**Technical Proposal**

**Title: Specifications for definition of the Multi-Channel Operation (MCO) for support of Day 2 and beyond related Safety and Traffic efficiency services.**

**Specific agreement number: ETSI/2019-03**

**Organisation: ETSI**

**Date**: 07 October 2019

**Part I – Policy relevance and expected market impact**

# Policy relevance

Cooperative Intelligent Transport Systems (C-ITS) services and applications create a clear benefit in terms of transport efficiency, sustainability, safety and security. C-ITS contributes to the EU’s single market and competitiveness objectives. This proposal action is in response to the ACTION 1, ACTION 3, ACTION 7, ACTION 9 and ACTION 19 of the Rolling Plan for ICT standardisation 2019[[1]](#footnote-1) part Intelligent Transport Systems (ITS)

ACTION 1: *“To complete the minimum set of standards required to deploy C-ITS systems and applications, completing the activities foreseen in the M/453 and building in the results of the mandate, in particular by achieving the Release 2 for C-ITS (including V2V, V2I/I2V and I2I communications)”*

ACTION 3: *“Taking into account the C-ITS architecture, ICT related standards for applications to support vulnerable road users (VRU, e.g. projects like VRUITS www.vruits.eu). In particular, SDOs should agree on common requirements and relevant communication standards.”*

ACTION 7: *“SDOs to standardise of data and communication aspects to ensure interoperable implementation and data sharing system for increased location accuracy”.*

ACTION 9: “*SDOs to extend the local dynamic map standards to integrate mechanisms supporting the use of high precision positioning and related objects. This may require additional specific object definition standardisation.*”

ACTION 19: *“SDOs are invited to develop and perform a gap analysis with respect to the broad range of services for Cooperative, Connected and Automated Mobility taking into account the existing C-ITS architecture, standards and technical specifications, in particular those developed within the framework of M/453. The analysis should identify missing complementary standards and identify possibly conflicting standards with the overarching objective of full C-ITS service interoperability. The analysis should be based on currently implemented technologies (recognised by Member States within the C-Roads platform and subject to automotive deployment in line with COM (2016) 766) while also considering newly emerging technologies (in line with the 5G Action Plan) and build upon the principles and results of the RSCOM Mandate to CEPT (RSCOM17-26 rev.3) with the aim to enable interoperability between all C-ITS end user service”*

# Rationale

On 13 March 2018 the European Parliament adopted its opinion on cooperative intelligent transport systems C-ITS to improve road safety, traffic flow and reduce CO2 emission through instant short-range communication between vehicles, vehicles and the infrastructure and public transport (the report was coordinated by Hungarian MEP, István Ujhelyi and received with broad cross-party support (633 in favour, 43 against, 11 abstention).

The European Parliament supports the European Commission strategy on C-ITS[[2]](#footnote-2) as driven by DG MOVE. In its draft (2017/2067(INI))[[3]](#footnote-3) report the Parliament Transport Committee defines that the deployment of C-ITS is essential to realize the safety and CO2 emission reduction objectives.

In the recent years a first set of C-ITS standards for the exchange of transport safety and transport efficiency by means of Dedicated Short Range Communication (DSRC), as captured in the ETSI TR 101 607 V1.1.1, have been developed to support the current deployment of Day-1 C-ITS services as identified in the EU Commission C-ITS Deployment Platform Report Phase-1 2016[[4]](#footnote-4) and mostly covered by the ETSI TR 102 638 C-ITS “Basic Set of Applications” (BSA). The Vehicle Industry represented by the C2C-CC[[5]](#footnote-5) and the Member States organized in the C-ROADS[[6]](#footnote-6) project have started with the deployment of these services Europe wide.

While the Day-1 deployment is ongoing, the different stakeholders have identified Day-2 and beyond services and applications as currently being identified by the European H2020 project CODECS[[7]](#footnote-7) where roadmaps from the different stakeholders, such as from the CIMEC[[8]](#footnote-8) EU H2020 project (Urban services and applications), ERTRAC[[9]](#footnote-9), Car2Car Communication Consortium[[10]](#footnote-10) (C2C-CC) and from the C-ROADS[[11]](#footnote-11) platform are collected. Among other things these projects, platform and organisations have identified a strong need to share more DSRC oriented awareness, events and control information to support Vulnerable Road User (VRU), Collective Perception (CPM), Manoeuvre Coordination (MCM), Positioning improvements (POTI) and Traffic Automation services such as C-ACC, Platooning based services. Additionally, there is the need to include the support for new Transport requirements such as Urban Rail. All of this needs to be realized within the context of the system Functional Safety requirements as defined in ISO TS 26262 while recognizing the General Data Protection Regulation (GDPR)[[12]](#footnote-12).

These growing needs of information exchanges are recognized by spectrum regulation. A EU spectrum mandate RSCOM17-26 has been recently issued to CEPT in order to study the possibility to extend the designated spectrum for traffic safety and traffic efficiency from 30 to 50 MHz, in the 5875-5925 MHz band while for none safety C-ITS applications 20 MHz in the band from 5855-5875 MHz is allocated, to support these Day-2 and beyond services and make efficiently use of this spectrum an efficient channel use needs to be realized.

ETSI received and accepted two ITS-related “mandates”: M/453 in 2009 related to C-ITS and standardisation request M/546 on urban ITS in 2016. This proposed action is in response to both since an efficient channel use is essential for the deployment of Day-2 Cooperative systems-based ITS services (M/453) and are a key element for the future deployment of these same services in urban areas (M/546). Due to the amount of work to be performed and to the fact that the efficient channel use is an important element for the deployment of Day-2 Cooperative systems-based ITS services, this requires financial support in order to make sure the relevant standards are available in due time to ensure the effective use C-ITS system to support the European objectives regarding traffic safety, CO2 emission and traffic efficiency in a spectrum usage effective way.

