driver+

Driving Innovation in Crisis Management for European Resilience

D942.23 – REPORT ON THE APPLICATION OF THE SOLUTIONS IN TRIAL 4

SP94 - TRIALS

JUNE 2019 (M62)

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The DRIVER+ project

Current and future challenges, due to increasingly severe consequences of natural disasters and terrorist threats, require the development and uptake of innovative solutions that are addressing the operational needs of practitioners dealing with Crisis Management. DRIVER+ (Driving Innovation in Crisis Management for European Resilience) is a FP7 Crisis Management demonstration project aiming at improving the way capability development and innovation management is tackled. DRIVER+ has three main objectives:

1. Develop a pan-European Test-bed for Crisis Management capability development:
   a. Develop a common guidance methodology and tool, supporting Trials and the gathering of lessons learnt.
   b. Develop an infrastructure to create relevant environments, for enabling the trialling of new solutions and to explore and share Crisis Management capabilities.
   c. Run Trials in order to assess the value of solutions addressing specific needs using guidance and infrastructure.
   d. Ensure the sustainability of the pan-European Test-bed.
2. Develop a well-balanced comprehensive Portfolio of Crisis Management Solutions:
   a. Facilitate the usage of the Portfolio of Solutions.
   b. Ensure the sustainability of the Portfolio of Solutions.
3. Facilitate a shared understanding of Crisis Management across Europe:
   a. Establish a common background.
   b. Cooperate with external partners in joint Trials.
   c. Disseminate project results.

In order to achieve these objectives, five Subprojects (SPs) have been established. **SP91** ***Project Management*** is devoted to consortium level project management, and it is also in charge of the alignment of DRIVER+ with external initiatives on Crisis Management for the benefit of DRIVER+ and its stakeholders. In DRIVER+, all activities related to Societal Impact Assessment are part of **SP91** as well. **SP92** ***Test-bed*** will deliver a guidance methodology and guidance tool supporting the design, conduct and analysis of Trials and will develop a reference implementation of the Test-bed. It will also create the scenario simulation capability to support execution of the Trials. **SP93** ***Solutions*** will deliver the Portfolio of Solutions which is a database driven web site that documents all the available DRIVER+ solutions, as well as solutions from external organisations. Adapting solutions to fit the needs addressed in Trials will be done in **SP93**. **SP94** ***Trials*** will organize four series of Trials as well as the Final Demo (FD). **SP95** ***Impact, Engagement and Sustainability***, is in charge of communication and dissemination, and also addresses issues related to improving sustainability, market aspects of solutions, and standardisation.

The DRIVER+ Trials and the Final Demonstration will benefit from the DRIVER+ Test-bed, providing the technological infrastructure, the necessary supporting methodology and adequate support tools to prepare, conduct and evaluate the Trials. All results from the Trials will be stored and made available in the Portfolio of Solutions, being a central platform to present innovative solutions from consortium partners and third parties, and to share experiences and best practices with respect to their application. In order to enhance the current European cooperation framework within the Crisis Management domain and to facilitate a shared understanding of Crisis Management across Europe, DRIVER+ will carry out a wide range of activities. Most important will be to build and structure a dedicated Community of Practice in Crisis Management, thereby connecting and fostering the exchange of lessons learnt and best practices between Crisis Management practitioners as well as technological solution providers.

Executive summary

This document reports on the application of solutions in Trial – The Netherlands (project internally also named Trial 4), the main functions of the solutions which were applied, the preparation activities for the Trial and the way they were finally integrated into the crisis management (CM) procedures of the participating practitioners during the Trial itself. Its intended audience is non-technical readers interested in Trial - The Netherlands and Trials in general. It is focused on the application of solutions and closely connected to the DRIVER+ deliverables **D946.11** ***Report on Trial Action Plan – Trial -4*** (1), **D942.12** ***Report on review and selection process (Trial 3-4-demo)*** (2) and the upcoming **D946.12** ***Report on Trial evaluation – Trial 4*** (3).

The general purpose of the Trial -The Netherlands was to improve current crisis management capabilities by identifying solutions for shortcomings, particularly in the planning of resources (qualified personnel and equipment) for response during large scale and long-term crises, the ability to exchange crisis-related information among agencies and organizations (also related to interoperability) as well as limitations in planning and managing large scale evacuations of population in urban areas, including the management of side effects of such evacuations.

The Trial was organized by DLR and Safety Region Haaglanden (SRH) and was conducted as a table-top Trial at the premises of SRH in The Hague. The scenario covered a storm and technical failure of one of the locks protecting the city of The Hague, causing a flood as well as several cascading effects. CM practitioners of several different disciplines (fire service, police, health service, military defence, waterboard, and municipality) were involved to work with and evaluate the solutions.

The following solutions were applied during Trial -The Netherlands:

- LCMS (legacy tool by IFV) for a common operational picture and information exchange between connected parties.
- 3Di-DEM edit by Nelen & Schuurmans for flood modelling and simulation.
- SIM-CI by SIM-CI Holding B.V. for visualizing flood data and analysing cascading effects.
- CrisisSuite by Merlin Software B.V. for information exchange.
- Airborne and Terrestrial Situational Awareness (Keep Operational & ZKI) by DLR for crisis mapping using remote sensing data and routing support.
- HumLogSim by WWU for logistical support.

Further details can be accessed via the DRIVER+ Portfolio of Solutions website (https://pos.driver-project.eu/en/PoS/solutions).

The main objectives of this document are to describe the solutions used during Trial – The Netherlands, explain the preparation work and discuss how the prepared solutions were applied during the Trial. It also aims at drawing lessons learnt from the experience of Trial -The Netherlands for the benefits of future DRIVER+ and other Trials.

