



REQUEST FOR PROPOSAL

Real-time and Historical Sourced Data and Platform for the Operation Green Light (OGL) Regional Traffic Signal Program

**Requested by
The Mid-America Regional Council**

January 19, 2024

REQUEST FOR PROPOSAL (RFP)

Real-time and Historical Sourced Data and Platform for Operation Green Light (OGL)

A. INTRODUCTION

The Mid America Regional Council (MARC) leads the Regional Traffic Signal Operations & Management program, “Operation Green Light” (OGL), that improves traffic flow and reduces vehicle emissions throughout the Kansas City metro area. The program is operated by dedicated MARC staff. OGL works with federal, state and 27 local agencies to develop and implement a system that coordinates traffic signal timing plans and communication between traffic signal equipment for 750 traffic signals across jurisdictional boundaries. The program is overseen by a steering committee composed of representatives from each participating agency, including local municipalities along with Kansas and Missouri Departments of Transportation and their assigned Federal Highway Administration (FHWA) representatives.

To take advantage of newly available data sources and software tools, MARC and OGL seek to enable their partner agencies to improve the regional transportation network through real-time and historical data and performance measures. OGL submitted and was awarded an FHWA Strengthening Mobility and Revolutionizing Transportation (SMART) grant to evaluate various systems and assess what impact these systems can have in supporting system operations.

MARC is seeking proposals from qualified firms to provide regional agencies with traffic data, analysis, reporting, and other metrics to assess operational conditions on the arterial roadways across the Kansas City metropolitan area. Up to four (4) vendors will be selected via this RFP to provide historical and real-time data through a software platform to allow agencies to utilize transportation data and Advanced Traffic Signal Performance Measures (ATSPMs) over a 12-month evaluation period. At the conclusion of the 12-month period, OGL will submit a request for Stage 2 of the SMART grant process to implement one or more systems (which could include one or more of the four evaluated systems) for a longer-term operation. The length of the future contract is unknown and not assured.

B. PRE-PROPOSAL MEETING

There will be an optional pre-proposal meeting for all interested vendors on **Friday February 2nd from 1:00 PM to 2:00 PM CST**. The meeting will be held virtually using Microsoft Teams, and vendors will have the opportunity to ask questions.

Pre-proposal Conference Call Information:

[Click here to join the meeting](#)

Meeting ID: 222 132 755 081

Passcode: k4Diyp

Or call in (audio only)

+1 402-513-0085, 400702712# United States, Omaha

(877) 571-4499, 400702712# United States (Toll-free)

Phone Conference ID: 400 702 712#

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C. QUESTIONS

Vendors may submit written questions, request clarifications, or request exceptions to this RFP by the questions deadline shown in the Estimated Schedule. All written inquiries shall be directed to Ray M. Webb, Manager of Traffic Operations at (816) 701-8358 or by e-mail to rwebb@marc.org. MARC will post responses to any inquiries received by the date and time shown in the Estimated Schedule.

MARC will respond to vendor questions via addendum, which will be posted on the MARC RFP website (<https://www.marc.org/Requests-for-Proposals>) and DemandStar (<https://business.demandstar.com>) no later than February 14, 2024.

D. OPTIONAL INTERVIEWS/DEMONSTRATIONS

At its sole discretion, MARC may determine that an interview/demonstration may help with system selection. If exercised, MARC will provide details to short-listed vendors along with potential interview dates to be conducted during the week of February 26, 2024. All interviews/demonstrations will be held virtually.

E. ESTIMATED SCHEDULE

The Estimated Schedule includes the expected dates and times for each activity associated with the RFP. All dates and times are subject to change based on the best interests of MARC and the project; however, effort will be made to maintain the dates and times shown here.

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Milestone	Date	Time
Request for Proposal (RFP) Released	1/19/2024	-
Pre-proposal Meeting (Virtual)	2/2/2024	1:00-2:00 PM CST
Deadline to Submit Written Questions	2/9/2024	5:00 PM CST
Response to Written Questions	2/14/2024	5:00 PM CST
Proposal Due	2/21/2024	3:00 PM CST
Optional Interviews/Demonstrations	Week of 2/26	Various
Recommendation of Award	3/8/2024	Close of Business Day
Contract negotiations and award, Notice to Proceed (NTP)	3/26/2024	Close of Business Day
System set-up for selected vendors	4/26/2024	-
System operation	3/26/2024 – 3/26/2025	-

PROPOSAL SUBMITTAL REQUIREMENTS

Open Records Act and Proprietary Information

The Mid-America Regional Council (MARC) is a public organization and is subject to the Missouri Open Records Act (Chapter 610, RSMo). All records obtained or retained by MARC are considered public records and are open to the public or media upon request unless those records are specifically protected from disclosure by law or exempted under the Missouri Sunshine Law. All contents of a response to a Request for Bids, Qualifications, Proposals or information issued by MARC are considered public records and subject to public release following decisions by MARC regarding the bid request. If a vendor has information that it considers proprietary, they shall identify documents or portions of documents having descriptions of scientific and technological innovations in which it has a proprietary interest or other information that is protected from public disclosure by law, which is contained in a Proposal. After either a contract is executed or all submittals are rejected, if a request is made to inspect information submitted and if documents are identified as “Proprietary Information” as provided above under Missouri Sunshine Law, MARC will notify the vendor of the request for access, and it shall be the burden of the vendor to establish that those documents are exempt from disclosure under the law.

To be eligible for consideration, vendors must submit One (1) copy of each of the following:

- Portable Document Format (PDF) of the response to the RFP, including *Preliminary*

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Information, Proposal Narrative, and Required Disclosures and Attachments defined in Section F below

- Microsoft® Excel® version of the completed requirements matrix

3:00:00 PM Central Standard Time on February 21, 2024

Only emailed submittals will be accepted. All attached documents must be in PDF or Excel format as described below, fully completed, and submitted with proposal. The MARC email system limits the size of email attachments to under 10MB (cumulative of all attachments) and emails exceeding this limit may be rejected by the system. Proposals received after the designated time will not be considered. The proposal shall be titled as:

Proposal to: OGL Real-time and Historical Sourced Data and Platform

Proposals must be emailed to Ray Webb at: rwebb@marc.org by the date and time indicated above. No late proposals will be accepted. It is the proposer's responsibility to confirm receipt of the proposal.

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F. INSTRUCTIONS FOR SUBMITTING PROPOSALS

I. Proposal Format

Vendors interested in responding to this request are invited to submit a proposal, which shall meet the listed requirements and include the following minimum information. All proposals shall respond clearly to the questions and information requested in the RFP, shall be complete in every respect, and must answer concisely and clearly all proposed requirements stipulated by the RFP. All pages shall be 8.5" x 11" and all text shall be no smaller than 12 pt. font. The proposal should follow the format of the RFP in presentation of the information requested by the RFP, listing each response under the appropriate section number. The proposed pricing schedule should follow the RFP responses and be in the same format as provided in the RFP. A grand total of all data and service costs must be included.

