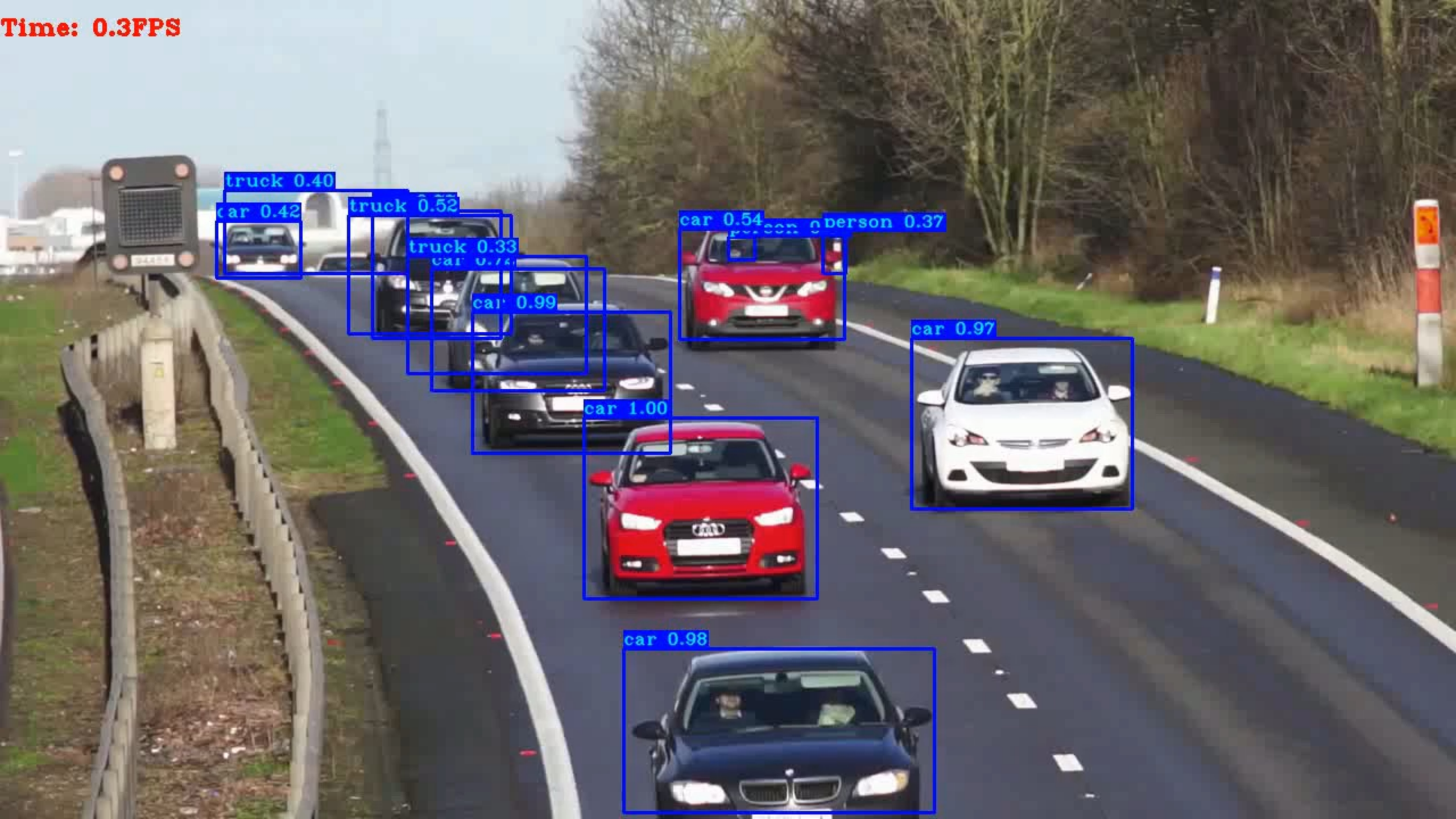
Neural Networks
emulate the human brain
and can be trained to
recognize cars, trucks,
bicycles and pedestrians.





