

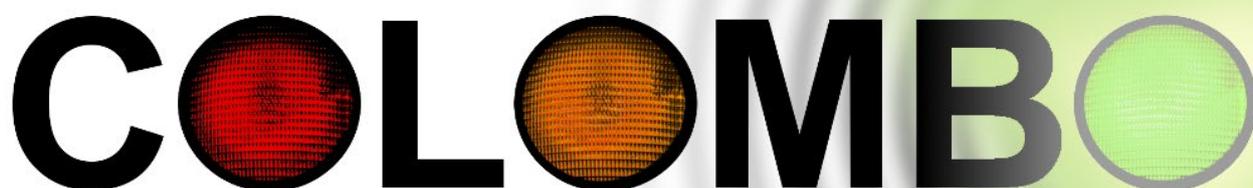
Small or medium-scale focused research project (STREP)



ICT Call 8

FP7-ICT-2011-8

**Cooperative Self-Organizing System for low Carbon Mobility at
low Penetration Rates**



COLOMBO

COLOMBO: Deliverable 6.6

**Periodic report on User Community involvement and
Dissemination**

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1 Introduction

1.1 Project Context

The COLOMBO project will deliver a set of modern cooperative traffic surveillance and control applications that target at different transport related goals such as increasing mobility, resource efficiency, and environmental friendliness.

The surveillance applications use information gained via vehicular communication technology at low penetration rates (WP1). The self-organizing traffic light controls applications are of type using swarm intelligence methods (WP2). They are optimised based on simulations-in-the-loop (WP3). To allow the ex-ante appraisal of the applications’ impacts, the evaluation framework must be defined. It has design interdependencies with the traffic simulation scenarios which trigger modification and extension requirements to existing simulation tools. Once realized they are implemented into a dedicated software suite which is mainly open source (WP5). Finally, the design and employment of emission models allows the development of environment-friendly solutions (WP4).

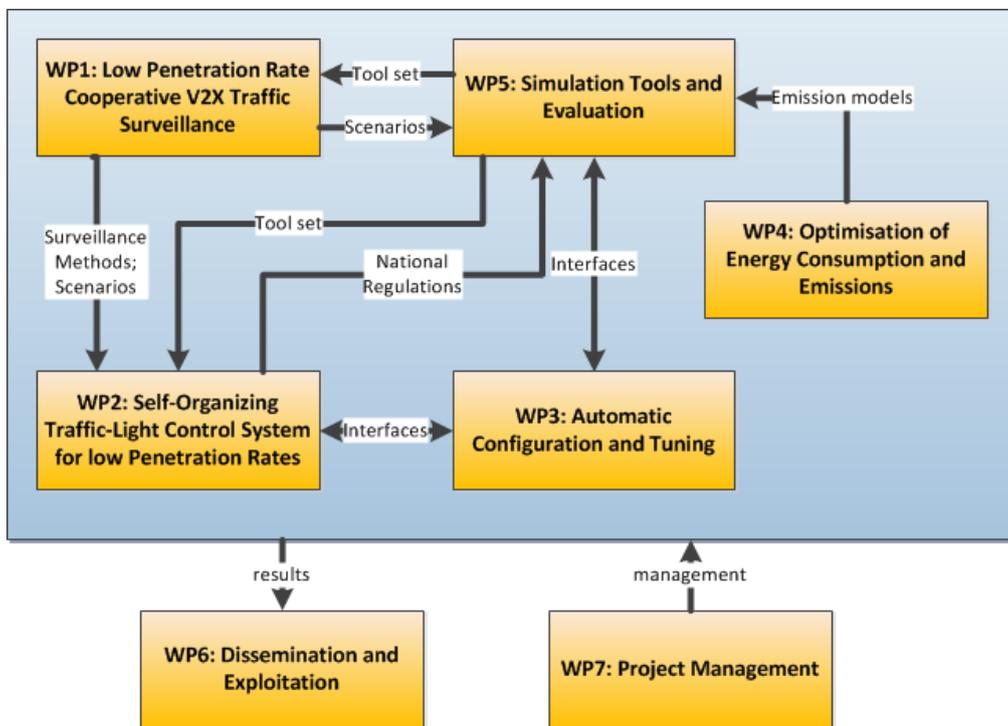


Figure 1.1: COLOMBO work packages

This deliverable is part of WP6 about the dissemination and involves the results of WP1-5. The objective of this work package is to disseminate the results of the project by involvement of the potential user community. Furthermore, increasing public knowledge about the project is also a way to prepare for exploitation.

