

Event Based Data from a 2070 Controller

Automated Traffic Signal Performance Measures Workshop

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Agenda

- Introduction
- Motivation
- Module Development
- Deployment Sites
- Data Collection
- Preliminary Results
- Next Steps



SPR 781: Snapshot

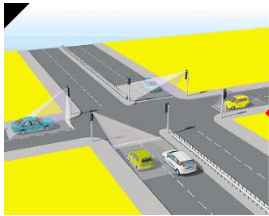
- Funding Agency: Oregon DOT
 - Project Title: Improving Adaptive / Responsive Signal Control Performance: Implications of Non-Invasive Detection and Legacy Timing Practices
- Lead: Northern Arizona University
- Subs:
 - Portland State University (Sirisha Kothuri)
 - Iowa State University (Anuj Sharma)
- Objective
 - Different detection sources provide varying levels of accuracy
 - The impact of less than optimal detection on traditional call and extend operation is well known
 - How does sub-optimal detection impact the operation of higher level control algorithms, such as adaptive and/or traffic responsive?

Motivation

- Desire to collect high resolution event based data from 2070 running Voyage (Northwest Signal / Peek)
- Inspiration taken from ASC/3 event based data logger worked on while at Purdue
- Desire to collect as large a sample as possible
- Need for portable event based data logger

Data Flow

Vehicle Detectors



Radar



Video



Loops

Detector Status

Detector Status

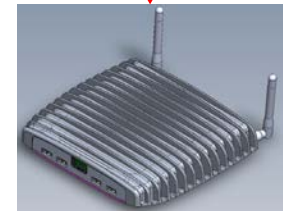
Detector Status

Traffic Controller

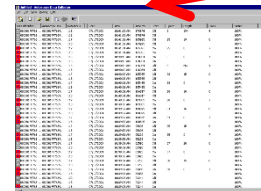


Event States

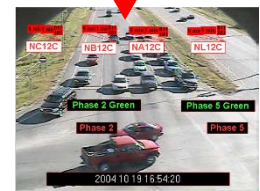
Video Feed



Fit PC



Event Log



Dynamic Overlay

Module Development

- Northwest Signal's Testbox

NWS Testbox - Session8

Record Stop Play >>
Load Save Pause II

Program / View Preset Controls

Apply Presets

Help

Memo Pad

Close

Stop

	Set 1	Set 2	Set 3	Set 4	Set 5	Set 6										
	Off	Off	Off	Off	Off	Off										

Displaying Comm w/Controller

Function	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th
Red																
Yellow																
Green																
Don't Walk	D W	D W	D W	D W	D W	D W	D W	D W								
Walk																
Ped Clear																
Detector Active 1 - 16																
Detector Active 17 - 32																
Detector Active 33 - 48																
Detector Active 49 - 64																

Module Development

Build a Dynamic Object

Dynamic Object Name: DO8.dof Close

Controller: Voyage.con

phaseStatusGroupReds - Parameter Range Change Functions List to English

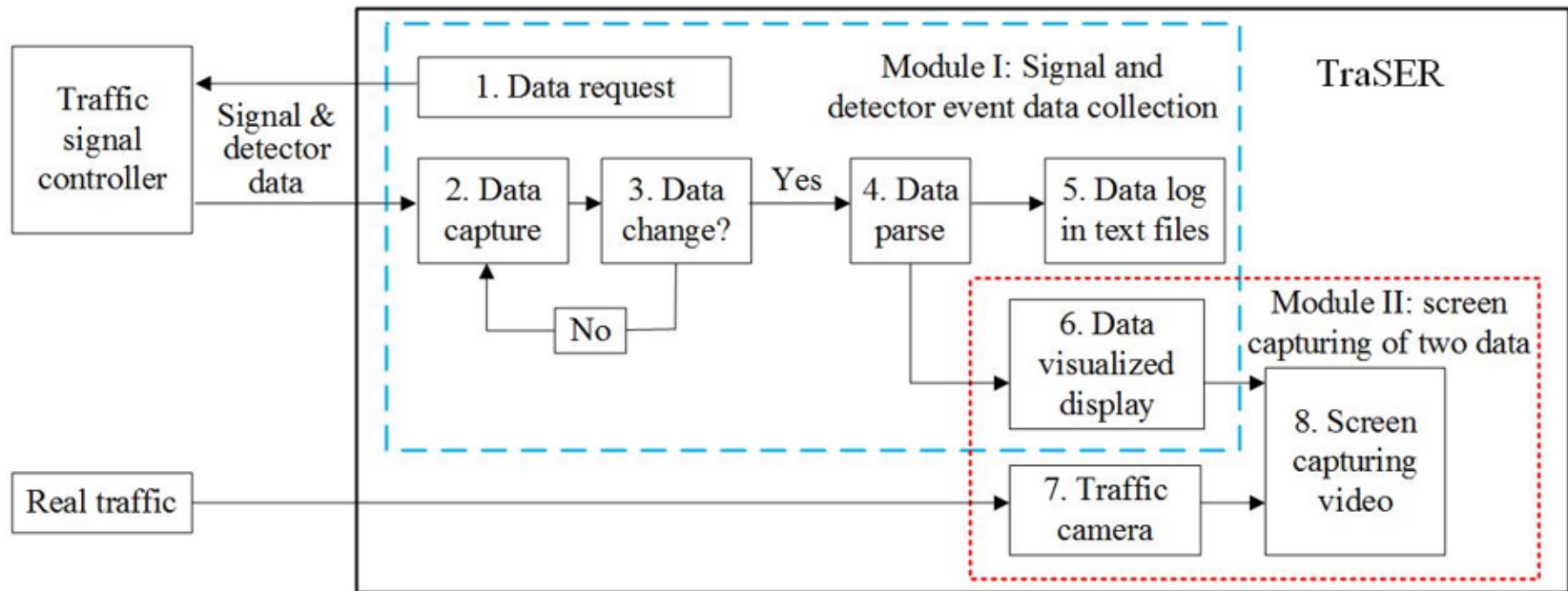
Index	Dynamic Object	Group
1	phaseStatusGroupReds	1
2	phaseStatusGroupYellows	1
3	phaseStatusGroupGreens	1
4	phaseStatusGroupDontWalks	1
5	phaseStatusGroupWalks	1
6	phaseStatusGroupPedClears	1
7	vehicleDetectorStatusGroupActive	1
8	vehicleDetectorStatusGroupActive	2
9	vehicleDetectorStatusGroupActive	3
10	vehicleDetectorStatusGroupActive	4
11	vehicleDetectorStatusGroupActive	5
12	vehicleDetectorStatusGroupActive	6
13	vehicleDetectorStatusGroupActive	7
14	vehicleDetectorStatusGroupActive	8
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		