Investigations have shown that C-ITS improves traffic safety and traffic efficiency. However, safety services do not easily provide the needed business cases. Safety is a social aspect and the improvement of safety a common responsibility. The industry takes this responsibility by exploring research and doing developments but can’t do this alone and through this proposal requests for support by the community.

# Objective

The objective of this action is to extend the ETSI ITS Release-1 set of C-ITS specifications with a consistent set of interoperable Multi-Channel Operation (MCO) specifications, forming the bases of a Release-2 set of norms and standards to facilitate the growing amount of C-ITS and Automation requirements and increase of information exchange between C-ITS stations as required for handling the Day-2 and beyond road traffic services.

This action will focus on the extensions for the existing ITS specifications developed in response to European mandates M/453 (C-ITS systems) and M/546 (Urban ITS), in accordance with ITS Actions 1 3, 7, 9 and 19 of the 2019 Rolling Plan for ICT Standardisation.

This action will develop a set of specifications considering the currently available or being developed short-range technologies identified as ITS-G5 and LTE-V2X as part of an MCO communication approach supporting safety and traffic efficiency related information exchange making use of the spectrum according to spectrum efficiency requirements.

This action will realize these improvements based on ongoing European projects, on the Interoperability requirements as given by the ITS Directive 2010/40/EU[[13]](#footnote-13), the EC Decision 2008/671/EC[[14]](#footnote-14) on safety-related ITS and the CEPT report 71[[15]](#footnote-15). Overall, the C-ITS requirements will be set as far as possible in a technology neutral way.

# Market impact

The Release 1 specifications support the initial deployment of Day-1 services and applications focused on providing road safety warnings based on the exchange of a limited amount of information while ensuring the privacy of the road users. Currently Day-2 and beyond developments of VRU, C-ACC and Platooning services and CPM, MCM and POTI awareness increasing facilities have started leading to market introduction of Day-2 services in the coming years. Features which will be integrated in to vehicles, motorcycles, trucks, public transport, emergency vehicles and VRU equipment. These services are supporting business cases of interest. For Platooning, as an example, there is the EU H2020 project ENSEMBLE which aims to realize the initial deployment of the interoperable Platooning service in which all European Truck manufacturers and supply chain are participating to realize the required interoperability and to create the related Business environment. The realisation of an interoperable Multi-Channel Operation (MCO) environment is essential to ensure that these services can be implemented to realise a business impact the market expects and a social economic impact by increase safety and traffic efficiency, and contribution to the decrease of CO2 emission as identified. The development of the MCO approach will boost the development of these and next generation C-ITS and Transport Automation services by defining the access to the available spectrum in a coexisting and interoperable manner. Additionally, it will enable the support of more stakeholders, such as Urban Rail and Agriculture Automation making use of the interoperable technology and broaden the deployment of the envisioned systems.

Without proper standards in place (standards that need to cover communication aspects from the application to the physical layer) there is a great chance that a plethora of non-standardised proprietary solutions will appear on the market with obvious consequences that no interoperability and no conformity will lead with increased risk of road fatalities and no improvement of traffic efficiency. In addition, there might be integration problems and consequently the risk of reinvestment in the related deployed infrastructure and market products at a later stage in order to upgrade or re-engineer the deployed solutions to the required standards with obvious consequences in terms of costs and moreover no trust into the systems by the end users.

**Part II – Execution of the work**

# Working method / approach

## Specialist Task Force (STF)

ETSI will perform this work by the creation of an ETSI STF, reporting the milestones and providing the draft deliverables to ETSI TC ITS, according to the planned meeting agenda and additional dates agreed by the TC ITS Chairman. TC ITS WG2 will perform an active role in steering and contributing to this work. A significant contribution from the other TC ITS WGs especially from WG3 and WG4 as well as from TC ERM TG37 is expected.

Coordination with various other stakeholders will be necessary, under TC ITS supervision, to achieve the best outcome of this work and the widest possible collection of views amongst all parties concerned. ITSCG will be involved in the process as well.

The STF will liaise with other SDO’s such as SAE, IEEE, CEN/ISO, 3GPP and those other players involved in the domain of C-ITS to assure the development of a consistent set of specifications. It will also liaise with C2C-CC, the C-ROADS platform, 5GAA, and other stakeholders. In addition, it is expected to interact also with relevant H2020 projects such as ENSEMBLE, Concorda, C-ROADS’s, InterCor, PROSPECT, XCYCLE, Imagine, AutoPilot, C-Mobile and SafetyCube.

## Other interested actors

The draft deliverables (stable drafts and final drafts for approval) will be distributed for comments not only to relevant ETSI members via mailing lists, but also to relevant ETSI partners such as 3GPP and SAE to collect inputs from as wide as possible ITS community.

## Expertise required (qualifications, experience, required, mix of skills)

The STF work will be performed by a group of Companies/Organizations (Service Providers) that will collectively ensure the following mix of skills are represented:

* Deep knowledge of C-ITS and CCAM specific Functional requirements;
* Knowledge of Automotive requirements (automotive connection);
* C-ITS System architecture and facilities layer functions;
* C-ITS Networking expertise;
* C-ITS Physical Layer design and behavioural expertise ITS-G5 and LTE-V2X;
* C-ITS Security and Privacy expertise and in-depth knowledge of the current C-ITS Release-1 specification;
* Decentralized Congestion Control mechanism expertise;
* Spectrum and radio expertise;
* Project management skills are required for the STF leader who will be responsible for Task-1.

