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COORDINATION AND SUPPORT ACTION

FOT-Net Data

FIELD OPERATIONAL TEST NETWORKING AND DATA SHARING SUPPORT

International workshop: "FOT-Net Data International Workshop on ITS and Connected Vehicle Data"

5 October 2015 Bordeaux

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www.fot-net.eu

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Table of Contents

1 Introduction

1.1 Background

FOT-Net Data is a Support Action funded by the European Commission. It is a continuation of the FOT-Net projects that networked Field Operational Tests (FOT) and maintained the common FOT methodology (the FESTA methodology) for performing these tests. FOT-Net has brought together organisers of Field Operational Tests (FOTs) in one strategic platform in order to address common issues related to the practical organisation, set up and follow-up of FOT results. FOT-Net Data develops and promotes a framework for sharing data, a framework to describe available datasets, recommendations for data protection, strategies to facilitate data sharing and awareness about the value of data sharing. It takes into account the pre-requisites necessary in the FOTs, such as legal agreements, to enable future re-use of data. International collaboration is an important part of FOT-Net. Every year an international workshop is organised in conjunction with the ITS World Congress, and representatives from the three regions present and discuss work related to FOTs.

The International Workshop on ITS and Connected Vehicle Data was organised by FOT-Net Data in collaboration with the U.S. Department of Transportation (DOT) on Monday 5 October 2015 in Bordeaux, France. It concluded right before the opening ceremony of the ITS World Congress 2015.

1.2 Objectives of the workshop

This workshop aimed to facilitate exchange of information on FOTs and data sharing between the three regions, and focused on challenges and opportunities with data collection, sharing, and management, as connected vehicle programs transition from research to deployment.

The questions addressed included:

- How can lessons learned from FOTs concerning data ownership, personal data and anonymisation be used in the deployment phase?
- How to deal with research versus operational data?
- How can stakeholders profit from international sharing of data and experiences from FOTs and pilots?
- Which research areas or specific questions need to be answered to enable and facilitate deployment, and can analysis of existing FOT datasets provide some of the answers?

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Additional information on FOT-NET Data: **www.fot-net.eu**

All presentations of the International Workshop are available at the FOT-Net website at the following link:

http://fot-net.eu/Documents/fot-net-data-international-workshop-on-its-and-connected-vehicle-data/

2 Agenda

FOT-Net Data International Workshop on ITS and Connected Vehicle Data

Organised in collaboration with the U.S. Department of Transportation (DOT)

Monday, 5 October, 2015, 09:00–15:30

(before the ITS World Congress opening ceremony)

Palais des Congrès, room F1, Bordeaux

08:30	**Breakfast and registrations**	
09:00	**Welcome from the Regions: Introduction on FOT activities** •Europe: FOT-Net Data project & Horizon 2020 •US: Connected Data Systems Program •Japan: ITS Spot project	Sami Koskinen (VTT) Carl Andersen (USDOT) Hiroshi Makino (MLIT)
09:30	**Data sharing initiatives** •Europe: •US: •Japan: **Questions & Answers session**	Europe: Jean-Philippe Mechin (CEREMA) Carl Andersen (USDOT) Hideyuki Kanoshima (MLIT)
10:20	Coffee break *(Espace Panoramique)*	
10:40	**Data and deployment** In this session first 2 short introductions will be given by the speakers. The introductions are followed by discussions in small groups. Small groups addressing one of the following questions: • **How can lessons learned from FOTs concerning data ownership,** **personal data and anonymisation be used in the deployment phase?** **• How to deal with research versus operational data?** The main questions will be detailed into more dedicated questions. Discussions will be held in small groups of 6-10 participants, each addressing one of the questions Few groups will move in ROOM H2 in front for the discussion	Speakers: Europe: John-Fredrik Grönvall (Volvo Cars) US: Ram Kandarpa (Booz Allen Hamilton)
12:00	Lunch *(Espace Panoramique)*	
12:45	Reports from the rapporteurs	