Inset Space
Remove a Function
Clear all Functions
Move Up
Move Down

Index	Dynamic Object Function List
1	phaseStatusGroupReds
2	phaseStatusGroupYellows
3	phaseStatusGroupGreens
4	phaseStatusGroupDontWalks
5	phaseStatusGroupPedClears
6	phaseStatusGroupWalks
7	phaseStatusGroupVehCalls
8	phaseStatusGroupPedCalls
9	phaseStatusGroupPhaseOns
10	phaseStatusGroupPhaseNexts
11	-----
12	overlapStatusGroupReds
13	overlapStatusGroupYellows
14	overlapStatusGroupGreens
15	-----
16	channelStatusGroupReds
17	channelStatusGroupYellows
18	channelStatusGroupGreens
19	-----
20	vehicleDetectorStatusGroupActive
21	vehicleDetectorStatusGroupAlarms
22	vehicleDetectorAlarms
23	vehicleDetectorReportedAlarms
24	pedestrianDetectorAlarms
25	-----
26	volumeOccupancySequence
27	detectorVolume
28	detectorOccupancy
29	-----
30	unitControlStatus

Module Development

- Data Flow Diagram



Module Development

- Visual interface that can be overlaid on screen / video
- Event based data file recorded from state changes

Controller Data Surveillance

Time: 2015-06-24 12:28:22.450

Phase	1st	2nd	3rd	4th	5th	6th	7th	8th
Red								
Yellow								
Green								
Don't Walk	DW	DW	DW	DW	DW		DW	DW
Walk						WA		
Ped Clear								
Det (1-8)								
Det (9-16)	9							
Det (17-24)				20				
Det (25-32)								
Det (33-40)								
Det (41-48)			43					
Det (49-56)								
Det (57-64)	57							

Intersection: 97h Controller IP: 10.43.72.48 Interface number: 5

Start Stop

Module Development

```

1.. 2015070909ChgData.txt
0 10 20 30 40
1 Intersection;Date;Time;Signal;Phase;Status
2 97th;2015-07-09;09:32:29.544;R;3;1
3 97th;2015-07-09;09:32:29.544;R;4;1
4 97th;2015-07-09;09:32:29.544;R;7;1
5 97th;2015-07-09;09:32:29.544;R;8;1
6 97th;2015-07-09;09:32:29.544;G;2;1
7 97th;2015-07-09;09:32:29.544;G;6;1
8 97th;2015-07-09;09:32:29.544;DW;1;1
9 97th;2015-07-09;09:32:29.544;DW;2;1
10 97th;2015-07-09;09:32:29.544;DW;3;1
11 97th;2015-07-09;09:32:29.544;DW;4;1
12 97th;2015-07-09;09:32:29.544;DW;5;1
13 97th;2015-07-09;09:32:29.544;DW;6;1
14 97th;2015-07-09;09:32:29.544;DW;7;1
15 97th;2015-07-09;09:32:29.544;DW;8;1
16 97th;2015-07-09;09:32:40.760;DET;9;1
17 97th;2015-07-09;09:32:41.748;DET;41;1
18 97th;2015-07-09;09:32:42.110;DET;9;0
19 97th;2015-07-09;09:32:42.161;DET;9;1
    
```