In addition, there must be experience in drafting standards and the expert team must include members with international connections such as relations to the EU Commission, European projects, Member-States, business stakeholders and SDO’s.

Based on the interest and variety of skills the experts team may vary in size. For project execution efficiency a maximum of 6 experts is expected.

The STF Leader will be responsible for coordinating the execution of the tasks according to the requirements in the Terms of Reference (based on the action grant) and following the technical direction given by TC ITS. The STF leader also possesses project management experience, report-writing skills, standardisation process, experience of consensus building, presentation skills, experience of working in an international environment especially with the EU Commission, different SDO’s, authorities and industry.

The Following Tasks are identified:

1. STF Lead including liaison with relevant organisations and other actors in the European and International C-ITS domain as well as the production of the 2 Interim Reports (IRs) and the Final Report (FR) to the EC/EFTA.
2. Production of a technical report TR 100 439, Multi-Channel Operation including study results, recognized requirements, MCO concepts, implementation limitations.
3. Production of the technical specification TS 103 696, specifying the ITS Architectural extensions to enable Multi-Channel Operation (MCO) operation with the intention to realize an EN 302 665 update at the appropriate time.
4. Production of the technical specification TS 103 697, defining the MCO requirements; definition of the functional MCO architecture; definition of the channel management mechanisms and related interfaces.
5. Production of the technical specification TS 103 141, specifying the C-ITS Facilities layer Communication Congestion Control including MCO extensions.
6. Production of the technical specification TS 102 636-8-1, specifying the MCO extensions for GeoNetworking.
7. Production of a technical specification TS 103 695, specifying the MCO access layer extensions of EN 302 663 with the intension to update the EN 302 663 in the appropriate time.

## Previous work

ETSI has been developing ITS standards since 2008 and has produced a full list of standards for Day-1 services and applications under the European mandate M/453 which are listed in the Release-1 standardisation ETSI report TR 101 607 from 2013 and form the bases for the further development of ITS cooperative services and Automation. Day-2 and beyond services have been and are currently developed in cooperation with the main stakeholders. In Europe there are many projects developing Day-2 and beyond services and applications ranging from AutoNet 2030, CODIS, Truck Platooning Challenge, ENSEMBLE TIMON, HIGHTS, Intercor, C-ROADS, VRUITS (improving the safety and mobility of Vulnerable Road Users through ITS applications), PROSPECTS (Proactive Safety for Pedestrians and Cyclists), XCYCLE (Advanced measures to reduce cyclists' fatalities and increase comfort in the interaction with motorised vehicles), SafetyCube (Safety CaUsation, Benefits and Efficiency) and SENIORS (Safety Enhanced Innovations for Older Road userS). In line with these developments, standardisation initiatives have been taken in the different SDO’s. In ETSI for example standardisation investigations have started with regards to VRU, C-ACC and Platooning while at CEN at TC 278 a new Working Group (WG17) has been installed to handle Urban ITS aspects. Outside of Europe SEA has taken initiatives to integrate initial VRU aspects in their specifications.

# Performance indicators

Information that will act as performance indicators against the contracted activity will be provided by the STF in the following cases:

Effectiveness and efficiency:

Details will be provided, throughout the lifetime of the proposed action, on:

* the number of meetings held in relation to this work:
  + the number of participants;
  + the stakeholder communities represented;
  + the number of presentations and technical contributions made on the activity by the STF;
* an evaluation of feedback received identifying key points that needed to be considered by the STF and any recommended actions;
* project progress in relation to the schedule specified

**Proposed effectiveness and efficiency benchmarks**

1. Reports produced by the STF for ETSI TC ITS about the progress of the work. A report will be produced for each TC ITS meeting held during this activity (at least 3 reports a year).
2. Draft versions of the deliverables to be provided to relevant TC ITS Working Groups and TC ITS for circulation within the stakeholder community for commenting, namely: stable draft and final draft for approval.
3. Draft versions of the deliverables to be circulated to SAE J2945/0 for alignment on channel usage, IEEE 802.11 for physical layer adjustments and other relevant partners for comments, namely: stable draft and final draft for approval.
4. 90% of the tasks and other milestone-related schedule on time (less than 10 days after the planned dates).

Stakeholder engagement and satisfaction:

An analysis will be given of the balance of stakeholder representation in the activity and the number of liaison activities performed.

The STF, through TC ITS, will liaise with those stakeholders working in related areas such as SAE, IEEE and 3GPP.

**Proposed Benchmarks**

1. Contributions received from other stakeholders to the work (at least 4 liaisons with stakeholders external to TC ITS, e.g. SAE and IEEE).
2. Comments provided to the draft versions of the deliverables circulated by the STF (at least 5 comments per deliverable provided to the draft versions from TC ITS and external stakeholders).

Dissemination of results:

Information will be provided on the effectiveness of activities related to the dissemination of project deliverables and efforts made to raise industry awareness of the activity.

**Proposed Benchmarks**

1. At least 2 presentations made to the SAE.
2. At least 2 presentations made to the C-ITS world congress.
3. At least 2 presentations made to the IEEE 802.11 relevant groups.
4. At least 2 presentations made to the ITS-CG.
5. At least one news release on the ETSI web site on the work, detailing the achievement of important results and milestones.
6. At least one news release on the 3GPP web site on the work, detailing the achievement of important results and milestones.

# Work plan, milestones and deliverables

## Deliverable

As shown in Table 1, the action will produce three deliverables to be submitted to the EC/EFTA:

* Two interim reports (IRs) and
* a final report (FR)

The first IR (IR1) will be submitted 10 months after the signature of the action grant and will detail the work performed to achieve the production of the technical deliverables (D1 to D6) as well as the latest drafts of these specifications.