13:15	**Profiting from FOT experiences in deployment** In this session first 2 short introductions will be given by the speakers. The introductions are followed by discussions in small groups. Small groups addressing one of the following questions: • **How can stakeholders profit from international sharing of data and experiences from FOTs and pilots?** • **Which research areas or specific questions need to be answered to enable and facilitate deployment, and can analysis of existing FOT datasets provide some of the answers?** The main questions will be detailed into dedicated questions. Discussions will be held in small groups of 6-10 participants, each addressing one of the questions Few groups will move in ROOM H2 in front for the discussion	Speakers: Europe: Tom Alkim (Rijkswaterstaat) Kazuya Takeda (Nagoya University)
14:45	Reports from the small groups	
15:00	**Panel discussion on next steps in deployment**	Moderator: Maxime Flament (ERTICO – ITS Europe) Panellists from: • Europe • Japan • US
15:30	**Adjourn**	

3 Welcome from the Regions: Introduction on FOT activities

3.1 Europe

Sami Koskinen (VTT, and coordinator of the FOT-Net Data project) presented Field Operational Tests (FOT) and data management activities in Europe. Since 2008, the EU has supported a number of large-scale field tests of latest vehicle information technology. Thousands of drivers have been able to test the most promising prototypes and products just entering the markets. FOTs have evaluated societal impacts of these technologies, and also contributed to their introduction.

Dr. Koskinen took stock of C-ITS tests in Europe. A first phase was driven by projects such as Drive C2X (2010-2015, including simTD, SCORE@F), FOTSIS and Compass 4D. They achieved good technical progress, but business and privacy models need further collaboration.

The EC has since set up a C-ITS Platform to support deployment, and bring several actors together to work on how to overcome deployment barriers. The next phase of testing could be defined as a time for corridor projects, demonstrating cross-border interoperability. That is the case of Cooperative ITS Corridor, SCOOP@F, NordicWay, etc.

The next calls for C-ITS and automated driving test proposals open in mid-October and included €10m (MG-6.2) funds for large-scale C-ITS demonstration projects. There are also several projects for automated and connected driving under the Automated Road Transport (ART) call. As proposals are to include data management and collaboration plans, they can refer to FOT-Net Data.

Access to data is a critical topic for C-ITS. Proposals for new projects will have to answer questions such as: What types of data will the project generate/collect? What standards will be used? How will this data be exploited and/or shared/made accessible for verification and re-use? How will this data be treated and preserved?

3.2 US

Carl Andersen (USDOT) gave an overview of the activities in the US. The key programmes from the ITS Joint Program Office focus on research on connected vehicles, automated vehicles and training and standards in ITS. Along these lines, the ITS Strategic Plan 2015 – 2019 tackles connected vehicles, automation and emerging capabilities from different strategic angles, i.e. enterprise data, interoperability and accelerating deployment.

One of the programmes included in the plan is Connected Data Systems (CDS), which seeks to develop scalable data management and delivery methods to (1) exploit the potential of high-volume multi-source data from connected and automated vehicles, connected travellers with mobile devices, and other sources; and (2) enhance current operational practices and transform surface transportation system management.

There are 6 CDS Program Initiatives, including “Leverage Emerging Data Sources” and “Enhancing Legacy Transportation”, among others.

The Research Data Exchange tool was also presented.

3.3 Japan

Hiroshi Makino welcomed the participants and provided a short introduction to the main activity on-going in Japan.

In particular, he mentioned the wide interest for the deployment of ITS technologies in Japan and the importance of raising public awareness: providing services to users, such as the one for traffic light, will help this process.

Deployment Pilots

3.4 Europe: Compass 4D

Jean-Philippe Mechin (CEREMA) presented the Compass4D project pilot. Compass4D focuses on testing and delivering services that will increase drivers' safety and comfort while triggering a positive impact on the environment, mainly through reducing polluting and GHG emissions. The Compass4D project is demonstrating how cost-effective is deploying C-ITS solutions. Proof of that is that participating cities have decided to continue operating the systems after the project's lifetime.

The key success factors of the Compass4D project include international collaboration, identification of barriers and solutions and proven benefits for different stakeholders (public transport, hauliers, emergency services, taxies and private cars) as well as the prospects of business and use cases.