1.2 Document Objectives

The objectives of this document are to give an overview on the dissemination activities and user community involvement that has taken place during the second year.

1.3 Document structure

The document distinguishes between dissemination in chapter 2 and user community involvement in chapter 3. Within dissemination sections have been made for the website, presentations, publications and dissemination activities that have been started up, but have not yet finished. Within user community involvement there are sections for the SUMO community, the ns-3 community and the traffic engineering community.

2 Dissemination

2.1 Colombo project website

The web page located at <http://www.colombo-fp7.eu/> is the first source of information about the project. The web page's basic layout was already discussed in D6.5 and has not changed. It is shown in Figure 2.

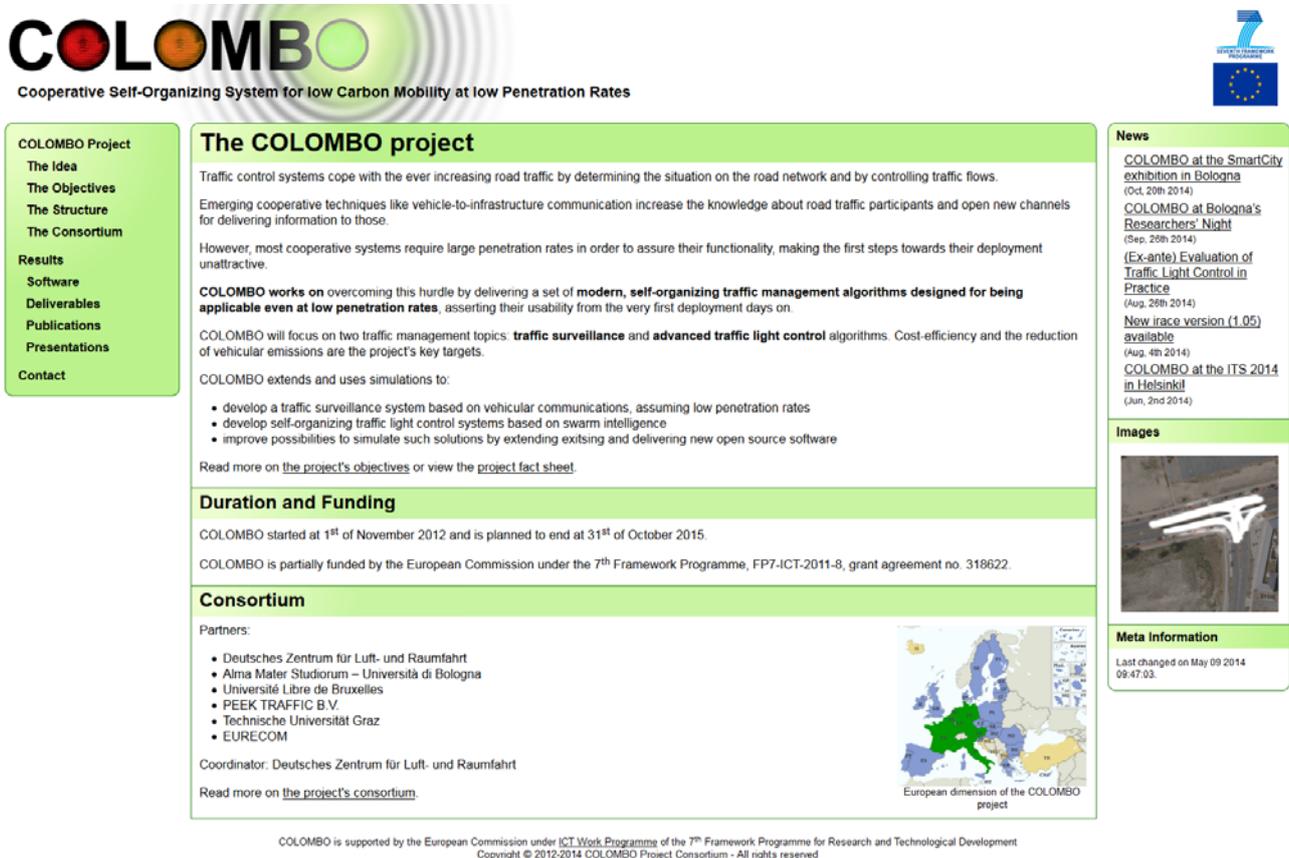


Figure 2: The COLOMBO web site as shown in Mozilla Firefox version 25

The changes performed on the web pages after the last user and community involvement deliverable (D6.5) are described in a high detail in the deliverables D6.8#3 and D6.8#4. They can be summarized as following:

- a web page with presentations that currently includes the slides presented at the webinar and at the first stakeholder workshop, see section 2.5, has been added,
- the results pages were updated, including updates of the pages that list the publications and the deliverables, as well as a rework of the software development,
- the blog has been revitalised.

The number of web site visitors, as shown in Figure 3 and Figure 4, does not show any special or specific patterns.



Figure 3: Visitor numbers of the COLOMBO web pages within the second Reporting Period (1st of November 2013 to 30th of October 2014)

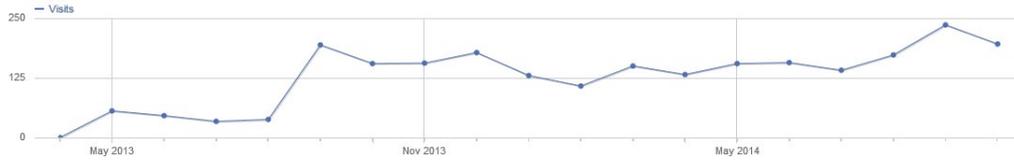


Figure 4: Visitors per month since tracking the visitors.

Again, as reported in D6.5 after the first period, most of the visitors come from the United States of America, as shown in Figure 5.

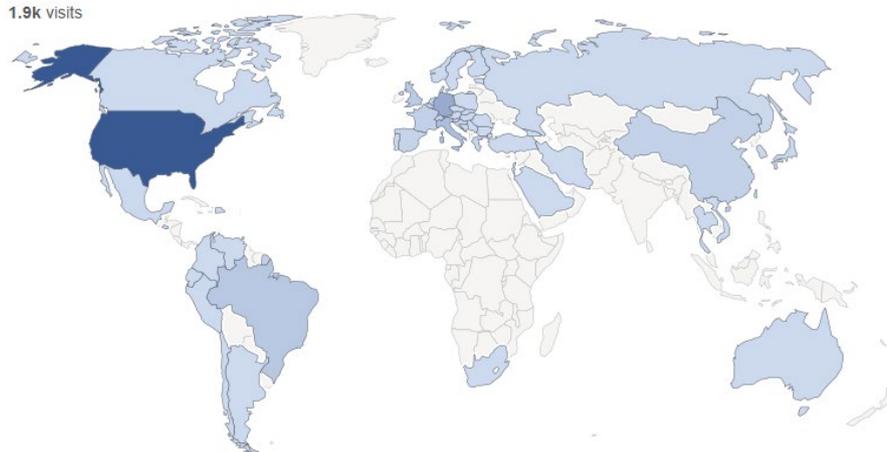


Figure 5: COLOMBO web pages visitors by country (1st of November 2013 to 30st of October 2014)

Besides, a LinkedIn group has been established which mirrors the news posted on the blog. It is as well used successfully as a channel for communicating with scientists and practitioners. Further information was given in the web site updates (D6.8#3 and D6.8#4) and is as well included in the Periodic Report (D7.3).

2.2 Presentations

The project has been presented at the Bologna smart city exhibition in March 2014. At the Pisa smart city master in July 2014 and the researchers night in Bologna in September 2014. Even though the last Bologna Smart City Exhibition was in November and thus in the final project year (after the second Reporting Period), it is worth mentioning that COLOMBO was presented in a workshop on urban mobility. The attendance was high (around 60 people) and the project has established many contacts with mobility managers in provinces and municipalities that are interested in the COLOMBO solution.

In particular, the municipality Monza, a smaller city close to Milano, is interested in using the system for a couple of intersections that are very congested and they do not want to make structural changes to the road network. This is a very interesting preliminary contact as far as exploitation is concerned and it will be followed up during the last project year.