The second IR (IR2) will be submitted 19 months after the signature of the action grant and will detail the progress of work performed to achieve the production of the technical deliverables (D1 to D6) as well as their status (D1 and D2 published).

The FR provided at the end of the action i.e. not later than 28 months after the signature of the action grant will provide an overall report of the activity performed along with one TR and 5 TSs published (D1 to D6), as well as details of the resource usage along with an analysis of the performance indicators.

Table 1: List of Reports

| **Deliv. ID** | Title and Contents |
| --- | --- |
| Interim Report 1 (IR1) | **Title**: Interim Report 1 to the EC/EFTA  **Content**: This report to the EC/EFTA will include:   1. The activities performed until month 10, the coordination work of the STF activities and the production of the expected deliverables anticipated in the work-plan. 2. The latest drafts of the deliverables specified in Table 2 as available according to the time plan. 3. Overview of ad-hoc meetings (for instance with SAE) if necessary 4. The plan for the future activities until the next reporting and further expected coordination meetings. |
| Interim Report 2 (IR2) | **Title**: Interim Report 2 to the EC/EFTA  **Content**: This report to the EC/EFTA will include:   1. The activities performed until month 19, the coordination work of the STF activities and the production of the expected deliverables anticipated in the work-plan 2. The published deliverables specified in Table 2 (D1 and D2) 3. The status of the other deliverables specified in Table 2. 4. Overview of ad-hoc meetings (for instance with SAE) if necessary 5. The plan for the future activities until the next reporting and further expected coordination meetings. |
| Final Report (FR) | **Title**: Final Report to the EC/EFTA.  **Content**: This report will include:   1. The activities performed, the coordination work of the STF activities and the production of the expected deliverables. 2. The published deliverables specified in Table 2 (D3 to D6) 3. Detailed report of the performance indicators outlined in clause 6 of this proposal. 4. Details of specific meetings (for instance with SAE) if necessary. 5. Report on the resources that have been used for performing the work |

The goal of this action is to define the Multi-Channel Operation for ITS in the context of C-ITS and automation in a technology neutral interoperable way such that future technologies can be added later on a seamless way. This action provides the essential specifications as shown in Table 2. Section 7.2 gives more details on the work plan, milestones and due dates.

Table 2: list of deliverables

|  |  |  |  |
| --- | --- | --- | --- |
| **Delive-rable ID** | **Standard number/version** | **Working title** | **Scope/Remarks** |
| D1 | TR 103 439 V1.1.1\* | Intelligent Transport System (ITS); Multi-Channel Operation Study | Including the Multi-Channel Operational requirements; system limitations; possible methods; Analysis of the impact on existing standards will be performed and included in an informative annex. |
| D2 | TS 103 696 V1.1.1\* | Intelligent Transport System (ITS); Communication Architecture for Multi-Channel Operation (MCO) | A specification specifying the ITS Architectural extensions to enable Multi-Channel Operation (MCO) operation. |
| D3 | TS 103 697  V1.1.1\* | Intelligent Transport System (ITS); Multi-Channel Operation (MCO) for ITS | Definition of the MCO requirements; definition of the functional MCO architecture; definition of the channel management mechanisms and related interfaces |
| D4 | TS 103 141 V1.1.1\* | Intelligent Transportation Systems (ITS); Facilities layer function; Communication Congestion Control | Definition of the MCO congestion control requirements and mechanisms; define the specify the related interfaces and message handling specifications. |
| D5 | TS 102 636-8-1 V1.1.1\* | Intelligent Transportation Systems (ITS); Communications; GeoNetworking: Part 8: Transport Protocols for Multi-Channel Operation (MCO): Sub-Part 1: Basic Transport Protocol | Definition and specification of the GeoNetworking extensions for MCO to enable multi-channel operation. |
| D6 | TS 103 695 V1.1.1\* | Intelligent Transportation Systems (ITS); Access Layer specification for Multi-Channel Operation (MCO) in the 5GHz frequency band | A specification specifying the access layer extensions for MCO to enable multi-channel operation. |

\* Version at publication time.

## Work plan

The work plan consists of 7 Tasks which are organized in an efficient way. Table 3 shows the detailed work plan for this action in terms of tasks. T0 is the date of signature of the contract.