Module Development

Autoscope Video Player - 2015,06,24 12:17:15 -- 10.5.0 -- 100539FF2B530236 -- EB Phase 8 - 97th @ Lawnfield -- Lum mount -- 2 -- Terra Access Point NEMA --

File View Play DetectorOverlay Bookmarks Window Help

MPEG4 Color (RTSP) 1/6 maximum

Controller Data Surveillance

Time: 2015-06-24 12:28:22.450

Phase	1st	2nd	3rd	4th	5th	6th	7th	8th
Red	■	■	■	■	■	■	■	■
Yellow	■	■	■	■	■	■	■	■
Green	■	■	■	■	■	■	■	■
Don't Walk	DW	DW	DW	DW	DW	■	DW	DW
Walk	■	■	■	■	■	WA	■	■
Ped Clear	■	■	■	■	■	■	■	■
Det (1-8)	■	■	■	■	■	■	■	■
Det (9-16)	9	■	■	■	■	■	■	■
Det (17-24)	■	■	■	20	■	■	■	■
Det (25-32)	■	■	■	■	■	■	■	■
Det (33-40)	■	■	■	■	■	■	■	■
Det (41-48)	■	■	43	■	■	■	■	■
Det (49-56)	■	■	■	■	■	■	■	■
Det (57-64)	■	■	■	■	■	■	■	57

Intersection: 97th Controller IP: 10.43.72.48 Interface number: 5

Start Stop

2015,06,24 12:17:15 -- 10.5.0 -- 10053AF...

1 MPEG4 - FPS = 5.00 (4.74) 2835

2015,06,24 12:17:15 -- 10.5.0 -- 100539...

Ready 2 MPEG4 - FPS = 5.00 (4.96) 2885

2015,06,24 12:17:15 -- 10.5.0 -- 100549F...

Ready 3 MPEG4 - FPS = 5.00 (3.76) 2305

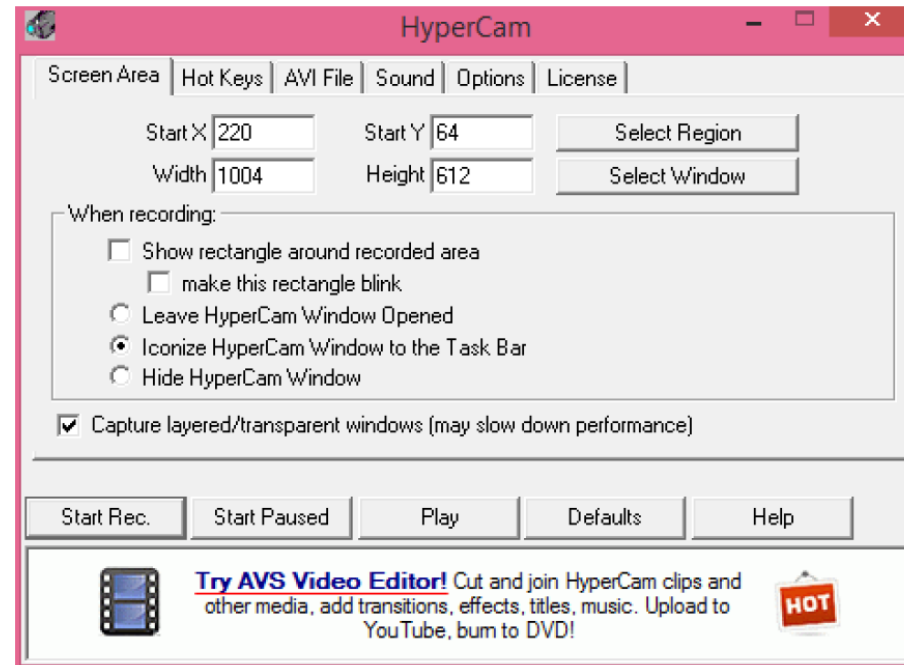
2015,06,24 12:17:15 -- 10.5.0 -- 100538FF5...