Lastly, COLOMBO was present at 4 plenary talks at conferences about optimization like the 8th International Symposium on Intelligent Distributed Computing (IDC'2014) in Madrid, Spain; the Workshop on Rough Sets: Theory & Applications at the Joint Rough Set Symposium, Granada, Spain; the EVOLVE 2014 conference, Beijing, China; and the 2nd Brazilian Conference on Intelligent Systems (BRACIS-13), Fortaleza, Brazil.

2.3 Publications

Multiple conferences have been visited in which the following list of papers were published and presented:

Sumo conference, May 2014

- Daniel Krajzewicz, Michael Behrisch, Peter Wagner, Stefan Hausberger, Mario Krumnow: 2nd Generation of Pollutant Emission Models for SUMO.
- Laura Bieker, Daniel Krajzewicz, Traffic Simulation for all: a real world traffic scenario from the city of Bologna.
- Robbin Blokpoel, Network conversion for SUMO integration.
- Robbin Blokpoel, Interface between proprietary controllers and SUMO.

ITS Europe, June 2014:

- Daniel Krajzewicz, Jakob Erdmann, Thrasylvoulos Spyropoulos, Including Pedestrian and Bicycle Traffic into the Traffic Simulation SUMO.
- Cornelia Hebenstreit, Robbin Blokpoel, COLOMBO: Significant Differences concerning Traffic Light regulations and its Implication for Traffic Light Control across Europe.
- Robbin Blokpoel, Siebe Turksma, Traffic control using probe vehicle data.

Other conferences:

- Jérôme Härrri, Paolo Bellavista, Luca Foschini, Robbin Blokpoel, Extending the iTETRIS platform for Smartphone Sensing and Communication Simulation, Transport Research Arena, Paris, France, April 2014.
- Daniel Krajzewicz, Marek Heinrich, Michela Milano, Paolo Bellavista, Thomas Stützle, Jérôme Härrri, Thrasylvoulos Spyropoulos, Robbin Blokpoel, Stefan Hausberger, Martin Fellendorf. COLOMBO: Investigating the Potential of V2X for Traffic Management Purposes assuming low penetration Rates. ITS Europe 2013, 04. - 07. Jun. 2013, Dublin, Ireland
- Leslie Pérez Cáceres, Manuel López-Ibáñez and Thomas Stützle, An Analysis of irace 14th European Conference on Evolutionary Computation in Combinatorial Optimisation, Granada, Spain, April 2014.
- Daniel Krajzewicz, Nikolaus Furian, Josep Tomàs Vergés, Großflächige Simulation von Verkehrsmanagementansätzen zur Reduktion von Schadstoffemissionen, 24th Verkehrswissenschaftliche Tage, March 2014 (published in German language).
- Daniel Krajzewicz, Robbin Blokpoel, Wolfgang Niebel, Cornelia Hebenstreit, Jérôme Härrri, Michela Milano, Anna-Chiara Bellini, Thomas Stützle, Towards a unified Evaluation of Traffic Light Algorithms, Transport Research Arena, Paris, France, April 2014.
- Jaap Vreeswijk, Robbin Blokpoel, Daniel Krajzewicz, Unified Evaluation Method for Traffic Control Algorithms, 21st ITS World Conference, Detroit, USA, September 2014.
- Paolo Bellavista, Luca Foschini, Enrico Zamagni, V2X Protocols for Low-Penetration-Rate and Cooperative Traffic Estimations, 80th IEEE Vehicular Technology Conference 2014 (VTC2014-Fall), Vancouver, Canada, September 2014.
- Paolo Bellavista, Federico Caselli, Luca Foschini, Implementing and evaluating V2X protocols over iTETRIS: traffic estimation in the COLOMBO project, 4th ACM Symposium on Design and Analysis of Intelligent Vehicular Networks and Applications (DIVANet 2014), Montreal, Canada, September 2014.
- Riccardo Belletti, Alessio Bonfietti, Luca Foschini, Michela Milano, Daniel Krajzewicz, Swarm-based traffic lights policy selection, 4th ACM Symposium on Design and Analysis of Intelligent Vehicular Networks and Applications (DIVANet 2014), Montreal, Canada, September 2014.

2.4 Activities in progress

During the 2014 SUMO conference, the best papers according to the visitors were invited to publish in the Springer lecture notes on mobility. The following papers have been submitted for this publication:

- Robbin Blokpoel, Jaap Vreeswijk, Online micro modelling using proprietary controllers and SUMO.
- Daniel Krajzewicz, Michael Behrisch, Peter Wagner, Raphael Luz, Mario Krumnow: 2nd Generation of Pollutant Emission Models for SUMO.