Mr. Mechin focuses on concrete implementation perspectives in France, and concluded with a brief mention to the Scoop@f project, which will continue the work done within Compass4D in places such as the Bordeaux ring road.

3.5 US: ITS Deployment and Pilot Projects

Carl Andersen (USDOT) gave an overview on ITS Deployment and Pilot Projects carried out in the US. He highlighted three main deployment concepts enabled by probe data.

The first one, Intelligent Network Flow Optimization (INFLO), is a collection of apps that seek to maximize roadway throughput, reducing crashes and fuel consumption. This is done thanks to multisource data acquired from connected vehicles, infrastructure and travellers' mobile devices.

The Road Weather Management Program (RWM) aims to develop tools to monitor and predict the impacts of weather on the roads. Enhanced Maintenance Decision Support System Applications generate and send improved road-surface treatment plans to snow plow operators and drivers of maintenance vehicles by using road-weather data.

Road Agency Operations employ Traffic Management Measures Estimation Applications to estimates key traffic measures (e.g. travel times, speeds, etc.) to provide comprehensive and precise information rapidly for improving decision-making.

Carl Andersen also presented the Research Data Exchange (RDE), a data sharing system that includes real-time and archived data, probe data from field tests and data from research projects (including simulations' data). These data can be easily search and downloaded.

3.6 Japan: ITS Spot

Hiroshi Makino (MLIT) gave an overview of the Japanese activities. Five years ago the Ministry of Transportation initiated the world first V2I service, called "ITS Spot". It focused on route exchange, Safety applications, Electronic Toll Collection (ETC), and GPS correction. 360 000 were equipped with on board units (OBU) and 1600 highway road-side units (RSU) have been installed with 400 m in-between.

However, this has evolved into ETC 2.0, and optimised version of ITS Spot, which includes new services; i.e. tolls for individual routes and commercial vehicle management. In addition to ETC for expressways, ETC 2.0 works in tandem with car navigation systems to provide additional services such as safe driving support, ideal route selection based on the toll and guidance for large vehicles.

Traffic information is generated by processing the various types of data gathered by road administrators and traffic management personnel on almost all sections of expressways and national highways. This information is sent to vehicles by roadside units.

A total of 26 automobile, car navigation system and OBU manufacturers offer ETC2.0 compatible car navigation systems. The number of on-board units has increased dramatically in recent years.

4 Data and Deployment

This session started with two short presentations from John-Frederik Grönvall (Volvo Cars) and Raam Kandarpa (Booz Allen Hamilton).

John-Frederik Grönvall discussed the usage of widely available versus restricted data, as well as the sensitivity (in terms of privacy) of the content. Different data can be used with different purposes, i.e. commercial or research. He also posed a number of questions to the audience, oriented to provide an answer to data usage of research and operational data. For instance, he asked: Can personal data be collected during the deployment phase? If so, how?

Raam Kandarpa highlighted the importance of considering data re-use when drafting data collection plans, therefore, prior to deployment. This will allow for timely consideration of data issues and how to overcome them, particularly in reference to data gaps, accessibility and privacy.

1. **How can lessons learned from FOT's concerning data ownership, personal data and anonymisation be used in the deployment phase?**
    a. Can personal data be collected during the deployment phase, and if so, how?
    b. Can personal data as operational data be anonymised in real time?
    c. How can deployment data be expanded taking data ownership into account?
2. **How to deal with research versus operational data?**
    a. How could requirements for additional data for research be collected before the deployment test?
    b. How should deployment data be stored to facilitate further re-use?
    c. Who owns the operational data delivered in real-time?

4.1 Reported discussion on data and deployment

The main points discussed are reported below considering the feedbacks from the different Working Groups.

GROUP 1

How could requirements for additional data for research be collected before the deployment test? Standardise some level of data collection; work at past research for ideas on how probe data was used; Log all basic data; Develop subsets of selected "clean" data, probably aggregated; Bring in researchers / future users, but possible with requirements to pay

How should deployment data be stored to facilitate further re-use? Bring in an IT specialist and develop a data storage architecture; determine how much of the data are really required; What data elements might be used to evaluate "goodness" of data, but may not need to be stored with each data entry (e.g. transmission power may indicate if the system is operating properly, but is not necessary for each entry); Quarantined/suspect data should be stored

separately; Automated tools could be used to evaluate valuable data. Important questions to define: Who owns the data? Is there the right to use them?