Ready 4 MPEG4 - FPS = 5.00 (4.30) 2385

11

Module Development

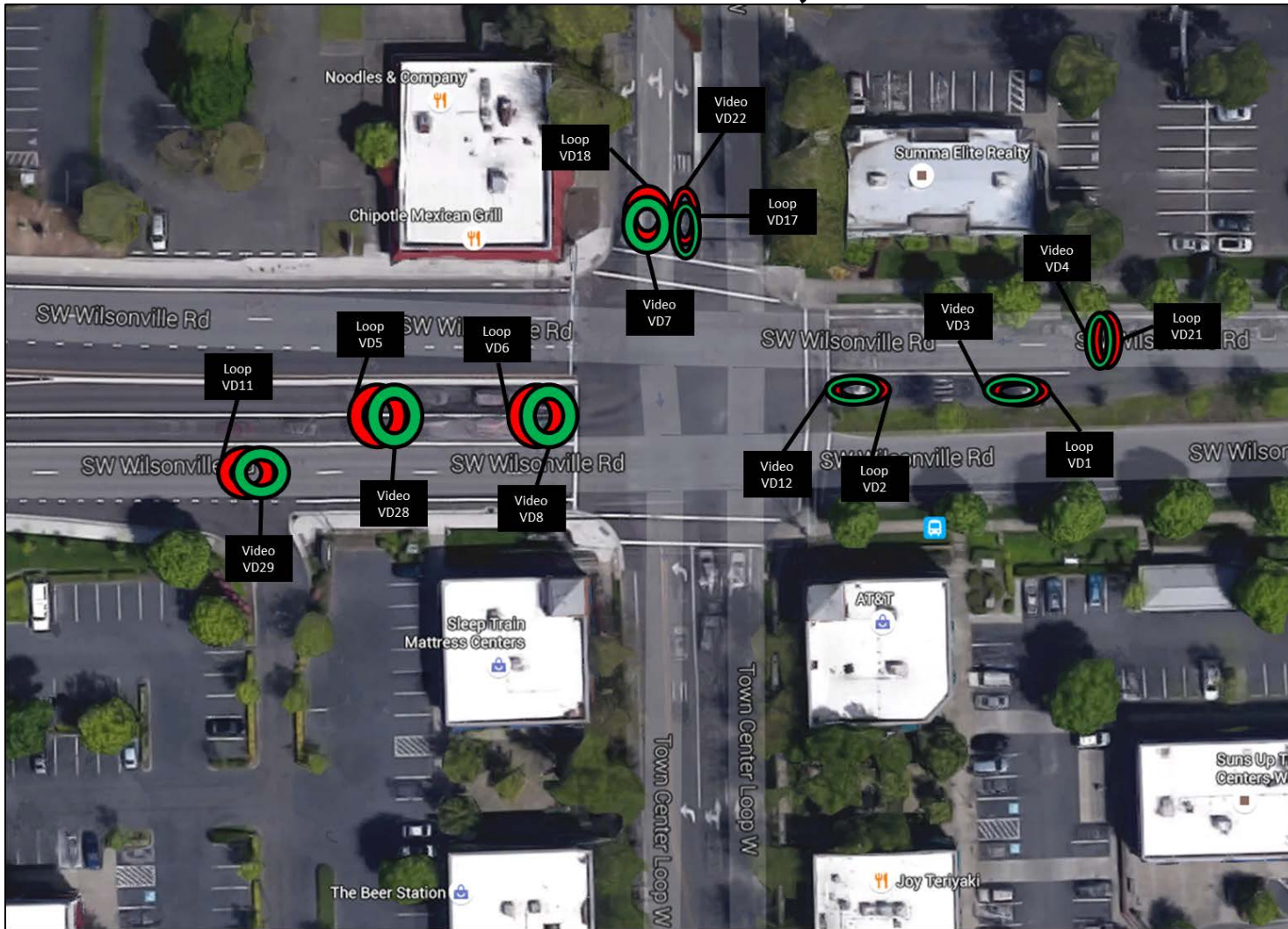
- Use HyperCam to capture screen
- Slice video and data files into 1 hr increments with batch operation
- Will run “indefinitely”