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List of Acronyms

Acronym	Definition
AC	Action Centre
AOI	Area of Interest
C/DM	Crisis / Disaster Management
CfA	Call for Application
CM	Crisis Management
CMINE	Crisis Management Innovation Network Europe
COP	Common Operational Picture
CoW	DRIVER+ online Collaborated Workspace
CT	Crisis Team
DEM	Digital Elevation Model
DR	Dry Run
DR1 / DR2	Dry Run 1 / Dry Run 2
D&C	Dissemination and Communication
ECM	External Cooperation Manager
ERCC	European Response Coordination Centre
EU	European Union
GIS	Geographical Information System
GT	Guidance Tool, a part of TGM
KPI	Key Performance Indicator
OST	Observer Support Tool
PoS	Portfolio of Solutions
PR	Public Relations
ROT	Regional Operational Team
RQ	Research Question (TGM)
T1, T2, T3, T4	Trial 1, Trial 2, Trial 3, Trial 4
TAP	Trial Action Plan
TIM	Trial Integration Meeting
TGM	Trial Guidance Methodology
TGT	Trial Guidance Tool
TRL	Technology Readiness Level
UN	United Nations

1. Introduction

This document deals with the application of solutions in Trial – The Netherlands (project internally also referred to as Trial 4), since the implementation and evaluation of solutions is a central part of a Trial. To develop, prepare and execute a Trial, the Trial Guidance Methodology (TGM) (4) was developed as part of the DRIVER+ project. According to this methodology, gaps in crisis management (CM) were identified together with CM practitioners for Trial – The Netherlands. Subsequently, a first draft of a realistic scenario was developed to serve as a test case for the solutions that could fill these identified gaps and improve practitioners' work. Finally, DRIVER+ internal as well as external solutions could apply for participating in Trial – The Netherlands (2) and the following six solutions were initially selected:

- 3Di-DEM edit by Nelen & Schuurmans.
- SIM-CI by SIM-CI Holding B.V.
- GINA by GINA Software s.r.o. (later replaced by Crisis Suite).
- CrisisSuite by Merlin Software B.V. (initially selected as backup solution).
- Airborne and Terrestrial Situational Awareness (Keep Operational & ZKI) by DLR.
- HumLogSim by WWU.

The complete set of used applications in the Trial was more exhaustive, including communication applications (XVR Crisis Media by XVR) and legacy systems (LCMS by IFV, modified by TNO). These applications were also partly trained but are not included in the evaluation phase.

The next step in the preparation phase of the Trial was the Trial Integration Meeting (TIM) in The Hague for further introduction of the solutions and discussions about the upcoming work on the connection to the DRIVER+ Test-bed infrastructure. In addition, the original scenario design could now be adapted to the selected solutions in order to optimize their contribution possibilities. The solution GINA decided to leave Trial – The Netherlands after this meeting. The decision to leave cleared the way for the participation of the solution CrisisSuite. Preparations and execution of Dry-Run 1, Dry-Run 2, and the Trial followed, which are described below with regard to implementation and use of the solutions.

The document is structured as follows:

- This introduction discusses the **purpose, scope and structure** of this document.
- Section 2 presents an **overview of the defined gaps** as a decisive factor for the development of Trial – The Netherlands, **the scenario as well as the participating solutions.**
- Section 3 serves as main section of this document. It provides a **description of the solutions, their role during the preparation phase, their technical deployment and their application** during the Trial.
- Section 4 discusses the **achievements and lessons learnt** regarding the application of the selected solutions during the preparation and execution of Trial – The Netherlands.

2. Scenario overview and selected solutions

According to the DRIVER+ deliverable **D922.11 *List of CM gaps*** (5) three gaps were defined and served as a basis for the definition of the scenario and the selection of solutions:

- Gap 4.1 *Planning of resources*: Limitations in the planning of personnel and equipment for response during large scale and long-term crisis.
- Gap 4.2 *Exchange of crisis information*: Shortcomings in the ability to exchange crisis related information among agencies and organizations.
- Gap 4.3 *Evacuation planning & management*: Shortcomings in planning and managing large scale evacuation of population in urban areas.

Table 2.1 displays the selected solutions and the gaps they address.

Table 2.1: Selected solutions and relevant gaps

Solution name	Solution provider	Relevant gap (s)
3Di-DEM edit	Nelen & Schuurmans	4.1, 4.2, 4.3
Airborne and Terrestrial Situational Awareness	DLR	4.2, 4.3
GINA (participation withdrawn on 19/11/2018, replaced by Crisis Suite)	GINA Software s.r.o.	4.1, 4.2, 4.3
Crisis Suite (replacement for GINA since 6/12/2018)	Merlin Software B.V.	4.2
HumLogSim	WWU	4.1, 4.3
SIM-CI	SIM-CI Holding B.V.	4.1, 4.2, 4.3

Together with practitioners of different disciplines a flood scenario was developed to address these gaps in the most realistic way. The scenario dealt with the flooding of The Hague and cascading effects such as (partial) power outage, (tele-) communications failure, flooded roads and railways, shortcomings in supply of fresh drinking water and food for the population outside and inside the affected area. The (predicted) flood required decisions on evacuation needs for inhabitants of the threatened area. The scale of crises required deployment of evacuation forces and volunteers to deal with the increasing number of exposed people and to manage all cascading effects. The scenario required a commitment of stakeholders (end-users and decision makers) from every crisis management level (local, regional, national and international level) such as representatives of the ministry of infrastructure and water, national police, regional fire and medical services, crisis management experts, representatives of water sectors, and representatives of non-governmental and international organizations. Actions were taken by these stakeholders in a realistic information environment, based on currently available means, crisis management plans, rescue procedures and good practices of participants.

The scenario covered the threat phase before the flooding as well as the impact phase after the flooding and was split in four different blocks described in, with 0h simulation time marking the moment of dyke breach and thus the beginning of the flooding.

