Towards a European Roadmap on Research and Innovation in Engineering and Management of Cyber-Physical Systems of Systems

Project Deliverable

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Abstract :

This document gives an overview of the 2nd Working Group Meeting of the Transport and Logistics Working Group held at Automotive Megatrends Europe 2014 in Brussels.

Authors (organizations):

Haydn Thompson (Haydn Consulting Ltd.)

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State-of-the-art, Cyber Physical Systems of Systems, Automotive, Aerospace, Rail, Marine, Logistics.

Revision History

The following table describes the main changes done in the document since it was created.

Revision	Date	Description	Author (Organisation)
Draft	15/9/2014	Creation	H A Thompson
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Acronyms and Definitions

Acronym	Defined as
ADAS	Advanced Driver Assistance Systems
ACEA	European Automobile Manufacturers' Association
CPS	Cyber Physical Systems
CPSoS	Cyber Physical Systems of Systems
UPS	United Parcel Service
VDA	Verband der Automobilindustrie

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1 EXECUTIVE SUMMARY

Fig. 1 Automotive Megatrends Europe 2014 Attracted Around 250 Participants

The 2nd Working Group Meeting of the Transport and Logistics Working Group took place in conjunction with Automotive Megatrends Europe 2014 which was held in Brussels on the 10th and 11th of September. The event attracted around 250 participants with key actors from industry and academia. Free tickets were negotiated for the CPSoS Working Group members who attended the main conference and participated in sessions, discussions and networking activities. This maximised exchange of ideas and provided a number of key insights into the logistics and connected car areas. A Working Group Meeting was held on the afternoon of second day to discuss the State-of-the-Art and Challenges in Transport and Logistics Report [1] and overall CPSoS recommendations.

For maximum exposure of the project CPSoS was branded on the Conference website, on a Mobile App and also around the event and on the main conference stages. Additionally, CPSoS had an Exhibition Stand at the event in the Networking Area. This generated a lot of interest and the work of the project was discussed with many conference attendees.

For wider dissemination an advert was placed in the Automotive Megatrends magazine which has a 20,000+ readership and an article was also published of an interview with Haydn Thompson discussing the role of Cyber Physical Systems of Systems and the challenges faced by the automotive and logistics sectors in the future.

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2 AUTOMOTIVE MEGATRENDS EUROPE 2014

Fig. 2 Conference Agenda Day 1- Commercial Vehicles and Logistics

The Automotive Megatrends Conference brings together key stakeholders to network and debate business models, technologies and trends that look set to shape Europe's commercial vehicle and passenger car markets over the next ten years and beyond. The conference attracts over 100 expert speakers and 250 delegates to discuss cutting edge topics including fuel economy, emissions reduction, eMobility and in-car connectivity.

The panel sessions and talks covered a wide range of topics highlighting :

- Megatrends – the key megatrends affecting the automotive and logistics sectors are the ageing population, increased urbanisation, fewer younger people buying cars due to living in cities and starting families later in life, younger consumer expectations for WiFi connected services (for passengers mainly), and the advance of Google with the future being a "Google dashboard".

- Telematics - Telematics is seen as a key technology for the future. Currently there is a low uptake of telematics due to concerns about tracking but larger companies such as DHL and UPS had many success stories of using telematics for optimising efficiency of operations, maintenance, diagnostics, prognostics and safety. Monitoring of drivers was being used to enhance their driving style to be more fuel efficient. There was a need for harmonisation of different standards across Europe, e.g. for automated tolls for truck drivers – a driver needs to install many different devices to travel across Europe presently. Car-to-car and car-to-infrastructure communications were seen as the future but there were issues of privacy and security. Additionally, there were concerns of Big Data being sent for processing to datacentres in the USA.

- Logistics – Key drivers in the logistics sector are reductions in fuel consumption and emissions. Although alternative fuels, use of hybrid vehicles, more efficient engines, more efficient tyres, aerodynamic truck

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design, larger trucks and double trucks would all reduce fuel consumption and emissions far more significant savings could be made through optimised logistics networks and use of ICT. This requires sophisticated optimisation algorithms and the use of data mining of Big Data. Major savings can be made by reducing the number of part full trucks on the road, return of empty trucks (40% saving) and avoiding operation of trucks in stop-start traffic (50% saving).

