
Connected Intersections (CI) Testing & Conformity Task Force

Wednesday, April 21 (03:30 PM – 5:30 PM EDT)

Virtual Meeting

TF - J. Parikh / C. Spindler

SME - R. Roebuck / M. Insignares

T&C Field Test

- Purpose / Objective
- Testing Approach
- Captured Message Format
- Message Capture, Analysis and Visualization
 - SPaT/MAP Analysis & Summary Report
 - MAP Message Visualization
- Next Steps

CI Field Verification – Purpose and Objective

– Purpose:

- Field verification/conformance of equipped intersections' Over-The-Air (OTA) broadcast of SPaT and MAP messages per CI implementation guide

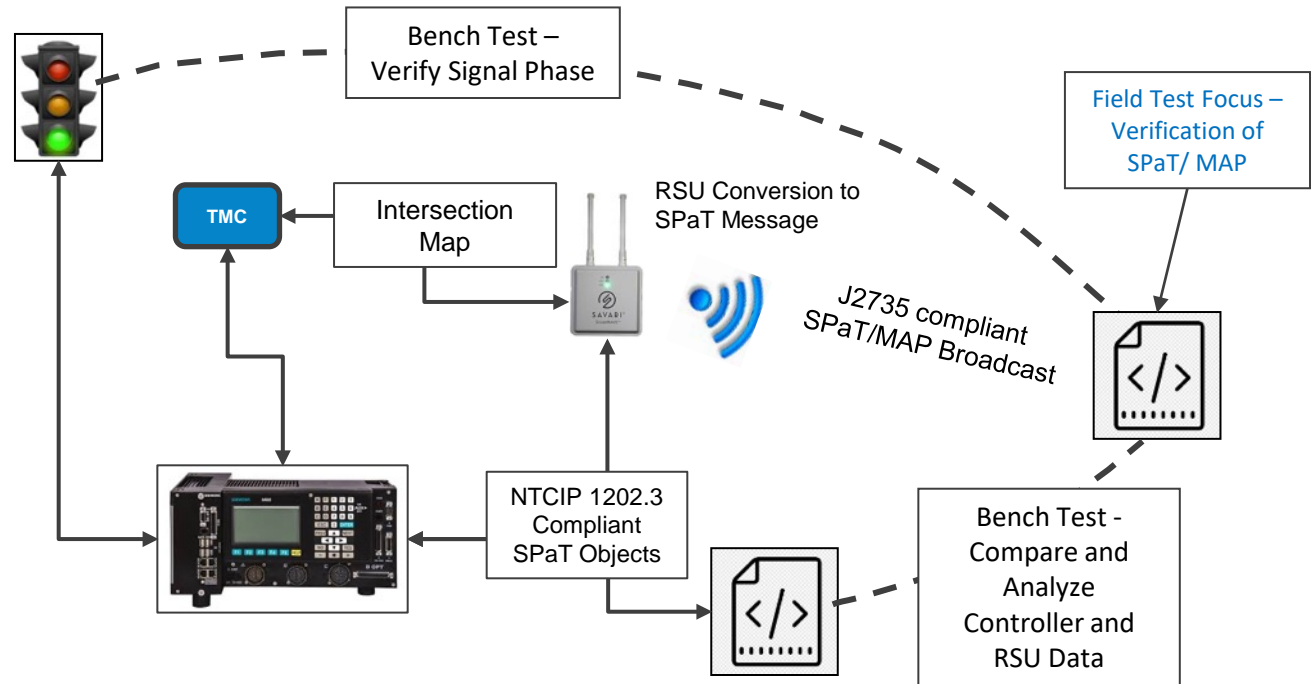
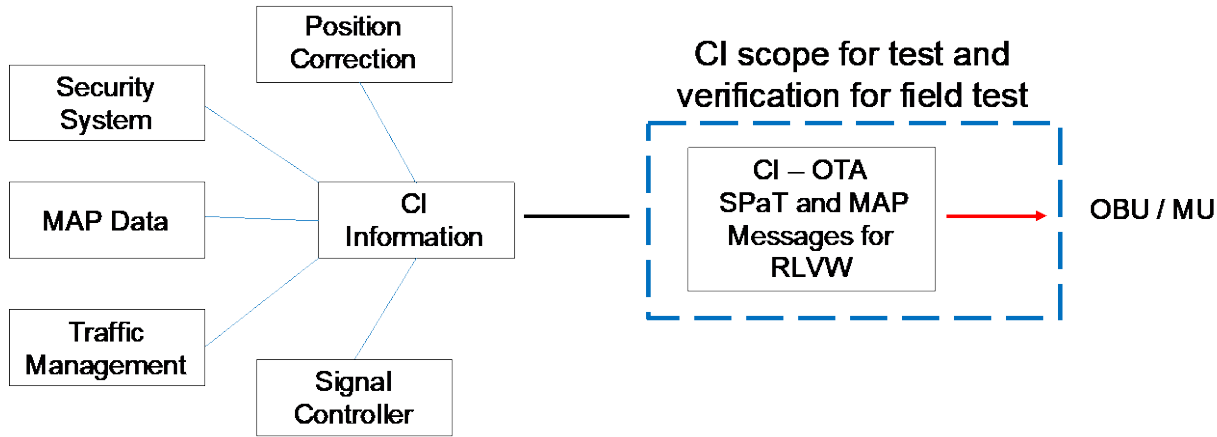
– Objective:

- Verify structure of data frames and data elements defined for SPaT/MAP for the Red-Light Violation Warning (RLVW) application as per J2735
- Verify data values in SPaT/MAP are valid within limits as specified in SAE J2735

Why We Need Field Test?