Table 2.2: Defined blocks and their objectives

Trial Day	Phase	Simulation Time	Block	Objective
1	Threat	-48h to -24h	**1** Cascading effects	Assessment of 3 areas (The Hague city centre, Wateringseveld & Leidschenveen) and cascading effects
1	Threat	-24h to 0h	**2** Evacuation	Assessment of evacuation strategy, actions/measures for one area expected to be flooded (The Hague city centre)
2	Impact	12h to 24h	**3** Damage assessment	Assessment of damage in the flooded area (The Hague city centre) and mitigation measures
2	Impact	24h to 48h	**4** Damage control	Answering questions of International Organizations, planning police personnel, mitigating measures

3. Application of the solutions

This section describes the use of the solutions during the preparation phase and during the Trial. It includes the technical setup and the technical integration into the Test-bed infrastructure, the integration into the scenario, and the actual use of the solutions by the users in the action centres (ACs) and crisis teams (CTs). Some of this information has already been included in the DRIVER+ deliverable **D946.11 *Report on Trial Action Plan – Trial 4*** (1), but as that report represents preliminary results only, the following information, tables and figures must be considered for final information.

3.1 Solutions overview

3.1.1 LCMS

LCMS is a nation-wide crisis management system used in The Netherlands to maintain and share a common operational picture supporting large-scale crisis management collaboration. LCMS is used by all 25 safety regions, the majority of the waterboards, Rijkswaterstaat, an increasing number of emergency health care organizations, the Royal Military Police organization and some drinking water providers. LCMS supports net centric collaboration, which is a way of working in which clear agreements are made about sharing information so that decision-making under (crisis) circumstances is always based on an up-to-date, consistent and common operational picture. LCMS is a web-based collaboration environment with a very high level of availability. The environment can be used to share information within an organisation as well as between organizations. It supports maintaining and sharing geographical as well as textual pictures.

As a legacy system, this solution is not included in the DRIVER+ Portfolio of Solutions website. More information can be accessed via https://www.lcms.nl/about-lcms.

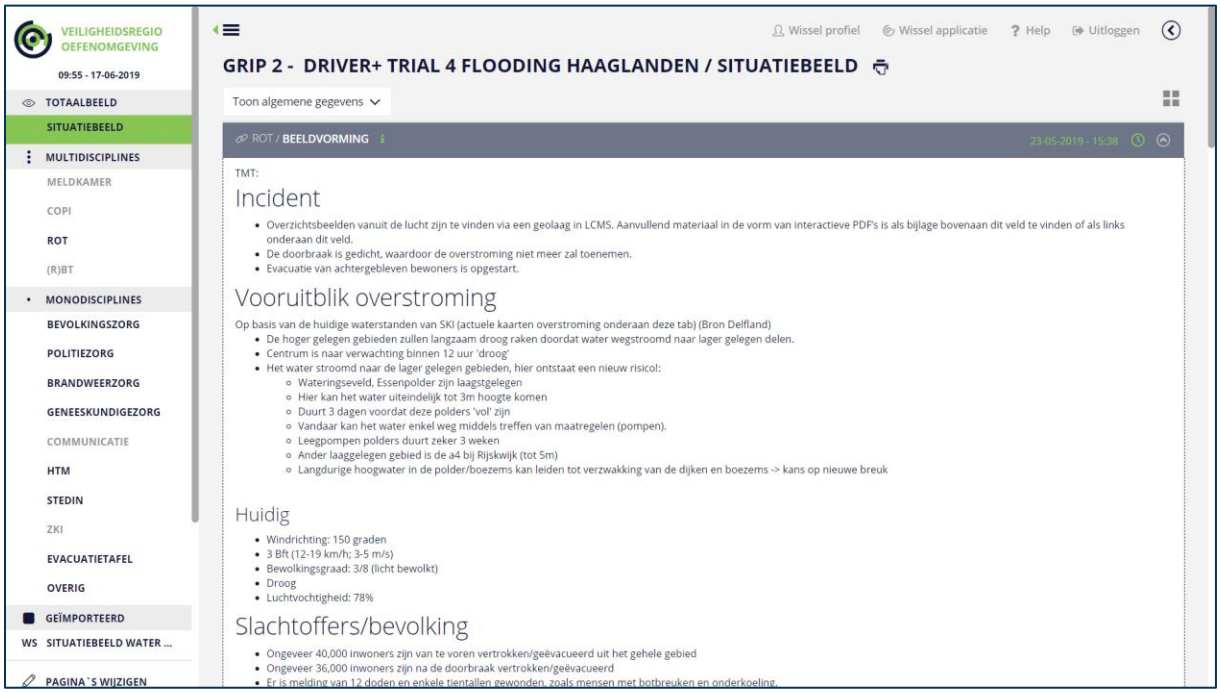

Figure 3.1: Screenshot of LCMS

3.1.2 3Di – DEM edit

3Di is an interactive water simulation model that enables crisis managers to construct a common operational picture of the dynamics of floods and allows a quick calculation of the effects of mitigation measures.

Within 3Di, a tool gives users the possibility to edit the Digital Elevation Model (DEM-edit function) during a simulation. Using this tool, it is very easy to calculate the effects of adding a mobile flood wall or breaching a levee in any chosen location to prevent floods in another location. Combined with the already present option to add positive and negative discharge points to the simulation, which can simulate pumps, this gives crisis managers the possibility to calculate the effects of several mitigation measures in a very short time horizon (minutes) and use those to support them in the decision-making process. Since crisis managers only have limited resources available, knowing the consequences of different choices can be very helpful for them in the hectic process of crisis management.