Preliminary Information (limit 3 pages)

1. Title Page: Include one title page indicating the RFP subject, official name of the firm, mailing address, telephone and fax numbers, date, name of primary contact person, and contact person's phone number and email address.
2. Transmittal Letter (limit one page): The letter must be signed by an official authorized to solicit business and enter into contracts for the firm. Provide contact name with phone number and email if different from the person signing the letter. The letter shall (i) indicate whether there are any conflicts of interest, limiting the firm's ability to provide the requested services; (ii) acknowledge the receipt of this RFP and any addendum to the RFP; And (iii) indicate that the proposal is a firm offer to enter into a contract within a period of 120 days from the proposal due date.
3. Table of Contents

Proposal Narrative (limit 20 total pages)

4. Project Understanding and Approach: This section should provide an overall understanding of the project and the general approach to be taken by the vendor. This section must include a description of project management, system implementation approach, product support, and training. This section may include a discussion of known constraints, challenges, and the vendor's approach, solutions, and assumptions.
5. System Functionality: Briefly describe system capabilities and functionality and include expanded comments from the Requirements Matrix as needed. Highlight special features and strengths of the system, especially as they address OGL needs.
6. Firm Qualifications: Provide a brief description of the firm, including location of offices and headquarters, number of employees, and number of years in business. Include the name and address of the contracting firm, together with the name,

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telephone number, and e-mail address of the primary contact person for purposes of this proposal.

Provide a list of similar deployments in size and scope (three deployments minimum) performed within the last 3 years to include dollar amount, project description, and owner/client/reference contacts including phone numbers and addresses. Provide references: Names, email addresses, and phone numbers for the similar projects.

7. Project Schedule: Include a proposed schedule for completing the work. Include/highlight major deliverables and milestones.
8. Cost Proposal: The maximum amount that will be awarded to each selected vendor will be \$100,000 for the 12-month evaluation period. Respondents must acknowledge that what they are proposing will not exceed the maximum amount. Additionally, the respondents shall provide their standard pricing model if they would be selected to move forward for the ongoing contract. Include pricing for the base system along with costs for additional features, functions, modules, or services. The goal of this requirement is to understand the financial impacts associated with deploying the system at scale.

Vendors should also include the price for required 3rd party data that is to be purchased. OGL recognizes that the cost of third-party data may not be entirely within the vendor's control, sufficient information should be provided to allow OGL to make an appropriate budgetary estimate.

OGL also recognizes that for some specialty systems, especially those focused on using data from intersection detectors obtained through TransSuite, effective system-wide deployment may be dependent on the installation of intersection-based detection. These specialty systems should provide sufficient information to allow OGL to understand the pricing and cost model at various scalability points (for example, per intersection for 10, 50, and 100 intersections, or per corridor for 1, 10, and 20 corridors – or however the vendor's cost model is structured).

Required Attachments and Disclosures (page limits defined where applicable)

9. Disadvantaged Business Enterprise (DBE) Requirements and Participation: This project is funded in part by USDOT and is required to follow rule 49 CFR part 26, Disadvantage Business Enterprise Program. This project has a DBE goal of 0%. See **Attachment A**.
10. Completed Requirements Matrix (in MS Excel format): See **Attachment B**.

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11. Sample System Output: As an option, vendors may include, as an appendix, up to 15 pages of sample graphics, reports, user interface images, dashboards, data views, system outputs, brochures, etc. This section is intended for supplemental information only and should not include additional proposal narrative.
12. Software License Agreement: Vendors shall attach a standard software license agreement with terms modified to accommodate the scope of services and requirements of this project.

II. Discrepancies in Proposals

If discrepancies between sections or other errors are found in a proposal, MARC may reject the proposal, or at its sole discretion, retain the proposal and ignore any obvious inadvertent non-substantive errors.

III. Vendor's Conditions

Any conditions or expectations on the part of the vendor for performance by MARC must be set forth in the proposal.

IV. System for Award Management System (sam.gov) Registration

This project is being financed in part by USDOT funds as such, the selected firm(s) must be registered with the US Government's System for Award Management system ([SAM.gov](https://sam.gov)). Failure to register will invalidate your participation in this project. Due to registration backlogs, if not already registered, timely registration is encouraged.

G. DEFINITIONS OF TERMS

Automated Traffic Signal Performance Measures (ATSPMs) – ATSPM's show real-time and historical functionality at signalized intersections. This will allow regional agencies and the OGL program to directly measure what previously could only be estimated and modeled to improve operations throughout the Kansas City metropolitan area.

Advanced Traffic Management System (ATMS) – Software that serves as a central control system, communicating to traffic signal controllers and other traffic-related devices and systems.

Crowd-Sourced Data - Crowdsourced data collect time-stamped location and speed data sourced from cars, cell phones, or other electronic GPS systems, mobile applications, etc.

Vendor – The prime vendor and all associated subcontractors that will provide all contract deliverables.

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Collusion – An agreement or cooperation between two or more persons or entities to accomplish a fraudulent, deceitful, or unlawful purpose.

H. SCOPE OF SERVICES AND REQUIREMENTS

I. General

Overall Objectives and Context

The mission of the OGL program is as stated as follows: “Operation Green Light monitors and manages the existing transportation system through safe and efficient traffic signal operations to reduce travel time, fuel consumption and air pollution.”

To accomplish all elements of this mission more effectively, OGL is seeking to leverage new technologies and data sources that can help drive data-driven decisions. It is anticipated that these new technologies will help them overcome the current challenge of needing comprehensive and consistent information about operations across the metro without requiring significant time, expertise, or expense. At its core, there are two primary needs 1) to fully understand the system’s operational status, and 2) the ability to effectively communicate that operational status to others. The following outline adds detail to these primary needs:

1. Fully understand the system status
 - a. Information is needed in the following categories:
 - i. General regional and corridor level operations
 - ii. Detailed signal level operations
 - iii. Real-time operational status
 - iv. Operational trends over time
 - b. Information is also needed to help drive operational decision-making in the following subcategories:
 - i. Various locations (intersections and definable corridors and regions)
 - ii. Various user types (pedestrians, bicycles, transit vehicles, and heavy vehicles)
 - iii. Various categories of information (traffic flow, safety, environment)
 - c. The system needs to:
 - i. Provide both data and a platform to access the data and assess performance with minimal staff effort
 - ii. Combine data from disparate local and commercial sources
 - iii. Use modern data analytics techniques to synthesize this disparate data, calculate performance measures, and highlight issues based on criticality to operations staff

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- iv. Alert staff about real-time operational issues needing immediate attention
2. Need to communicate the system's status, including measures that help tell a full story
 - a. To management, produce measures that:
 - i. Convey summarized system operation information by intersection, corridor, or definable region
 - ii. Help drive data-driven decision-making on funding and action priorities
 - iii. Demonstrate the impacts of operational changes
 - b. To elected officials, produce measures that:
 - i. Demonstrate the impact, effectiveness, and value of system operations efforts and identify future needs and needed support
 - c. Public, produce measures that:
 - i. Demonstrate the impact, effectiveness, and value of system operations efforts

OGL staff understands that few if any individual systems are available that meet all these needs. While some systems may cover a wide breadth of these needs, other systems may specialize in some areas (for example, intersection-level ATSPMs and signal timing). It is the intention of the OGL staff to select up to four systems in such a way as to cover as many of these needs at the best quality, largest geographic coverage, and highest value possible. To achieve the highest overall value for the program, this is likely to result in a combination of specialty systems that focus on a subset of needs and broad systems that cover a wide range of needs.