- To test and verify installed connected intersection:
 - As defined in CI implementation guide document:
 - per the SAE J2735 specification
 - per the required data elements specified for SPaT and MAP messages by the SPAT/MAP TF
 - per the required position correction data specified by the Position TF
 - digitally signed messages as per the Security TF
 - Visualize received SPaT and MAP messages for visual confirmation
 - Analyze and correlate received SPaT and MAP messages:
 - From the same intersection
 - Message provides complete geographic map of the intersection
 - all lanes are mapped
 - mapped lane length confirms to the requirement
 - Correlate intersection map with:
 - signal grouping, maneuvers, required lane attributes, etc.

CI Test Environment for Field Verification



Message Logging and Verification Using Test Tool

1. DSRC OBU-based device to capture and log OTA SPaT and MAP messages
 - Logged messages are conformant with SAE J2735 ASN.1 in JavaScript Object Notation (JSON) Encoding Rule (JER)
 - SPaT/MAP message log format – next slide
 - Message logging does not support C-V2X mode 4 Sidelink PC5 Interface
 - However, if an agency can log messages in JSON as specified, it can be processed using the analysis software
 - At this time, RTCM position correction messages are not supported
2. CAMP in a different project, developed software to convert logged PCAP file to JSON compliant message format
 - Conversion software is being tested
3. Analysis and Verification Software
 - Based on logged message format
 - Logged message analysis software developed by CAMP to process and generate a pass/fail report for verification
 - Generate SPaT and MAP messages in csv format for analysis and verification
 - Generate Google satellite view based detailed visualization of MAP message for visual verification of intersection geometry

Logged SPaT / MAP Message Payload in JSON

Unix Epoch in
Milliseconds

Message ID

SPaT Message
Payload in JSON

```
1614112834300,19,{'messageId':19,'value':{'intersections':[{'id':{'id':167},'revision':109,'status':'0000','moy':78493,'timeStamp':34382,'states':[{'signalGroup':1,'state-time-speed':{'eventState':'stop-And-Remain','timing':{'minEndTime':24708,'maxEndTime':24708}}},{'signalGroup':2,'state-time-speed':{'eventState':'stop-And-Remain','timing':{'minEndTime':24358,'maxEndTime':24358}}},{'signalGroup':3,'state-time-speed':{'eventState':'stop-And-Remain','timing':{'minEndTime':24708,'maxEndTime':25178}}},{'signalGroup':4,'state-time-speed':{'eventState':'stop-And-Remain','timing':{'minEndTime':24358,'maxEndTime':24358}}},{'signalGroup':5,'state-time-speed':{'eventState':'stop-And-Remain','timing':{'minEndTime':24688,'maxEndTime':24688}}}]}}},0
```

Signed Message
Indicator

Unix Epoch in
Milliseconds

Message ID

MAP Message
Payload in JSON

```
1614112838845,18,{'messageId':18,'value':{'msgIssueRevision':0,'layerType':'intersectionData','layerID':1,'intersections':[{'id':{'id':167},'revision':1,'refPoint':{'lat':422297898,'long':-837195685,'elevation':279},'laneWidth':306,'laneSet':[{'laneID':3,'ingressApproach':1,'laneAttributes':{'directionalUse':'80','sharedWith':'1c80','laneType':{'vehicle':{'value':'01','length':8}}},'maneuvers':'a400','nodeList':{'nodes':[{'delta':{'node-XY3':{'x':-1420,'y':-405}}},{'delta':{'node-XY1':{'x':-38,'y':-1}}},{'delta':{'node-XY4':{'x':-3300,'y':-73}}},{'delta':{'node-XY5':{'x':-5585,'y':-147}}},{'delta':{'node-XY6':{'x':-15423,'y':-365}}},{'delta':{'node-XY6':{'x':-13136,'y':-389}}}],'connectsTo':[{'connectingLane':{'lane':11,'maneuver':'8000','signalGroup':6},...{'laneID':15,'laneAttributes':{'directionalUse':'00','sharedWith':'0340','laneType':{'crosswalk':'c400'}},'maneuvers':'8000','nodeList':{'nodes':[{'delta':{'node-XY3':{'x':-1064,'y':-881}}},{'delta':{'node-XY3':{'x':-148,'y':1624}}}],{'laneID':16,'laneAttributes':{'directionalUse':'00','sharedWith':'0340','laneType':{'crosswalk':'c400'}},'maneuvers':'8000','nodeList':{'nodes':[{'delta':{'node-XY3':{'x':715,'y':-1380}}},{'delta':{'node-XY3':{'x':-1340,'y':-43}}}],{'laneID':17,'laneAttributes':{'directionalUse':'00','sharedWith':'0340','laneType':{'crosswalk':'c400'}},'maneuvers':'8000','nodeList':{'nodes':[{'delta':{'node-XY3':{'x':1193,'y':-751}}},{'delta':{'node-XY3':{'x':-72,'y':1645}}}],{'laneID':18,'laneAttributes':{'directionalUse':'00','sharedWith':'0340','laneType':{'crosswalk':'c400'}},'maneuvers':'8000','nodeList':{'nodes':[{'delta':{'node-XY3':{'x':-710,'y':1239}}},{'delta':{'node-XY3':{'x':1398,'y':44}}}]}}}]}}},0
```