Table 3: Task Description with milestones

| Task | Description and methodology | Deliverables |
| --- | --- | --- |
| T1 | STF Organization |  |
| T1.1 | STF Setup  ETSI, the TC ITS chairman as well as the ITS WG1/WG2/WG3/WG4 chairmen will interview the STF candidates and select those to best meet the work plan.  ETSI will make arrangements for STF members (service contracts, etc.). |  |
| T1.2 | STF Leader  The STF leader will:   * Plan the work of the STF members, ensuring that the timescales of the STF deliverables are met * Organise STF meetings to discuss the drafts, recording any major issues and resolutions of the STF, identifying and progressing the actions of STF members * Report to TC ITS and TC ITS Working Groups as appropriate on the work of the STF * Represent, or arrange for other STF members to represent the STF at other external meetings as appropriate * Provide drafts of the IR and FR to the ETSI secretariat   **Expertise required:**   * Ability to lead and manage a team * Project management and communication skills   11 travels to present results to TC ITS meetings  **Effort Required:88 units**  **Milestones:**  **Start**: T0+2  **M1.1** Interim report 1: T0+10  **M1.2** Interim report 2: T0+19  **M1.3** Final report: T0+28 |  |
| T1.3 | Interactions with other relevant organizations  The objective of this task is to ensure that the STF fluently interacts with relevant actors in the C-ITS and Automation field in order to make sure the work is well coordinated and synchronised. The organisation of relevance for this action is SAE that has already produced relevant elements of the MCO requirements in the J2945/0. This interaction is therefore indispensable for ensuring a harmonized approach with other regions. It is also expected that the MCO requirements will influence physical layer aspects as specified in the IEEE 802.11 and for that reason alignment with IEEE 802.11 is also expected.  In addition, this task covers the interaction with relevant H2020 projects as mentioned to ensure that requirements are covered, and verification of the specifications are possible.  Intercontinental travels to present results to C-ITS community, including SAE and IEEE.  **Effort Required: 66 units** |  |
| T2 | **MCO Study** | D1  [TR 103 439] |
| T2.1 | **Description:** The goal of this task is to produce the deliverable TR 103 439: “Intelligent Transport System (ITS); Multi-Channel Operation study. This deliverable will specify the Multi-Channel Operational requirements; system limitations and methods. An analysis of the impact on existing standards will be performed as well. |  |
| T2.1a | **Methodology:** The Identification of the MCO requirements, the identification of the MCO relevant methods and available functional and technical capabilities. The identification of the relevant Release-1 specifications being affected.  **Input** from the following identities will be used:  ETSI, CEN/ISO, IEEE, SAE and 3GPP standardisation, EC C-ITS deployment Platform report, CEPT, key European projects CODECS, C-ROADS and from organisations such as C2C-CC, 5GAA, Amsterdam Group, ACEA and others.  **The methodology** for the development of the first part of the Technical Report will be the following:   * The context in which MCO will have to be realized and the relation to Hybrid Communication as defined by the EC; * Evaluation of the current C-ITS Architecture and relevant elements including relation with IEEE 802.11; * Definition of Spectrum Regulation constraints; * General Regulation requirements and constraints; * Identification of worldwide MCO developments in other SDOs; * Definition of the communication requirements to be covered including detailed capacity and behavioural; * Definition of the System and Technical requirements; * Impact on the Security and Privacy requirements.   **Working sessions:**  It is anticipated that the majority of the work will be performed as drafting work remotely and electronically. However, a few face-to-face working sessions will be needed for clarification purposes with regard to terms and definitions and the alignment of the various information sources. It is planned to have 3 STF-Experts physical working sessions and 3 STF-Experts remote working sessions. All expertise is needed.  **Intermediate and final Milestones:**  **Start**: T0 + 2.  **M2.1**: Early Draft: T0 + 6.  **Effort required: 110 units** |  |
| T2.1b | **Methodology:** To evaluate the requirements existing ITS Release-1 and available technical MCO capabilities. To Identify the MCO concept to be used for Multi-Channel ITS.  This Task includes the assessment of all relevant Release-1 standards to identify MCO required changes besides those to be realized as part of this action.  The ITS security and privacy (GDPR) requirement will be included.  **Input** from the following identities will be used:  From the results from Task 2.1a; From ETSI and IEEE standardization bodies; from C2C-CC, 5GAA stakeholder groups and From Technology providers.  **The methodology** for the development of the second part of the Technical Report will be the following:   * Analyses and Evaluated Communication methods; * Evaluation of realisation capabilities and limitations; * Evaluation of presented MCO methods Functionally; * Evaluation of presented MCO methods against the security and privacy requirements; * Specification of the ITS MCO approach including technology neutral interoperability extension possibilities to other technologies at the facility layer; * Definition of other Release-1 standards that need to be updated to support MCO in addition to those ones within the scope of this Action.   **Working sessions:**  It is anticipated that about 60% of the work will be performed as drafting work remotely and electronically. To accommodate good definitions of the specifications 2 STF-Experts physical working sessions will be organized and 3 STF-Experts remote working sessions are expected. All expertise is needed.  **Intermediate and final Milestones:**  **Start**: T0 + 6.  **M2.2**: Stable Draft: T0 + 10.  **M2.3**: Final draft approved by TC ITS: T0 + 14.  **M2.4:** TB approval and publication TR 103 439 V1.1.1: T0 + 15.  **Effort required: 128 units** |  |
| T3 | Communication Architecture for Multi-Channel Operation (MCO) | D2 [TS 103 696] |
| T3.1 | **Description:** The goal of this task is to specify the ITS Architectural extensions for MCO: “Intelligent Transport System (ITS); Communication Architecture for Multi-Channel Operation (MCO)”.  The work will be based on:   * The outcome of the MCO study (Task T2); * Feedback from ongoing development of Day-2 and beyond services and applications; * Feedback from ongoing technology developments and findings from relevant EU projects; * Developments in other SDOs worldwide. |  |
| T3.1a | **Methodology:** To define the architectural extensions of the current ITS Communication Architecture to support specifically Multi-Channel Operation ITS in a technology neutral way such that at later on other technologies can easily be integrated. The extensions include interface and basic system requirements.  **Input** from the following identities will be used:  Task 2.1b; ETSI, IEEE, 3GPP and SAE standardization bodies; from C2C-CC, 5GAA, C-ROADS, technology providers and other stakeholder groups.  The methodology for the development of this deliverable will be the following:   * Analyses of the outcome of T2 (MCO study in TR 103 439); * Identify the effects of the MCO requirements on the ITS station architecture and its different station types and define the changes required to facilitate MCO functionality; * Identify the effects of the MCO requirements on the ITSC ISO protocol stack and define the changes required to facilitate MCO functionality as well as the future integration of other technologies; * Identify the effects of the MCO requirements on the ITSC management and security entities and define the changes required to facilitate MCO functionality.   **Working sessions:**  It is anticipated that most of the work will be performed remotely. To accommodate good definitions of the specification 2 STF-Experts physical working sessions will be organized and about 6 STF-Experts remote working sessions are expected. Major work is for Architecture expertise with support from the other expertise.  **Intermediate and final Milestones:**  **Start**: T0 +10. (Stable Draft level of the TR 103 439)  **M3.1:** Stable Draft: T0 + 14.  **M3.2:** Final Draft approved by TC ITS: T0 + 18.  **M3.3:** TB approval and publication TS 103 696 V1.1.1: T0 + 19.  **Effort required: 155 units** |  |
| T4 | Multi-Channel Operation (MCO) for ITS | D3  [TS 103 697] |
| T4.1 | **Description:** The goal of this task is to produce the deliverable the TS 103 697: “Intelligent Transport System (ITS); Multi-Channel Operation (MCO) for ITS.  The work will be based on:   * The outcome of the MCO study (Task T2); * The architectural MCO measures realized in EN 302 665 update (Task T3); * Feedback from ongoing developments of Day-2 and beyond services and applications. * Feedback from ongoing technology developments and findings from relevant EU projects. * Developments in other SDO’s worldwide. |  |
