I. Proposal

 Draft new UN Regulation on uniform provisions concerning the approval of vehicles with regard to cyber security and of their cybersecurity management systems

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 1. Scope

1.1. This Regulation applies to vehicles, with regard to cyber security, of the categories M, N, O [and, R, S and T].

1.2. This regulation also applies to vehicles of Categories L6 and L7 if equipped with automated driving functionalities

1.3. This Regulation is without prejudice to other UN Regulations, regional or national legislations governing the access by authorized parties to the vehicle, its data, functions and resources, and conditions of such access. It is also without prejudice to the application of national and regional legislation on privacy and the protection of natural persons with regard to the processing of their personal data.

 2. Definitions

 For the purpose of this Regulation the following definitions shall apply:

2.1. "*Vehicle type*" means vehicles which do not differ in at least the following essential respects:

(a) The manufacturer’s designation of the vehicle type;

(b) Essential aspects of the electric/electronic architecture and external interfaces with respect to cyber security.

2.2. "*Cyber security*" means the condition in which road vehicles and their functions are protected from cyber threats to electrical or electronic components.

2.3. "*Cyber Security Management System (CSMS)*" means a systematic risk-based approach defining organisational processes, responsibilities and governance to treat risk associated with cyber threats to vehicles and protect them from cyber-attacks.

2.4. “*System*” means a set of components and/or sub-systems that implements a function or functions.

2.5. “*Development phase*” means the period before a vehicle type is type approved.

2.6. “*Production phase*” refers to the duration of production of a vehicle type.

2.7. “*Post-production phase*” refers to the period after which a vehicle type is no longer produced. Vehicles incorporating a specific vehicle type will be operational during this phase but will no longer be produced. The phase ends when there are no longer any operational vehicles of a specific vehicle type.

2.8. "*Mitigation*" means a measure that is reducing risk.

2.9. "*Risk*" means the potential that a given threat will exploit vulnerabilities of a vehicle and thereby cause harm to the organization or to an individual.

2.10. "*Risk Assessment*" means the overall process of finding, recognizing and describing risks (risk identification), to comprehend the nature of risk and to determine the level of risk (risk analysis), and of comparing the results of risk analysis with risk criteria to determine whether the risk and/or its magnitude is acceptable or tolerable (risk evaluation).

2.11. "*Risk Management*" means coordinated activities to direct and control an organization with regard to risk.

2.12. "*Threat*" means a potential cause of an unwanted incident, which may result in harm to a system, organization or individual

2.13. "*Vulnerability*" means a weakness of an asset or mitigation that can be exploited by one or more threats.

 3. Application for approval

3.1. The application for approval of a vehicle type with regard to cyber security shall be submitted by the vehicle manufacturer or by their duly accredited representative.

3.2. It shall be accompanied by the undermentioned documents in triplicate, and by the following particulars:

3.2.1. A description of the vehicle type with regard to the items specified in Annex 1 to this Regulation.

3.2.2. In cases where information is shown to be covered by intellectual property rights or to constitute specific know-how of the manufacturer or of their suppliers, the manufacturer or their suppliers shall make available sufficient information to enable the checks referred to in this Regulation to be made properly. Such information shall be treated on a confidential basis.

3.2.3. The Certificate of Compliance for CSMS according to paragraph 6 of this Regulation.

3.3. Documentation shall be made available in two parts:

(a) The formal documentation package for the approval, containing the material specified in Annex 1 which shall be supplied to the Approval Authority or its Technical Service at the time of submission of the type approval application. This documentation package shall be used by the Approval Authority or its Technical Service as the basic reference for the approval process. The Approval Authority or its Technical Service shall ensure that this documentation package remains available for at least 10 years counted from the time when production of the vehicle type is definitely discontinued.

(b) Additional material relevant to the requirements of this regulation may be retained by the manufacturer, but made open for inspection at the time of type approval. The manufacturer shall ensure that any material made open for inspection at the time of type approval remains available for at least a period of 10 years counted from the time when production of the vehicle type is definitely discontinued.

 4. Marking

4.1. There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle conforming to a vehicle type approved under this Regulation an international approval mark consisting of:

4.1.1. A circle surrounding the Letter "E" followed by the distinguishing number of the country which has granted approval.

4.1.2. The number of this Regulation, followed by the letter "R", a dash and the approval number to the right of the circle described in paragraph 4.1.1. above.

4.2. If the vehicle conforms to a vehicle type approved under one or more other Regulations annexed to the Agreement in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.1.1. above need not be repeated; in this case the Regulation and approval numbers and the additional symbols of all the Regulations under which approval has been granted in the country which has granted approval under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.1.1. above.

4.3. The approval mark shall be clearly legible and shall be indelible.

4.4. The approval mark shall be placed on or close to the vehicle data plate affixed by the Manufacturer.

4.5. Annex 3 to this Regulation gives examples of the arrangements of the approval mark.

 5. Approval

5.1. Approval Authorities shall grant, as appropriate, type approval with regard to cyber security, only to such vehicle types that satisfy the requirements of this Regulation.

5.1.bis

 so as to demonstrate that suppliers-related risks are identified and are managed

s

(d) Detect and respond to possible cyber security attacks

(e) Log data to support the detection of cyber-attacks and provide data forensic capability to enable analysis of attempted of successful cyber-attacks.

5.1.ter Before granting the approval, the Approval Authority or its Technical Service shall also verify by vehicle testing that the vehicle manufacturer has implemented the cyber security measures they have documented. This may be achieved through sampling.

5.1.x. In particular, the Approval Authority or Technical Service shall refuse to grant the type approval with regard to cyber security where the vehicle manufacturer has not fulfilled one of the requirements referred to in paragraph 7.3. , notably:

(a) the manufacturer did not perform the exhaustive risk assessment referred to in paragraph 7.3.3.; including where the manufacturer did not consider all the risks related to threats referred to in Annex 5, Part A;

(b) the manufacturer did not ensure that critical elements of the vehicle type are protected against risks identified in the vehicle manufacturer’s risk assessment, including where the manufacturer did not ensure that at least the mitigations referred to in Annex 5, Part B, which are relevant to the risks identified, are implemented;

(c) the manufacturer did not ensure that appropriate and proportionate measures have been put in place to secure dedicated environments on the vehicle type (if provided) for the storage and execution of aftermarket software, services, applications or data;

(d) the manufacturer has not performed appropriate and sufficient testing to verify the effectiveness of the security measures implemented and the outcome of those tests.