0

Time: 0.3FPS



truck 0.40

car 0.42

truck 0.52

truck 0.33

car 0.72

car 0.99

car 0.54

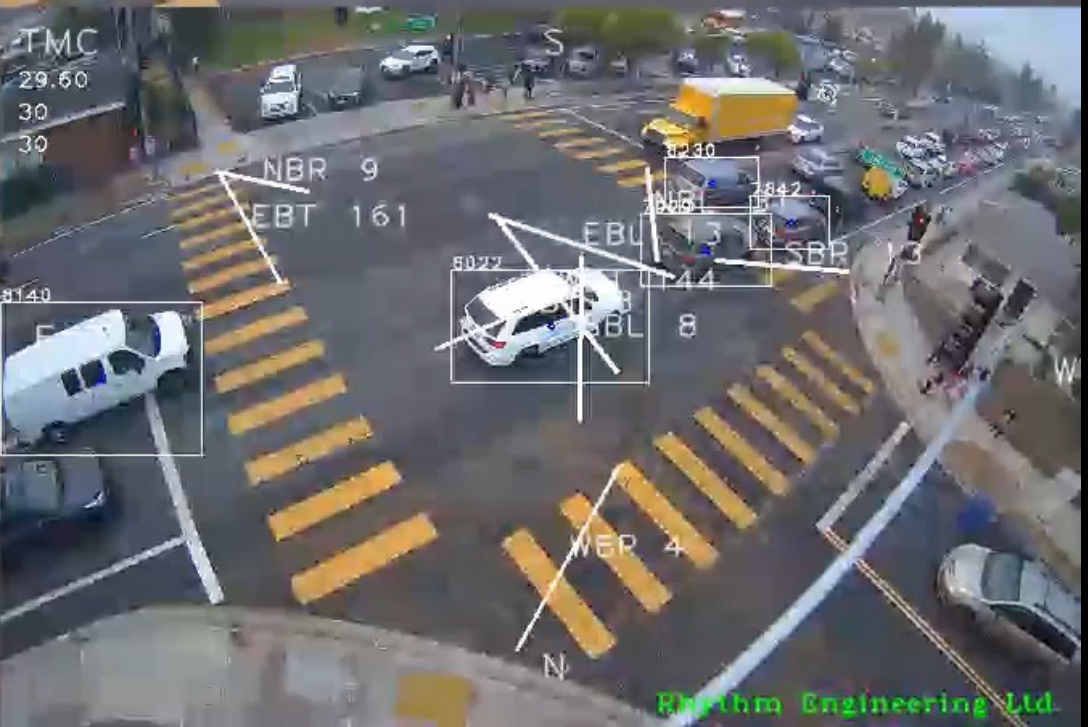
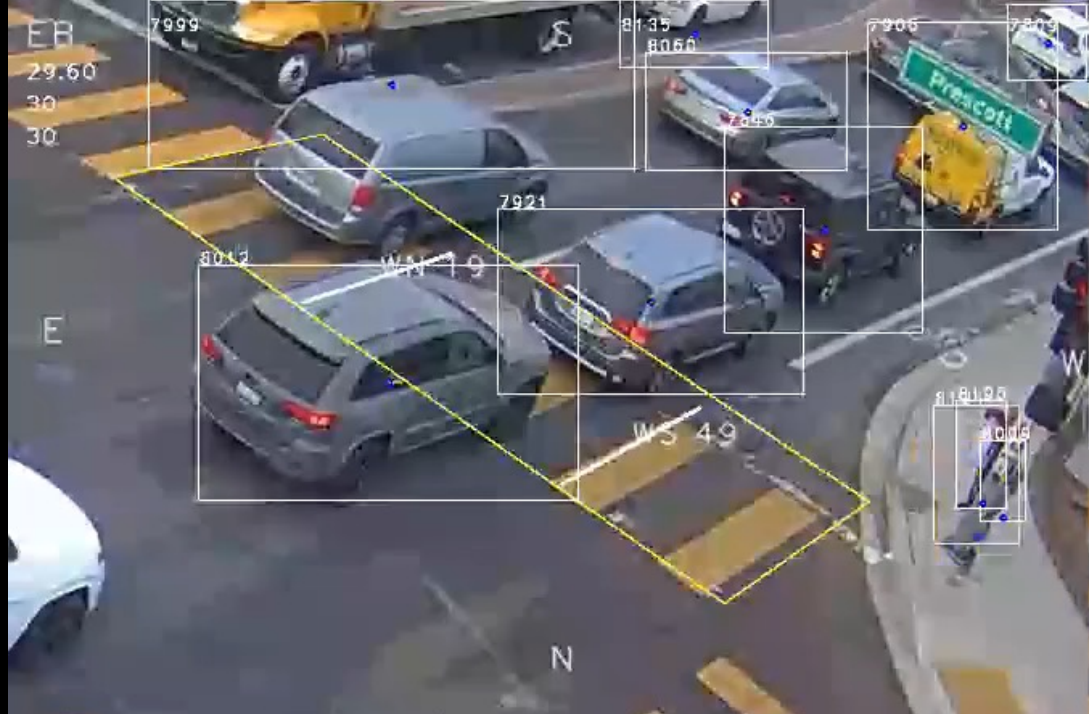
person 0.37