3Di has short computation times with a high spatial resolution, an accurate prediction of floods and a realistic visualization of model outputs. Furthermore, it has a very easy user interface, comparable with Google Maps, and can be operated via touch. This user interface is tested with people that had no model experience, supervised by experts, and has proven to be usable for this user group. 3Di was successfully tested in various disaster exercises in the Netherlands. Outputs from the model (predicted flood waves and river flow) can be exported to other systems. All the input and output data are in common (GIS) formats.

The solution 3Di is mature (Technology Readiness Level (TRL) 9 – operational use). It is in use since 2014 and has been applied in numerous flood analysis and calamity exercises in The Netherlands, UK, Taiwan, Vietnam, Australia, South Africa, Kenya, Grenada and Saint Lucia. The DEM-edit function is currently being developed and tested (TRL6 – technology demonstration). The feature has been applied by hand but has not been used in an operational setting yet.

More information can be accessed via the DRIVER+ Portfolio of Solutions website: https://pos.driver-project.eu/en/PoS/solution/14.

The main tasks for Trial -The Netherlands were the calculation of flood scenarios (forecast) and the calculation of the effects of proposed measures including the use of the DEM-edit function.

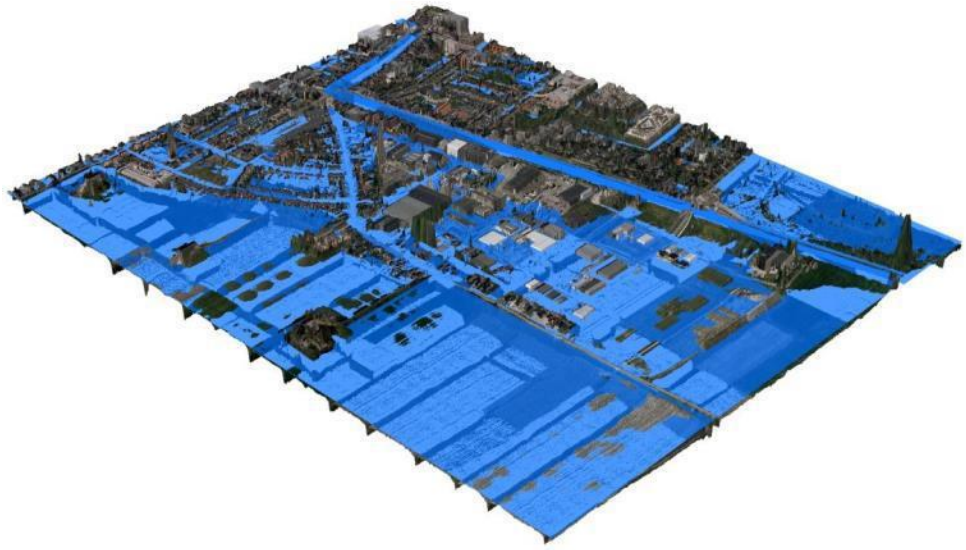

Figure 3.2: 3Di flood mask example

3.1.3 SIM-CI

SIM-CI visualizes the flooding event and its cascading effects on critical infrastructures in The Hague by means of a Digital Twin City. With its simulation, crisis managers can see how water spreads through the area. They will see the Digital Twin City of The Hague including buildings and critical infrastructures such as roads and the electricity and telecoms networks. Some of the cascading effects calculated and visualized by the tool are electricity failure due to flooding and the subsequent loss of mobile reception. In addition, impact on society is calculated as well. Crisis managers will experience the direct and indirect effects of flooding on the critical infrastructures and eventually on people, residents and businesses in the area.

Based on this simulation the crisis management team can align, prioritize and communicate their crisis response plan. This crisis response plan will be based on supplied predictions of floods and on the effects calculated and visualized, such as the availability of roads (important for evacuation routes), mobile reception and electricity in each area in the city.

To sum up, SIM-CI enables integration of different types of information and can help answering questions like, when does the water reach certain areas, how much time is available until the first power failure, until what time can we communicate with residents in certain areas, and are roads still available. This provides operational crisis managers and decision makers insights into the integral character of a flooding, or disruption in general.

The SIM-CI model is mature (TRL9). The Simulation Engine integrates the SIM-CI model with different network models into a spatial environment and visualizes this into a 3D simulation. The combination of technologies is used in several projects in The Netherlands. The combination has not been used externally in an operational manner, giving the combined system TRL 6.

More information can be accessed via the DRIVER+ Portfolio of Solutions website: https://pos.driver-project.eu/en/PoS/solution/76.

The main task for Trial – The Netherlands was the calculation of cascading effects based on the selected forecast scenarios.

Figure 3.3: SIM-CI example

3.1.4 CrisisSuite

CrisisSuite is an online crisis management software application that enables organisations to successfully manage information during a crisis. CrisisSuite supports the net-centric working methods of crisis teams by creating a universal picture of the crisis and share it horizontally and vertically with the other teams in the crisis organisation. It also assists in maintaining an effective crisis meeting structure and it decreases the administrative workload for the people managing the crisis.

CrisisSuite is a solution that different organisations can use to manage their information on operational, tactical and a strategic level during a crisis. The solution is made up of the following components:

1. Organization – Define people with their contact details in different groups (roles, teams).
2. Plans – Store existing crisis management plans, and link them to the relevant people, roles or teams.
3. Alarming – Alarm people about a crisis and request a response.
4. Maps – Draw a geographical overview of the impacted area.
5. Log tool – Create a logbook of all the processed crisis information, decisions and actions.
6. Action – Keep an overview of all actions and their status.
7. Attachments – Store any documents (e.g. pictures) that are relevant to the crisis.
8. Sitreps – Create situation reports (sitreps) regarding certain topics in the crisis.
9. CrisisSuiteApp – The app for mobile devices enables the user to receive notifications and view information on the go.

The Technology Readiness Level of CrisisSuite is TRL 9. The system is currently in use by organisations in different sectors, e.g. the energy sector, healthcare sector and government sector.