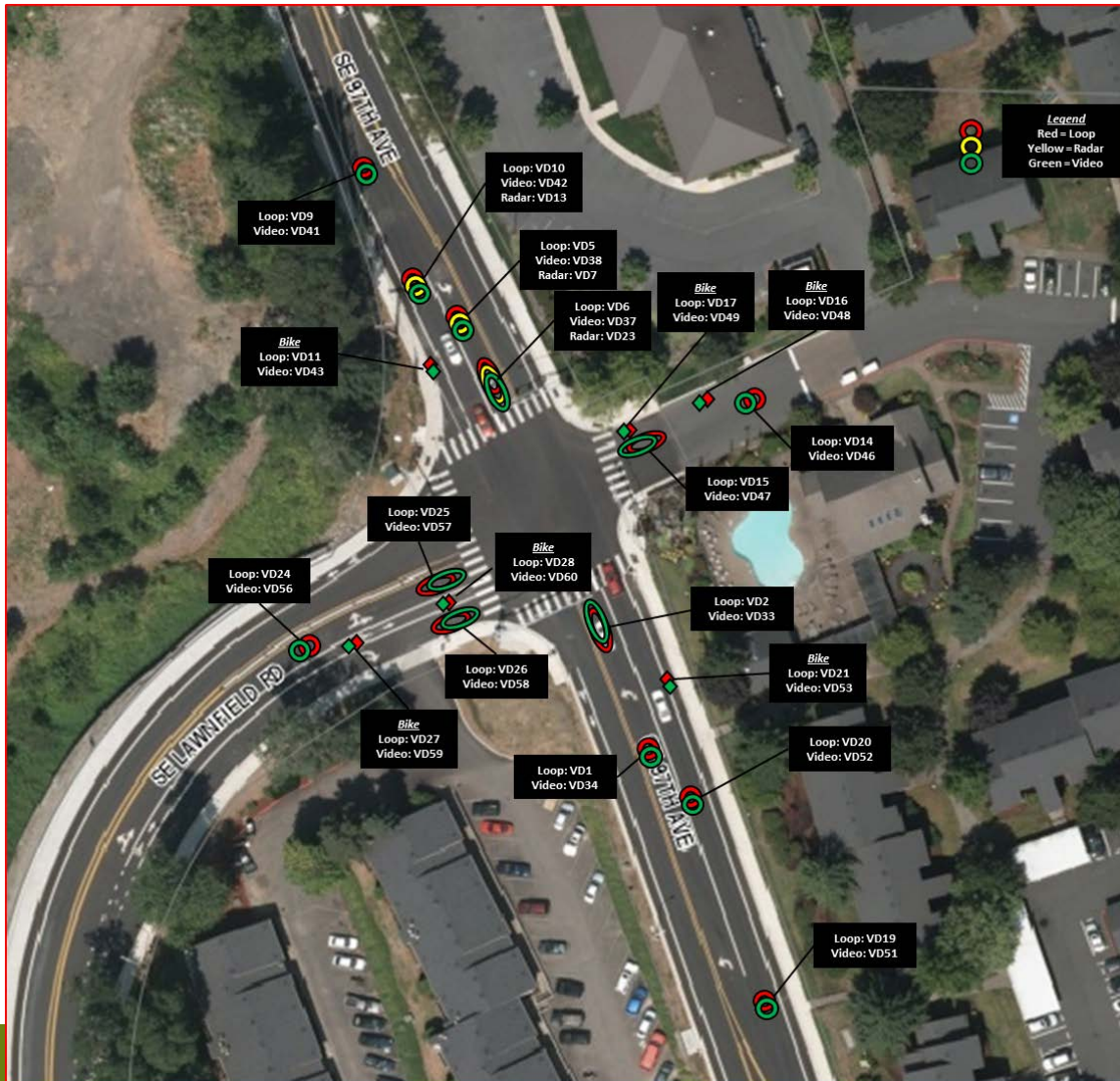
Site Locations



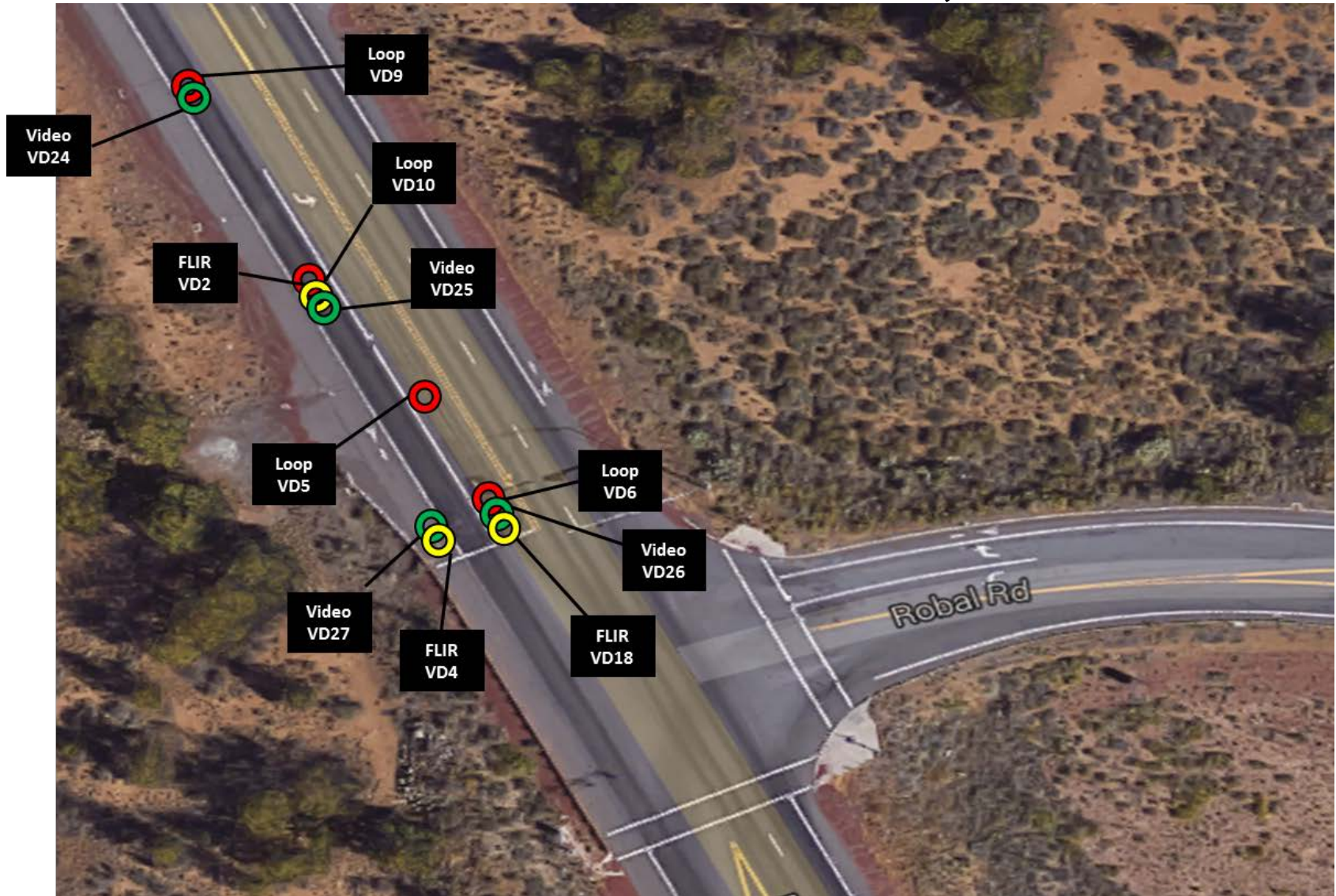
Town Center Loop West & Wilsonville Road, Wilsonville