- Autonomous Vehicles – The future will see the gradual introduction of ADAS (Advanced Driver Assistance Systems). Fully autonomous cars will be on the roads shortly in tests such as in the Drive Me project in Sweden. Already autonomous trucks have been tested in Sweden. Autonomy is seen as a way of improving safety and fuel efficiency. Platooning of vehicles was highlighted as being problematic. Cars need to communicate with trucks and the truck drivers need to consider whether the truck at the front of the platoon are being driven efficiently and whether they will meet their delivery schedule.

- Emissions regulations – New emission regulations are driving the design of truck engines and it is becoming increasingly difficult to achieve further savings with diesel engines. The future is thus hybrid vehicles or use of alternative fuels. This is being driven by Euro 6/"Euro 7" standards for emissions and there is an industry initiative to provide Green Freight Badging. Already tyres are being provided with energy efficient labels similar to those found for white goods energy efficiency.

Fig. 3 Kristian Hedberg, Head of Unit, Land Transport, DG for Mobility and Transport, European Commission

The first day ended with a keynote presentation given by Kristian Hedberg, Head of Unit, Land Transport, DG for Mobility and Transport, the European Commission. In this he advocated integration of Automotive, Rail, Maritime and Air Transport systems. Following the presentation the work of CPSoS was discussed with him and he expressed interest in receiving a copy of the State-of-the-Art in Transport and Logistics report [1].

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Fig. 4 Agenda for Day 2 – Passenger Cars and Connected Cars

The second day of the event concentrated on the future of passenger cars and the increased connectivity of cars. The future of the passenger car market was discussed by representatives of the European Commission, General Motors, Toyota, the European Automobile Manufacturers' Association (ACEA) and Verband der Automobilindustrie (VDA). This highlighted that the market is a global market and this introduces challenges of designing vehicles to meet the various regulations around the world. The relatively low uptake of telematics at present was thought to be due to devices not currently being fitted at point of manufacture. The cost of retrofit is far higher. Already CD players were no longer being designed into cars and Apple and Android are producing systems for cars and promoting Apps and connections to wearable devices. Google have intentions to take over the dashboard as they are keen to gather data from cars for their mapping activities. The "Google Dashboard" is likely to be the future but this raises concerns over security and tracking.

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Fig. 5 Panel Discussion Connected Car Panel discussion with European Commission, GM, Toyota, ACEA and VDA

The sessions highlighted that increased connectivity is the future and this offers many advantages for both commercial vehicles and passenger cars. Examples of fuel, emissions and maintenance savings made by a number of key companies operating fleets of vehicles were highlighted. It was also noted that the majority of truck fleets in Europe are only around 10 vehicles and there was relatively low uptake of connectivity technology by these companies. Additionally, standards are needed to avoid many disparate systems being used. An example of this is the many different tolling systems used across Europe that requires truck drivers to install a myriad of different devices.

Fig. 6 Increased Connectivity

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Fig. 7 Increased Connectivity to form Systems of Systems

The increased connection of different systems was also highlighted as the future. Here the idea of the “extended” vehicle was introduced that interacted with the wider world and through the connected society. United Parcel Service (UPS) described themselves as moving from a trucking company to a “technology company with trucks”.

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3 WORKING GROUP MEETING

Meeting Agenda

1.30 Welcome and Aims - H Thompson
1.35 Round Table Introductions
1.40 Presentation of State-of-the-Art Report - H Thompson
- Feedback from relevant experts on domains – Refinements/Suggestions/Additional Points

3.10 Networking Break (with Conference)
3.40 Presentation of Overall Research Priorities - H Thompson
4.00 Discussion on research priorities
- All key topics covered?
- Ranking of research priorities?

5.00 Networking Drinks (with Conference)
6.00 End

Fig. 8 Hermitage Room and Meeting Agenda

The Working Group Meeting was held on the afternoon of the second day of the conference and coordinated with the sessions. The objectives of the Working Group Meeting were twofold:

1) Refinement and Comments on State-of-the-Art and Challenges in Transport and Logistics Report
2) Discussion of the Draft Overall Research Priorities put forward by CPSoS

The following working group members attended the meeting.