More information can be accessed via the DRIVER+ Portfolio of Solutions website: https://pos.driver-project.eu/en/PoS/solution/22.

The main task for Trial – The Netherlands was bi-directional information sharing with LCMS in order to connect also stakeholders from other organisations.

3.1.5 Airborne and Terrestrial Situational Awareness (KeepOperational)

The solution deals with the influence of an affected transportation system on professional responders during crisis management and contributes to overall situational awareness.

To ensure efficient planning and managing of large-scale supply of the population or evacuations, this module provides reliable transport and traffic information, for instance: Web-based visualisation of current traffic situation based on various traffic data sources, routing advice and visualisation of the timely reach-ability in dependency of the current traffic situation, and traffic prediction. A special feature of this module is its capability to optimise the routing and to provide routing options depending on the actual availability of the traffic infrastructures in the affected area. For this purpose, the routable network can be adapted by considering either automatically generated vector-based input datasets or manually created network adaptations (i.e. the solution provides an interactive functionality that allows the user to manually adapt single edges or wider areas of the network).

More information can be accessed via the DRIVER+ Portfolio of Solutions website: https://pos.driver-project.eu/en/PoS/solution/24.

The main task for Trial – The Netherlands was the calculation of traffic routes considering flood maps and road blockages.

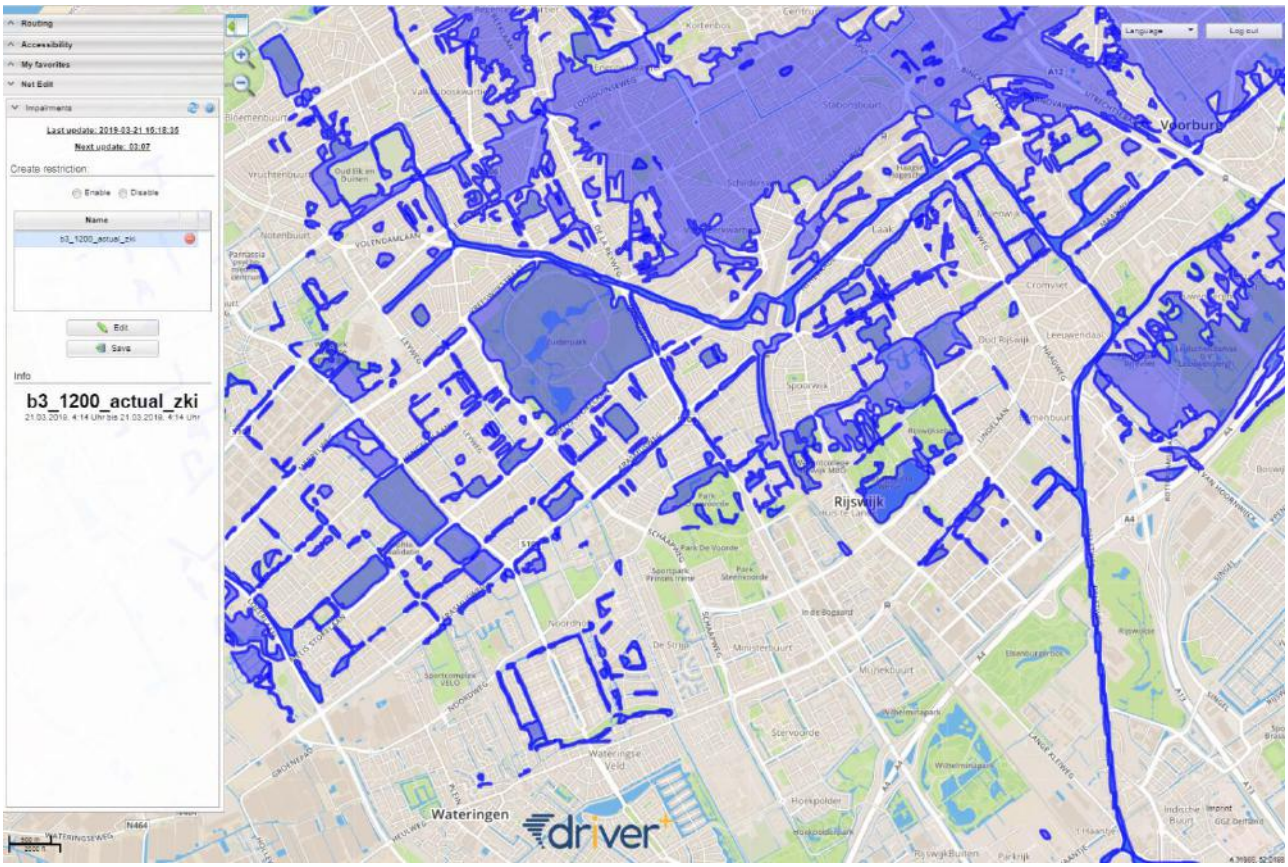

Figure 3.4: KeepOperational example

3.1.6 Airborne and Terrestrial Situational Awareness (ZKI)

Regarding the scenario of flooding in The Hague, this module derives crisis-related impact information such as surface water extent or affected infrastructures and buildings at different time steps from aerial and satellite imagery. On the one hand, the flood extent information can be one of the input datasets for the above-mentioned transport and traffic management related support to update the routable traffic network to optimise the existing routing functionalities in the hazard area. On the other hand, 2D maps and interactive 3D visualisations are provided for professional responders to improve situational awareness, to support damage and needs assessment and to facilitate decision making processes.

From a maturity point of view, the solution relates to stage 2 (“Research and Development”) of the stages of innovation. However, the solution has an overall technology readiness level of TRL 6, which means it has already been demonstrated and tested in a relevant environment.