II. Project Management

Each vendor shall designate a dedicated project manager that will be committed to this project through the duration of the contract. The vendor Project Manager's responsibilities shall include but not be limited to:

- Coordinate all work related to this project.
- Maintain regular communication with OGL staff and the evaluation team.
- Submit invoices and supporting progress documentation.

Project Schedule

Each contract resulting from this RFP will be issued from the date of award for a duration of 12 months. Because of the need for system evaluation, it is desired that the vendor complete system configuration and setup within four weeks of the Notice to Proceed (NTP). Vendors should state that they can either meet this desired timeframe or provide an alternative timeframe with an explanation.

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Meetings

1. Kick-off Meeting

Within 5-7 business days of the NTP, OGL shall meet with each vendor to outline project goals, report/data deliverables, data platform access, vendor needs, and any other applicable project details.

2. Monthly Progress Meetings

Each vendor PM shall attend regular monthly progress meetings (assume 11 total meetings, not including the kickoff meeting) virtually with the OGL project manager and the evaluation team. Topics shall generally include project management topics along with system usage, support, and operational questions.

III. System Evaluation

For this project, MARC has contracted with an evaluation team who will coordinate the evaluation efforts and assist with other aspects of the work associated with the project as directed by the OGL project manager.

This evaluation team will be assessing all aspects of each vendor's system. The evaluation will include both qualitative and quantitative elements of system, as well as the vendor's performance. For this reason, each vendor is required cooperate with OGL and the evaluation team in answering questions and providing information about the system and its operation. A few examples of the many elements that will be documented are:

- Qualitative/System: Ease of system configuration and data access
- Quantitative/System: Accuracy of data and performance measures compared to ground truth
- Qualitative/Vendor: Responsiveness to answering questions and resolving system issues

As part of this evaluation, it is required that the vendor allow one or more members of the OGL program and the evaluation team to observe the system configuration process. This will provide information on the required time and tasks involved in the initial setup, expansion, and future system modification.

While OGL partners and the evaluation team may have an occasional question at any time, we will strive to queue up and send questions in advance of each monthly progress meeting to allow the vendor time to prepare and avoid a constant stream of questions.

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IV. System Support

Throughout the course of the project, each vendor is required to provide system support, including:

- Provide accessible system support resources, such as email, phone, chat, etc.
- Be responsive to support requests within 4 business hours (which may span into the next business day). The response time refers to the time available to the vendor to understand the request and share back the amount of time and level of effort required to satisfy the request. The response time does not include satisfying and closing out the request.
- Communicate the issue resolution status regularly according to the criticality of the issue. For example, critical issue status might be communicated hourly, and minor issue status might be communicated weekly or during the monthly status meeting as needed.

Note that no major system enhancements or new development is anticipated during this stage of the project. Support requests may, however, include assistance with items such as custom reports and user views.

V. Training

The vendor shall provide an initial demonstration and training session of up to two hours for OGL, its partners, and the evaluation team. Upon request, the vendor shall provide one additional two-hour training session or presentation to cover more advanced topics or to address specific questions. For example, OGL may ask for training on how to perform a specific type of evaluation. All training sessions will be conducted virtually. OGL may record the training sessions and make them available to any OGL member agencies not in attendance.

Example Data Analysis and Reports

While OGL is anticipating generating reports directly from the system once it is implemented, the vendor shall prepare a set of reports and graphical outputs (in electronic form) that demonstrate both that the system is working and that highlight the range of capabilities that the system is able to provide. These reports and outputs will be shared with OGL as a part of the training.

Vendors should propose what they believe to be an appropriate set of analytics, graphics, and reports to use as a “baseline” for overall arterial system performance from Phase 1 data. For example, to support prioritizing signal timing updates to corridors within the Phase 1 study area, plots of AM and PM peak hour average speed by direction across the monitored network could be generated by geographic subarea for a particular time period, such as for a month or selected weekdays within each of the four quarters of the year. The ideal outcome would be to generate data in such a way that it is compatible

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with either TransCAD format or GIS network format. Vendors should comment on the ability to provide these capabilities, the types of network outputs, and what is required for this to occur. The time(s) of year and geographies represented will be discussed between the vendor and MARC/OGL staff.

VI. Data and Application Requirements

The vendor shall provide both the data and a visualization and reporting platform. The specific system functionality, data, and performance measure requirements are detailed in the **Requirements Matrix: Attachment B**. Using the instructions in the workbook, fully complete all sections and submit with the RFP and other required attachments.

Coverage Areas

For this project, each vendor is required to provide data for the corridors listed in Table 1 at a minimum. This is also depicted visually in Figure 1. Vendors are encouraged to provide data for additional areas (e.g., regional data) where possible within the allocated budget. In addition, the vendor should provide an indication of available data (geographic extents and penetration rates).

Table 1: Required Corridors

No.	Corridor	Start	End	Miles	Traffic Signals
1	Kaw Drive/K-32 and Kansas Avenue/K-132 in Kansas City, Kansas	I-435 SB	2 nd St	11	22
2	Burlington Avenue and North Oak Trafficway, plus US-69 from Old Pike to Commercial entrance, plus M-9 & 32 nd St, connecting Kansas City, North Kansas City and Gladstone, Missouri	I-70	New Mark Dr	12	33
3	Independence Avenue/US-24 in Kansas City and Independence, Missouri	Manchester Ave	Little Blue Pkwy	9	25
4	Shawnee Mission Parkway connecting multiple cities in Johnson County, Kansas and Kansas City, MO	I-435	Ward Pkwy	10	23
5	US Highway 71 plus Prospect Ave from 55 th St to Gregory Blvd, in Kansas City, Missouri	I-670	I-435	11	10
6	Santa Fe/135th Street in Olathe and Overland Park, Kansas	Ridgeview Rd	Nall Ave	8	23