Haydn THOMPSON	Haydn Consulting Ltd.
Carlos CANUDAS DE WIT	CNRS GIPSA-Lab
Philippe LIATARD	CEA – Leti
Martin Torngren	KTH Stockholm (CyPHers)
John AMOORE	Rail Infrastructure Technology Ltd., UK
Christina DIAKAKI	Technical University of Crete – FP7 project Local4Global

Apologies were received from:

Uwe CLAUSEN	Fraunhofer IML & ITL, TU Dortmund University
Charles DIBSDALE	OSyS (Rolls Royce)
Antonio PASCOAL	Instituto Superior Tecnico, Lisbon
Hermann KOPETZ	Vienna University of Technology – FP7 project AMADEOS
Judith DAHMANN	The Mitre Corporation, US

All working group members were circulated with a copy of the Draft State-of-the-Art and Challenges in Transport and Logistics Report two weeks in advance of the meeting. Feedback was received by email and telephone from the working group members. The report was presented over the first half of the meeting and comments were received in the meeting and clarifications given on the key findings. The Working Group Members indicated that they concurred with the findings of the report and that it represented the state-of-the-art well.

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Following interest in the CPSoS work from the conference attendees additional input was also provided by DHL, UPS, and Toyota for the report. The conference provided many other useful pieces of information which were incorporated into the report sections on the automotive and logistics domains.

In summary the Key Recommendations for future research priorities from the Transport and Logistics Working Group are as follows:

Support for Development

- Requirements engineering, model-based systems engineering and validation and verification that support "systems that are never finished" and legacy integration
- Modelling (interdisciplinary) and large-scale simulation of heterogeneous Systems of Systems
    - Multi-objective optimisation of Systems of Systems
    - Proving (economic) benefits of increased integration/system-wide control
    - Giving confidence in safety
    - Identifying any emergent behaviors

Autonomy and Increased Interconnectivity

- Autonomous decision making, system-wide control and coordination
- Socio technical issues of humans interacting with "autonomous" Systems of Systems (noting that not everything will be autonomous)
- Interoperability between systems and development of data exchange standards
- Trust – which becomes more of an issue as systems become more autonomous and highly interconnected (considering security, privacy, and designing to fail safe or operate in presence of security breaches)

Resilience and Monitoring (Situational Awareness)

- Condition monitoring, fault detection and reconfiguration strategies to provide resilience
- Low cost (self-powered) sensor technologies to provide data
- Management of data deluge via large-scale online data analysis to extract information and visualization tools to provide a view of the "real-world in real-time"

Additionally, the draft overall recommendations from CPSoS were discussed. This highlighted the need for clarifications in a number of areas and the need to consider complexity management, risk modelling and management of models.

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4 INTEREST IN CPSoS TRANSPORT AND LOGISTICS WORKING GROUP

CPSoS was presented to the following people at the Conference who expressed an interest in the work. This led to some interesting discussions and DHL, UPS and Toyota provided further information subsequent to the conference for inclusion in the State-of-the-Art and Challenges in Transport and Logistics report.

Kristian Hedberg	- Head of Unit. Land Transport, DG for Mobility and Transport, European Commission
Frederic Bruneteau	- Managing Director, PTOLEMUS Consulting Group, Telematics
Fabio Sacchi	- Vice President, Sub Sector Commericial Vehicles, DHL Customer Solutions and Innovations
Dennis Holmes	- Vice President, GSCM Product Development Europe, DHL Germany.
James Hookham	- Managing Director, Freight Transport Association, UK
Peter Harris	- Director Of Sustainability, UPS
Rudolf Douque	- Public Relations, UPS Belgium
Derek Williams	- General Manager, Telematics Programme and Multimedia Product Planning, Toyota Europe
Andreas Dharmawan	- Electric Cloud USA.
Kevo Meehan	- Senior Territory Development EMEA, Electric Cloud, UK.
Norbert Rainer	- Project Manager, Commercial Powertrain Systems, AVL List
Sari Abwa	- Director, Testfield Efficiency, AVL List GmbH
Mahesh Mahendrakar	- Business Development Manager, Satven, Germany
Guy Tremayne	- Business Development Manager, Johnson Matthey, UK.
Matthew Joss	- Strategy Analyst, Energy Technologies Institute, UK.
Peter Williams	- Product Environmental Management Director, Cummins Diesels, UK.
Steve Green	- Director Global Business Development Commercial Vehicle Sector, NORGREN, UK
Sebastian Kirchner	- VDA, Germany
Jeremy Green	- Principal Analyst, Machina Research
Damien Declerq	- Executive Vice President, Local Motors, USA
Alex Serrarens	- Manager Business Development, Punch Powertrain, Netherlands.
Stephen Roser	- AISIN Europe S.A, Belgium.
Martin Kahl	- Automotive World, UK
Christof Remppis	- Market intelligence, Market ZF Group, Germany

