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Joining Sitraffic Stream with other Public Transportation Systems

Conception Requirements

Version 1.3

Table of Contents

Version

Version	Date	Modifications*		Editor
V 0.1	2015-05-13	Creation	c	Roth
V 0.2	2015-05-19	Review, Editing	c, w	Rother
V 1.0	2015-05-19	Review, Editing	c, w, r	Roth
V1.1	2015-08-12	Review		Sax
V1.2	2015-08-20	Translation	c, w	Monteiro
V1.2	2015-08-20	Review	w, r	Sousa
V 1.3	2015-09-16	Review en by TS CA	c, w, r	Rother

*c=change/w=review/r=release

Abbreviations and Description

Abbreviation	Comment
GNSS	Global Navigation Satellite System (Globales Navigationssatellitensystem)
GPS	Global Positioning System
TLCI (LSA)	Traffic Light- Controlled Intersection (Lichtsignalanlage)
OBU	Onboard-Unit
OCIT	Open Communication Interface for Road Traffic Control Systems
PT (ÖPNV)	Public Transports (Öffentlicher Personennahverkehr)
VPN	Virtual Private Network

References

No.	Document	Content	Where to find?
1	OCIT-C	Specification	http://www.ocit.org/OCIT-C.htm
2	Stream Brochure	Sitraffic Stream System Description and Specifications	https://www.mobility.siemens.com/mobility/global/SiteCollectionDocuments/de/road-solutions/urban/infrastructure/sitraffic-Stream-mass-transit-de.pdf

1. Introduction

Sitraffic Stream is a complete system that allows quick passage and prioritization of public transports (PT) and emergency vehicles in traffic light-controlled intersections (TLCI). This system includes the onboard units (OBU) for the vehicles, the data communicator, the actual Stream server and the traffic signal controller (Sitraffic C900 or sX).

Pre-existing PT systems for different applications can often be associated with the Stream system, if combined with Stream-equivalent adaptations. If OBUs already exist in the vehicle and present vehicle location and central communication functions, it is possible to use them in most cases for Stream.

This document describes the necessary adaptations required for the OBUs, as well as the interface for the Stream system. For Stream to be able to measure and transfer the necessary information, general software adaptations in the OBUs are required and the PT central must be equipped with a Stream system interface.

2. Limitations (Outline)

This document is best suited for the prioritization of PT vehicles. Although also possible, the quick passage and prioritization of emergency vehicles in TLCI via Stream is not considered here, unless the same prioritization methodology has been used.

3. System Architecture

As described in chapter 1 (Introduction), the case considered in this document is the existence of an available PT system, while the Stream's OBUs are still not being used. The pre-existing PT system consists of OBUs connected via radio link to a PT central, meant for data exchange. The OBUs can determine the position of the vehicle, using, for example, GPS and traffic meter, while transferring the data via radio to the PT central.

To enable a combination of the Stream system to the existing one, the OBUs must be functionally expanded so that, additionally, the Stream-relevant information in the PT system can be accessed and transferred. Moreover, this data first exists in the PT central and can be forwarded from there to Stream, meaning no direct links between the OBUs and Stream. The same applies in the opposite direction, as the data transmission from the Stream system to the OBUs must always be made via PT central.

For the data exchange between the PT central and Stream, a bidirectional TCP/IP communication is provided to enable data connection in XML-format. While the Stream system assumes the role of OCIT-C server, the previously existing PT system becomes OCIT-C client. The correspondent OCIT-C Standard interface (http://www.ocit.org/OCIT-C.htm) is then extended with further object types required for Stream. Since this extension is not an official component from OCIT-C, but instead a Siemens-owned data format, the object types' specifications can be provided afterwards, as long as a Non-Disclosure-Agreement (NDA) is presented and signed.

An OpenVPN tunnel is used as a network link between the PT central and Stream, if LAN links through common intranet Gateways and Routers are not possible. This OpenVPN tunnel attributes the role of server to the Stream server and client to the previously existing PT system.

The system architecture is shown in the following illustration. Within the PT system, the vehicle's OBU communicates with the PT central. Then, the Stream server is connected and the relevant data for the prioritization of the TLCI is exchanged. The Stream server then receives the data from the traffic control central (Siemens' Sitraffic Scala) and directs it onto the TLCI, where the signal groups are assigned to diminish or eliminate the waiting time in intersections for PT vehicles.

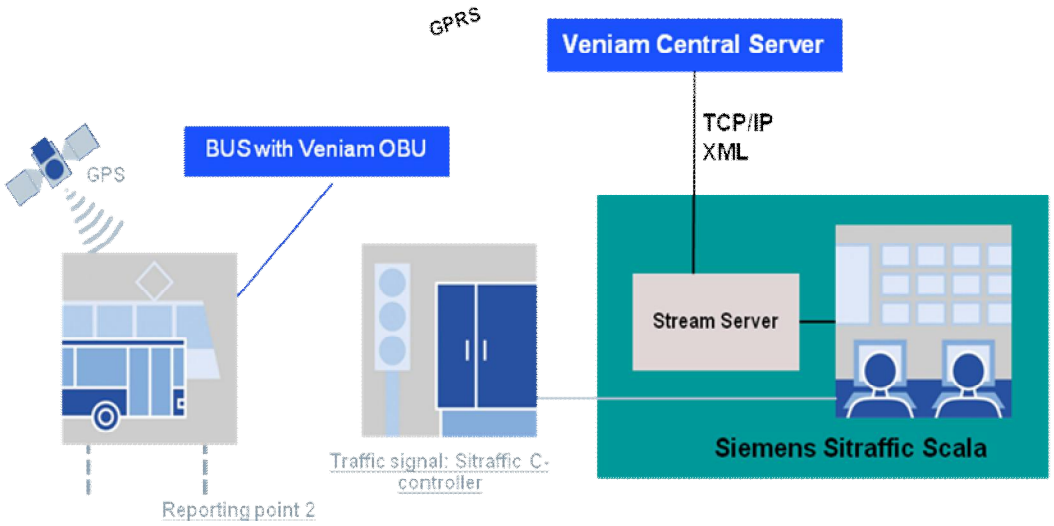

Illustration1: System Architecture

The GNSS release of the registration points and information transfer to all involved communication parties via transmission lines is time-critical. The transfer time from the acknowledgement and release of registration points up to the transfer to the Stream server via OCIT-C interface should be under 2.5 seconds and should also account for at least 95% of the data records.

4. Overview of OCIT-C object types

In OCIT-C, the following object types were defined:

1. Stream_Obu
2. Stream_TrackingTriggerRelease
3. Stream_TriggerLine
4. Stream_TriggerRelease

The object type Stream_Obu is used to transfer OBU and vehicle information to the Stream system. Here, the client can set the data with the OCIT-C "put" command.

The object type Stream_TrackingTriggerRelease is used to transfer the GNSS Tracking to the Stream server, using also the OCIT-C "put" command.

The object type Stream_TriggerLine is used to transfer the registration points specified as "Master" in the foreign system. The reporting point specifications can be obtained from the client using the OCIT-C "get" and "inquireAll" command.

The object type Stream_TriggerRelease is used to release registration points in the Stream server. The client can set the data with the OCIT-C "put" command.