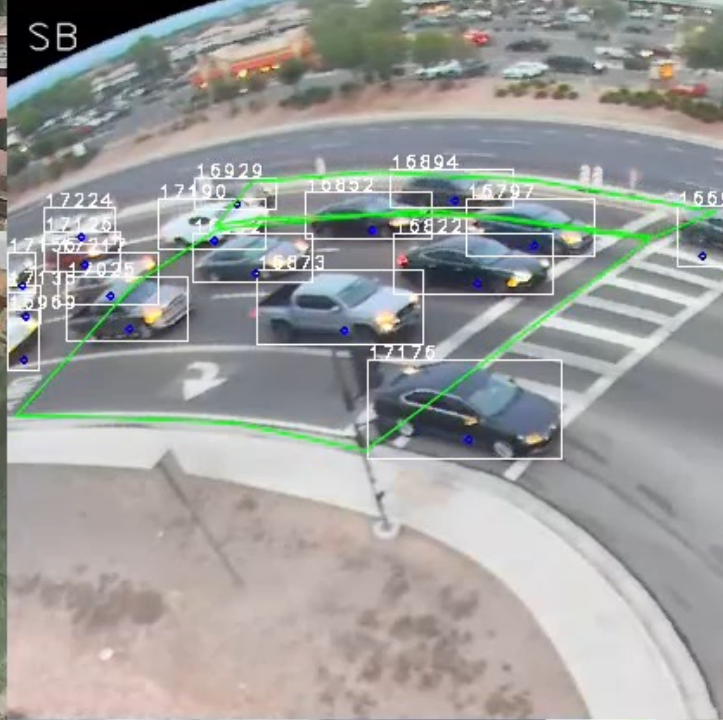
person 0.37

car 0.97

car 1.00

car 0.98





**2022
Best ITS
Implementation
Project**

**Automated Signal
Timing Plan
Generator for SR 347**

Rhythm Engineering



ITS Arizona 29th Annual Conference
"ITS - Intelligent Transportation SOLUTIONS"



- **TIMING PLANS**
- **ATSPM**
- **TMC ANALYSIS**



**CONTROL
SIGNALS**

Arterial Explorer

peak ↑

Navajo Cty

SE Johnson Creek Blvd

Untitled Timing Plan 01

New Timing Plan...

New Arterial...

Mohave Cty

Yuma Cty

New Folder...

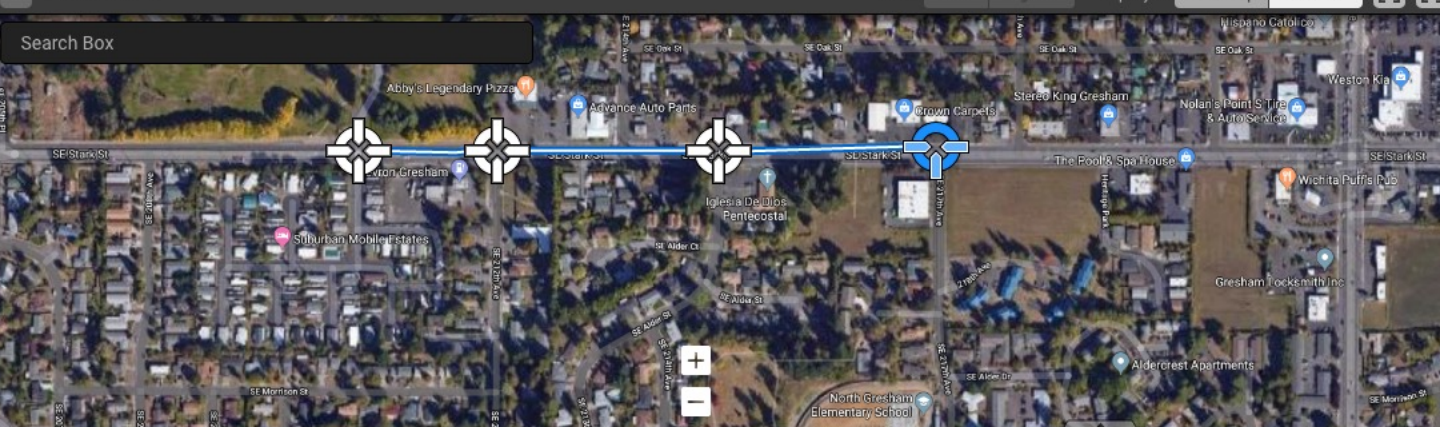
Arterial Map [SE Johnson Creek Blvd]

+ New Intersection

Search Box

Data: LOS Signals

Map layer: Base map Satellite



Coordination [AM Peak Plan]