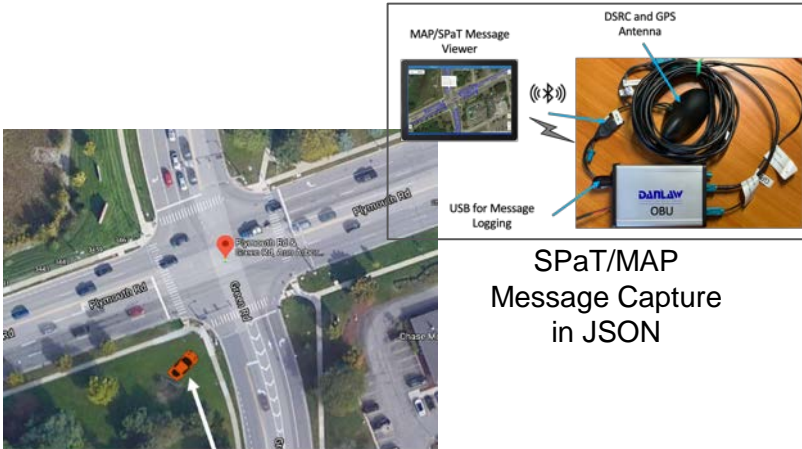
Signed Message
Indicator

Proposed Field Test Criteria

- Select up to 4 intersections for testing per agency:
 - Select intersection type:
 - Standard: 2 to 3 lanes, straight and turn movements
 - Moderately complex: 3 to 4 lanes, straight and turn movements, turn pockets
 - Complex: Moderately complex plus combination of protected and permissive movements, leading and lagging phase, actuated signal operation, etc.

- Message Logging:
 - Log messages for up to 10 minutes in stationary condition to get up to 5 complete cycles – Not required to drive through the intersection
 - If possible, conduct test during peak and off-peak time when different time plans are in effect

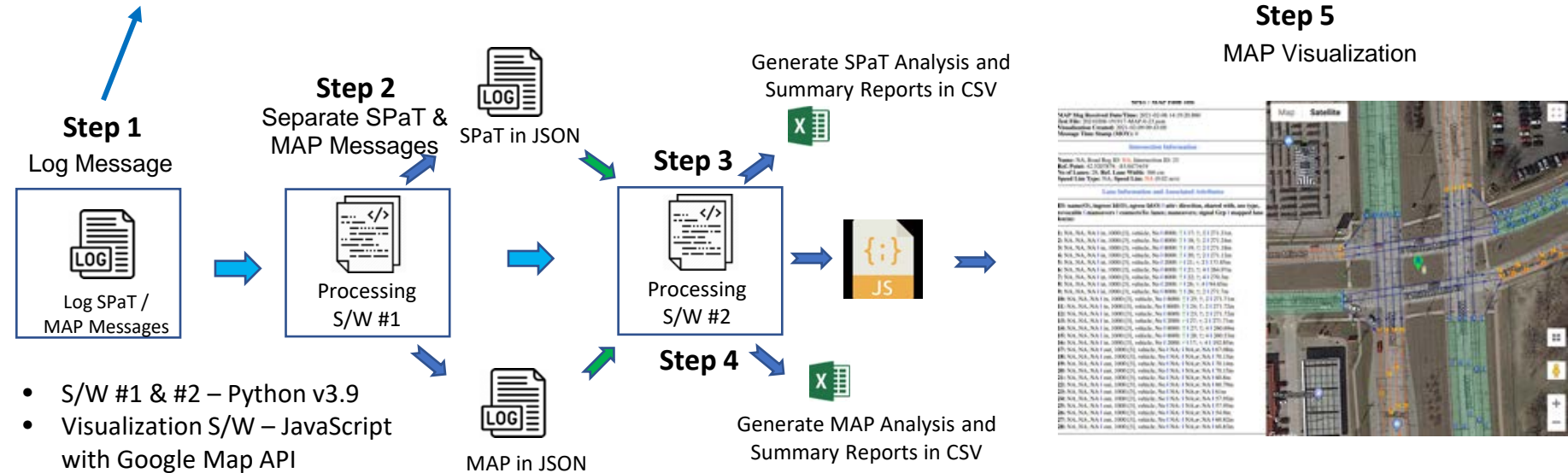
SPaT / MAP Message Capture, Analysis and Visualization



SPaT/MAP Message Capture in JSON

1. Log messages
2. Separate SPaT and MAP for processing
3. Process and generate analysis in CSV
4. Generate summary reports
5. Generate Visualization

Test Vehicle



- S/W #1 & #2 – Python v3.9
- Visualization S/W – JavaScript with Google Map API

SPaT Analysis Report in CSV

- List of all required data elements (as per CI impl. guide)
- Message received timestamp for each message
- Computed time difference between:
 - consecutive message received by the receiver (OBU)
 - consecutive message generated by RSU (from controller SPaT data)
 - message received time (OBU) and generated time (RSU)
- Computed Min / Max end time remaining in current phase from time mark value for each signal group