| T4.1a | **Methodology:** To define the ITS MCO specific requirements, architecture, interfaces and data management element in a neutral Interoperable way such that a later stage other technologies e.g. cellular technology can easily by integrated.  **Input** from the following identities will be used:  Task 2.1b, 3.1a and 5.1a; ETSI, 3GPP and SAE standardization bodies; C2C-CC, 5GAA, C-ROADS, technology providers and other stakeholder groups.  The methodology for the development of this deliverable will be the following:   * Analyses of the outcome of T2 (MCO study in TR 103 439 as well as T3 (ITS architecture evolution); * Definition of the MCO architecture and MCO entity; * Definition of the MCO data management and control parameters; * Definition of the MCO parameter limits; * Definition of the MCO interfaces with their functions and semantics; * Identification of the effect of the MCO requirements on other facility related specifications and definition of related change requests to be provided.   **Working sessions:**  It is anticipated that about 60% of the work will be performed remotely. To accommodate good definitions of the specification 4 STF-Experts physical working sessions will be organized and 6 STF-Experts remote working sessions are expected. All expertise is needed with most focus on Architecture.  **Intermediate and final Milestones:**  **Start**: T0 +14. (at Stable Draft level of the TS 103 696, at T3.1a)  **M4.1:** Stable Draft: T0 + 23.  **M4.2:** Final Draft approved by TC ITS: T0 + 27.  **M4.3:** TB approval and publication of the TS 103 697 V1.1.1:  T0 + 28.  **Effort required: 184 units** |  |
| T5 | Communication Congestion Control | D4  [TS 103 141] |
| T5.1 | **Description:** The goal of this task is to produce the deliverable the TS 103 141: “Intelligent Transport System (ITS); Facility Layer; Communication Congestion Control”.  The work will be based on:   * The outcome of the MCO study (Task T2); * The architectural MCO measures realized in TS 103 696 update (Task T3); * The MCO for ITS as defined in Task T4; * Feedback from ongoing developments of Day-2 and beyond services and applications; * Feedback from ongoing technology developments and findings from relevant EU projects; * Developments in other SDO’s worldwide. |  |
| T5.1a | **Methodology:** To define the ITS MCO facilities Communication Congestion Control (CCC) specific requirements, architecture and interfaces in a technology neutral Interoperable way.  **Input** from the following identities will be used:  Task 2.1b, 3.1a and 4.1a; ETSI, C2C-CC, 5GAA, C-ROADS, technology providers and other stakeholder groups.  The methodology for the development of this deliverable will be the following:   * Analyses of the outcome of T2 (MCO study in TR 103 439); * Define the CCC and CCC facilities entity; * Define the CCC facilities interfaces.   **Working sessions:**  It is anticipated that about 50% of the work will be performed remotely. To accommodate good definitions of the specification 4 STF-Experts physical working sessions will be organized and 4 STF-Experts remote working sessions are expected. All expertise needed with major effort from the DCC and Architecture.  **Intermediate and final Milestones:**  **Start**: T0 +14. (at Stable Draft level of the TS 103 696, at T3.1a)  **M5.1:** Stable Draft: T0 + 23.  **M5.2:** Final Draft approved by TC ITS: T0 + 27.  **M5.3:** TB approval and publication of the TS 103 141 V1.1.1:  T0 + 28.  **Effort required: 118 units** |  |
| T6 | Communications; GeoNetworking: Part 8: Transport Protocols for Multi-Channel Operation (MCO): Sub-Part 1: Basic Transport Protocol | D5  [TS 102 636-8-1] |
| T6.1 | **Description:** The goal of specify the GeoNetworking extension for GeoNetworking: “Intelligent Transportation Systems (ITS); Communications; GeoNetworking: Part 8: Transport Protocols for Multi-Channel Operation (MCO): Sub-Part 1: Basic Transport Protocol”.  The deliverable will include Multi-Channel Operation mechanisms and will be based on:   * The outcome of the MCO study (Task T2); * The architectural MCO measures realized in TS 103 696 update (Task T3); * The MCO for ITS as defined in Task T4; * Feedback from ongoing developments of Day-2 and beyond services and applications; * Feedback from ongoing technology developments and findings from relevant EU projects; * Developments in other SDO’s worldwide. |  |
| T6.1a | **Methodology:** To define the GeoNetworking extensions of the current GeoNetworking Protocol to facilitate ITS Multi-Channel Operation in a technology neutral way such that at later stage solutions supporting other technologies e.g. cellular technology can easily integrated. It will include interface and basic system requirements.  **Input** from the following identities will be used:  Task 2.1b, 3.1a and 4.1a; ETSI, C2C-CC, C-ROADS, technology providers and other stakeholder groups.  The methodology for the development of this deliverable will be the following:   * Analyses of the outcome of tasks T2, T3 and T4, with respect to GeoNetworking; * Identification of the effects of the MCO requirements on the GeoNetworking services and definition of the changes to the specification; * Identification of the effects of the MCO requirements on the BTP packet structure and BTP header and definition of the changes; * Identification of the effect of the MCO requirements on other GeoNetworking layer specifications, definition of related change requests to be provided to ETSI TC ITS for acceptance and implementation .   **Working sessions:**  It is anticipated that most of the work will be performed remotely. To accommodate good definitions of the specification 2 STF-Experts physical working sessions will be organized and 5 STF-Experts remote working sessions are expected. Especially networking expertise is needed with mostly support from Security, Physical layer and Facility layer.  **Intermediate and final Milestones:**  **Start**: T0 +16. (Start of T4.1 and T5.1)  **M6.1:** Stable Draft: T0 + 23.  **M6.2:** Final Draft approved by TC ITS: T0 + 27.  **M6.3:** TB approval and publication of the TS 102 636-8-1 V1.1.1: T0 + 28.  **Effort required: 108 units** |  |
| T7 | Access Layer specification for Multi-Channel Operation (MCO) in the 5GHz frequency band | D6  [TS 103 695] |
| T7.1 | **Description:** The goal of this task is to specify the MCO requirements for operation in the 5GHz band “Intelligent Transportation Systems (ITS); Access Layer specification for Multi-Channel Operation (MCO) in the 5GHz frequency band”.  The deliverable will include Multi-Channel Operation mechanisms and will be based on:   * The outcome of the MCO study (Task T2); * The architectural MCO measures realized in TS 103 696 update (Task T3); * The MCO for ITS as defined in Task T4. * Feedback from ongoing developments of Day-2 and beyond services and applications; * Feedback from ongoing technology developments and findings from relevant EU projects; * Developments in other SDO’s worldwide. |  |
| T7.1a | **Methodology:** To define the Access layer extensions of the current Access layer requirements and architecture to facilitate ITS Multi-Channel Operation in a technology neutral way such that at later stage solutions supporting other technologies e.g. cellular technology can easily integrated. It will include interface and basic system requirements.  **Input** from the following identities will be used:  Task 2.1b, 3.1a and 4.1a; ETSI, C2C-CC, C-ROADS, technology providers and other stakeholder groups.  The methodology for the development of this deliverable will be the following:   * Analyses of the outcome of tasks T2, T3 and T4 and their impacts on the Access layer; * Identification of the effects of the MCO requirements on the Access layer definition; * Identification of the effects of the MCO requirements on the Channel allocation, Transmit and Receive requirements; * Identification of the effects of the MCO requirements on the Quality of Service.   Identification of the effect of the MCO requirements on other Access layer specifications, definition of related change requests to be provided to ETSI TC ITS for acceptance and implementation.  **Working sessions:**  It is anticipated that most of the work will be performed remotely. To accommodate good definitions of the specification 2 STF-Experts physical working sessions will be organized and 6 STF-Experts remote working sessions are expected. Especially Physical Layer, Spectrum and Architecture expertise required.  **Intermediate and final Milestones:**  **Start**: T0 +16. (right after Start of T4.1 and T5.1)  **M7.1:** Stable Draft: T0 + 23.  **M7.2:** Final Draft approved by TC ITS: T0 + 27.  **M7.3:** TB approval and publication of the TS 103 695 V1.1.1:  T0 + 28.  **Effort required: 108 units** |  |