Edit: Timing Tunnel

EB: Tunnel

Segments

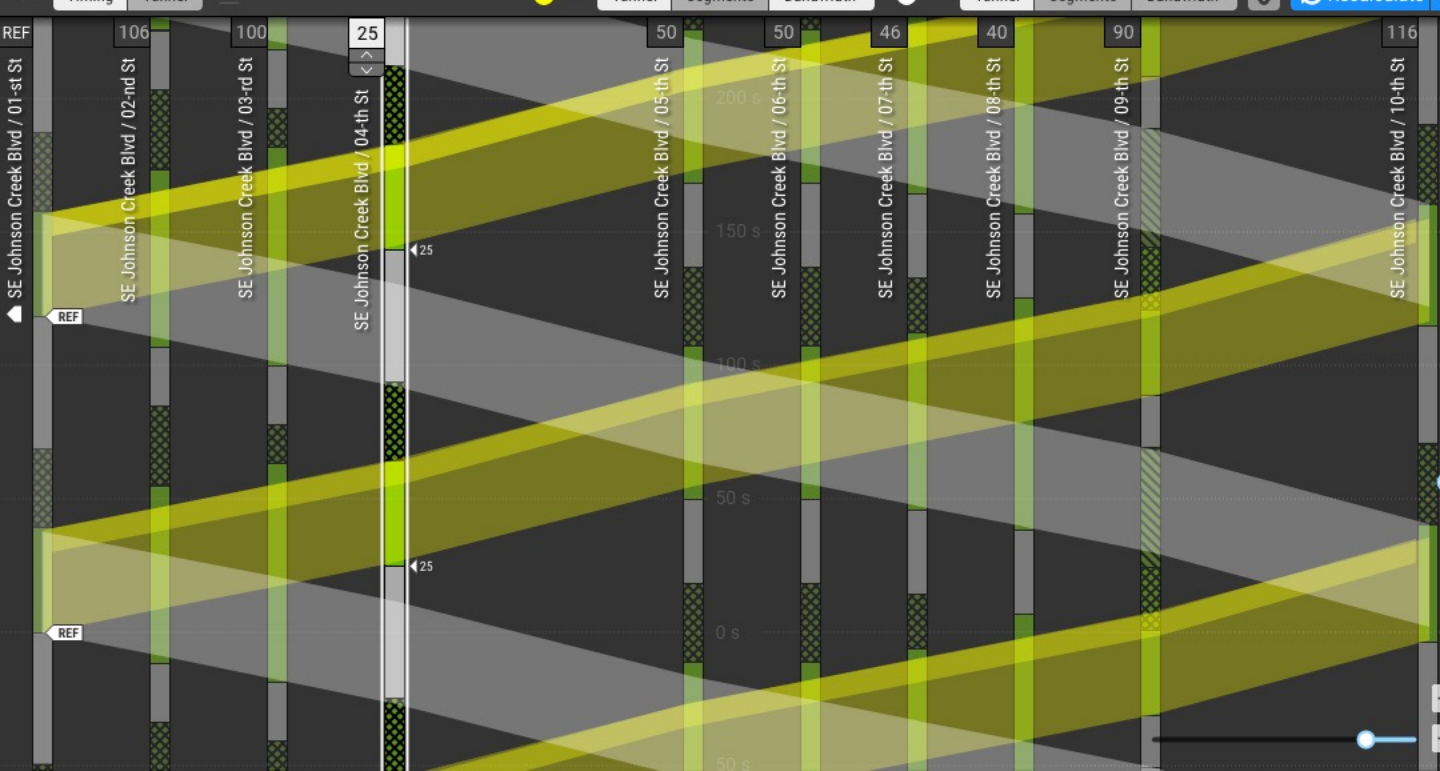
Bandwidth

WB: Tunnel

Segments

Bandwidth

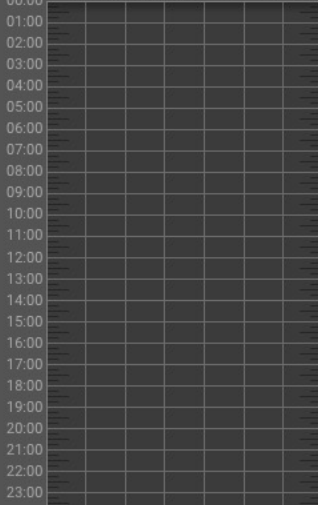
Recalculate



Schedule [SE Johnson Creek]

< 07/04/2019 - 07/11/2019 >

Sun Mon Tue Wed Thu Fri Sat



Arterial Setup

Intersections

TMC Database

Revert

Calculate

Date: << >>

Tue 07/04/2019 >>

Insert from File

SE Johnson Creek Blvd / S James Rd

Approach	↑ NB			→ EB			↓ SB			← WB		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
10:45 - 11:00	44	219	87	44	219	87	44	219	87	44	219	87
11:00 - 11:15	44	219	87	44	219	87	44	219	87	44	219	87
11:15 - 11:30	44	219	87	44	219	87	44	219	87	44	219	87
11:30 - 11:45	44	219	87	44	219	87	44	219	87	44	219	87
11:45 - 12:00	44	219	87	44	219	87	44	219	87	44	219	87
12:00 - 12:15	44	219	87	44	219	87	44	219	87	44	219	87
12:15 - 12:30	44	219	87	44	219	87	44	219	87	44	219	87
12:30 - 12:45	44	219	87	44	219	87	44	219	87	44	219	87
12:45 - 13:00	44	219	87	44	219	87	44	219	87	44	219	87