More information can be accessed via the DRIVER+ Portfolio of Solutions website: https://pos.driver-project.eu/en/PoS/solution/24.

The main task for Trial – The Netherlands was the provision of flood masks and flood maps using satellite imagery of the flooded area (i.e. after the dyke breach).

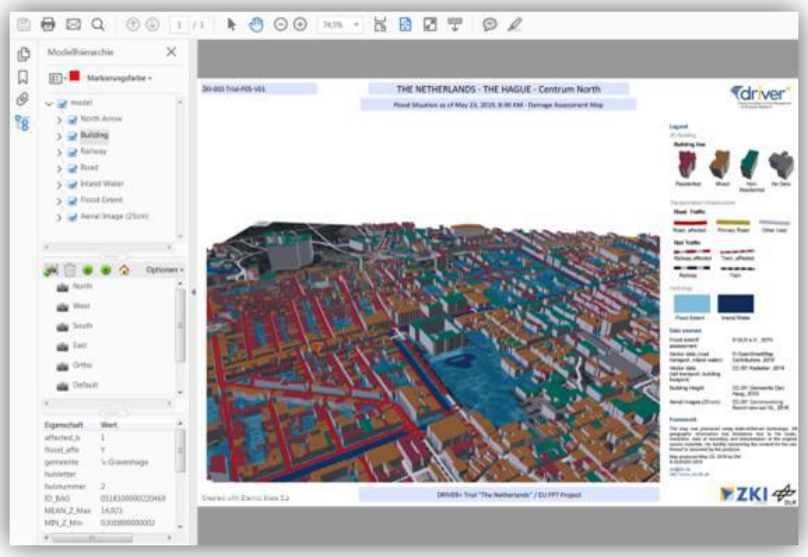

Figure 3.5: ZKI example of a 3D map product

3.1.7 HumLogSim

HumLogSim is a performance assessment platform that serves logistic processes in crisis management. It can operate on both current operational logistics network and fictional (planned) network configurations. The functionality comprises strategic planning support as well as tactical and operational decision support by assessing and comparing the network performance under given situations and realistic crisis management actions. The main target groups are higher-level crisis managers, coordinating field operations, and responder networks in their strategic network design and configuration. The name “HumLog” refers to the humanitarian logistics context, thereby representing planning, implementation and controlling of efficient, cost-effective flow and storage of goods, materials and equipment as well as related information, from point of origin to point of consumption aiming to meet the beneficiaries’ requirements under given resource capacities. HumLogSim is an adaptable simulation environment for discrete event-based and agent-based simulations. It represents crisis management activities within and between humanitarian organizations on the way to a defined objective, whilst assessing the overall performance.

HumLogSim is applicable to different settings and operation levels of crisis management. On a strategic level, it supports creating or updating a relief network of one or multiple responder organizations. The simulation environment can analyse different possible network configurations in terms of facility locations, relief goods stock values, warehouse capacities, human resources and others. By executing so-called “what-if” scenarios, the performance of a planned network can be simulated under a fictive crisis event, which can make use of historical crisis event data to represent a realistic scenario.

On a tactical level, these capabilities can also be utilized to compare possible execution plans and to estimate their expected outcomes. Given a relief network of one or multiple responder organizations in an actual crisis event, crisis management commanders can test different strategies in addressing the crisis without any influence on the real-world resources. The simulation capabilities can thereby be freely adapted to the needs of an individual organization, like the construction of sandbag barriers, evacuation of the population or allocation and transportation of human resources. The simulation will take all available resources and capacity restrictions into account to provide a complete and sophisticated execution protocol, which can then be used by command staff to compare execution strategies.

More information can be accessed via the DRIVER+ Portfolio of Solutions website: https://pos.driver-project.eu/en/PoS/solution/25.

The main task for Trial – The Netherlands was the calculation of evacuation strategies and the calculation of personnel and logistics.

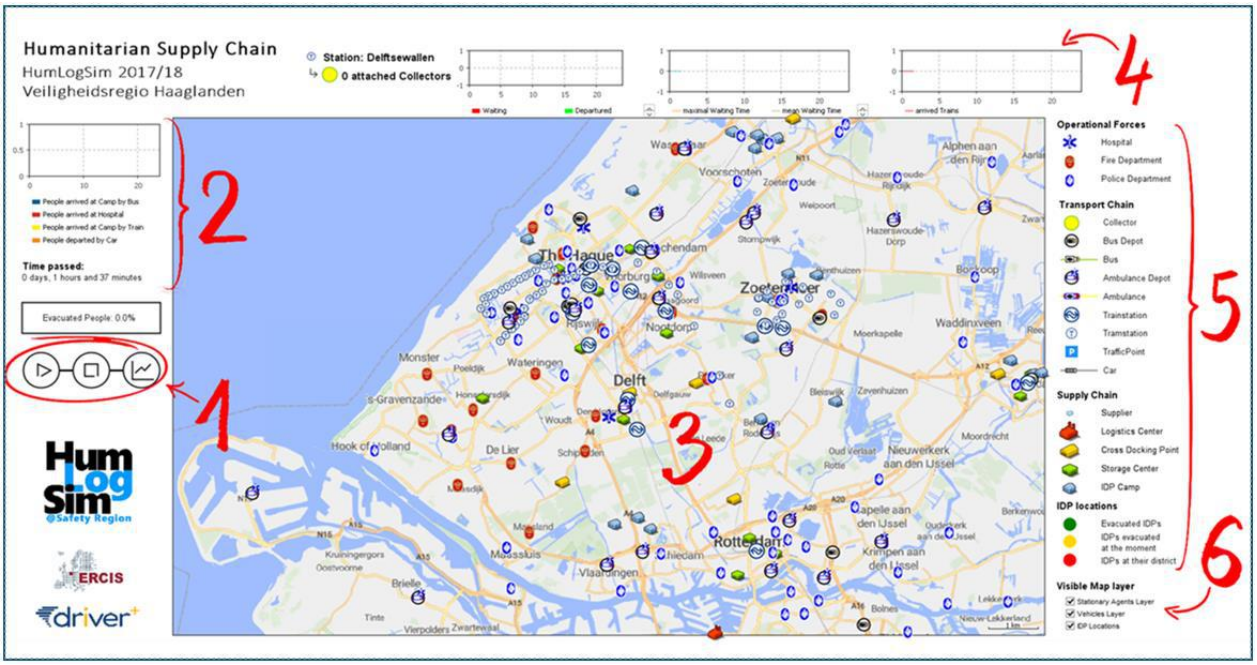

Figure 3.6: HumLogSim example (1: control buttons; 2: general overview; 3: map; 4: key values of an agent; 5: legend; 6: map options)