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5 CPSoS EXHIBITION STAND

Fig. 9 CPSoS Exhibition Stand

The CPSoS logo was prominently displayed in all publication materials, around the conference venue, and on the stage. Additionally, the project was represented by an Exhibition Stand highlighting the project in the conference networking area over the two days of the event. A CPSoS poster was generated to support this and flyers were distributed. This generated considerable interest and the project was discussed with many conference attendees.

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6 MAGAZINE

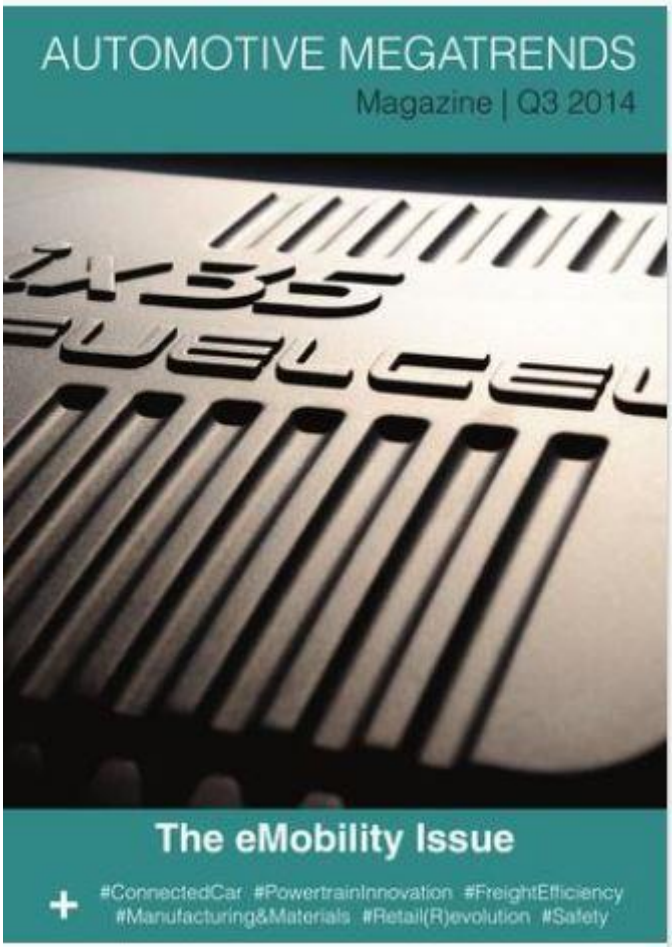

Fig. 10 Automotive Megatrends Magazine and CPSoS Advert

An advert was produced describing the project which was published in the Automotive Megatrends quarterly magazine. This has a readership of 20,000+ readers in the automotive domain. The magazine can be accessed at:

http://www.automotiveworld.com/megatrends-magazine/automotive-megatrends-magazine-q3-2014/