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PROJECT AREA MAP

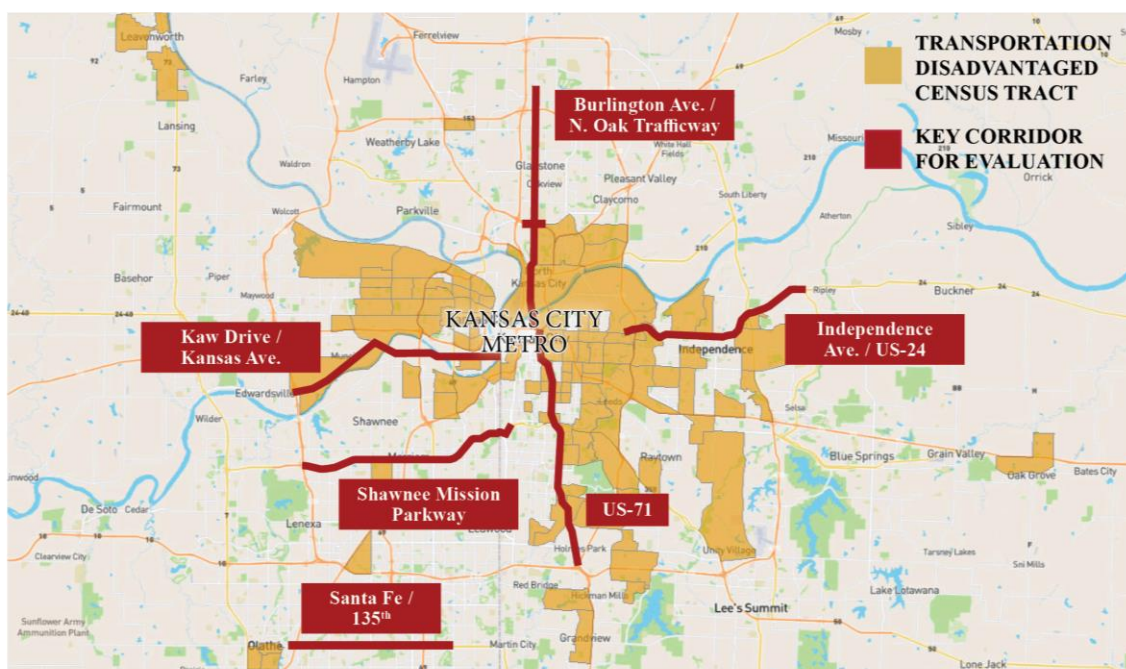


Figure 1: Required Corridors

Detailed ATSPM Data at Traffic Signals

For systems that can leverage detailed ATSPM data, an Application Programming Interface (API) to the local TransSuite traffic signal control system is available and included as Attachment C. Data obtained through this API are available at a once-per-second level based on NTCIP polling. If vendors desire the raw 0.1 second high resolution data directly from the controllers, access may be provided in the form of access to a folder with a text file for each day. There are four individual TransSuite implementations in the OGL system which are connected via Center-to-Center protocols. Each of the four centers will need to provide these feeds independently, if desired.

Note that among the six corridors identified in Table 1, only the intersections along Santa Fe/135th Street in Olathe and Overland Park, Kansas have substantial detection (including some intersections with advanced detectors) with high-resolution data. Vendors with this type of system are still required to demonstrate what can be done on all 6 corridors, all of which have varying levels of detection and controller capability.

In addition, it is recognized that some development may be needed for vendors to use data from TransSuite. The 30-calendar-day configuration requirement may be extended another 15 calendar days to accommodate this development, or vendors should provide a revised schedule in their proposals. However, because of the limited time provided by FHWA for

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this stage of the project, vendors are encouraged to complete this development as quickly as reasonably possible to maximize the time needed for a proper evaluation of the system.

I. PROPOSAL EVALUATION CRITERIA

The proposals submitted by each Contractor, Firm, or Contractor Team, will be evaluated according to the following factors, in order of priority:

- A) 40%: System Functionality
 - 1) Complete and accurate requirements matrix submitted
 - 2) System capabilities and functionality
 - 3) System special features and strengths
 - 4) Specialized or broad capabilities complement other proposed systems to effectively meet a broad range of OGL needs
- B) 15%: Project Understanding and Approach
 - 1) Understanding the requested project scope of work and overall OGL goals and needs
 - 2) An effective and organized project approach, including project management, training, support, and evaluation support services
 - 3) General organization and clarity of the proposal
- C) 15%: Experience and technical competence of the vendor relative to the scope of work and task requirements outlined in this RFP
 - 1) Experience of the vendor and subcontractors and suppliers
 - 2) Experience of other assigned individuals
 - 3) References reflecting previous work experience of the project team
 - i) Ability to meet work schedules
 - ii) Responsiveness to support requests
 - iii) Overall satisfaction with products and services
- D) 10%: Schedule
 - 1) Implementation schedule
- E) 20%: Proposed current costs and cost model for potential expansion
 - 1) Acknowledge Phase 1 maximum cost of \$100,000
 - i) Ability to provide requested data on the required corridors
 - 2) The ability to provide services and data for additional corridors, areas, and/or signalized intersections
 - 3) The financial impacts associated with full-scale system deployment across the OGL region
 - i) Standard pricing model if selected for Phase 2, including
 - (1) Pricing for the base system
 - (2) Cost for additional features, functions, modules, and services, if applicable
 - (3) Price of 3rd party data, if applicable (understanding that this may not be entirely within the vendor's control)

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J. CONTRACT AWARD

MARC will notify the selected candidates by telephone, e-mail and in writing. Following verbal notification, MARC will negotiate a standard professional service agreement with the selected candidates. Each selected candidate's proposal will be incorporated by reference into their respective contract. Additionally, MARC will notify, in writing, the candidates who are not selected.

K. PAYMENT TERMS

The milestones used to determine payments for all fixed-price design and development phase activities (when applicable), shall be based on the following:

Install, Configure, and provide the initial Training – 16 percent

Full payment for this milestone shall be based on the proposed software platform being received, installed, and operational.

Ongoing Real-time and Historical Data and Application Support – 84 percent

Over the course of the contract, the vendor shall be paid 7 percent monthly for ongoing access to real-time and historical data. The fees for the initial month(s) should not be invoiced before the initial configuration is completed, and the initial configuration and initial months can be included on the same invoice.

L. PROTEST PROCEDURES

In the course of this solicitation, for proposals and the selection process, a vendor (bidder of offer or whose direct economic interest would be affected by the award of the contract) may file a protest when in the vendor's opinion, actions were taken by MARC staff and /or the selection committee which could unfairly affect the outcome of the selection procedure. All protest should be in writing and directed to MARC's Director of Transportation, Mid-America Regional Council, 600 Broadway, Suite 200, Kansas City, MO 64105. Protest should be made immediately upon occurrence of the incident in question but no later than three (3) days after the vendor receives notification of the outcome of the section procedure. The protest should clearly state the grounds for such a protest.

Upon receipt of the protest, MARC's Director of Transportation will review the actual procedures followed during the selection process and the documentation available. If it is determined the action(s) unfairly changed the outcome of the process, notifications with the selected vendor will cease until the matter is resolved.

Upon resolution, the Director of Transportation's decision shall be final and conclusive unless, within seven (7) days from the date of receipt of its copy, the vendor mails or

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otherwise furnishes a written appeal to MARC's Executive Director. In connection with any such appeal, the vendor shall be afforded an opportunity to be heard and to offer evidence in support of its position. The decision of MARC's Executive Director shall be binding upon the vendor and the proposer shall abide by the decision unless it decides to further pursue its remedies through formal proceedings in court, arbitration or otherwise, which the vendor may do, in the vendor's sole discretion.