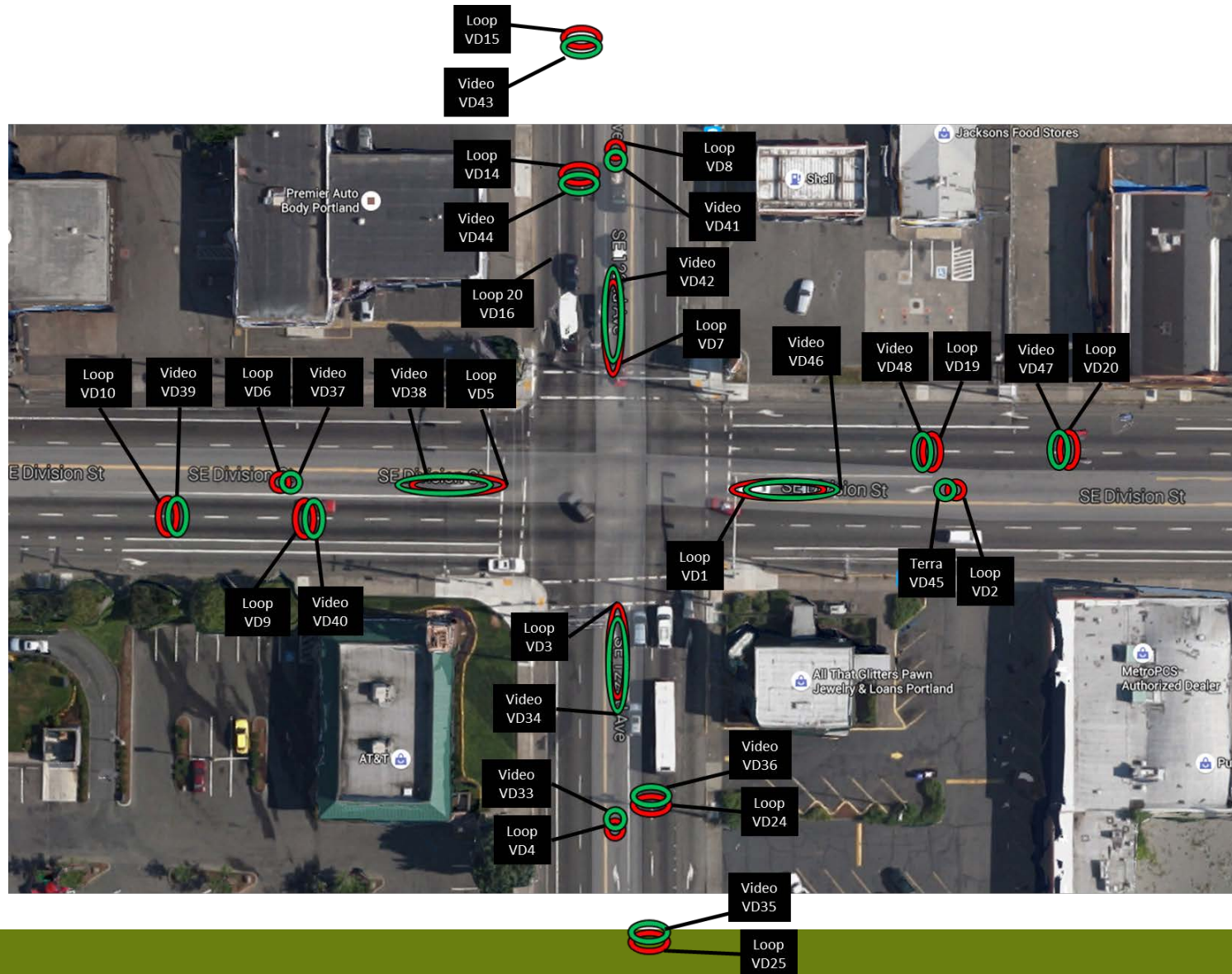
97th & Lawnfield, Clackamas County



US 20 & Robal Rd, Bend



122nd & SE Division, Portland

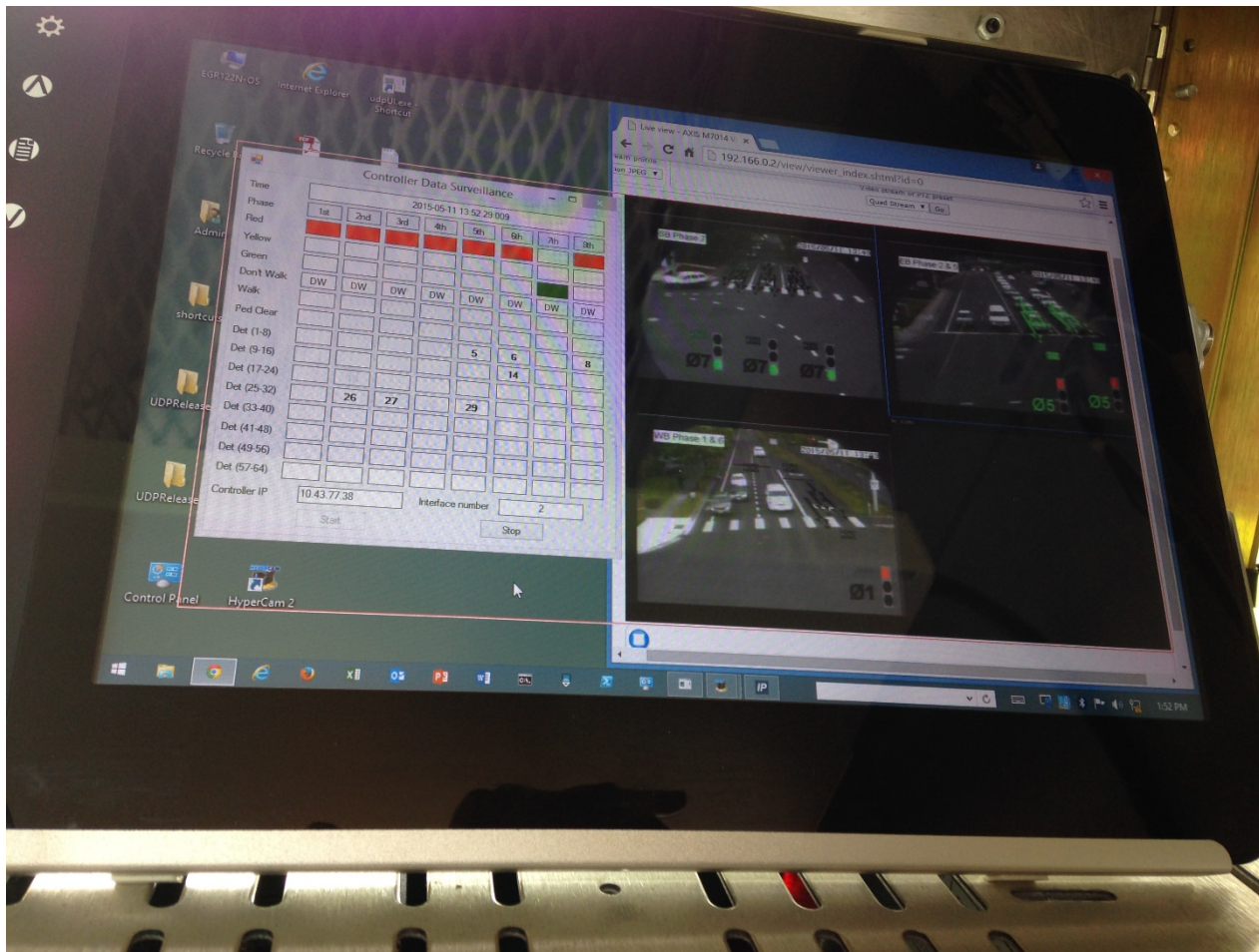


Data Collection

- Used Fit PC and Axis encoder as hardware
- Ethernet connections
- Does not have to be onsite



Data Collection



Data Collection

- Minor issues occurred at 97th / Lawnfield & TCLW / Wilsonville related to MS Windows pop-ups
- Major issues at Bend severely limited data collection
- 122nd / SE Division was uneventful

Location	Data Collection Dates	Good Data
SW Wilsonville Rd. and Town Center Loop W	5/11/15 – 6/18/15	507 hrs (~21 days)
SE 97 th Ave. and SE Lawnfield Rd.	6/18/15 – 7/28/15	599 hrs (~25 days)
US 20 and Robal Rd.	6/25/15 – 11/6/15	196 hrs (~8 days)
SE Division St. and SE 122 nd Ave.	10/20/15 – 11/16/15	626 hrs (~26 days)