Currently there are no papers under review but in the third year many publications will follow. The consortium is planning to attend at least the SUMO 2015 conference and the ITS World congress in 2015, but more conferences that focus on communications will also be attended.

2.5 Workshop and webinar

In April 2014 a webinar was organized for the Advisory board. Even though not all members attended, the event was successful and gave interesting insights to the consortium. The following presentations were given:

- Jérôme Härrri: [Approaches for Low Penetration C2X Traffic Surveillance Systems](http://colombo-fp7.eu/presentations/COLOMBO_webinar1_WP1.pdf)
(http://colombo-fp7.eu/presentations/COLOMBO_webinar1_WP1.pdf)
- Michela Milano: [Self-Organizing Traffic-Light Control System](http://colombo-fp7.eu/presentations/COLOMBO_webinar1_WP2.pdf)
(http://colombo-fp7.eu/presentations/COLOMBO_webinar1_WP2.pdf)

The webinar was meant to bridge the gap between the start of the project and the first workshop that took place in June 2014 during the ITS Europe congress. This first workshop was part of the official program of the ITS Europe congress as session SW04 ‘Traffic control using low penetration rate cooperative detection’. The session started with an introduction held by Anders Torp Madsen (Municipality of Copenhagen) who described the traffic surveillance and traffic lights systems in the city of Copenhagen, Denmark. Afterwards, COLOMBO's intermediate results from traffic surveillance, traffic lights control, and simulation were presented. The session closed with a summary on traffic management, data fusion, and simulations given by Hans van Lint (TU Delft, Netherlands). The session was attended by approximately 30 people of which only around 8-10 were connected to the organizers. This can be considered a successful attendance and a sign that people show interest for the subject. The presentations about the progress and ideas in the field were clear to the audience as they did not raise fundamental questions. As well, the audience agreed to some of the presented ideas and performed work steps. The following presentations were given:

- Anders Torp Madsen: [Traffic detection in Copenhagen](http://colombo-fp7.eu/presentations/COLOMBO_workshop1_Madsen.pdf)
(http://colombo-fp7.eu/presentations/COLOMBO_workshop1_Madsen.pdf)
- Jérôme Härrri: [Low Penetration Rate Cooperative V2X Traffic Surveillance System](http://colombo-fp7.eu/presentations/COLOMBO_workshop1_WP1.pdf)
(http://colombo-fp7.eu/presentations/COLOMBO_workshop1_WP1.pdf)
- Riccardo Belletti: [Traffic Lights Control using swarm-based algorithms](http://colombo-fp7.eu/presentations/COLOMBO_workshop1_WP2.pdf)
(http://colombo-fp7.eu/presentations/COLOMBO_workshop1_WP2.pdf)
- Daniel Krajzewicz: [COLOMBO's open source simulation framework - and some initial results](http://colombo-fp7.eu/presentations/COLOMBO_workshop1_WP5.pdf)
(http://colombo-fp7.eu/presentations/COLOMBO_workshop1_WP5.pdf)
- Hans van Lint: [Data fusion, State Estimation & prediction](http://colombo-fp7.eu/presentations/COLOMBO_workshop1_vanLint.pdf)
(http://colombo-fp7.eu/presentations/COLOMBO_workshop1_vanLint.pdf)

The discussion after the workshop did not directly lead to new algorithms or ideas for the field of research, but led to extra points to keep in mind for active researchers. For instance:

- How to deal with multimodality in detection, as sophisticated filtering is needed to know if a certain 3G-connected device is inside a car, public transport or even just in the possession of a pedestrian or cyclist.
- Privacy should also be a point of attention for systems design, when this is adopted in an early stage the privacy of users can be guaranteed implicitly.
- More related to deployment, the system design should also avoid single points of failure. It shouldn't be possible that the traffic lights in an entire city degrade or even turn off once for instance a back office server is down.
- To deploy new cooperative traffic control there may also be resistance from road authorities because of investment in "old" technologies or unfinished.