Sequences [AM Peak Plan]

Cycle Length: 120 s

Save & Download

SE Johnson Creek Blvd / 01-st St

REF

30 20 30 40

40 s 30 s 40 s

SE Johnson Creek Blvd / 02-nd St

58

30 20 30 40

40 s 30 s 40 s

SE Johnson Creek Blvd / 03-rd St

44

30 20 30 40

40 s 30 s 40 s

SE Johnson Creek Blvd / 04-th St

10

39 11 30 40

40 s 30 s 40 s

SE Johnson Creek Blvd / 05-th St

22

30 20 30 40

40 s 30 s 40 s

Arterial Explorer

search

- Navajo Cty
 - Arterial Name 01
 - Intersection 01
 - Intersection 02
 - Arterial Name 02
- Mohave Cty
- Yuma Cty

Metrics [Intersection 01]

Volume / Flow

Volume

- Total Volume
- PHF / Direction
- PHF / Lane
- Flow Rate / Direction
- Flow Rate / Lane
- Occupancy

Performance

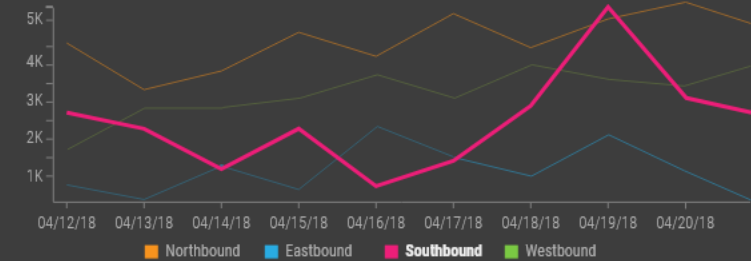
- Delay
- Total Delay
- Occupancy
- Queue Length
- Arrivals on Red
- Average Speed
- LOS / Approach
- LOS / Intersection
- Purdue Coordination Diagram
- Purdue Split Failure
- Purdue Phase Termination

LOS Analysis

New view - 01

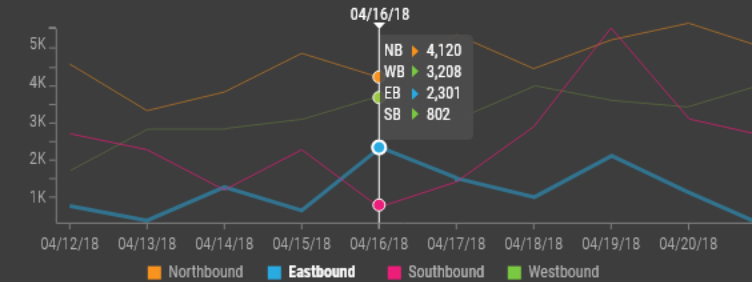
Arterial 02 | Intersection 02 | Volume

[P: 07/17/2019 10:00-17:00 | R: 15 min]



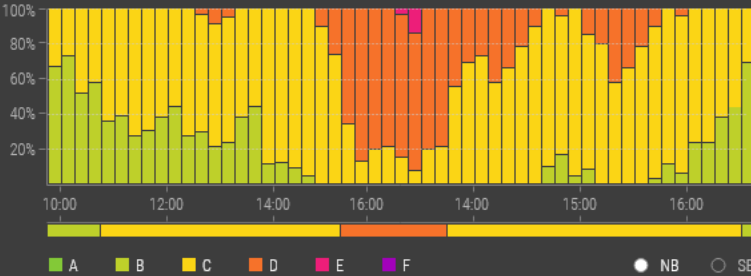
Arterial 02 | Intersection 01 | Volume

[P: 07/17/2019 10:00-17:00 | R: 15 min]



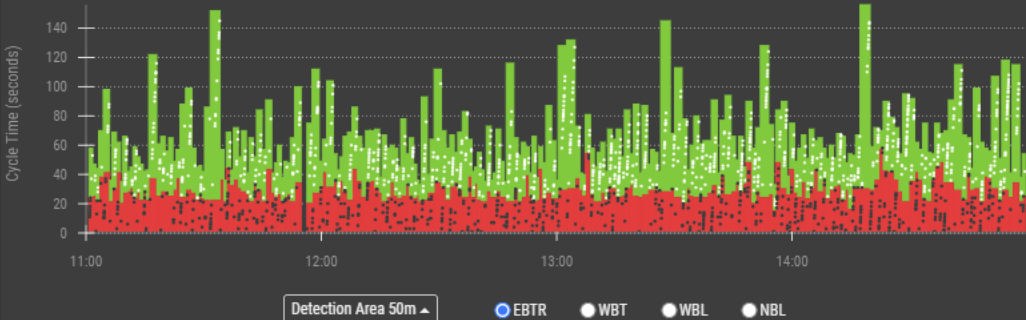
Arterial 02 | Intersection 02 | LOS

[P: 07/17/2019 10:00-17:00 | R: 15 min]