Test Name: SPaT Message																						
SPaT File: ../Field_Test_Data/AA_Test/20210223-201422-SPaT-0-155.json																						
Date & Time 2021/02/23 - 20:14:27.456 (UTC)																						
<<< START OF SPaT MESSAGE >>>																						
epoch_TS_m	epoch_UTC	epoch_diff_r	Msg_ID	TS_MOY	InTx_Name	InTx_Reg_ID	InTx_ID	Msg_Rev	InTx_Status	InTx_MOY	InTx_TS_ms	InTx_Time	MSG_TS_Dif	RX_Time_Dif	Sig_Grp_1	Event_State	Sig_Phase_1	Start_TM_1	Start_Time	MinEnd_TM	MinEnd_Tim	Min_ET_Ren
1.6141E+12	2021/02/23	100	19	NA	NA	NA	155	42	0	78467	27779	54d - 11:47:2	100	74	1	protected-M	Prot-Green	NA	00:00.0	9174	0:15:17.400	49.547
1.6141E+12	2021/02/23	102	19	NA	NA	NA	155	43	0	78467	27879	54d - 11:47:2	100	76	1	protected-M	Prot-Green	NA	00:00.0	9174	0:15:17.400	49.445
1.6141E+12	2021/02/23	99	19	NA	NA	NA	155	44	0	78467	27981	54d - 11:47:2	102	73	1	protected-M	Prot-Green	NA	00:00.0	9174	0:15:17.400	49.346
1.6141E+12	2021/02/23	98	19	NA	NA	NA	155	45	0	78467	28081	54d - 11:47:2	100	71	1	protected-M	Prot-Green	NA	00:00.0	9174	0:15:17.400	49.248
1.6141E+12	2021/02/23	103	19	NA	NA	NA	155	46	0	78467	28181	54d - 11:47:2	100	74	1	protected-M	Prot-Green	NA	00:00.0	9174	0:15:17.400	49.145
1.6141E+12	2021/02/23	98	19	NA	NA	NA	155	47	0	78467	28281	54d - 11:47:2	100	72	1	protected-M	Prot-Green	NA	00:00.0	9174	0:15:17.400	49.047
1.6141E+12	2021/02/23	100	19	NA	NA	NA	155	48	0	78467	28387	54d - 11:47:2	106	66	1	protected-M	Prot-Green	NA	00:00.0	9174	0:15:17.400	48.947
1.6141E+12	2021/02/23	102	19	NA	NA	NA	155	49	0	78467	28487	54d - 11:47:2	100	68	1	protected-M	Prot-Green	NA	00:00.0	9174	0:15:17.400	48.845
1.6141E+12	2021/02/23	99	19	NA	NA	NA	155	50	0	78467	28585	54d - 11:47:2	98	69	1	protected-M	Prot-Green	NA	00:00.0	9174	0:15:17.400	48.746
1.6141E+12	2021/02/23	100	19	NA	NA	NA	155	51	0	78467	28685	54d - 11:47:2	100	69	1	protected-M	Prot-Green	NA	00:00.0	9174	0:15:17.400	48.646
1.6141E+12	2021/02/23	101	19	NA	NA	NA	155	52	0	78467	28792	54d - 11:47:2	107	63	1	protected-M	Prot-Green	NA	00:00.0	9174	0:15:17.400	48.545
1.6141E+12	2021/02/23	100	19	NA	NA	NA	155	53	0	78467	28892	54d - 11:47:2	100	63	1	protected-M	Prot-Green	NA	00:00.0	9174	0:15:17.400	48.445
1.6141E+12	2021/02/23	98	19	NA	NA	NA	155	54	0	78467	28990	54d - 11:47:2	98	63	1	protected-M	Prot-Green	NA	00:00.0	9174	0:15:17.400	48.347
1.6141E+12	2021/02/23	100	19	NA	NA	NA	155	55	0	78467	29090	54d - 11:47:2	100	63	1	protected-M	Prot-Green	NA	00:00.0	9174	0:15:17.400	48.247
1.6141E+12	2021/02/23	103	19	NA	NA	NA	155	56	0	78467	29195	54d - 11:47:2	105	61	1	protected-M	Prot-Green	NA	00:00.0	9174	0:15:17.400	48.144
1.6141E+12	2021/02/23	100	19	NA	NA	NA	155	57	0	78467	29295	54d - 11:47:2	100	61	1	protected-M	Prot-Green	NA	00:00.0	9174	0:15:17.400	48.044
1.6141E+12	2021/02/23	98	19	NA	NA	NA	155	58	0	78467	29388	54d - 11:47:2	93	66	1	protected-M	Prot-Green	NA	00:00.0	9174	0:15:17.400	47.946
1.6141E+12	2021/02/23	99	19	NA	NA	NA	155	59	0	78467	29488	54d - 11:47:2	100	65	1	protected-M	Prot-Green	NA	00:00.0	9174	0:15:17.400	47.847
1.6141E+12	2021/02/23	101	19	NA	NA	NA	155	60	0	78467	29578	54d - 11:47:2	90	76	1	protected-M	Prot-Green	NA	00:00.0	9174	0:15:17.400	47.746