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ATTACHMENTS

- A. Complete the INTENT TO PERFORM AS A DBE (**Attachment A – if applicable**)
- B. Complete the REQUIREMENTS MATRIX (**Attachment B**)
- C. The TRANSSUITE CONNECTED VEHICLE DATA PORT INTERFACE specification is included for reference (**Attachment C**)

ATTACHMENT A

INTENT TO PERFORM As A DISADVANTAGE BUSINESS ENTERPRISE (DBE)

Project Title and Description:

The undersigned intends to perform work in connection with the above project as (check one):

_____ Prime Contractor

_____ Subcontractor

_____ Joint Venture

_____ Other (please specify) _____

If applicable name of prime contractor or joint venture partner:

The DBE status of the undersigned is confirmed by a DBE Certification from one or all of the following (please provide copy of current Certification Certificate):

_____ MRCC (Missouri Regional Certification Committee)

_____ KDOT

_____ MoDOT

_____ City of Kansas City Missouri

_____ Kansas City Area Transportation Agency (KCATA)

_____ Other (please specify) _____

(MARC may require additional certification documentation)

The undersigned is prepared to perform the following described work in connection with the above project (attach additional sheet in needed),

at the following price _____

Date

Name of DBE Firm

By: _____

Signature of DBE Firm's Authorized Representative

Print Name and title

ATTACHMENT B

SEE REQUIREMENTS MATRIX UNDER SEPARATE FILE

TransSuite

TRANSUITE TCS

CONNECTED VEHICLE DATA PORT INTERFACE

Version 4.0

Prepared by:

**TransCore ITS, LLC
192 Technology Parkway, Suite 500
Norcross, Georgia 30092
(770) 447-6831 phone
(770) 449-6268 fax**

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Document Revision History

Version #	Date	By	Purpose
1.0	09/07/2017		Initial Release
2.0	10/23/2017		Second Release
3.0	02/18/2019		Third Release
4.0	07/08/2019		Fourth Release
4.1	07/19/2019	Keith Patton	Added codes for preempt active/inactive
4.2	12/11/2019	James Martin	Added codes for Intelight and ASC/3 preempts

1. INTRODUCTION

The TransSuite TCS Connected Vehicle Data Port (CVDP) is a REST service that provides data about intersection inventory and real-time status updates. This document describes the interface and how client applications can interact with the interface.

2. OVERVIEW

Client applications may call the CVDP REST service to obtain an inventory of intersections. These intersections are available for clients to subscribe to real-time status updates. Client applications may obtain a session identifier from the REST service and use it in subsequent calls to set intersection status subscriptions and to obtain status updates. Finally, a client application may choose to stop a session when it is no longer interested in receiving updates, or as part of a graceful shutdown. Sessions that have been inactive for at least one minute will automatically be timed-out by the server, with the same effect as stopping a session.

Multiple sessions can be created and are supported by the server. This allows for multiple client applications to connect and retrieve data.

3. WADL DEFINITIONS

Two Web Application Description Language (WADL) files have been generated to describe the interface.

1. **CVDP.simplified.wadl.xml** – A simplified version of the interface with user and core resources only.
2. **CVDP.full.wadl.xml** – The full WADL including extended resources.

4. OPERATION CALLS

As seen in either WADL file, there are six operations that can be called on the REST interface.

4.1 INTERSECTION INVENTORY

Path: /IntersectionInventory

Method: GET

Produces: text/plain

Parameters: None

This will return the inventory of all intersections on the TCS system that have been configured to have their data shared. The response is in CSV format, where the first line is the header. The columns are as follows:

- **Intersection ID** – The numerical identifier of the intersection. This is the ID that is displayed in TransSuite TCS, and is unique to each intersection.
- **Description** – A free-form text description of the intersection, as entered by the user.
- **Main Street** – The main street of the intersection.
- **Cross Street** – The cross street of the intersection.
- **Latitude** – The latitude portion of the location of the intersection. This field is in micro degrees. This value will be zero if the intersection hasn't been plotted on the map.
- **Longitude** – The longitude portion of the location of the intersection. This field is in micro degrees. This value will be zero if the intersection hasn't been plotted on the map.
- **MaxPhaseTimingSets** – The maximum number of phase timing sets the controller supports. For NTCIP controllers, this is the max number of phase timing plans (not to be confused with coordinated patterns). For other controller types, this is the number of phase timing banks.

Example Response:

"Intersection ID","Description","Main Street","Cross Street","Latitude","Longitude","MaxPhaseTimingSets"
 "20101","Test Intersection","Spalding Drive","Technology Parkway Northwest","33968191","-84217253","1"

4.2 START SESSION

Path: /StartSession

Method: GET

Produces: text/plain

Parameters: None

This will create a new client session in the server and return a new session identifier to the client. The session identifier should be used in calls to set subscriptions, get real-time status updates, and when stopping a session.

4.3 SET SUBSCRIPTIONS

Path: /SetSubscriptions

Method: GET

Produces: text/plain

Parameters:

1. **sessionId** - The session identifier obtained from a previous call to "Start Session".
2. **intersectionIds** - A list of zero or more intersection identifiers. These should match up with the "Intersection ID" column from the "Intersection Inventory" response. Alternatively, this can be set to asterisk (*) if the client wishes to subscribe to all intersections.

Possible Responses:

- **"OK"** – Indicates that the command was accepted.

- **“Invalid Session ID”** – Indicates that the session identifier provided by the client is invalid. This could happen if the client is not using the session ID provided by the “Start Session” call, if the client already stopped the session, if the server timed-out the client session due to inactivity, or if the server restarted.
- **<Anything else>** - Indicates some other error has occurred.

This will configure the CVDP server to accumulate real-time status updates for the specified intersections for the client using the specified session identifier. These updates can be obtained by the client by calling “Get Real-Time Status” or “Get Real-Time Status v2”.

4.4 GET REAL-TIME STATUS

Path: /GetRealTimeStatus

Method: GET

Produces: application/octet-stream

Parameters: **sessionId** - The session identifier obtained from a previous call to “Start Session”.

This will query the CVDP server for any real-time status updates that have accumulated since the last call to this operation. If this is the first call since initially setting the subscriptions, it will include status updates since the subscriptions were made.

The CVDP server will reply with new events that have occurred since their last call. The data format will be binary:

- 1 byte indicating status
 - a) 0 = OK
 - b) 1 = Invalid session ID
 - c) 2 = Other error
- 4 bytes indicating number of second-by-second updates that follow. This is a 32-bit integer in big endian format. This value will be zero if the first byte indicating status was non-zero (indicating invalid session ID or other error).
- (Thus begins the second-by-second updates)
- 4 bytes of timestamp in UTC seconds. This is a 32-bit integer in big endian format.
- 4 bytes indicating the number of records that follow. This is a 32-bit integer in big endian format.
- (Thus begins the events that occurred this second)
- Each record contains:
 - a) 4 bytes of intersection ID. This is a 32-bit integer in big endian format.
 - b) 1 byte of event code
 - c) 1 byte of event parameter

The event code and event parameter are derived from the “Indiana Traffic Signal Hi Resolution Data Logger Enumerations” and can be interpreted as such. The subset of event codes returned by this entry point is listed below. Note that codes 132 through 149 will only be returned for intersections running in adaptive mode.