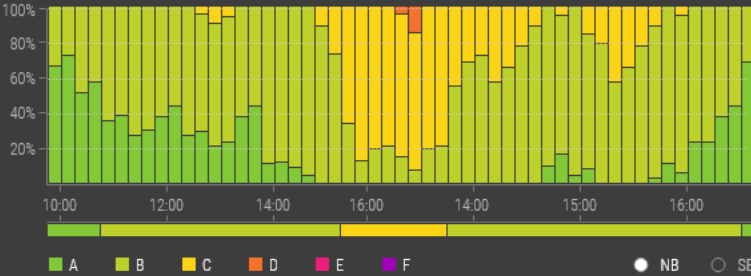
Purdue Diagram

[P: 07/17/2019 10:00-17:00 | R: 15 min]



Arterial 03 | Intersection 08 | LOS

[P: 07/17/2019 10:00-17:00 | R: 15 min]



Arterial 03 | Intersection 08 | Performance Overview

[P: 07/17/2019 10:00-17:00 | R: 15 min]

Arterial 03 | Intersection 01 | Volume [WB]
Arterial 03 | Intersection 01 | TMC [WBL]
Arterial 03 | Total Volume
Arterial 03 | Intersection 02 | Volume [WB]
Arterial 03 | Intersection 03 | Volume [EB]
Arterial 03 | Intersection 04 | Volume [EB]
Arterial 03 | Intersection 05 | Volume [WB]
Arterial 03 | Intersection 06 | Volume [WB]
Arterial 03 | Intersection 07 | Volume [WB]
Arterial 03 | Intersection 08 | Volume [WB]

NBL	NBT	EBL	EBT	SBL	SBT	WBL	WBT
2,340	1,020	1,800	1,455	500	1,940	912	1,750
140	41	176	39	211	233	12	44
66.4K	54.4K	99.3K	35.5K	89.9K	45.5K	35.1K	15.0K
2,340	1,020	1,800	1,455	500	1,940	912	1,750
1,340	920	800	1,255	500	650	990	899
1,160	1,720	801	55	500	1,040	121	1,750
2,340	1,020	1,800	1,455	500	1,940	912	1,750
2,340	1,020	1,800	1,455	500	1,940	912	1,750
2,340	1,020	1,800	1,455	500	1,940	912	1,750
2,340	1,020	1,800	1,455	500	1,940	912	1,750



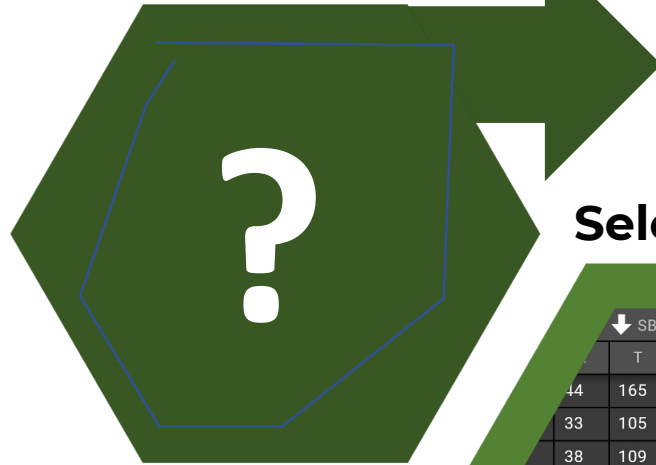
TIMING PLAN
CREATION

CREATE A TIMING PLAN IN 5 MINUTES

**Automatic Data
Collection 24/7 TMCs**

**Create
Timing Plan**

 **Automatic Download
to Any Controller**

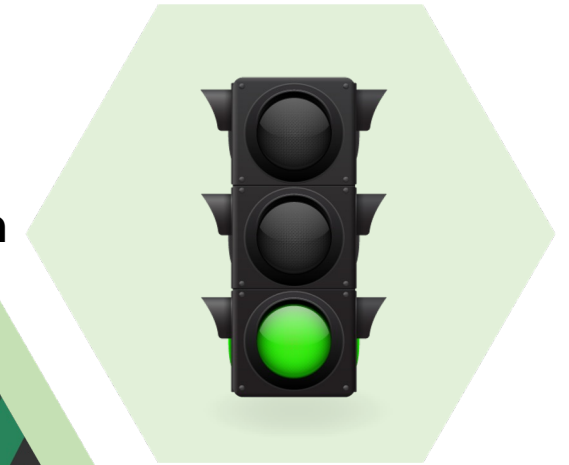
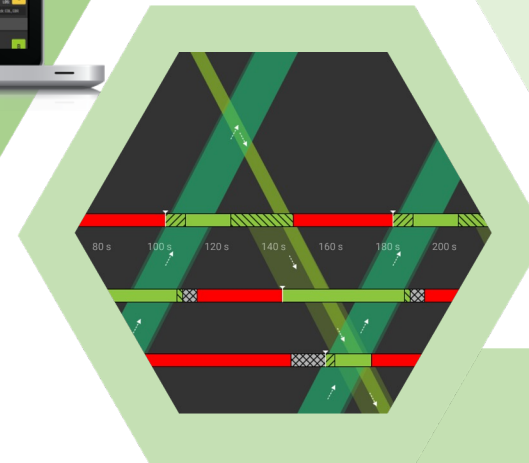