SPaT Analysis Summary Report

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Test Name:	SPaT - Test Location:					# of Msg:	2123	Test Time:	0:15:09.058				
SPaT File:	SPaT - 20210223-201422-SPaT-0-155_Summary_Report.csv					#of Sig Grp:	2	Sig Groups:	[1, 2]				
Date & Time	2021/02/23 - 20:14:27.456 (UTC)												
	SAE J2735 SPaT Data Frames and Elements					M/O/C in	Pass/Fail	M/O/C in CI	Pass/Fail	Invalid	Data Range	Data Range	Remark
						SAE J2735	J2735	Impl - RLVW	CI Impl RLVW	Data	Low	High	
messageId=DE_DSRC_MessageID=19 (SPaT UPER)						M	Pass	M	Pass	78467	0	32767	
timeStamp=DE_MinuteOfTheYear						O	Fail	M	Fail		0	5274040	Invalid or incorrect value
name=DE_DescriptiveName (only for debug)						O	--	O	--				
intersections=DF_IntersectionStateList						M	Pass	M	Pass				
name=DE_DescriptiveName (only for debug)						O	--	O	--				
id=DF_IntersectionReferencID						M	Pass	M	Pass				
region=DE_RoadRegulatorID						O	--	M	Fail		0	65535	Missing data
id=DE_IntersectionID						M	Pass	M	Pass		0	65535	
revision=DE_MsgCount						M	Pass	M	Pass		0	127	
status=DE_IntersectionStatusObject						M	Pass	M	Fail	0	513	65532	Invalid or incorrect value
moy=DE_MinuteOfTheYear						O	--	O	--		0	5274040	
timeStamp=DE_Dsecond						O	--	M	Pass		0	65535	
enabledLanes=DF_EnabledLaneList						O	--	C	--				C-When revocable lane is active
states=DF_MovementList=1 to 255 x DF_MovementState						M	Pass	M	Pass				
movementName=DE_DescriptiveName (only for debug)						O	--	O	--				
signalGroup=DE_SignalGroupID						M	Pass	M	Pass		0	255	
state-time-speed=DF_MovementEventList						M	Pass	M	Pass				
eventState=DE_MovementPhaseState						M	Pass	M	Pass				
timing=DF_TimeChangeDetails						O	--	M	Pass				
startTime=DE_TimeMark						O	--	C	--		0	36001	C-If available
minEndTime=DE_TimeMark						M	Pass	M	Pass		0	36001	
maxEndTime=DE_TimeMark						O	--	M	Pass		0	36001	
likelyTime=DE_TimeMark						O	--	--	--		0	36001	
confidence=DE_TimeIntervalConfidence						O	--	--	--		0	15	
nextTime=DE_TimeMark						O	--	C	Fail		0	36001	Missing data
Notes:	Columns A-F SPaT objects as defined in SAE J2735												
	Column G	M - Mandatory, O - Optional, or C - Conditional objects for SPaT as defined in J2735 specification											
	Column H	Pass (present), Fail (absent) or -- (Not Applicable) for the objects in SPaT messages as per column G											
	Column I	M - Mandatory, O - Optional or C - Conditional objects for SPaT as defined in the CI Implementation Guide for RLVW application											
	Column J	Pass (present), Fail (absent) or -- (Not Applicable) for the objects in SPaT messages as per column I											
	Column K	Invalid or incorrect data value for the object or the value is outside the range as listed in columns L and M											
	Column L	Valid lowest numeric data value as defined in J2735. Blank indicates - data frame or alphanumeric object											
	Column M	Valid highest numeric data value as defined in J2735. Blank indicates - data frame or alphanumeric object											
	Column N	Remark											