GROUP 2

Research (data that cannot be used as operational) vs. personal data; Operational data shared to all; ITS Japan: car data only used for traffic man and ITS deployment while Ministry of transport uses data for safety purpose. Probe data anonymised: user concern position and speed (only authorities can collect speed). ITS no individual data (accident data collected from car)

The need of consent is very important: how can we get it? 1) By contacting stakeholders: though the need changes due to the development consent to use data 2) Projects: collaborative data centre. Traffic data (no personal data easily used, plus personal based as consented) 3) Commercial (which can raise more concerns): a. Open data for states / no owners b. Owning data / liability. In Japan: no manipulation/aggregated data ownership

GROUP 3

Reuse: There is a gap between research and operations.

For Research: Proof of concept is not valid in operations. What is pushing you to do a pilot? a) Different scoop b) Different aim (safety? Efficiency?). Research questions – answers limited: Collect as much data as you can in order to support your policy decision (YES/NO)

For Operations: Different environment / there should be a clear business case. Service oriented: you collect what you need for the service. It would be important to capitalise on sensors already in vehicles.It is important to understand which data are already available: how much? Where are they? The challenge is also to combine datasets and use available datasets.

Japan: open questions: how to open data? To be considered: rule of the private sector and social benefit of data. What is private? Who should decide? Customers/Government

Incentive programme: use of the data is authorised by given an incentive and data can be reused for ever.

Public vs. private: Cities have more trust for privacy. Added value can be claimed. The idea could be to choose of data can be reused: controllability of the reuse of data

Operations: examples are the Telematic platform / RDE developed by US DoT.

GROUP 4

Collecting speed data + geo-localisations are more sensitive then others (EU-SCOOP). Vehicle external data sources (e.g. cameras) should be anonymised automatically when storing data (for instance with less than 2 km. cut-off). Anonymisation should be done but not in synchronised steps of processing. Data ownership processor rules are mayor barrier to fully exploit the potentials of data analysis and sharing.

GROUP 5

1) Personal data can be collected but you need to be aware that they need to have a specific consideration. They should be collected with a limited scale so that it is easy to identify them

and to deal with them. Telephone number or addresses can be dropped off, but it is harder for GPS or images. An high percentage of the population already provide data in different format that are related to their private life. A 100% penetration is not needed for most of the systems to get the benefits.

Scalability of benefits with time/penetration? Typically things that it is possible to do with a small fleet cannot be done with a very large penetration. Deployment, continuous improvement is needed. In deployment different user identification needs than in research (but resolution is typically always needed, e.g. sampling). New connections between datasets can create added value: by aggregation but there is the possibility to lose something; this process can be done on-line for instance. It is hard to find funding for documentation and sharing of data (the obligation can be to make it available, not defining how much and how, but not to share it). Hard to do documentation that cannot be misinterpreted: a support is typically needed. Resources needed to really support re-use. Sharing and back-ups cost money. New data come in all the time, oldest data can be stored not to be actively accessible so easily.

5 Profiting from FOT experiences in deployment

This session started with two short presentations from Tom Alkim (Rijkswaterstaat) and Kazuya Takeda (Nagoya University).

Tom Alkim addressed the activity on automation in the Netherlands focusing on the following points:

1. Adjustment of (inter)national law
2. Facilitate large-scale practical tests
3. International efforts to make deployment a reality
4. Stimulating and developing knowledge

Kazuya Takeda presented experiences in data collection and data sharing at Nagoya University. He employed a thousand instrumented vehicles to study driver behaviour. This valuable data has been used by more than 20 research institutes. Privacy was one of the main issues to be addressed carefully, so data could be really shared and used as the core of international collaboration activities.

The introductions were followed by discussions in small groups. The discussions revolved around two sets of questions:

1. How can stakeholders profit from international sharing of data and experience from FOT's and pilots?
   a) Can you capture all experience in data?
   b) How to account for controlled environment/limited scope?
2. Which research areas or specific questions need to be answered to enable and facilitate deployment, and can analysis of existing FOT datasets provide some of the answers?
   a) Are all domains equally important for deployment?

b) Where are the show stoppers?