Select Data

	↓ SB			→ EB	
	T	R	L	T	
44	165	56	40	130	87
33	105	43	44	165	90
38	109	63	53	185	50
31	49	122	46	63	197
					65
					97
44	148	36	72	219	63
					87
62	149	47	66	200	53
54	152	34	69	202	43
	160	49	75	197	36
	180	39	93	176	



**Fine-Tune
Timing Plan**



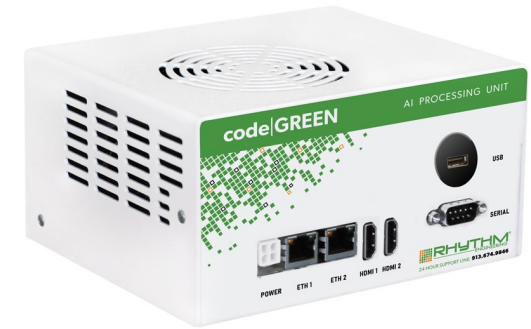
HARDWARE



1 CAMERA
with Large Field of View (FOV)



1 CABLE

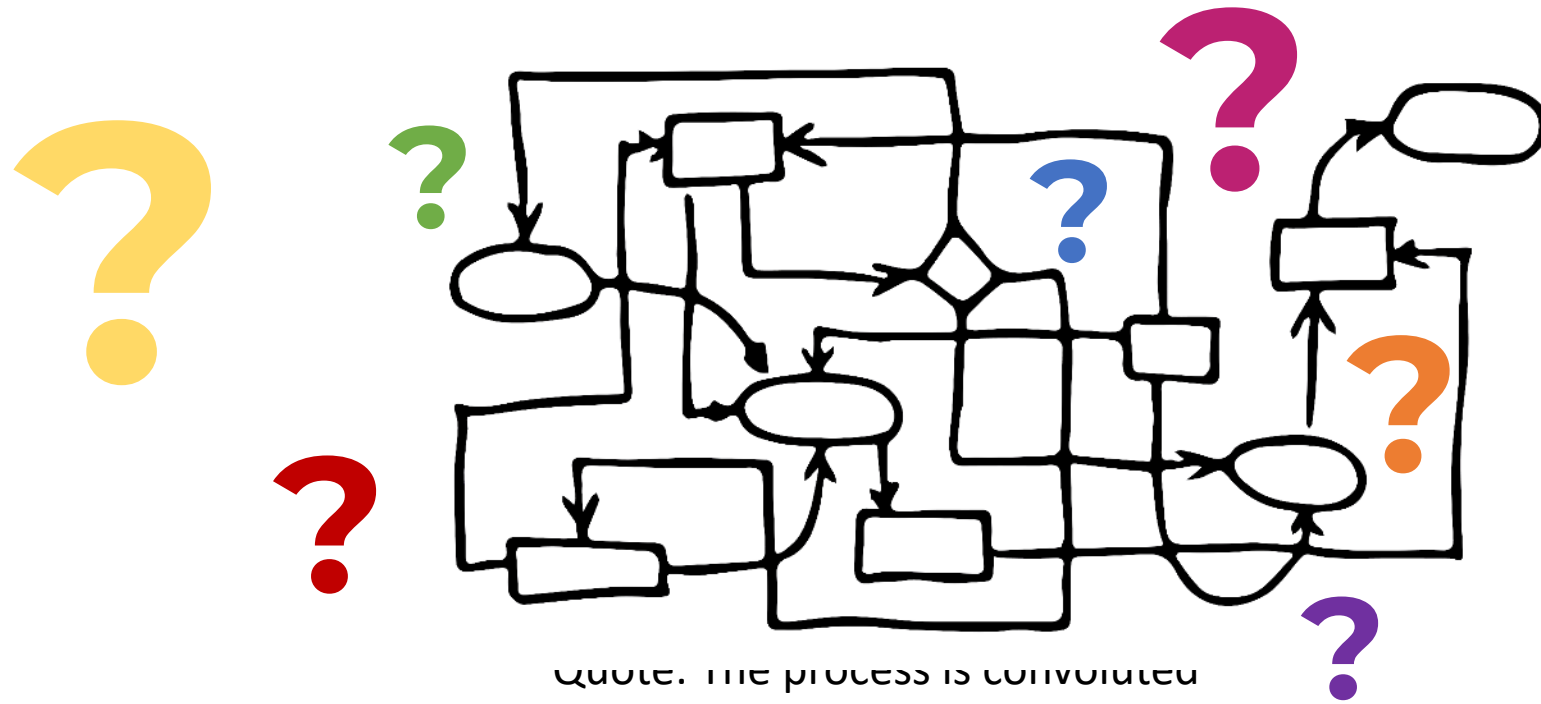


1 PROCESSOR
6-11/16"(L) x 5-1/2"(W) x 2-3/4"(H) / 170 x 140 x 70 mm







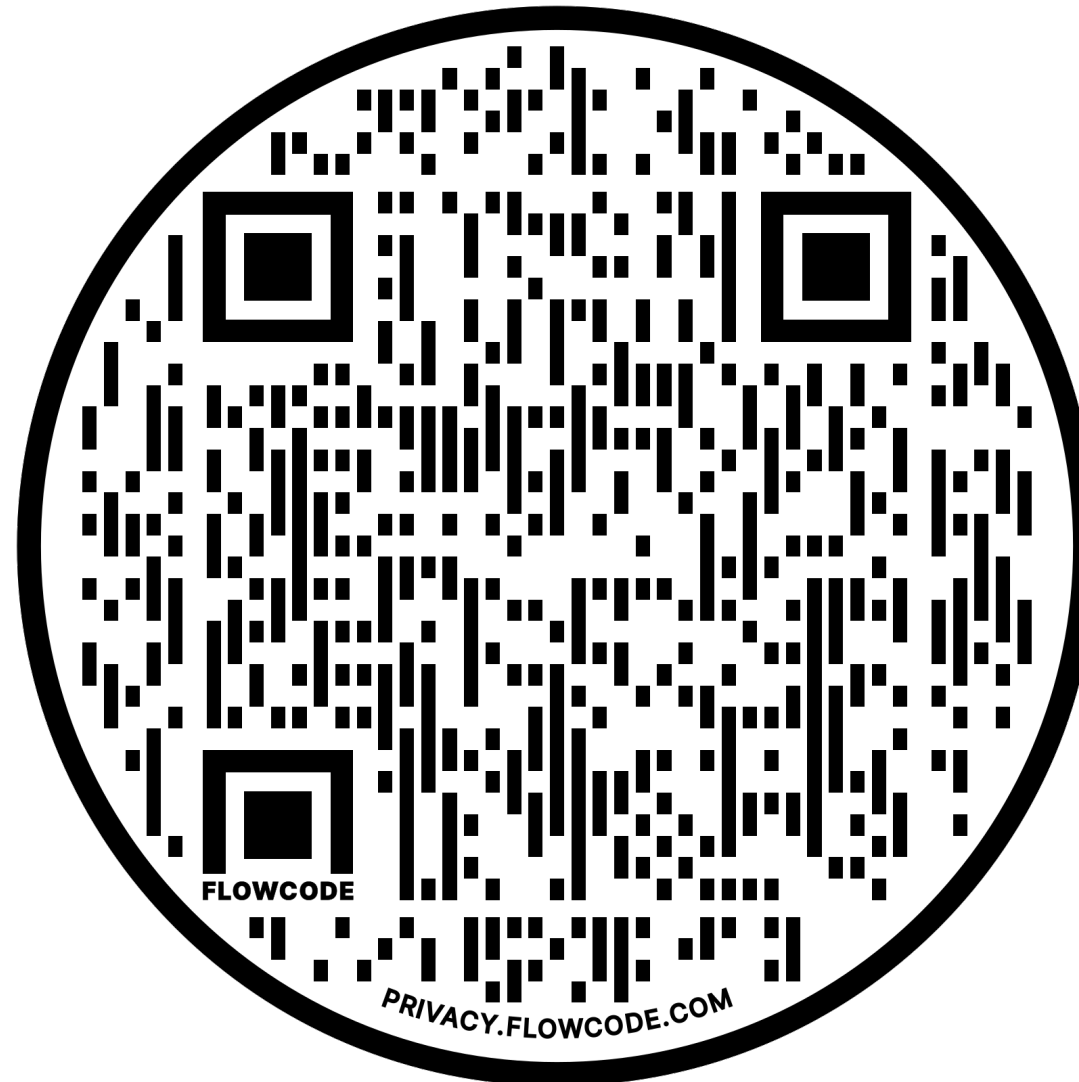


**LACK OF
DATA**



**CONVOLUTED
PROCESS**

SIGNAL OPTIMIZATION PROJECT



3-IN-1 SOLUTION

THE NEW WAY