5.1.y The assessing Approval Authority shall also refuse to grant the type approval with regard to cyber security where this Approval Authority or Technical Service has not received sufficient information from the Vehicle Manufacturer to assess the cyber security of the vehicle type.

5.2. Notice of approval or of extension or refusal of approval of a vehicle type pursuant to this Regulation shall be communicated to the Parties to the 1958 Agreement which apply this Regulation, by means of a form conforming to the model in Annex 2 to this Regulation.

5.3. Approval Authorities shall not grant any type approval without verifying that the manufacturer has put in place satisfactory arrangements and procedures to manage properly the cyber security aspects as covered by this Regulation.

5.3.bis Each Approval Authority shall actively inform and seek guidance from other Approval Authorities before making the decision grant a type approval under this Regulation. To this effect, the Approval Authority concerned shall notify the Approval Authorities applying this Regulation of the draft approval decision, together with the description of the method and criteria of assessment employed by the Approval Authority. The documents referred to in paragraph 3.3 and the results of the tests performed pursuant to paragraph 5.1 ter shall be open for inspection by the Approval Authorities applying this Regulation, except where the manufacturer notifies, with the notifying Approval Authority, opposition to the inspection of designated part of the documentation, no later than at the moment of notification.

5.3.ter Each Approval Authority applying this Regulation may notify the other Parties, within 30 calendar days, its reasoned reservations with regard to the whole or the part of the decision notified. Subsequently, the Approval Authority shall notify to the Approval Authorities applying this Regulation the draft decision revised taking into account the reservations received.

5.3. quater If at least two Parties notify, within 30 calendar days, reasoned reservations to this draft decision, the Approval Authority shall not adopt a type approval decision. In this case, the draft type approval decision, together with the description of the method and criteria of assessment employed by the Approval Authority, and the reservations notified pursuant to this section shall be referred to the Chair of the World Forum for Harmonization of Vehicle Regulations (WP.29) and to the Chair of the subsidiary Working Party as diverging interpretations within the meaning of Schedule 6 to the [1958 Agreement]. The procedure provided for in paragraph 3 of Schedule 6 shall apply. The documents referred to in paragraph 3.3 and the results of the tests performed pursuant to paragraph 5.1 ter shall be open for inspection by the Chair of WP.29 and the Chair of the subsidiary Working Party on the same conditions as those set out in paragraph 5.3 bis above.

5.3.quinquies The interpretation agreed in the Working Party shall be implemented and the approval authority shall issue UN type approval accordingly.

5.4. For the purpose of paragraph 7.2. of this Regulation, the manufacturer shall ensure that the cyber security aspects covered by this Regulation are implemented.

 6. Certificate of Compliance for Cyber Security Management System

6.1. Contracting Parties shall appoint an Approval Authority to carry out the assessment of the manufacturer and to issue a Certificate of Compliance for CSMS.

6.2. An application for a Certificate of Compliance for Cyber Security Management System shall be submitted by the vehicle manufacturer or by their duly accredited representative.

6.3. It shall be accompanied by the undermentioned documents in triplicate, and by the following particular:

6.3.1. Documents describing the Cyber Security Management System.

6.3.2. A signed declaration using the model as defined in Appendix 1 to Annex 1.

6.4. In the context of the assessment, the manufacturer shall declare using the model as defined in Appendix 1 to Annex 1 and demonstrate to the satisfaction of the Approval Authority or its Technical Service that they have the necessary processes to comply with all the requirements for cyber security according to this Regulation.

6.5. When this assessment has been satisfactorily completed and in receipt of a signed declaration from the manufacturer according to the model as defined in Appendix 1 to Annex 1, a certificate named Certificate of Compliance for CSMS as described in Annex 4 to this Regulation (hereinafter the Certificate of Compliance for CSMS) shall be granted to the manufacturer.

6.6. The Approval Authority or its Technical Service shall use the model set out in Annex 4 to this Regulation for the Certificate of Compliance for CSMS.

6.7. The Certificate of Compliance for CSMS shall remain valid for a maximum of three years from the date of deliverance of the certificate unless it is withdrawn.

6.8. The Approval Authority which has granted the Certificate of Compliance for CSMS may at any time verify that the requirements for it continue to be met. The Approval Authority shall withdraw the Certificate of Compliance for CSMS if the requirements laid down in this Regulation are no longer met.

6.9. The manufacturer shall inform the Approval Authority or its Technical Service of any change that will affect the relevance of the Certificate of Compliance for CSMS. After consultation with the manufacturer, the Approval Authority or its Technical Service shall decide whether new checks are necessary.

6.10. At the end of the period of validity of the Certificate of Compliance for CSMS, the Approval Authority shall, after a positive assessment, issue a new Certificate of Compliance for CSMS or extend its validity for a further period of three years. The Approval Authority shall issue a new certificate in cases where changes have been brought to the attention of the Approval Authority or its Technical Service and the changes have been positively re-assessed.

6.11. Existing vehicle type approvals shall not lose their validity due to the expiration of the manufacturer’s Certificate of Compliance for CSMS.

 7. Specifications

 7.1. General specifications

7.1.1. The requirements of this Regulation shall not restrict provisions or requirements of other UN Regulations.

7.1.2. The vehicle manufacturer may refer to [the Resolution on Cyber Security and Interpretation Document on Cyber Security] in their assessment of cyber security risks and the mitigations, as well as when describing the processes employed.

 7.2. Requirements for the Cyber Security Management System

7.2.1. For the assessment the Approval Authority or its Technical Service shall verify that the vehicle manufacturer has a Cyber Security Management System in place and shall verify its compliance with this Regulation.

7.2.2. The Cyber Security Management System shall cover the following aspects:

7.2.2.1. The vehicle manufacturer shall demonstrate to an Approval Authority or Technical Service that their Cyber Security Management System considers the following phases:

- Development phase;

- Production phase;

- Post-production phase.

7.2.2.2. The vehicle manufacturer shall demonstrate that the processes used within their Cyber Security Management System ensure security is adequately considered. This shall include:

(a)  The processes used within the manufacturer’s organization to manage cyber security;

(b)  The processes used for the identification of risks to vehicle types. Within these processes, the threats in [section IV and Annex B of the Resolution on Cyber Security] and other relevant threats shall be considered.

(c) The processes used for the assessment, categorization and treatment of the risks identified;

(d)  The processes in place to verify that the risks identified are appropriately managed;

(e)  The processes used for testing the cyber security of a vehicle type;

(f)  The processes used for ensuring that the risk assessment is kept current;

(g)  The processes used to monitor for, detect and respond to cyber-attacks, cyber threats and vulnerabilities on vehicle types and the processes used to assess whether the cyber security measures implemented are still effective in the light of new cyber threats and vulnerabilities that have been identified.