5.1 Reported discussion on profiting from FOT experiences in deployment.

The main points discussed are reported below considering the feedbacks from the different Working Groups.

GROUP 1

Need to augment the data: reports, results, metadata and narrative around the experience. It is a danger to share data that is not documented enough. Data can be easily misinterpreted and interpretation is very important.

Stakeholder engagement process is important to state the research questions: they should start to discuss before data collection. How to do this? Litterature, State of the Art, consultations are very important.

Veracity vs. volume vs. diversity: precise data have a higher cost. Veracity: there is the need of precision, but to what extent is it possible to scarify it? The following questions should be considered: What kind of data is collected? For which purpose?

It is important to identify how other data set can complement your data set to increase the value of your results.

What is important? Data set access (through download) OR access to data set (through queries)? It is important to implement data guidelines. Data set without a proper access is useless.

RDE guidance: contract, negotiate, planning, implement and transfer data to the RDE. It is important not to lose lessons learnt and implement lessons in open tools.

Transferability and scalability of data the datasets is very complex. Not enough to study one thing and scale up to large areas. It is difficult to separate effects of single traffic measures: used to look at combined effects.

Benefits of collaboration:

a) Understand safety mobility emission impacts

b) Understand cost and benefits (at least start from something)

c) Share data analytical tools

d) Cross-leverage investments

GROUP 2

In Korea taxi are used for data collection. There is demand for more public transport during the night. In Seoul mobile phone data are collected, phone companies did the analysis. Also electric vehicles are used for data logging. For road charging data can be sensitive. They should be stored by areas of interest.

An important question is: how is shared ownership managed?

Japanese are interested in how to protect privacy, facial recognition, health, tyre pressure, and monitoring systems. Governmental pilot prospects testing private data collection, discussion is on if a driver would agree or not on data collection.

GROUP 3

What can we learn from data to pilot your service from deployment with FOT data. List of variables to collect; metadata; contextual data; data format.

Benefits/challenges: International data include more variance; Average behaviour may not represent anything; National differences are a challenge

It is possible to learn from the kind of research not done in your country at all: avoid making mistakes or doing a bad selection: what to deploy / to start making research? Preliminary results (magnitude) and estimate fleet size could be supported.

Challenges may arise in relation to the lack of common definition of “road type”. Common minimum set of data definitions would increase possibilities to use international data. Purpose of research depends on who is funding/doing research: common issues are emission data, quality of travel. Respect also OEM’s privacy/IPR/. Common political goals are safety, environment, efficiency and public transport. Data accuracy should be known. Logic of data processing should be documented. Validation of results, product ability of science (results are more trustable when the same results is coming from several sources/data sets).

Public data are often used to enrich FOT data. In the USA data collected with public money need to be shared (e.g. RDE).

GROUP 4

A detailed description of the context is very important. For data reuse metadata and comparisons are important. For instance pedestrian warning systems could be seen differently in different countries. Experiences are different. Driving situations vary very much from one country to another after an accident.

Aviation collects huge databases of what it went wrong. Automated driving development can be the same.

Basic data can be shared but sharing competitive data is an issue. Before an accident how to prove that your automated car works? What is the trust level of automotive industry?

6 Panel discussion on international collaboration in data sharing

The workshop concluded with a panel from the different regions, moderated by Maxime Flament (ERTICO – ITS Europe) addressing some of the topics that have been addressed in the group discussion:

a) Data sharing: how to support data sharing? Collected data, but also results derived from this data should be shared. How to show the value of collected data to attract the attention of the stakeholders?

b) Which sharing facilities are the most suitable to foster data sharing?

c) How to evaluate costs and benefits of data sharing?