3.2 Preparation phase

To coordinate the preparations for the Trial, a total of twelve weekly telephone conferences were held and coordinated by the Solution Coordinator of Trial – The Netherlands, starting from 15th January 2019. These telephone conferences were attended by the solution providers as well as the technically responsible persons, and sometimes even practitioners in order to exchange information and to clarify technical as well as content-related questions. Adapters required for the connection to the Test-bed were discussed and the integration status was tracked. Communication details between several solutions (e.g. Keep Operational and HumLogSim) were clarified. Minutes of the meetings were prepared, circulated, and stored on a website for everyone to read, correct and comment. Action items were defined and tracked at the beginning of each telephone conference.

In addition to the regular telephone conferences, two online test sessions were organised, bringing together all solution providers for tests before Dry Run 1 and the Trial, respectively. These test sessions made most problems and needs for adaptations visible and served as additional preparation for the face-to-face meetings.

3.2.1 Technical integration

The technical integration and testing of the solutions is described in the DRIVER+ deliverable **D934.24** ***Solution testing procedure*** (6). According to this procedure, the standalone solutions need first to be integrated into the Test-bed reference implementation. This was followed by a Trial-specific integration and testing against Trial-specific requirements. Finally, multiple solutions got tested in the Trial set-up.

Figure 3.7 provides the final data exchange diagram for Trial – The Netherlands. It shows all solutions and the legacy system (LCMS) to be used during the Trial and which output they give to participants and how these participants interact with them. It also provides the data flows of these solutions and legacy system to/from the Test-bed infrastructure, which components of the Test-bed Infrastructure are used, and which

simulators are used to provide input of the simulated flood (threat) to these solutions and to the participants.

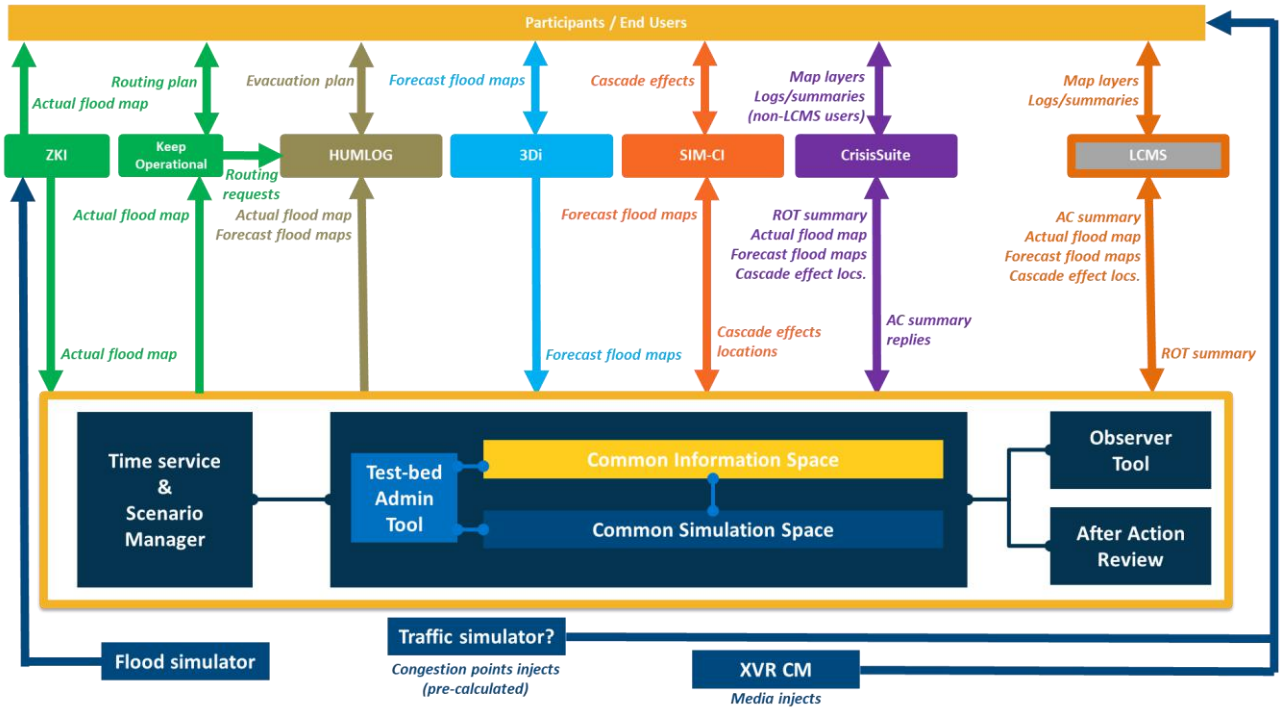

Figure 3.7: Data Exchange Diagram for Trial – The Netherlands (1)

Figure 3.8 is an addition to the data exchange diagram, specifying how the data of the solutions and LCMS flows via the Test-bed infrastructure. It also includes the converters to exchange standardised input and output information between the solutions and LCMS.