Event Code	Event Descriptor	Parameter
1	Phase Begin Green	Phase # (1-40)
7	Phase Green Termination	Phase # (1-40)
8	Phase Begin Yellow Clearance	Phase # (1-40)
9	Phase End Yellow Clearance	Phase # (1-40)
21	Pedestrian Begin Walk	Phase # (1-40)
22	Pedestrian Begin Clearance	Phase # (1-40)
23	Pedestrian Begin Solid Don't Walk	Phase # (1-40)
32	FYA Begin Permissive	Phase # (1-16)
33	FYA End Permissive	Phase # (1-16)
43	Phase Call Registered	Phase # (1-40)
44	Phase Call Dropped	Phase # (1-40)
45	Pedestrian Call Registered	Phase # (1-40)
67	Pedestrian Overlap Begin Walk	Overlap # (as number A-1, B-2, etc.)
81	Detector Off	DET Channel # (1-128)
82	Detector On	DET Channel # (1-128)
102	Preempt (Call) Input On	Preempt # (1-32)
104	Preempt (Call) Input Off	Preempt # (1-32)
105	Preempt Entry Started	Preempt # (1-32)
106	Preempt Begin Track Clearance	Preempt # (1-32)
107	Preempt Begin Dwell Service	Preempt # (1-32)
108	Preempt Link Input Active	Preempt # (1-32)
110	Preempt Max Presence Exceeded	Preempt # (1-32)

111	Preempt Begin Exit Interval	Preempt # (1-32)
112	TSP Check In	TSP # (1-8)
115	TSP Check Out	TSP # (1-8)
131	Coord Pattern Change	Pattern # (0-255)
132	Cycle Length Change	Seconds (0-255)
133	Offset Length Change	Seconds (0-255)
134	Split 1 Change	New Split Time in Seconds (0-255)
135	Split 2 Change	New Split Time in Seconds (0-255)
136	Split 3 Change	New Split Time in Seconds (0-255)
137	Split 4 Change	New Split Time in Seconds (0-255)
138	Split 5 Change	New Split Time in Seconds (0-255)
139	Split 6 Change	New Split Time in Seconds (0-255)
140	Split 7 Change	New Split Time in Seconds (0-255)
141	Split 8 Change	New Split Time in Seconds (0-255)
142	Split 9 Change	New Split Time in Seconds (0-255)
143	Split 10 Change	New Split Time in Seconds (0-255)
144	Split 11 Change	New Split Time in Seconds (0-255)
145	Split 12 Change	New Split Time in Seconds (0-255)
146	Split 13 Change	New Split Time in Seconds (0-255)
147	Split 14 Change	New Split Time in Seconds (0-255)
148	Split 15 Change	New Split Time in Seconds (0-255)
149	Split 16 Change	New Split Time in Seconds (0-255)
150	Coord cycle state change	Parameter (0-6) defined as: 0 = Free 1 = In Step 2 = Transition - Add

		3 = Transition - Subtract 4 = Transition - Dwell 5 = Local Zero 6 = Begin Pickup
174	Unit Alarm Status 1 Change	unitAlarmStatus1
175	Alarm Group State Change	Bit 0: Alarm 1 Bit 1: Alarm 2 Bit 2: Alarm 3 Bit 3: Alarm 4
176	Special Function Output On	Special Function # (1-16)
177	Special Function Output Off	Special Function # (1-16)
178	Manual Control Enable	off/on # (0,1)
180	Stop Time Input	off/on # (0,1)
184	Power Restored	True (1)

4.5 GET REAL-TIME STATUS V2

Path: /GetRealTimeStatusV2

Method: GET

Produces: application/octet-stream

Parameters: **sessionId** - The session identifier obtained from a previous call to “Start Session”.

This will query the CVDP server for any real-time status updates that have accumulated since the last call to this operation. If this is the first call since initially setting the subscriptions, it will include status updates since the subscriptions were made. This alternative to “/GetRealTimeStatus” uses a 2-byte event code to allow an extended set of events.

The CVDP server will reply with new events that have occurred since their last call. The data format will be binary:

- 1 byte indicating status
 - a) 0 = OK
 - b) 1 = Invalid session ID
 - c) 2 = Other error
 - 4 bytes indicating number of second-by-second updates that follow. This is a 32-bit integer in big endian format. This value will be zero if the first byte indicating status was non-zero (indicating invalid session ID or other error).
- (Thus begins the second-by-second updates)

- 4 bytes of timestamp in UTC seconds. This is a 32-bit integer in big endian format.
- 4 bytes indicating the number of records that follow. This is a 32-bit integer in big endian format.
(Thus begins the events that occurred this second)
- Each record contains:
 - a) 4 bytes of intersection ID. This is a 32-bit integer in big endian format.
 - b) 2 bytes of event code in big endian format.
 - c) 1 byte of event parameter

The event code and event parameter are derived from the “Indiana Traffic Signal Hi Resolution Data Logger Enumerations” along with a new set of event codes, starting at 10000. The set of event codes returned by this entry point is listed below. Note that codes 132 through 149 will only be returned for intersections running in adaptive mode.

Event Code	Event Descriptor	Parameter
1	Phase Begin Green	Phase # (1-40)
7	Phase Green Termination	Phase # (1-40)
8	Phase Begin Yellow Clearance	Phase # (1-40)
9	Phase End Yellow Clearance	Phase # (1-40)
21	Pedestrian Begin Walk	Phase # (1-40)
22	Pedestrian Begin Clearance	Phase # (1-40)
23	Pedestrian Begin Solid Don't Walk	Phase # (1-40)
32	FYA Begin Permissive	Phase # (1-16)
33	FYA End Permissive	Phase # (1-16)
43	Phase Call Registered	Phase # (1-40)
44	Phase Call Dropped	Phase # (1-40)
45	Pedestrian Call Registered	Phase # (1-40)
67	Pedestrian Overlap Begin Walk	Overlap # (as number A-1, B-2, etc.)
81	Detector Off	DET Channel # (1-128)
82	Detector On	DET Channel # (1-128)
102	Preempt (Call) Input On	Preempt # (1-32)

104	Preempt (Call) Input Off	Preempt # (1-32)
105	Preempt Entry Started	Preempt # (1-32)
106	Preempt Begin Track Clearance	Preempt # (1-32)
107	Preempt Begin Dwell Service	Preempt # (1-32)
108	Preempt Link Input Active	Preempt # (1-32)
110	Preempt Max Presence Exceeded	Preempt # (1-32)
111	Preempt Begin Exit Interval	Preempt # (1-32)
112	TSP Check In	TSP # (1-8)
115	TSP Check Out	TSP # (1-8)
131	Coord Pattern Change	Pattern # (0-255)
132	Cycle Length Change	Seconds (0-255)
133	Offset Length Change	Seconds (0-255)
134	Split 1 Change	New Split Time in Seconds (0-255)
135	Split 2 Change	New Split Time in Seconds (0-255)
136	Split 3 Change	New Split Time in Seconds (0-255)
137	Split 4 Change	New Split Time in Seconds (0-255)
138	Split 5 Change	New Split Time in Seconds (0-255)
139	Split 6 Change	New Split Time in Seconds (0-255)
140	Split 7 Change	New Split Time in Seconds (0-255)
141	Split 8 Change	New Split Time in Seconds (0-255)
142	Split 9 Change	New Split Time in Seconds (0-255)
143	Split 10 Change	New Split Time in Seconds (0-255)
144	Split 11 Change	New Split Time in Seconds (0-255)
145	Split 12 Change	New Split Time in Seconds (0-255)