The following panellists discussed these questions and interacted with the audience:

- America: Raam Kandarpa (Booz Allen Hamilton).
  Carl Andersen (USDOT)
  John-Fredrik Grönvall (Volvo Cars)
- Europe: Tom Alkim (Rijkswaterstaat)
- Asia: Kazuya Takeda (Nagoya University)
  Hiroshi Makino (MLIT)

The following aspects have been highlighted by the speakers:

a) It is important to have minimal, simple level of data to foster data sharing: data of high level complexity are more difficult to share

b) Often in some project teams there aren't resources to prepare data for sharing them. This should be taken into account in the planning phase especially of project publically funded

c) Maintaining data available for sharing has some costs. For instance who should pay for the storage? This could be easier at national level (e.g. RDE) while it seems more difficult at international level

d) The data sharing framework of FOT-NET data should be considered as a reference for this collaborative opportunity

e) Also analysis tools can be shared

f) Challenges for data sharing are related to competitive and proprietary data.

Registered participants

Surname	Name	Company
Agerholm	Niels	Aalborg University
Alkim	Tom	Rijkswaterstaat
Andersen	Carl	USDOT
Barnard	Yvonne	University of Leeds
Boehm	Martin	Austriatech Gmbh
Bozhilov	Nikolai	Unimasters Logistics plc
Brizzolara	Davide	ERTICO - ITS EUROPE
Bruneau	Audrey	Toyota Motor Europe
Curbelo	Silvia	ERTICO - ITS EUROPE
Dingus	Thomas	Virginia Tech
Eloranta	Pekka	Mobisoft Oy
Flament	Maxime	ERTICO - ITS EUROPE
Frémont	Guy	Sanef
Gellerman	Helena	Chalmers
Grönvall	John-Fredrik	Volvo Car Corporation
Guyonvarch	Laurette	LAB Renault-PSA
Hatayama	Yoshinori	Panasonic Corporation
Henchoz	Jean-Michel	DENSO
Hrubeš	Pavel	Czech Technical Uni In Prague
I.Carrera	I.Carrera	sensefields
Innamaa	Satu	VTT
Ishida	Yukio	Yahoo Japan Corporation

Ito	Hiroshi	Japan Automobile Research Inst
Jia	Zanxing	Its Shenzhen
Ju	Xueming	OBIT Business&Technology GmbH
Kandarpa	Ram	Booz Allen Hamilton
Kanoshima	Hideyuki	NILIM, MLIT
Kikuchi	Shin	NAVITIME JAPAN Co.,Ltd.
Kim	Byung Hwa	KICT
Knaap, Van Der	Rien	Oc Mobility Coaching
Kojima	Yoshiko	Toyota Central R&D Labs., Inc.
Koskinen	Sami	VTT
Kulmala	Risto	Finnish Transport Agency
Lin	Yuanhui	Its Shenzhen
Makino	Hiroshi	NILIM, MLIT Japan
Maltoni	Claudia	Alpha Consult
Margerin	Franck	Laser Technology, Inc.
Matsui	Fusaki	ARIB
Minnikhanov	Rifkat	Ministry of Interior
Mistry	Sunilkumar	Pmc
Mitsakis	Evangelos	CERTH
Nacer	Mecheri	Location De Voitures Digo
Nau	Olivier	Setec its
Nieto	Marcos	Vicomtech-Ik4
Onishi	Hirofumi	Alpine Electronics Of America
Perpey	André	Geoloc systems
Pirrotta	Antonino	Autostrade Tech
Ragazzo	David	AXL Solution

Rashvand	Mohammad	Qazvin Municipolity
Renzi	Patrick	Press' Online
Rijeen Ameenulla	Mohamed	Department of Transport
Rosselet	Valérie	Setec its
Russ	Martin	Austriatech Gmbh
Saint Pierre	Guillaume	IFSTTAR
Sasaki2	Mikio	DENSO CORPORATION
Sato	Kenya	Doshisha University
Sayer	James	University of Michigan
Segawa	Kurazo	ARIB
Shehab	Ahmed	UNECE
Somers	Andrew	Transoptim
Spaltro	Emiliano	ALPHA Consult
Tahar	Alileche	TRANSPORT DE MARCHANDISES
Takeda	Kazuya	Nagoya University
Tierolf	Jan Willem	Ministry of Infrastructure
Tissot	Christine	Renault S.A.S.
Verkerk	Onno	Siqura B.V.
Vreeswijk	Jaap	Imtech
Wang	Ping	Tongji University