Table 4 shows the overall required effort in Units.

Table 4: summary of effort required (T1 to T7)

|  |  |  |
| --- | --- | --- |
| **Task** | **Output** | **Required Efforts (Units)** |
| **T1** | 2 IRs and FR | **154** |
| **T2** | TR 103 439 | **238** |
| **T3** | TS 103 696 | **155** |
| **T4** | TS 103 697 | **184** |
| **T5** | TS 103 141 | **118** |
| **T6** | TS 102 636-8-1 | **108** |
| **T7** | TS 103 695 | **108** |
| **TOTAL** | | **1065** |

Table 5 shows the calendar of tasks with the milestones.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Months | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Task** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **25** | **26** | **27** | **28** |
| **Establish STF Team** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **T1. STF Organisation** |  |  |  |  |  |  |  |  |  | **M 1.1** |  |  |  |  |  |  |  |  | **M 1.2** |  |  |  |  |  |  |  |  | **M 1.3** |
| **T2. TR 103 439** |  |  | **Start** |  |  | **M 2.1** |  |  |  | **M 2.2** |  |  |  | **M 2.3** | **M 2.4** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **T3. TS 103 696** |  |  |  |  |  |  |  |  |  | **Start** |  |  |  | **M 3.1** |  |  |  | **M 3.2** | **M 3.3** |  |  |  |  |  |  |  |  |  |
| **T4. TS 103 697** |  |  |  |  |  |  |  |  |  |  |  |  |  | **Start** |  |  |  |  |  |  |  |  | **M 4.1** |  |  |  | **M 4.2** | **M 4.3** |
| **T5. TS 103 141** |  |  |  |  |  |  |  |  |  |  |  |  |  | **Start** |  |  |  |  |  |  |  |  | **M 5.1** |  |  |  | **M 5.2** | **M 5.3** |
| **T6. TS 102 636-8-1** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **Start** |  |  |  |  |  |  | **M 6.1** |  |  |  | **M 6.2** | **M 6.3** |
| **T7. TS 103 695** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **Start** |  |  |  |  |  |  | **M 7.1** |  |  |  | **M 7.2** | **M 7.3** |