The workshop also proved to be a good conversation starter, since during the congress there were some interesting follow-up talks with participants of the workshop. One mentioned how systems could theoretically be hacked or compromised. For instance by changing the time synchronization, or corrupting the certificate authority that is involved in the authenticity of geonet messages.

3 User community involvement

3.1 SUMO community

COLOMBO itself has not yet been announced on main SUMO's communication channels, but changes are reflected in the documentation and according documentation pages were extended by a reference to the project, showing the feature's or sub-module's origin. Both, the project logo as well as the logo of the European Commission are included. Figure 6 shows a screenshot of used footer.

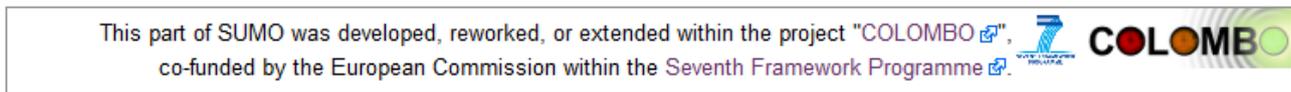


Figure 6: Footer used on SUMO documentation pages.

Extensions to SUMO implemented within the COLOMBO project are at first added to a working copy that is dedicated to the project. After being finalised, they are moved into SUMO's "main trunk" that contains the release version.

Up to now, the following extensions have been released:

- traceExporter
- PHEMlight
- Pedestrian dynamics and bicycle support

These extensions are well accepted by the SUMO users. The traceExporter script was already released within the first Reporting Period and initial interactions with SUMO-users regarding this tool were already given in D6.5.

The pedestrian dynamics extension was accepted very fast by third-party users and several discussions on the sumo-user mailing list have been observed. But (half a year after the release), no third-party publication that refers to it is known, yet.

PHEMlight is known to be under investigation by third-party users as well. SUMO is directly implemented within SUMO, but uses additional data files, each describing a single emission class. Within the standard SUMO-release, PHEMlight includes the definitions for two emission types only. Both describe a passenger EURE 4 vehicles, the first one powered by Diesel, the second by Gasoline. Up to now, only one commercial user has ordered a copy of the full data set - the project partner DLR who will use it in an internal project.

Besides some further, small and rather technical extensions (such as on-line interaction with abstract parameters, or an on-line access to pedestrians), the major pending contribution to SUMO from COLOMBO is the traffic light algorithm evaluation system. The system is assumed to be refactored, first, and released in conjunction with an appropriate publication, where the next ITS World in Bordeaux or the SUMO 2015 conference are preferred.

3.2 Traffic engineering community

The traffic engineering community has been directly involved in this period through the workshop at the ITS Europe congress. Also the follow-up activity from the researchers night in Bologna will be a direct involvement of the traffic engineering community as the contact is with the traffic departments of Monza and the state government of Bologna (see section 2.2).

As outlined in section 2.1 and described in D6.8#4 in detail, the LinkedIn group has been used for discussions with traffic community. Albeit no directly usable information could be obtained, the channel is assumed to be a very valuable dissemination channel.

The project also participated in an EU concertation meeting to share experiences with other projects. This was an interesting and inspiring meeting, but no concrete follow-up actions could be taken. Similarly, COLOMBO results were already included in new proposals for H2020 projects, like DETECT, which will use the additions to SUMO for accurate traffic modelling.

The results on emission modelling were as well given to the European Commissions's Joint Research Centre. The project promised to support future results as well.

3.3 Communication engineering community

The communication engineering community is following with interest the COLOMBO project, also through the dissemination of some important obtained result at the IEEE VTC2014-Fall venue and at the ACM DIVANet'14 symposium. Received feedbacks confirmed the strong interest from this community in the iTETRIS platform as a unique integrated simulation platform for both communication and traffic management.

In particular, we have already had more intense contacts and follow-ups with two research groups, one with Khadige Abboud, a research assistant in the BroadBand Communications Research group led by Prof. Sherman Shen, and another with Seth Hetu and Dr. Kakali Basak member of the Future Urban Mobility division of the Singapore-MIT Alliance for Research and Technology (SMART) MIT initiative. One of the main points raised by community members was the need to update the ns-3 subcomponent in iTETRIS to the latest ns-3 version that includes also the WAVE model, namely IEEE Std 802.11p-2010. Motivated by this suggestion we are considering to evolve the iTETRIS platform to ease integration with this and future ns-3 upgrades.