MAP Analysis Summary Report

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Test Name: MAP - Test Location:													
MAP File: MAP - 20210223-201422-MAP-0-86_Summary_Report.csv													
Date & Time: 2021-02-23 20:14:53.384 (UTC)													
						M/O/C in	Pass/Fail	M/O/C in Cl	Pass/Fail	Invalid	Data Range	Data Range	Remark
	SAE J2735 MAP Data Frames and Elements					SAE J2735	Impl - RLWV	Cl RLWV	Data		Low	High	
messageId=DE_DSRCmsgID=18 (MAP UPER)						M	Pass	M	Pass		0	32767	
msgIssueRevision=DE_MsgCount						M	Pass	M	Pass		0	127	
intersections=DF_IntersectionGeometryList=1 to 32 X DF_IntersectionGeome						O	--	M	Pass				
id=DF_IntersectionReferenceID						M	Pass	M	Pass				
region=DE_RoadRegulatorID						O	--	M	Pass		0	65535	
id=DE_IntersectionID						M	Pass	M	Pass		0	65535	
revision=DE_MsgCount						M	Pass	M	Pass		0	127	
refPoint=DF_Position3D						M	Pass	M	Pass				
lat=DE_Latitude						M	Pass	M	Pass		-90000000	90000000	
long=DE_Longitude						M	Pass	M	Pass		-90000000	90000000	
elevation=DE_Elevation						O	--	M	Pass		-4096	61439	
laneWidth=DE_LaneWidth						O	--	M	Pass		0	32767	
speedLimits=DF_SpeedLimitList=1 to 9 X DF_RegulatorySpeedLimit						O	--	M	Pass				
type=DE_SpeedLimitType						C (if Incl)	Pass	M	Pass				
speed=DE_Velocity						C (if Incl)	Pass	M	Pass		0	8191	
laneSet=DF_LaneList=1 to 255 X DF_GeneriLane						M	Pass	M	Pass				
laneID=DE_LaneID						M	Pass	M	Pass		0	254	0=unknown, 255=future use
laneAttributes=DF_LaneAttributes						M	Pass	M	Pass				
directionalUse=DE_LaneDirection						M	Pass	M	Pass		0	1	
sharedWith=DE_LaneSharing						M	Pass	M	Pass				
laneType=DF_LaneTypeAttributes (revocable)						M	Pass	M	Pass				
maneuvers=DE_AllowedManeuvers						O	--	M	Pass		0	4096	12 bits
nodeList=DF_NodeListXY=Choice of DF_NodeSetXY OR DF_ComputedLai						M	Pass	M	Pass				
nodes=DF_NodeSetXY=2 to 63 X DF_NodeXY						M	Pass	M	Pass				
delta=DF_NodeOffsetPointXY						M	Pass	M	Pass				
node-XY1=DF_Node_XY_20b						O.1 (1..*)	Pass	O.4 (1..*)	--				
x=DE_Offset_B10						C (if node-XY)	Pass	C (if node-XY)	--		-512	511	
y=DE_Offset_B10						C (if node-XY)	Pass	C (if node-XY)	--		-512	511	
node-XY2=DF_Node_XY_22b						O.1 (1..*)	Pass	O.4 (1..*)	--				
x=DE_Offset_B11						C (if node-XY)	Pass	C (if node-XY)	--		-1024	1023	
y=DE_Offset_B11						C (if node-XY)	Pass	C (if node-XY)	--		-1024	1023	
node-XY3=DF_Node_XY_24b						O.1 (1..*)	Pass	O.4 (1..*)	--				
x=DE_Offset_B12						C (if node-XY)	Pass	C (if node-XY)	--		-2048	2047	
y=DE_Offset_B12						C (if node-XY)	Pass	C (if node-XY)	--		-2048	2047	
node-XY4=DF_Node_XY_26b						O.1 (1..*)	Pass	O.4 (1..*)	--				
x=DE_Offset_B13						C (if node-XY)	Pass	C (if node-XY)	--		-4096	4095	
y=DE_Offset_B13						C (if node-XY)	Pass	C (if node-XY)	--		-4096	4095	
node-XY5=DF_Node_XY_28b						O.1 (1..*)	Pass	O.4 (1..*)	--				
x=DE_Offset_B14						C (if node-XY)	Pass	C (if node-XY)	--		-8192	8191	
y=DE_Offset_B14						C (if node-XY)	Pass	C (if node-XY)	--		-8192	8191	
node-XY6=DF_Node_XY_32b						O.1 (1..*)	Pass	O.4 (1..*)	--				
x=DE_Offset_B16						C (if node-XY)	Pass	C (if node-XY)	--		-32768	32767	
y=DE_Offset_B16						C (if node-XY)	Pass	C (if node-XY)	--		-32768	32767	
attributes=DF_NodeAttributeSetXY						O	Pass	O	--				
data=DF_LaneDataAttributeList=1 to 8 X DF_LaneDataAttribute						O	--	O	--				
DF_LaneDataAttribute=Choice						O	Pass	C (if data is i	--				
speedLimits=DF_SpeedLimitList=1 to 9 X DF_RegulatorySpeed						O	--	C (if data is i	--				
type=DE_SpeedLimitType						C (if speedLi	Pass	C (if data is i	--				
speed=DE_Velocity						C (if speedLi	--	C (if data is i	--				
dWidth=DE_Offset_B10						O	Pass	C (for differe	--				
dElevation=DE_Offset_B10						O	Pass	C (for differe	--				
computed=DF_Computed Lane						O	Pass	C (For comp	--				
referenceLaneID=DE_LaneID						C (if comput	Pass	C (For comp	--				
offsetXaxis=Choice						C (if comput	Pass	C (For comp	--				
small=DE_DriverLineOffsetSmall						O.2 (1..*) (if	Pass	O.7 (1) (For i	--				
large=DE_DriverLineOffsetLarge						O.2 (1..*) (if	Pass	O.7 (1) (For i	--				
offsetYaxis=Choice						C (if comput	Pass	C (For comp	--				
small=DE_DriverLineOffsetSmall						O.3 (1..*) (if	Pass	O.3 (1) (For i	--				
large=DE_DriverLineOffsetLarge						O.3 (1..*) (if	Pass	O.3 (1) (For i	--				
rotateXY=DE_Angle						O	Pass	O (For comp	--				
connectsTo=DF_ConnectsToList=1 to 16 X DF_Connection						O	Pass	M	Pass				
connectingLane=DF_ConnectingLane						C (if connect	Pass	M	Pass				
lane=DE_LaneID						C (if connect	Pass	M	Pass				
maneuvers=DE_AllowedManeuver						O	Pass	O	--				
signalGroup=DE_SignalGroupID						O	Pass	M	Pass				

Notes:

- Columns A-F MAP objects as defined in SAE J2735
- Column G M - Mandatory, O - Optional, or C - Conditional objects for MAP as defined in J2735 specification
- Column H Pass (present), Fail (absent) or -- (Not Applicable) for the objects in MAP messages as per column G
- Column I M - Mandatory, O - Optional or C - Conditional objects for MAP as defined in the CI Implementation Guide for RLWV application
- Column J Pass (present), Fail (absent) or -- (Not Applicable) for the objects in MAP messages as per column I
- Column K Invalid or incorrect data value for the object or the value is outside the range as listed in columns L and M
- Column L Valid lowest numeric data value as defined in J2735. Blank indicates - data frame or alphanumeric object
- Column M Valid highest end of data value as defined in J2735. Blank indicates - data frame or alphanumeric object
- Column N Remark

MAP Message Visualization

SPaT / MAP Field Test

MAP Msg Received Date/Time (UTC): 2021-02-23 20:14:53.384
 Test File: 20210223-201422-MAP-0-86.json
 Visualization Created: 2021-04-08 14:31:02
 Message Time Stamp (MOY): 0

Intersection Information

Name: NA, Road Reg ID: NA, Intersection ID: 86
 Ref. Point: 42.3050173, -83.6928826
 No of Lanes: 28; Ref. Lane Width: 305 cm
 Speed Lim Type: NA; Speed Lim: NA (0.02 m/s)

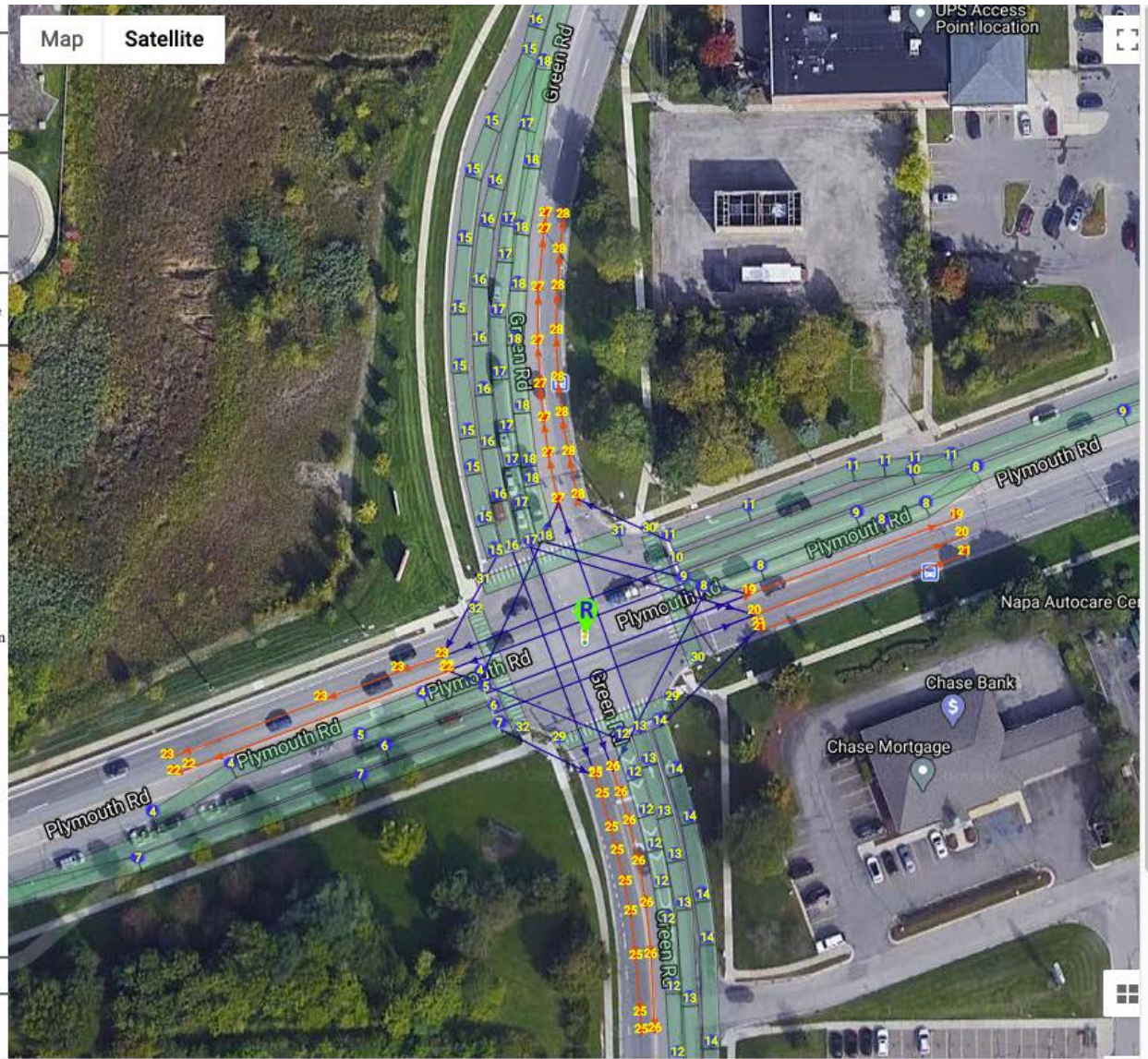
Lane Information and Associated Attributes