Table 5: Calendar of tasks with milestones (T1 to T7)

**Table 6 : Table of Milestones/Tasks & Budget**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Code** | **Task / Milestone** | **Target Date** | | **Estimated Cost (EUR)** |
| **From** | **To** |
|  | Start of work | 06/04/2020 |  |  |
| Milestone A | Interim Report 1 to the EC/EFTA to be made available and approved by ETSI Secretariat Stable Draft of the D1 [TR 103 439] made available to TC ITS |  | 30/11/2020 |  |
| T1 | STF Leadership | 06/04/2020 | 31/05/2022 | 79 000 |
| T2 | MCO Study D1 and Produce the deliverable D1 [TR 103 439] | 06/04/2020 | 30/04/2021 | 155 000 |
| Milestone B | Progress report approved by TC ITS Final draft D1 [TR 103 439 V1.1.1] approved by TC ITS and published Stable Draft of D2 [TS 103 696] made available to TC ITS |  | 30/04/2021 |  |
| T3 | Communication Architecture for Multi-Channel Operation (MCO) D2 [TS 103 696] | 01/05/2021 | 31/08/2021 | 100 000 |
| Milestone C | Final Draft D2 [TS 103 696 V.1.1.1] approved by TC ITS and published Interim Report 2 to the EC/EFTA to be made available and approved by ETSI Secretariat |  | 31/08/2021 |  |
| T4 | Multi-Channel Operation (MCO) for ITS D3 [TS 103 697] | 01/03/2021 | 31/05/2022 | 120 000 |
| T5 | Communication Congestion Control D4 [TS 103 141] | 01/03/2021 | 31/05/2022 | 76 000 |
| Milestone D | Progress report approved by TC ITS Stable Drafts of: - D3 [TS 103 697]; - D4 [TS 103 141]; - D5 [TS 102 636-8-1]; - D6 [TS 103 695] made available to TC ITS |  | 31/12/2021 |  |
| T6 | Communications; GeoNetworking: Part 8: Transport Protocols for Multi-Channel Operation (MCO): Sub-Part 1: Basic Transport Protocol D5 [TS 102 636-8-1] | 01/05/2021 | 31/05/2022 | 70 000 |
| T7 | Access Layer specification for Multi-Channel Operation (MCO) in the 5GHz frequency band D6 [TS 103 695] | 01/05/2021 | 31/05/2022 | 70 000 |
| Milestone E | Final report to the EC/EFTA to be made available and approved by ETSI Secretariat Final Drafts of: - D3 [TS 103 697]; - D4 [TS 103 141]; - D5 [TS 102 636-8-1]; - D6 [TS 103 695] approved by TC ITS and published |  | 31/05/2022 |  |
|  | | | | **670 000** |

**Part III: Financial part**

# Financial provisions in the EC/EFTA contract

## Total action costs

The total action costs will amount to 1 065 units x 649,83 EUR = 692 068,95 EUR (lump sum)

The total budget for Service Providers amounts 670 000 EUR

The total travel budget amounts 22 068,95 EUR for:

* Up to 11 travels to present STF results to TC ITS meetings
* 3-5 intercontinental travels to see ITS community including SAE and IEEE

## Subcontracting

There are no indirect costs involved.

## Direct (eligible) costs

The direct costs will amount to: 692 068,95 EUR **= lump sum** based on an EC contribution of 95% (657 465,50 EUR) and co-financed by 5% from EFTA (34 603,45 EUR).

1. https://ec.europa.eu/docsroom/documents/34521 [↑](#footnote-ref-1)
2. <http://www.europarl.europa.eu/RegData/etudes/BRIE/2017/608664/EPRS_BRI(2017)608664_EN.pdf> [↑](#footnote-ref-2)
3. [http://www.europarl.europa.eu/sides/getDoc.do?type=COMPARL&reference=PE- 610.712&format=PDF&language=EN&secondRef=01](http://www.europarl.europa.eu/sides/getDoc.do?type=COMPARL&reference=PE-%20610.712&format=PDF&language=EN&secondRef=01) [↑](#footnote-ref-3)
4. https://ec.europa.eu/transport/themes/its/c-its\_en [↑](#footnote-ref-4)
5. https://www.car-2-car.org/index.php?id=5 [↑](#footnote-ref-5)
6. https://www.c-roads.eu/platform.html [↑](#footnote-ref-6)
7. www.codecs-project.eu/ [↑](#footnote-ref-7)
8. cimec-project.eu/ [↑](#footnote-ref-8)
9. http://www.ertrac.org/index.php?page=ertrac-roadmap [↑](#footnote-ref-9)
10. https://www.car-2-car.org/ [↑](#footnote-ref-10)
11. https://www.c-roads.eu/ [↑](#footnote-ref-11)
12. https://ec.europa.eu/info/strategy/justice-and-fundamental-rights/data-protection\_en [↑](#footnote-ref-12)
13. European Parliament and Council, Directive 2010/40/EU, 7th July 2010, “DIRECTIVE 2010/40/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport” [↑](#footnote-ref-13)
14. 2008/671/EC: Commission Decision of 5 August 2008 on the harmonised use of radio spectrum in the 5875 - 5905 MHz frequency band for safety-related applications of Intelligent Transport Systems (ITS) (notified under document number C(2008) 4145) (Text with EEA relevance): https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32008D0671 [↑](#footnote-ref-14)
15. Report from CEPT to the European Commission in response to the Mandate to study the extension of the Intelligent Transport Systems (ITS) safety-related band at 5.9 GHz : <https://www.ecodocdb.dk/download/19a361a9-d547/CEPTRep071.pdf> [↑](#footnote-ref-15)