7.2.2.2bis. The vehicle manufacturer shall demonstrate that the processes used within their Cyber Security Management System will ensure that, based on categorization referred to in point 7.2.2.2 (c) and 7.2.2.2 (g), cyber threats and vulnerabilities which require a response from the manufacturer shall be mitigated within a reasonable timeframe.

7.2.2.2ter. The vehicle manufacturer shall demonstrate that the processes used within their Cyber Security Management System will ensure that the monitoring referred to in point 7.2.2.2 (g) shall be continuous. This shall:

(a) Include vehicles after first registration in the monitoring.

(b) Include the capability to analyse and detect cyber threats, vulnerabilities and cyber-attacks from vehicle data and vehicle logs. This capability shall respect point 1.3 and the privacy rights of car owners or drivers, particularly with respect to consent.

7.2.2.3. The vehicle manufacturer shall be required to demonstrate how their Cyber Security Management System will manage dependencies that may exist with contracted suppliers, service providers or manufacturer’s sub-organizations in regards of the requirements of paragraph 7.2.2.2.

 7.3. Requirements for vehicle types

7.3.1. The manufacturer shall have a valid Certificate of Compliance for the Cyber Security Management System relevant to the vehicle type being approved.

7.3.3. The vehicle manufacturer shall perform the exhaustive risk assessment for the vehicle type and shall treat/manage the identified risks appropriately.. The risk assessment shall consider the systems of the vehicle type and their interactions. The risk assessment shall further consider interactions with any external system. While assessing the risks, the manufacturer shall consider the risks related to all the threats referred to in Annex 5, Part A, as well as any other relevant risk.

7.3.4. The vehicle manufacturer shall ensure that critical elements of the vehicle type are protected against risks identified in the vehicle manufacturer’s risk assessment. Proportionate mitigations shall be implemented to protect such elements. The mitigations implemented shall include all mitigations referred to in Annex 5, Part B which are relevant for the risks identified. Whenever a mitigation referred to in Annex 5, Part B, is not relevant or not sufficient, the manufacturer shall ensure that another appropriate mitigation is implemented.

7.3.5. The vehicle manufacturer shall ensure that appropriate and proportionate measures have been put in place to secure dedicated environments on the vehicle type (if provided) for the storage and execution of aftermarket software, services, applications or data.

7.3.6. The vehicle manufacturer shall perform appropriate and sufficient testing to verify the effectiveness of the security measures implemented.

7.3.8 The vehicle manufacturer shall implement measures on the vehicle type to:

(a) detect and prevent cyber-attacks against vehicles of the vehicle type;

(b) support the monitoring capability of the manufacturer with regards to detecting threats, vulnerabilities and cyber-attacks relevant to the vehicle type;

(b) provide data forensic capability to enable analysis of attempted or successful cyber-attacks;

 8. Modification and extension of the vehicle type

8.1. Every modification of the vehicle type which affects its technical performance with respect to cybersecurity and/or documentation required in this Regulation shall be notified to the approval authority which approved the vehicle type. The Approval Authority may then either:

8.1.1. Consider that the modifications made still comply with the requirements and documentation of existing type approval; or

8.1.2. Require a further test report from the Technical Service responsible for conducting the tests.

8.1.3. Confirmation or extension or refusal of approval, specifying the alterations, shall be communicated by means of a communication form conforming to the model in Annex 2 to this Regulation. The Approval Authority issuing the extension of approval shall assign a series number for such an extension and inform there of the other Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model in Annex 2 to this Regulation.

 9. Conformity of production

9.1. The Conformity of Production Procedures shall comply with those set out in the 1958 Agreement, Schedule 1 (E/ECE/TRANS/505/Rev.3) with the following requirements:

9.1.1. The holder of the approval shall ensure that results of the conformity of production tests are recorded and that the annexed documents remain available for a period determined in agreement with the Approval Authority or its Technical Service. This period shall not exceed 10 years counted from the time when production is definitively discontinued;

9.1.2. The Approval Authority which has granted type approval may at any time verify the conformity control methods applied in each production facility. The normal frequency of these verifications shall be once every three years.

 10. Penalties for non-conformity of production

10.1. The approval granted in respect of a vehicle type pursuant to this Regulation may be withdrawn if the requirements laid down in this Regulation are not complied with or if sample vehicles fail to comply with the requirements of this Regulation.

10.2. If an Approval Authority withdraws an approval it has previously granted, it shall forthwith so notify the Contracting Parties applying this Regulation, by means of a communication form conforming to the model in Annex 2 to this Regulation.

 11. Production definitively discontinued

11.1. If the holder of the approval completely ceases to manufacture a type of vehicle approved in accordance with this Regulation, he shall so inform the authority which granted the approval. Upon receiving the relevant communication that authority shall inform thereof the other Contracting Parties to the Agreement applying this Regulation by means of a copy of the approval form bearing at the end, in large letters, the signed and dated annotation "PRODUCTION DISCONTINUED".

 12. Names and addresses of Technical Services responsible for conducting approval test, and of type approval authorities

12.1. The Contracting Parties to the Agreement which apply this Regulation shall communicate to the United Nations Secretariat the names and addresses of the Technical Services responsible for conducting approval tests and of the Type Approval Authorities which grant approval and to which forms certifying approval or extension or refusal or withdrawal of approval, issued in other countries, are to be sent.

 [13. Transitional provisions

13.1. As from the official date of entry into force of the 01 series of amendments, no Contracting Party applying this Regulation shall refuse to grant or refuse to accept type approvals under this Regulation as amended by the 01 series of amendments.

13.2. As from 1 September [2022], Contracting Parties applying this Regulation shall not be obliged to accept type approvals to the 00 series of amendments, first issued after 1 September [2022].

13.3. Contracting Parties applying this Regulation shall continue to accept type approvals issued according to the 00 series of amendments to this Regulation first issued before 1 September [2022].

13.4. Contracting Parties applying this Regulation shall not refuse to grant type approvals according to any preceding series of amendments to this Regulation or extensions thereof.

13.5. Notwithstanding paragraph 12.3, as from 1 September [2028], Contracting Parties applying this Regulation shall not be obliged to accept type approvals to the 00 series of amendments for vehicle types incorporating capabilities for receiving over the air software updates, which may impact type approved systems.]

Annex 1

 Information document

The following information, if applicable, shall be supplied in triplicate and include a list of contents. Any drawings shall be supplied in appropriate scale and in sufficient detail on size A4 or on a folder of A4 format. Photographs, if any, shall show sufficient detail.