146	Split 13 Change	New Split Time in Seconds (0-255)
147	Split 14 Change	New Split Time in Seconds (0-255)
148	Split 15 Change	New Split Time in Seconds (0-255)
149	Split 16 Change	New Split Time in Seconds (0-255)
150	Coord cycle state change	Parameter (0-6) defined as: 0 = Free 1 = In Step 2 = Transition - Add 3 = Transition - Subtract 4 = Transition - Dwell 5 = Local Zero 6 = Begin Pickup
174	Unit Alarm Status 1 Change	unitAlarmStatus1
175	Alarm Group State Change	Bit 0: Alarm 1 Bit 1: Alarm 2 Bit 2: Alarm 3 Bit 3: Alarm 4
176	Special Function Output On	Special Function # (1-16)
177	Special Function Output Off	Special Function # (1-16)
178	Manual Control Enable	off/on # (0,1)
180	Stop Time Input	off/on # (0,1)
184	Power Restored	True (1)
10000	D4 Transit Phase Remote Check In	TSP #(1-8)
10001	D4 Transit Phase Remote Check Out	TSP #(1-8)
10002	D4 Transit Phase No Call	TSP #(1-8)
10003	D4 Transit Phase No Priority Reservice Inhibit	TSP #(1-8)
10004	D4 Transit Phase Priority Pending	TSP #(1-8)
10005	D4 Transit Phase Defer Next Cycle	TSP #(1-8)
10006	D4 Transit Phase No Adjust	TSP #(1-8)

10007	D4 Transit Phase Recovery	TSP #(1-8)
10008	TransSuite Intersection Status	1 = Comm Failed 2 = Coordinated 3 = Free 4 = Failed 5 = Preempt 6 = Transition 7 = Flash 8 = Offline 9 = Manual Override 10 = Unknown 11 = TSP Active
10009	Preempt active	Preempt # (1-32)
10010	Preempt inactive	Preempt # (1-32)
10011	Intelight preempt track service 2	Preempt # (1-16)
10012	Intelight preempt dwell cycle	Preempt # (1-16)
10013	ASC/3 preempt track clearance	Preempt # (1-10)
10014	ASC/3 preempt cycling	Preempt # (1-10)
10015	ASC/3 preempt cycling delay	Preempt # (1-10)
10016	ASC/3 preempt advancing to flash	Preempt # (1-10)
10017	ASC/3 preempt flash	Preempt # (1-10)
10018	ASC/3 preempt flash delay	Preempt # (1-10)

4.6 STOP SESSION

Path: /StopSession

Method: GET

Produces: text/plain

Parameters: `sessionId` - The session identifier obtained from a previous call to "Start Session".

Possible Responses:

- **"OK"** – Indicates that the command was accepted.

- **“Invalid Session ID”** – Indicates that the session identifier provided by the client is invalid. This could happen if the client is not using the session ID provided by the “Start Session” call, if the client already stopped the session, if the server timed-out the client session due to inactivity, or if the server restarted.
- **<Anything else>** - Indicates some other error has occurred.

This will gracefully stop the client session in the CVDP server. Subscriptions and cached updates will be cleared. The client application should call this when terminating a session. Sessions that have been inactive for at least one minute will automatically be timed-out by the server, with the same effect as stopping a session.

5. INTERFACE TEST CLIENT

5.1 OVERVIEW

This section describes how to use the test client to verify connectivity to the CVDP server and test basic operations. It is not intended to validate encryption certificates. The test client is written in Java, and comes with Java 11. The test client comes already compiled, so there is no need to compile the source code. The source code is provided as a basic programming example.

5.2 REQUIRED FILES

The following table lists the files required to run the test client. These should all be unpacked in a folder together.

File/Folder Name	Description
config.properties	Configuration file for the test client. It includes important settings that should be reviewed/revised before starting the test.
TcsThinClient.jar	Contains compiled code for the test client.
TestCVDP.bat	Batch file to run the test client.
RestTestClient.java	Sample source code.
jersey	Sub-folder containing jars for assorted Apache Jersey libraries and dependencies.
jaf	Sub-folder containing files for the Java Activation Framework library.

5.3 CONFIGURATION SETTINGS

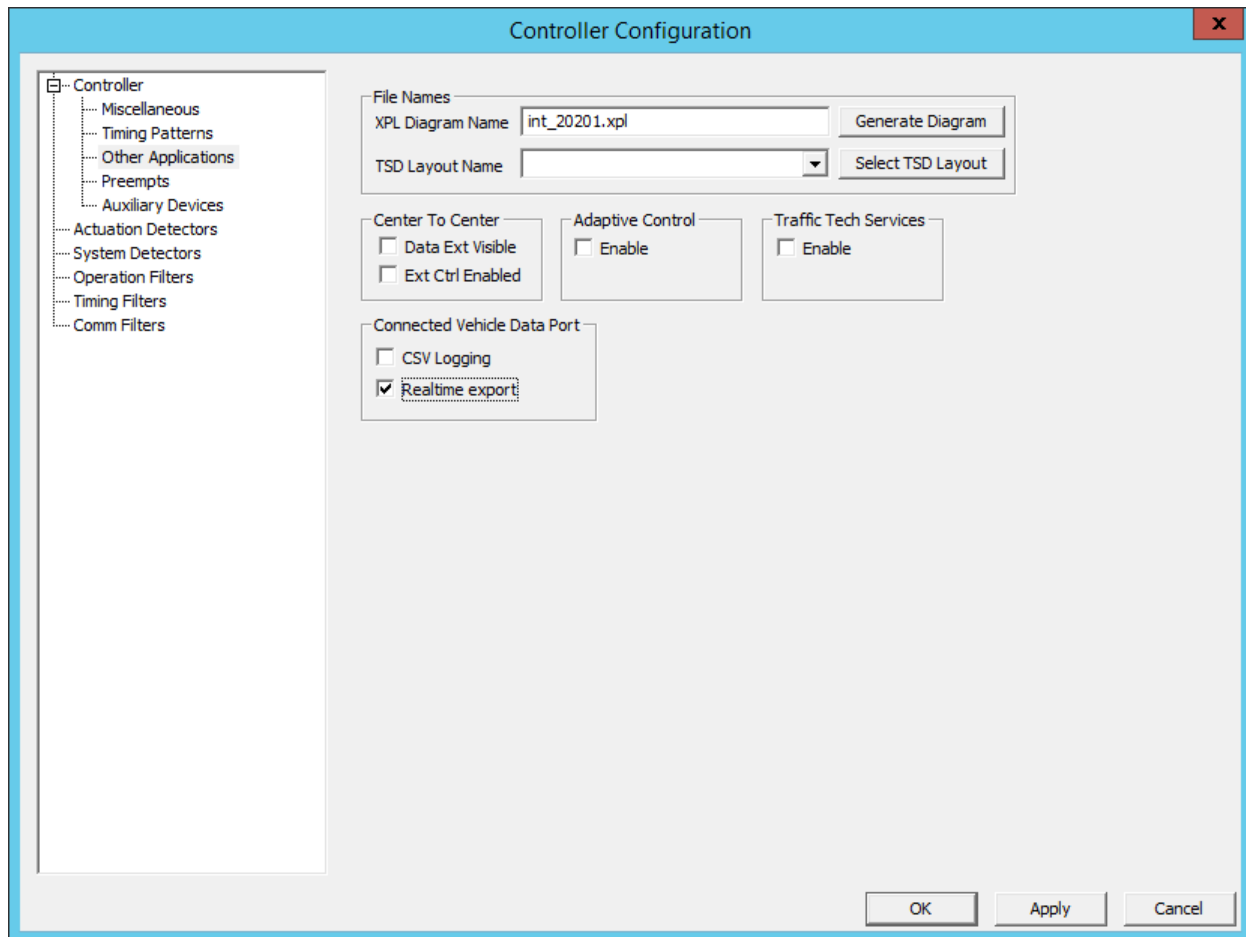
The **config.properties** file contains the configuration settings. These should be reviewed and revised before starting the test. The settings are as follows:

Property Name	Description
URL	This is the URL to access the CVDP REST interface.
status.test.duration	This is the duration of the real-time status test. The units are in seconds. The test client will poll the server once per second, up to this setting's value, and print the server responses to the screen.
status.version	This controls which version of the status messages to poll for. 1 = Use GetRealTimeStatus 2 = Use GetRealTimeStatusV2
subscription.intersection.ids	This is a comma-separated list of intersection IDs. The test client will use these values as the list of intersection identifiers when asking the CVDP server to set subscriptions.