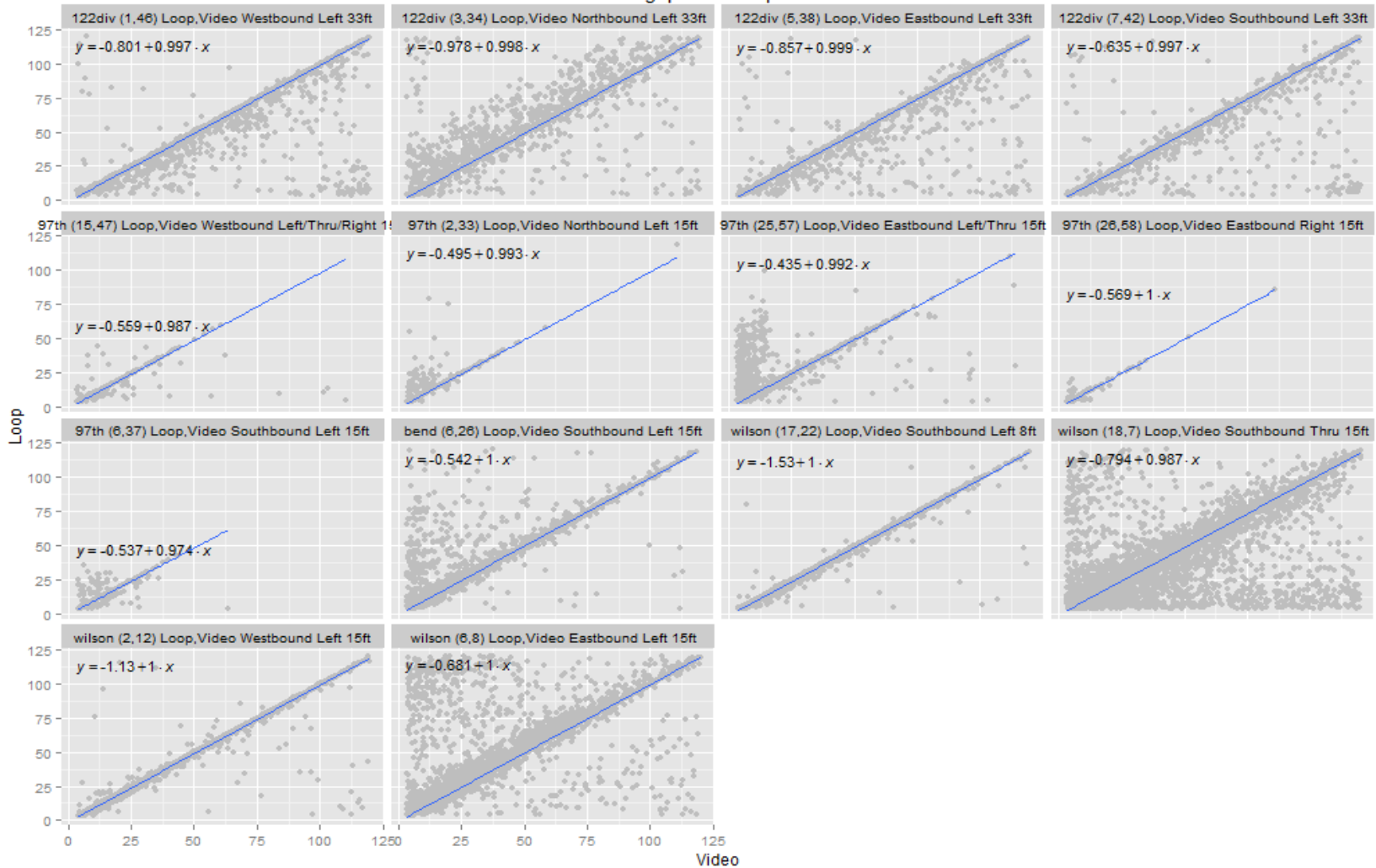
Preliminary Results

- Over 5 million unique records
- Tableau used as visualization tool



Preliminary Results

First time to gap out of stop bar detectors



Lessons Learned

- Use Linux (yeah, we probably knew this before we started)
- IT policies make it challenging for an external partner to monitor data collection
 - Data lost due to site visit gaps
- Support from project partners is critical
 - ODOT
 - Clackamas County
 - Portland Bureau of Transportation

Lessons Learned

- Support from vendors is also critical
 - Northwest Signal / Peek
 - Detection vendors / manufacturers
- While data collection module does not need to be on site, much bandwidth needed
- Processing power can be an issue

Next steps

- Very promising for data collection under Voyage
 - Ability to monitor virtually anything in controller (Dynamic Object set)
 - Future of Voyage in question, however
- Scalable to other platforms, however detector status by channel must be reported

Acknowledgements

- Oregon Department of Transportation
 - Jon Lazarus, Boettcher, Dave Hirsch and SPR 781 TAC
- Dan Carson and Jon Meusch, formerly of Northwest Signal / Peek
- Clackamas County
 - Bikram Raghubansh
- Portland Bureau of Transportation
 - Paul Zebell

Questions?



Thank you!