1. Make (trade name of manufacturer):

2. Type and general commercial description(s):

3. Means of identification of type, if marked on the vehicle:

4. Location of that marking:

5. Category(ies) of vehicle:

6. Name and address of manufacturer/ manufacturer's representative:

7. Name(s) and Address(es) of assembly plant(s):

8. Photograph(s) and/or drawing(s) of a representative vehicle:

9. Cyber Security

9.1. General construction characteristics of the vehicle type, including:

(a) The vehicle systems which are relevant to the cyber security of the vehicle type;

(b) The components of those systems that are relevant to cyber security;

(c) The interactions of those systems with other systems within the vehicle type and external interfaces.

9.2. Schematic representation of the vehicle type

9.3. The number of the Certificate of Compliance for CSMS:

9.4. Documents for the vehicle type to be approved describing the outcome of its risk assessment and the identified risks:

9.5 Documents for the vehicle type to be approved describing the mitigations that have been implemented on the systems listed, or to the vehicle type, and how they address the stated risks:

9.6. Documents for the vehicle type to be approved describing protection of dedicated environments for aftermarket software, services, applications or data:

9.7. Documents for the vehicle type to be approved describing what tests have been used to verify the cyber security of the vehicle type and its systems and the outcome of those tests:

9.8. Description of the consideration of the supply chain with respect to cyber security:

Annex 1 - Appendix 1

 Model of Manufacturer’s Declaration of Compliance for CSMS

Manufacturer’s declaration of compliance with the requirements for the Cyber Security Management System

Manufacturer Name:

Manufacturer Address:

…………………..(*Manufacturer Name*) attests that the necessary processes to comply with the requirements for the Cyber Security Management System laid down in paragraph 7.2 of UN Regulation [*this Regulation*] are installed and will be maintained.

Done at: …………………… (*place*)

Date:

Name of the signatory:

Function of the signatory:

(*Stamp and signature of the manufacturer’s representative*)

Annex 2

 Communication form

COMMUNICATION

(Maximum format: A4 (210 x 297 mm))

issued by: Name of administration:

......................................

......................................

......................................

[[1]](#footnote-2)

**1**



Concerning:[[2]](#footnote-3) Approval granted

 Approval extended

 Approval withdrawn with effect from dd/mm/yyyy

 Approval refused

 Production definitively discontinued

of a vehicle type, pursuant to UN Regulation No. [*this Regulation*]

Approval No.:

Extension No.:

Reason for extension:

1. Make (trade name of manufacturer):

2. Type and general commercial description(s)

3. Means of identification of type, if marked on the vehicle:

3.1. Location of that marking:

4. Category(ies) of vehicle:

5. Name and address of manufacturer / manufacturer’s representative:

6. Name(s) and Address(es) of the production plant(s)

7. Number of the certificate of compliance for cyber security management system:

8. Technical Service responsible for carrying out the tests:

9. Date of test report:

10. Number of test report:

11. Remarks: (if any).

12. Place:

13. Date:

14. Signature:

15. The index to the information package lodged with the Approval Authority, which may be obtained on request is attached.

Annex 3

 Arrangement of approval mark

**Model A**

(See paragraph 4.2 of this Regulation)



xxx

 a = 8 mm min.

The above approval mark affixed to a vehicle shows that the road vehicle type concerned has been approved in the Netherlands (E 4), pursuant to Regulation No. xx, and under the approval number 001234. The first two digits of the approval number indicate that the approval was granted in accordance with the requirements of this Regulation in its original form (00).

Annex 4

 Model of Certificate of Compliance for CSMS

**CERTIFICATE OF COMPLIANCE FOR
CYBER SECURITY MANAGEMENT SYSTEM**

WITH UN REGULATION No. [*This Regulation*]

Certificate Number [*Reference number*]

[……. *Approval Authority*]

Certifies that

Manufacturer:

Address of the manufacturer:

complies with the provisions of paragraph 7.2 of Regulation No. [*This Regulation*]

Verifications have been performed on:

by (name and address of the Approval Authority or Technical Service):

Number of report:

The certificate is valid until […..*Date*]

Done at [……*Place*]

On […….*Date*]

[………….*Signature*]

Attachments: description of the Cyber Security Management System by the manufacturer.

Annex 5

 List of threats and corresponding mitigations

1. (Deleted)

2. This annex consists of two parts. Part A of this annex describes the examples of vulnerability or attack method. Part B of this annex describes the mitigations to the threats.

3. These examples shall be considered and mitigations implemented by vehicle manufacturers and suppliers during the design, development, testing and implementation of vehicles and their systems, as appropriate. The vehicle manufacturers shall also, respectively, consider and implement threats and mitigations listed in Annex [X] of [Cybersecurity Resolution].

4. The high-level vulnerability and its corresponding examples have been indexed in Part A. The same indexing has been referenced in the tables in Part B to link each of the attack/vulnerability with its corresponding mitigation measures.

5. The threat analysis shall also consider possible attack outcomes. These may help ascertain the severity of a risk and identify additional risks. Possible attack outcomes may include:

 Safe operation of vehicle affected

 Vehicle functions stop working

 Software modified, performance altered

 Software altered but no operational effects

 Data integrity breach

 Data confidentiality breach

 Loss of data availability

 Other, including criminality

 Part A. Examples of vulnerability or attack method related to the threats

1. High level descriptions of threats and relating vulnerability or attack method are listed in Table 1.

Table 1

**List of examples of vulnerability or attack method related to the threats**

| *High level and sub-level descriptions of vulnerability/ threat* | *Example of vulnerability or attack method* |
| --- | --- |
| 4.3.1 Threats regarding back-end servers | 1 | Back-end servers used as a means to attack a vehicle or extract data | 1.1 | Abuse of privileges by staff (**insider attack**) |
| 1.2 | **Unauthorised internet access** to the server (enabled for example by backdoors, unpatched system software vulnerabilities, SQL attacks or other means) |
| 1.3 | **Unauthorised physical access** to the server (conducted by for example USB sticks or other media connecting to the server) |
| 2 | Services from back-end server being disrupted, affecting the operation of a vehicle | 2.1 | **Attack on back-end server stops it functioning**, for example it prevents it from interacting with vehicles and providing services they rely on |
| 3 | Data held on back-end servers being lost or compromised (“data breach”) | 3.1 | Abuse of privileges by staff (**insider attack)** |
| 3.2 | **Loss of information in the cloud**. Sensitive data may be lost due to attacks or accidents when data is stored by third-party cloud service providers |
|  | 3.3 | **Unauthorised internet access to the server** (enabled for example by backdoors, unpatched system software vulnerabilities, SQL attacks or other means) |
| 3.4 | **Unauthorised physical access to the server** (conducted for example by USB sticks or other media connecting to the server) |
| 3.5 | **Information breach** by unintended sharing of data (e.g. admin errors, storing data in servers in garages) |
| 4.3.2 Threats to vehicles regarding their communication channels | 4 | Spoofing of messages or data received by the vehicle | 4.1 | **Spoofing of messages** by impersonation (e.g. 802.11p V2X during platooning, GNSS messages, etc.)  |
| 4.2 | **Sybil attack** (in order to spoof other vehicles as if there are many vehicles on the road) |
| 5 | Communication channels used to conduct unauthorized manipulation, deletion or other amendments to vehicle held code/data | 5.1 | Communications channels permit **code injection**, for example tampered software binary might be injected into the communication stream |
| 5.2 | Communications channels permit **manipulate** of vehicle held data/code |
| 5.3 | Communications channels permit **overwrite** of vehicle held data/code |
| 5.4 | Communications channels permit **erasure** of vehicle held data/code |
| 5.5 | Communications channels permit introductionof data/code to the vehicle (write data code) |
| 6 | Communication channels permit untrusted/unreliable messages to be accepted or are vulnerable to session hijacking/replay attacks | 6.1 | Accepting information from an **unreliable or untrusted source** |
| 6.2 | **Man in the middle** attack/ session hijacking |
| 6.3 | **Replay attack**, for example an attack against a communication gateway allows the attacker to downgrade software of an ECU or firmware of the gateway |
| 7 | Information can be readily disclosed. For example through eavesdropping on communications or through allowing unauthorized access to sensitive files or folders | 7.1 | **Interception of information** / interfering radiations / monitoring communications |
| 7.2 | Gaining **unauthorised access** to files or data |
| 8 | Denial of service attacks via communication channels to disrupt vehicle functions | 8.1 | **Sending** a large number of garbage **data** to vehicle information system, **so that it is unable to provide services** in the normal manner |
| 8.2 | **Black hole attack**, in order to disrupt communication between vehicles the attacker is able to block messages between the vehicles |
| 9 | An unprivileged user is able to gain privileged access to vehicle systems | 9.1 | An unprivileged user is able to **gain privileged access**, for example root access |
| 10 | Viruses embedded in communication media are able to infect vehicle systems | 10.1 | **Virus** embedded in communication media infects vehicle systems |
| 11 | Messages received by the vehicle (for example X2V or diagnostic messages), or transmitted within it, contain malicious content | 11.1 | Malicious **internal** (e.g. CAN) **messages** |
| 11.2 | Malicious **V2X** **messages,** e.g. infrastructure to vehicle or vehicle-vehicle messages (e.g. CAM, DENM) |
| 11.3 | Malicious diagnostic messages |
| 11.4 | Malicious **proprietary messages** (e.g. those normally sent from OEM or component/system/function supplier) |
| 4.3.3. Threats to vehicles regarding their update procedures | 12 | Misuse or compromise of update procedures | 12.1 | Compromise of **over the air software update procedures**, This includes fabricating system update program or firmware |
| 12.2 | Compromise of **local/physical software update procedures**. This includes fabricating system update program or firmware |
| 12.3 | The **software** is **manipulated before the update process** (and is therefore corrupted), although the update process is intact |
| 12.4 | **Compromise** of cryptographic keys of the software provider **to** **allow invalid update** |
| 13 | It is possible to deny legitimate updates | 13.1 | Denial of Service attack against update server or network to **prevent rollout of critical software updates** and/or unlock of customer specific features |
| 4.3.4 Threats to vehicles regarding unintended human actions | 14 | Misconfiguration of equipment or systems by legitimate actor, e.g. owner or maintenance community | 14.1 | **Misconfiguration of equipment** by maintenance community or owner during installation/repair/use causing unintended consequence |
| 14.2 | **Erroneous use** or administration of devices and systems (incl. OTA updates) |
| 15 | Legitimate actors are able to take actions that would unwittingly facilitate a cyber-attack | 15.1 | Innocent victim (e.g. owner, operator or maintenance engineer) being **tricked into taking an action** tounintentionally load malware or enable an attack |
| 15.2 | **Defined security procedures** are not followed |
| 4.3.5 Threats to vehicles regarding their external connectivity and connections | 16 | Manipulation of the connectivity of vehicle functions enables a cyber-attack, this can include telematics; systems that permit remote operations; and systems using short range wireless communications | 16.1 | Manipulation of **functions designed to remotely operate systems**, such as remote key, immobiliser, and charging pile |
| 16.2 | **Manipulation of vehicle telematics** (e.g. manipulate temperature measurement of sensitive goods, remotely unlock cargo doors) |
| 16.3 | Interference with **short range wireless systems** or sensors |
| 17 | Hosted 3rd party software, e.g. entertainment applications, used as a means to attack vehicle systems | 17.1 | **Corrupted applications**, or those with poor software security, used as a method to attack vehicle systems |
| 18 | Devices connected to external interfaces e.g. USB ports, OBD port, used as a means to attack vehicle systems | 18.1 | **External interfaces** such as USB or other ports used as a point of attack, for example through code injection |
| 18.2 | Media infected with a **virus** connected to a vehicle system |
| 18.3 | **Diagnostic access (e.g. dongles in OBD port)** used to facilitate an attack, e.g. manipulate vehicle parameters (directly or indirectly) |
| 4.3.6 Potential targets of, or motivations for, an attack | 19 | Extraction of vehicle data/code | 19.1 | Extraction of copyright or proprietary software from vehicle systems (product **piracy**) |
| 19.2 | Unauthorized access to the **owner’s privacy information** such as personal identity, payment account information, address book information, location information, vehicle’s electronic ID, etc. |
| 19.3 | Extraction of cryptographic keys |
| 20 | Manipulation of vehicle data/code | 20.1 | Illegal/unauthorised changes to **vehicle’s electronic ID** |
| 20.2 | **Identity fraud.** For example if a user wants to display another identity when communicating with toll systems, manufacturer backend |
| 20.3 | Action to **circumvent monitoring systems** (e.g. hacking/ tampering/ blocking of messages such as ODR Tracker data, or number of runs) |
| 20.4 | Data manipulation to **falsify vehicle’s driving data** (e.g. mileage, driving speed, driving directions, etc.) |
| 20.5 | Unauthorised changes to **system diagnostic data** |
| 21 | Erasure of data/code | 21.1 | Unauthorized deletion/manipulation of **system event logs** |
| 22 | Introduction of malware | 22.2 | Introduce **malicious software** or malicious software activity |
| 23 | Introduction of new software or overwrite existing software | 23.1 | **Fabrication of software** of the vehicle control system or information system |
| 24 | Disruption of systems or operations | 24.1 | **Denial of service**, for example this may be triggered on the internal network by flooding a CAN bus, or by provoking faults on an ECU via a high rate of messaging |
| 25 | Manipulation of vehicle parameters | 25.1 | Unauthorized access of **falsify the configuration parameters** of vehicle’s key functions, such as brake data, airbag deployed threshold, etc. |
| 25.2 | Unauthorized access of **falsify the charging parameters**, such as charging voltage, charging power, battery temperature, etc. |
| 4.3.7 Potential vulnerabilities that could be exploited if not sufficiently protected or hardened | 26 | Cryptographic technologies can be compromised or are insufficiently applied | 26.1 | Combination of short **encryption keys** and long period of validity enables attacker to break encryption |
| 26.2 | Insufficient use of cryptographic algorithms to protect sensitive systems  |
| 26.3 | Using already or soon to be deprecated **cryptographic algorithms** |
| 27 | Parts or supplies could be compromised to permit vehicles to be attacked | 27.1 | **Hardware or software, engineered to enable an attack** or fails to meet design criteria to stop an attack |
| 28 | Software or hardware development permits vulnerabilities | 28.1 | **Software bugs**. The presence of software bugs can be a basis for potential exploitable vulnerabilities. This is particularly true if software has not been tested to verify that known bad code/bugs is not present and reduce the risk of unknown bad code/bugs being present.  |
| 28.2 | **Using remainders** from development (e.g. debug ports, JTAG ports, microprocessors, development certificates, developer passwords, …) can permit access to ECUs or permit attackers to gain higher privileges |
| 29 | Network design introduces vulnerabilities | 29.1 | **Superfluous internet ports left open**, providing access to network systems |
| 29.2 | Circumvent **network separation** to gain control. Specific example is the use of unprotected gateways, or access points (such as truck-trailer gateways), to circumvent protections and gain access to other network segments to perform malicious acts, such as sending arbitrary CAN bus messages |
| 30 | Physical loss of data can occur | 30.1 | **Damage** caused by a third party. Sensitive data may be lost or compromised due to physical damages in cases of traffic accident or theft |
| 30.2 | Loss from **DRM** (digital right management) conflicts. User data may be deleted due to DRM issues |
| 30.3 | The (integrity of) sensitive data may be lost due to IT **components wear and tear**, causing potential cascading issues (in case of key alteration, for example) |
| 31 | Unintended transfer of data can occur | 31.1 | Suggested amendment (EC)Information breach. ~~Private~~ **Personal** or sensitive data may be leaked when the **car changes user** (e.g. is sold or is used as hire vehicle with new hirers)  |
| 32 | Physical manipulation of systems can enable an attack | 32.1 | **Manipulation of ~~OEM~~ hardware**, e.g. unauthorised hardware added to a vehicle to enable "man-in-the-middle" attack **Replacement of authorized ~~OEM~~ hardware (e.g., sensors) with unauthorized hardware.****Manipulation of the information collected by a sensor~~. F~~(for example, using a magnet to tamper with the Hall effect sensor connected to the gearbox) ~~(see Digital Tachograph experience)~~** |