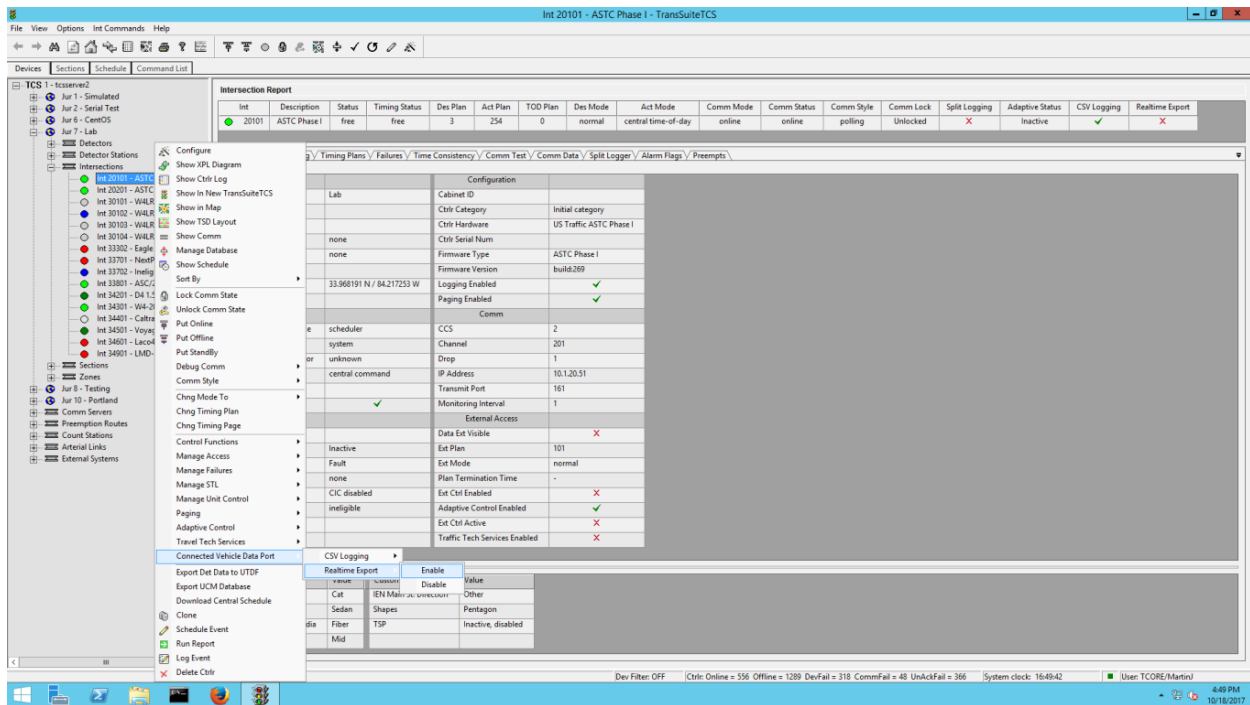
5.4 ENABLING CVDP FROM TCS

There are two ways to enable the CVDP from TransSuite TCS:

1 – Go into the intersection configuration screen, go to the “Other Applications” section, and check the “Realtime export” checkbox. Here is an example:

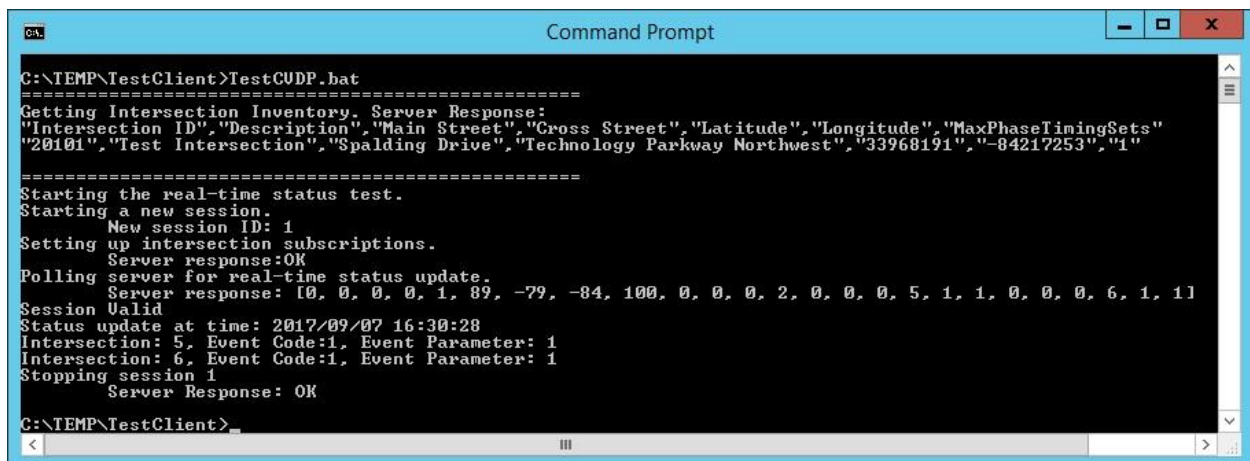


2 – From the intersection context menu. Right-click the intersection and choose *Connected Vehicle Data Port->Realtime Export->Enable*.



5.5 USAGE

Open a command prompt and change into the directory where the test client files are located. Start the test client by running the **TestCUDP.bat** script. An example of the output follows:



The test client starts by obtaining the intersection inventory from the server and printing the response. In this example, we see that intersection 20101 is the only intersection, with a main street of “Spalding Drive”, a cross street of “Technology Parkway Northwest”, latitude of value 33968191, longitude value of -84217253, and only one phase timing set is supported by the controller.

After the inventory, the real-time status test begins. The test client begins by starting a new session with the server. It obtains a session ID of “9”, which it will use in subsequent calls. It sets up subscriptions in the server, again using the session ID it obtained earlier. The intersections it subscribes to are listed in

the **config.properties** file. It proceeds to poll the server for a real-time status update for the intersections it has subscribed to. In this example, it received one status update. The length of this status polling test is configured in **config.properties**, in units of seconds. In this case, only one second was used. The server response displayed shows the raw byte array that includes the event data. The test client then parses the response and prints the meaning of the status byte ("Session Valid"), the timestamp for the set of events, followed by the event data. The test client proceeds to stop the session using the session ID it had obtained earlier, and then terminates.