ID: name(O), ingress Id(O), egress Id(O) | attr: direction, shared with, use type, revocable | maneuvers | connectsTo: lanes; maneuvers; signal Grp | mapped lane len(m)

- 4: NA, 1, NA | in, 1d80:[3,4,5,7,8], vehicle, Yes | 4000: ↑ | 27; ↓; 5 | 65.53m
- 5: NA, 1, NA | in, 1d80:[3,4,5,7,8], vehicle, Yes | 8000: ↑ | 19; ↑; 2 | 24.67m
- 6: NA, 1, NA | in, 1d80:[3,4,5,7,8], vehicle, Yes | 8000: ↑ | 20; ↑; 2 | 401.38m
- 7: NA, 1, NA | in, 1d80:[3,4,5,7,8], vehicle, Yes | 2400: ↑ | 25; ↑; 2 | 99.52m
- 8: NA, 3, NA | in, 1d80:[3,4,5,7,8], vehicle, Yes | 4000: ↑ | 26; ↓; 1 | 54.71m
- 9: NA, 2, NA | in, 1d80:[3,4,5,7,8], vehicle, Yes | 8000: ↑ | 22; ↑; 6 | 275.3m
- 10: NA, 2, NA | in, 1d80:[3,4,5,7,8], vehicle, Yes | 8000: ↑ | 23; ↑; 6 | 275.55m
- 11: NA, 2, NA | in, 1d80:[3,4,5,7,8], vehicle, Yes | 2400: ↑ | 28; ↑; 6 | 54.1m
- 12: NA, 6, NA | in, 1d80:[3,4,5,7,8], vehicle, Yes | 4000: ↑ | 22; ↓; 3 | 72m
- 13: NA, 6, NA | in, 1d80:[3,4,5,7,8], vehicle, Yes | 8000: ↑ | 27; ↑; 8 | 225.88m
- 14: NA, 6, NA | in, 1d80:[3,4,5,7,8], vehicle, Yes | 2400: ↑ | 21; ↑; 1 | 94.95m
- 15: NA, 5, NA | in, 1d80:[3,4,5,7,8], vehicle, Yes | 2400: ↑ | 23; ↑; 4 | 94.86m
- 16: NA, 5, NA | in, 1d80:[3,4,5,7,8], vehicle, Yes | 8000: ↑ | 25; ↑; 4 | 202.6m
- 17: NA, 5, NA | in, 1d80:[3,4,5,7,8], vehicle, Yes | c000: ↑ | 20,26; ↑; 7,7 | 201.64m
- 18: NA, 5, NA | in, 1d80:[3,4,5,7,8], vehicle, Yes | 4000: ↑ | 19; ↓; 7 | 87.34m
- 19: NA, NA, 7 | out, 1d80:[3,4,5,7,8], vehicle, Yes | 8000: ↑ | NA; NA | 40.42m
- 20: NA, NA, 7 | out, 1d80:[3,4,5,7,8], vehicle, Yes | 8000: ↑ | NA; NA | 40.43m
- 21: NA, NA, 7 | out, 1d80:[3,4,5,7,8], vehicle, Yes | 8000: ↑ | NA; NA | 40.86m
- 22: NA, NA, 8 | out, 1d80:[3,4,5,7,8], vehicle, Yes | 8000: ↑ | NA; NA | 53.47m
- 23: NA, NA, 8 | out, 1d80:[3,4,5,7,8], vehicle, Yes | 8000: ↑ | NA; NA | 53.31m
- 25: NA, NA, 10 | out, 1d80:[3,4,5,7,8], vehicle, Yes | 8000: ↑ | NA; NA | 47.95m
- 26: NA, NA, 10 | out, 1d80:[3,4,5,7,8], vehicle, Yes | 8000: ↑ | NA; NA | 48.59m
- 27: NA, NA, 9 | out, 1d80:[3,4,5,7,8], vehicle, Yes | 8000: ↑ | NA; NA | 52.71m
- 28: NA, NA, 9 | out, 1d80:[3,4,5,7,8], vehicle, Yes | 8000: ↑ | NA; NA | 51.87m
- 29: NA, NA, NA | in, 0340:[6,7,9], xwalk, Yes | 8000: ↑ | NA; NA | 21.81m
- 30: NA, NA, NA | in, 0340:[6,7,9], xwalk, Yes | 8000: ↑ | NA; NA | 25.32m
- 31: NA, NA, NA | in, 0340:[6,7,9], xwalk, Yes | 8000: ↑ | NA; NA | 26.37m
- 32: NA, NA, NA | in, 0340:[6,7,9], xwalk, Yes | 8000: ↑ | NA; NA | 23.49m

LEGENDS

NA = Not Available; in = ingress; out = egress
 ↑ = Go Straight; ↓ = Lt. Turn; ↑ = Rt. Turn; ∇ = Yield
 ○ = Stop & Go; ○ = U Turn



Next Steps

- Test and analysis tool, procedures and specifications to be shared with agencies
- Compile information on testing and analysis for agencies who wish to conduct self verification
- Develop template for validation / implementation guide / lessons learned for agencies
- ITE project outcome can incorporate lessons learned from bench/lab and Ann Arbor field tests
- Verification subcommittee weekly meetings
 - Status and Q&A with agencies

Questions