 Part B. Examples of mitigation to the threats

1. Examples of mitigation for "Back-end servers"

 Examples of mitigation to the threats which are related to "Back-end servers" are listed in Table B1.

Table B1
**Examples of mitigation to the threats which are related to "Back-end servers"**

|  |  |  |  |
| --- | --- | --- | --- |
| *Table 1 reference* | *Threats to "Back-end servers"* | *Ref* | *Mitigation* |
| 1.1 & 3.1 | Abuse of privileges by staff (insider attack) | M1 | Security Controls shall be applied to back-end systems to minimise the risk of insider attack. Example Security Controls can be found in OWASP. |
| 1.2 & 3.3 | Unauthorised internet access to the server (enabled for example by backdoors, unpatched system software vulnerabilities, SQL attacks or other means) | M2 | Security Controls shall be applied to back-end systems to minimise unauthorised access. Example Security Controls can be found in OWASP. |
| 1.3 & 3.4 | Unauthorised physical access to the server (conducted by for example USB sticks or other media connecting to the server) | M8 | Through system design and access control it should not be possible for unauthorised personnel to access personal or system critical data. Example Security Controls can be found in. |
| 2.1 | Attack on back-end server stops it functioning, for example it prevents it from interacting with vehicles and providing services they rely on. | M3 | Security Controls shall be applied to back-end systems. Where back-end servers are critical to the provision of services there are recovery measures in case of system outage. Example Security Controls can be found in OWASP. |
| 3.2 | Loss of information in the cloud. Sensitive data may be lost due to attacks or accidents when data is stored by third-party cloud service providers | M4 | Security Controls shall be applied to minimise risks associated with cloud computing. Example Security Controls can be found in OWASP and NCSC cloud computing guidance. |
| 3.5 | Information breach by unintended sharing of data (e.g. admin errors, storing data in servers in garages) | M5 | Security Controls shall be applied to back-end systems to prevent data breaches. Example Security Controls can be found in OWASP. |

2. Examples of mitigation for "Vehicle communication channels "

 Examples of mitigation to the threats which are related to "Vehicle communication channels" are listed in Table B2.

Table B2
**Examples of mitigation to the threats which are related to "Vehicle communication channels"**