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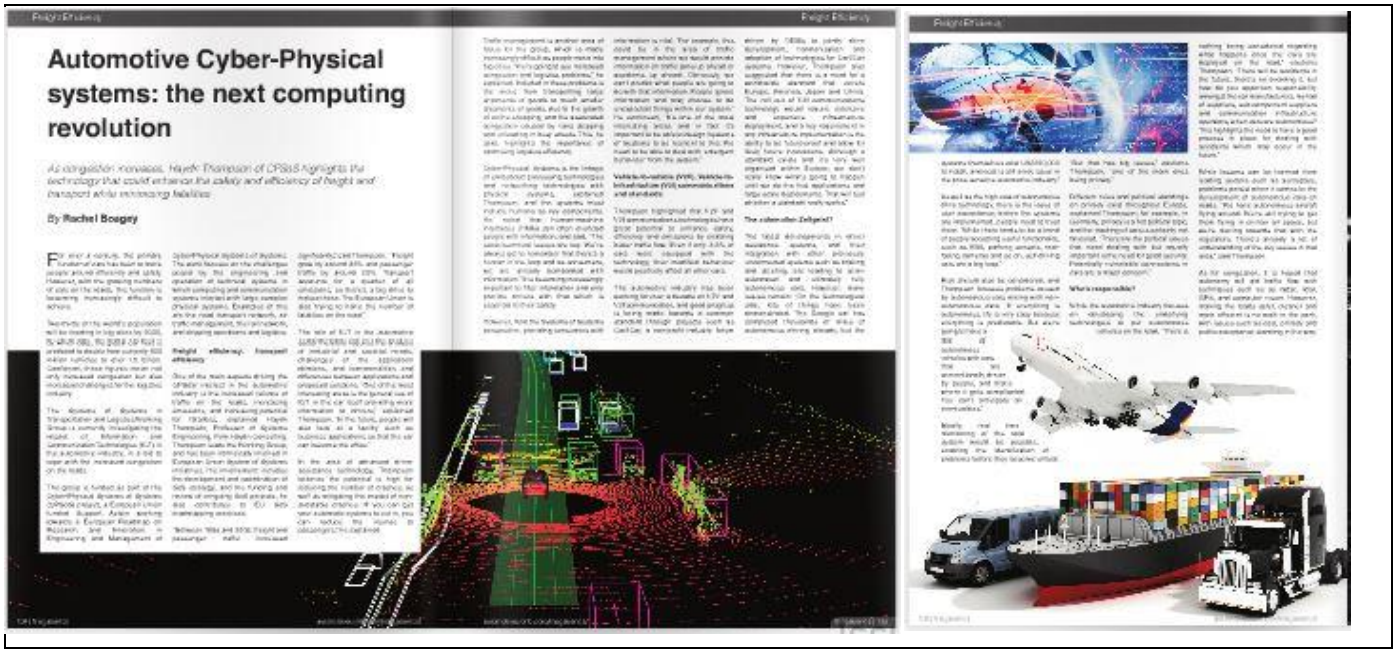

Automotive Cyber-Physical systems: the next computing revolution

As congestion increases, Haydn Thompson of CPSoS highlights the technology that could enhance the safety and efficiency of freight and transport while increasing liabilities

By Rachel Boagey

Fig. 11 Article in Automotive Megatrends Magazine

In addition an interview was provided for the magazine describing some of the findings of the report and giving an overview of how Cyber Physical Systems and Systems of Systems will impact the future of the automotive and logistics sector. The article can be found on pages 104-106 of the magazine.

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7 CONCLUDING REMARKS

The aim of the 2nd Transport and Logistics Working Group was to discuss the State-of-the-Art and Future Challenges in Transport and Logistics Report and finalise its content. The Working Group concurred that the report gave a good overview of the state-of-the-art across the different domains and with the recommendations made for future research priorities. The draft overall CPSoS recommendations were also discussed at the meeting and clarifications/modifications were made to these.

The meeting was held in conjunction with Automotive Megatrends Europe 2014 which gave the Working Group members an opportunity to listen to and engage with key industrial, academic and political actors in the transport and logistics area. This maximised exchange of ideas and provided a number of key insights into the logistics and connected car areas. Input from the conference and from interested companies was also incorporated into the State-of-the-Art and Future Challenges in Transport and Logistics report.

The event was also seen as a good opportunity for dissemination and CPSoS was branded on the Conference website, on a Mobile App, around the event and on the main conference stages. Additionally, CPSoS was represented with an Exhibition Stand at the event in the Networking Area. This was very successful in generating interest in the work with the conference attendees.

Much wider dissemination was achieved by placing an advert in the Automotive Megatrends magazine and also providing an interview on the role of Cyber Physical Systems of Systems and the challenges faced by the automotive and logistics sectors in the future. This magazine has a 20,000+ readership in the automotive and logistics domain and thus provides considerable outreach across the industry.

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8 REFERENCES

[1] H.A. Thompson, "D2.1 State-of-the-Art and Future Challenges in Cyber Physical Systems in Transport and Logistics", September 2014.

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