| *Table 1 reference* | *Threats to "Vehicle communication channels"* | *Ref* | *Mitigation* |
| --- | --- | --- | --- |
| 4.1 | Spoofing of messages (e.g. 802.11p V2X during platooning, GNSS messages, etc.) by impersonation | M10 | The vehicle shall verify the authenticity and integrity of messages it receives |
| 4.2 | Sybil attack (in order to spoof other vehicles as if there are many vehicles on the road) | M11 | Suggested amendment (EC)Security controls shall be implemented for storing cryptographic keys **(e.g., use of Hardware Security Modules)** |
| 5.1 | Communication channels permit code injection into vehicle held data/code, for example tampered software binary might be injected into the communication stream | M10M6 | The vehicle shall verify the authenticity and integrity of messages it receivesSystems shall implement security by design to minimize risks |
| 5.2 | Communication channels permit manipulation of vehicle held data/code | M7 | Access control techniques and designs shall be applied to protect system data/code |
| 5.3 | Communication channels permit overwrite of vehicle held data/code |
| 5.421.1 | Communication channels permit erasure of vehicle held data/code |
| 5.5 | Communication channels permit introduction of data/code to vehicle systems (write data code) |
| 6.1 | Accepting information from an unreliable or untrusted source | M10 | The vehicle shall verify the authenticity and integrity of messages it receives |
| 6.2 | Man in the middle attack / session hijacking. | M10 | The vehicle shall verify the authenticity and integrity of messages it receives |
| 6.3 | Replay attack, for example an attack against a communication gateway allows the attacker to downgrade software of an ECU or firmware of the gateway |
| 7.1 | Interception of information / interfering radiations / monitoring communications | M12 | Confidential data transmitted to or from the vehicle shall be protected |
| 7.2 | Gaining unauthorized access to files or data | M8 | Through system design and access control it should not be possible for unauthorized personnel to access personal or system critical data. Example Security Controls can be found in Security Controls can be found in OWASP. |
| 8.1 | Sending a large number of garbage data to vehicle information system, so that it is unable to provide services in the normal manner | M13 | Measures to detect and recover from a denial of service attack shall be employed |
| 8.2 | Black hole attack, disruption of communication between vehicles by blocking the transfer of messages to other vehicles | M13 | Measures to detect and recover from a denial of service attack shall be employed |
| 9.1 | An unprivileged user is able to gain privileged access, for example root access | M9 | Measures to prevent and detect unauthorized access shall be employed |
| 10.1 | Virus embedded in communication media infects vehicle systems | M14 | Measures to protect systems against embedded viruses/malware should be considered |
| 11.1 | Malicious internal (e.g. CAN) messages | M15 | Measures to detect malicious internal messages or activity should be considered |
| 11.2 | Malicious V2X messages, e.g. infrastructure to vehicle or vehicle-vehicle messages (e.g. CAM, DENM) | M10 | The vehicle shall verify the authenticity and integrity of messages it receives |
| 11.3 | Malicious diagnostic messages |
| 11.4 | Malicious proprietary messages (e.g. those normally sent from OEM or component/system/function supplier) |

2. Examples of mitigation for "Update process"

 Examples of mitigation to the threats which are related to "Update process" are listed in Table B3.

Table B3
**Examples of mitigation to the threats which are related to "Update process"**

| *Table 1 reference* | *Threats to "Update process"* | *Ref* | *Mitigation* |
| --- | --- | --- | --- |
| 12.1 | Compromise of over the air software update procedures, This includes fabricating system update program or firmware | M16 | Secure software update procedures shall be employed |
| 12.2 | Compromise of local/physical software update procedures. This includes fabricating system update program or firmware |
| 12.3 | The software is manipulated before the update process (and is therefore corrupted), although the update process is intact |  |
| 12.4 | Compromise of cryptographic keys of the software provider to allow invalid update | M11 | Security controls shall be implemented for storing cryptographic keys |
| 13.1 | Denial of Service attack against update server or network to prevent rollout of critical software updates and/or unlock of customer specific features | M3 | Security Controls shall be applied to back-end systems. Where back-end servers are critical to the provision of services there are recovery measures in case of system outage. Example Security Controls can be found in OWASP. |

3. Examples of mitigation for "Unintended human actions "

 Examples of mitigation to the threats which are related to "Unintended human actions" are listed in Table B4.

Table B4
**Examples of mitigation to the threats which are related to "Unintended human actions"**

| *Table 1 reference* | *Threats relating to "Unintended human actions"* | *Ref* | *Mitigation* |
| --- | --- | --- | --- |
| 14.1 | Misconfiguration of equipment by maintenance community or owner during installation/repair/use causing unintended consequences | M17 | Suggested amendment (EC)Measures shall be implemented for defining and controlling **configuration and** maintenance procedures |
| 14.2 | Erroneous use or administration of devices and systems (inc. OTA updates) |
| 15.1 | Innocent victim (e.g. owner, operator or maintenance engineer) is tricked into taking an action to unintentionally load malware or enable an attack | M18 | Measures shall be implemented for defining and controlling user roles and access privileges, based on the principle of least access privilege |
| 15.2 | Defined security procedures are not followed | M19 | Suggested amendment (EC)Organizations shall ensure security procedures are defined and followed **including logging of actions and access related to the management of the security functions** |

4. Examples of mitigation for "External connectivity and connections "

 Examples of mitigation to the threats which are related to "external connectivity and connections " are listed in Table B5.

Table B5
**Examples of mitigation to the threats which are related to "external connectivity and connections"**

| *Table 1 reference* | *Threats to "External connectivity"* | *Ref* | *Mitigation* |
| --- | --- | --- | --- |
| 16.1 | Manipulation of functions designed to remotely operate vehicle systems, such as remote key, immobiliser, and charging pile | M20 | Security controls shall be applied to systems that have remote access |
| 16.2 | Manipulation of vehicle telematics (e.g. manipulate temperature measurement of sensitive goods, remotely unlock cargo doors) |
| 16.3 | Interference with short range wireless systems or sensors |
| 17.1 | Corrupted applications, or those with poor software security, used as a method to attack vehicle systems | M21 | Software shall be security assessed, authenticated and integrity protected. Security controls shall be applied to minimise the risk from third party software that is intended or foreseeable to be hosted on the vehicle |
| 18.1 | External interfaces such as USB or other ports used as a point of attack, for example through code injection | M22 | Security controls shall be applied to external interfaces |
| 18.2 | Media infected with viruses connected to the vehicle  |
| 18.3 | Diagnostic access (e.g. dongles in OBD port) used to facilitate an attack, e.g. manipulate vehicle parameters (directly or indirectly) | M22 | Security controls shall be applied to external interfaces |

5. Examples of mitigation for "Potential targets of, or motivations for, an attack "

Examples of mitigation to the threats which are related to "Potential targets of, or motivations for, an attack " are listed in Table B6.

Table B6
**Examples of mitigation to the threats which are related to "Potential targets of, or motivations for, an attack"**

| *Table 1 reference* | *Threats to "Potential targets of, or motivations for, an attack"* | *Ref* | *Mitigation* |
| --- | --- | --- | --- |
| 19.1 | Extraction of copyright or proprietary software from vehicle systems (product piracy / stolen software) | M7 | Access control techniques and designs shall be applied to protect system data/code. Example Security Controls can be found in OWASP. |
| 19.2 | Unauthorized access to the owner’s privacy information such as personal identity, payment account information, address book information, location information, vehicle’s electronic ID, etc. | M8 | Suggested amendment (EC)Through system design and access control it should not be possible for unauthorized personnel to access personal or system critical data. Example**s of** Security Controls can be found in OWASP. |
| 19.3 | Extraction of cryptographic keys | M11 | Suggested amendment (EC)Security controls shall be implemented for storing cryptographic keys **like High Security Modules** |
| 20.1 | Illegal/unauthorised changes to vehicle’s electronic ID | M7 | Access control techniques and designs shall be applied to protect system data/code. Example Security Controls can be found in OWASP. |
| 20.2 | Identity fraud. For example if a user wants to display another identity when communicating with toll systems, manufacturer backend |
| 20.3 | Action to circumvent monitoring systems (e.g. hacking/ tampering/ blocking of messages such as ODR Tracker data, or number of runs) | M7 | Suggested amendment (EC)Access control techniques and designs shall be applied to protect system data/code. Example Security Controls can be found in OWASP.**Data manipulation attacks on sensors or transmitted data could be mitigated by correlating the data from different sources of information (e.g., manipulation of odometer data can be mitigated by comparing it with GNSS data)** |
| 20.4 | Data manipulation to falsify vehicle’s driving data (e.g. mileage, driving speed, driving directions, etc.) |
| 20.5 | Unauthorised changes to system diagnostic data |
| 21.1 | Unauthorized deletion/manipulation of system event logs | M7 | Access control techniques and designs shall be applied to protect system data/code. Example Security Controls can be found in OWASP. |
| 22.2 | Introduce malicious software or malicious software activity | M7 | Access control techniques and designs shall be applied to protect system data/code. Example Security Controls can be found in OWASP. |
| 23.1 | Fabrication of software of the vehicle control system or information system |
| 24.1 | Denial of service, for example this may be triggered on the internal network by flooding a CAN bus, or by provoking faults on an ECU via a high rate of messaging | M13 | Measures to detect and recover from a denial of service attack shall be employed |
| 25.1 | Unauthorized access to falsify configuration parameters of vehicle’s key functions, such as brake data, airbag deployed threshold, etc. | M7 | Access control techniques and designs shall be applied to protect system data/code. Example Security Controls can be found in OWASP. |
| 25.2 | Unauthorized access to falsify charging parameters, such as charging voltage, charging power, battery temperature, etc. |

6. Examples of mitigation for "Potential vulnerabilities that could be exploited if not sufficiently protected or hardened"

 Examples of mitigation to the threats which are related to "Potential vulnerabilities that could be exploited if not sufficiently protected or hardened" are listed in Table B7.

Table B7
**Examples of mitigation to the threats which are related to "Potential vulnerabilities that could be exploited if not sufficiently protected or hardened"**

| *Table 1 reference* | *Threats to "Potential vulnerabilities that could be exploited if not sufficiently protected or hardened"* | *Ref* | *Mitigation* |
| --- | --- | --- | --- |
| 26.1 | Combination of short encryption keys and long period of validity enables attacker to break encryption | M23 | Cybersecurity best practices for software and hardware development shall be followed. Example Security Controls can be found in SAE J3061 |
| 26.2 | Insufficient use of cryptographic algorithms to protect sensitive systems  |
| 26.3 | Using deprecated cryptographic algorithms  |
| 27.1 | Hardware or software, engineered to enable an attack or fail to meet design criteria to stop an attack | M23 | Cybersecurity best practices for software and hardware development shall be followed.  |
| 28.1 | The presence of software bugs can be a basis for potential exploitable vulnerabilities. This is particularly true if software has not been tested to verify that known bad code/bugs is not present and reduce the risk of unknown bad code/bugs being present. | M23 | Suggested amendment (EC)Cybersecurity best practices for software and hardware development shall be followed. **Cybersecurity certification with testing with adequate coverage.** |
| 28.2 | Using remainders from development (e.g. debug ports, JTAG ports, microprocessors, development certificates, developer passwords, …) can permit an attacker to access ECUs or gain higher privileges |
| 29.1 | Superfluous internet ports left open, providing access to network systems |
| 29.2 | Circumvent network separation to gain control. Specific example is the use of unprotected gateways, or access points (such as truck-trailer gateways), to circumvent protections and gain access to other network segments to perform malicious acts, such as sending arbitrary CAN bus messages | M23 | Suggested amendment (EC)Cybersecurity best practices for software and hardware development shall be followed. **Cybersecurity best practices for system design and system integration shall be followed.**  |

7. Examples of mitigation for "Data loss / data breach from vehicle"

 Examples of mitigation to the threats which are related to "Data loss / data breach from vehicle" are listed in Table B8.

Table B8
**Examples of mitigation to the threats which are related to "Data loss / data breach from vehicle"**

|  |  |  |  |
| --- | --- | --- | --- |
| *Table 1 reference* | *Threats of "Data loss / data breach from vehicle"* | *Ref* | *Mitigation* |
| 30.1 | Damage caused by a third party. Sensitive data may be lost or compromised due to physical damages in cases of traffic accident or theft | M24 | Updated suggested amendment (EC)Data **integrity and confidentiality** ~~protection~~ best practices shall be followed for storing ~~private~~ **personal** and sensitive data. Example Security Controls can be found in ISO/SC27/WG5.  |
| 30.2 | Loss from DRM (digital right management) conflicts. User data may be deleted due to DRM issues |
| 30.3 | The (integrity of) sensitive data may be lost due to IT components wear and tear, causing potential cascading issues (in case of key alteration, for example) |
| 31.1 | Suggested amendment (EC)Information breach. ~~Private~~ **Personal** or sensitive data may be breached when the car changes user (e.g. is sold or is used as hire vehicle with new hirers) |

8. Examples of mitigation for "Physical manipulation of systems to enable an attack"

Examples of mitigation to the threats which are related to "Physical manipulation of systems to enable an attack" are listed in Table B9.

Table B9
**Examples of mitigation to the threats which are related to "Physical manipulation of systems to enable an attack"**

|  |  |  |  |
| --- | --- | --- | --- |
| *Table 1 reference* | *Threats to "Physical manipulation of systems to enable an attack"* | *Ref* | *Mitigation* |
| 32.1 | Manipulation of OEM hardware, e.g. unauthorised hardware added to a vehicle to enable "man-in-the-middle" attack | M9 | Measures to prevent and detect unauthorized access shall be employed |

1. Distinguishing number of the country which has granted/extended/refused/withdrawn approval (see approval provisions in the Regulation). [↑](#footnote-ref-2)
2. Strike out what does not apply. [↑](#footnote-ref-3)