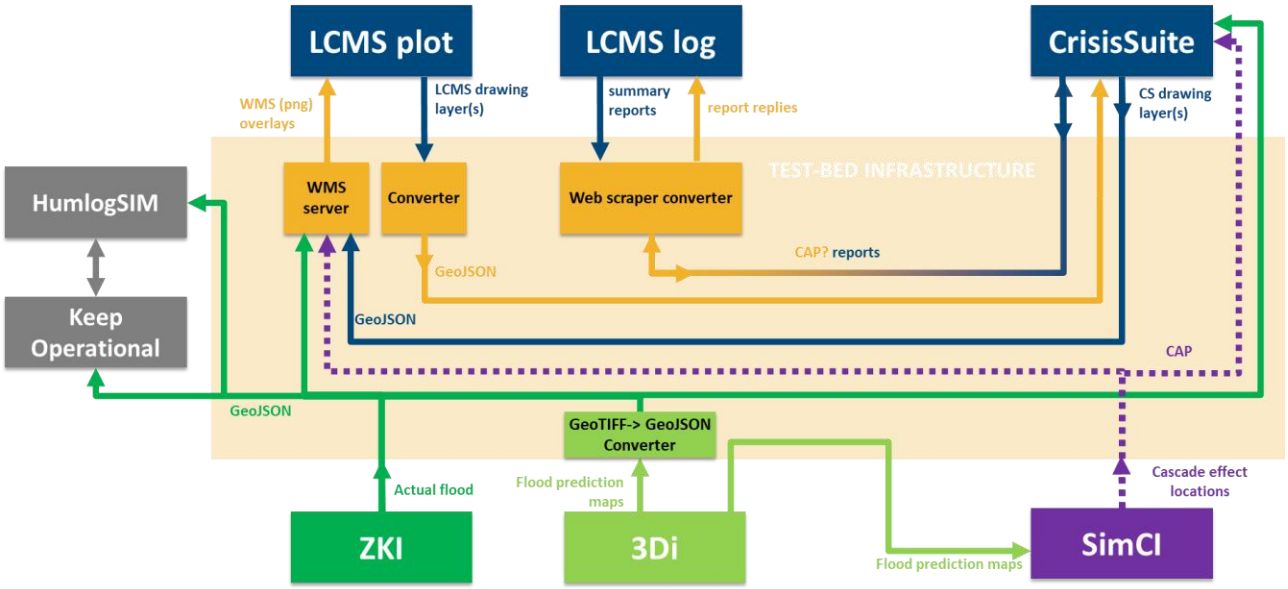

Figure 3.8: Data exchange lines and converters for all solutions in Trial – The Netherlands (1)

3.2.2 Trial Integration Meeting (TIM): 13-16/11/2018, The Hague

Trial – The Netherlands was the first DRIVER+ Trial with a Trial Integration Meeting before the dry runs. The need and necessity for this resulted from the previous Trials and was a result of their lessons learnt. During the TIM technical as well as more detailed scenario aspects were introduced to the solutions. The technical experts of the solutions got introduced to the Ted-bed and performed first installations and connections. Discussions about required adapters were raised and a discussion on other technical constrains and problems were started. In addition, the baseline (4) was introduced to the solutions and first ideas were collected together with practitioners on where to implement the different solutions' features for the innovation line and the development of the scenario.

3.2.3 Dry Run 1: 18-22/02/2019, The Hague

During Dry Run 1 the solutions were set up and functional tests of the solutions as well as of their Test-bed connection and the ability to exchange data were conducted. A technical play-though was performed following pre-defined workflows. Open issues and needs for change were identified during these tests. In addition to technical tests, the planning of solution trainings for practitioners was started.

3.2.4 Dry Run 2: 08-12/04/2019, The Hague

Dry Run 2 was conducted as full Trial without external observers. First, the practitioners were introduced to the solutions during dedicated solution training blocks. These training sessions were prepared as general introduction as well as hands-on trainings. The necessary documentation was provided by each solution provider. The second step was the play-through of the Trial scenario with practitioners.

Table 3.1 lists the action centres (AC) and crisis teams (CT) of practitioners and the solutions they used. Fields in light blue indicate that results of the solutions were used or displayed, while darker blue fields show where practitioners could directly work with the solutions and influence their output.

Table 3.1: Use of solutions during Dry Run 2 and Trial – The Netherlands

Player(s)	LCMS	3Di	SIM-CI	ZKI	Keep Operational	CrisisSuite	HumLog
Operational team							
AC police							
AC fire brigade							
AC GHOR (medical)							
AC municipality							
Evacuation table							
CT HTM (transport)							
CT water board							
CT Stedin (power)							
CT international organisations (EuroPol, EuroJust, UN Peace palace)							

3.3 Application during the Trial

3.3.1 Physical set-up

Trial – The Netherlands was conducted as table-top Trial at the premises of Safety Region Haaglanden (SRH) in The Hague. All Trial participants (DRIVER+ staff, solution technicians and practitioners of regional operation teams (ROT), ACs and CTs) were located on one floor as displayed in the floorplans in Figure 3.9, Figure 3.10, Figure 3.11 and Figure 3.12. The figures show the use/presence of the solutions (blue) and legacy system (orange) at the different locations according to each block of the scenario. While the DRIVER+ components (red) as well as the location of the solution technicians and the ROT remained unchanged during the blocks, the use of the solutions at the ACs and CTs changed as the scenario progressed. Changes are highlighted by red circles around the solutions. For example, at block 2 the solution HumLogSim entered the evacuation table to support logistical planning, during block 3 flood information of ZKI was made available at the ACs and CTs and replaced predictions displayed by SIM-CI, and during block 4 the solutions disappeared from the evacuation table as the evacuation activities were finished.

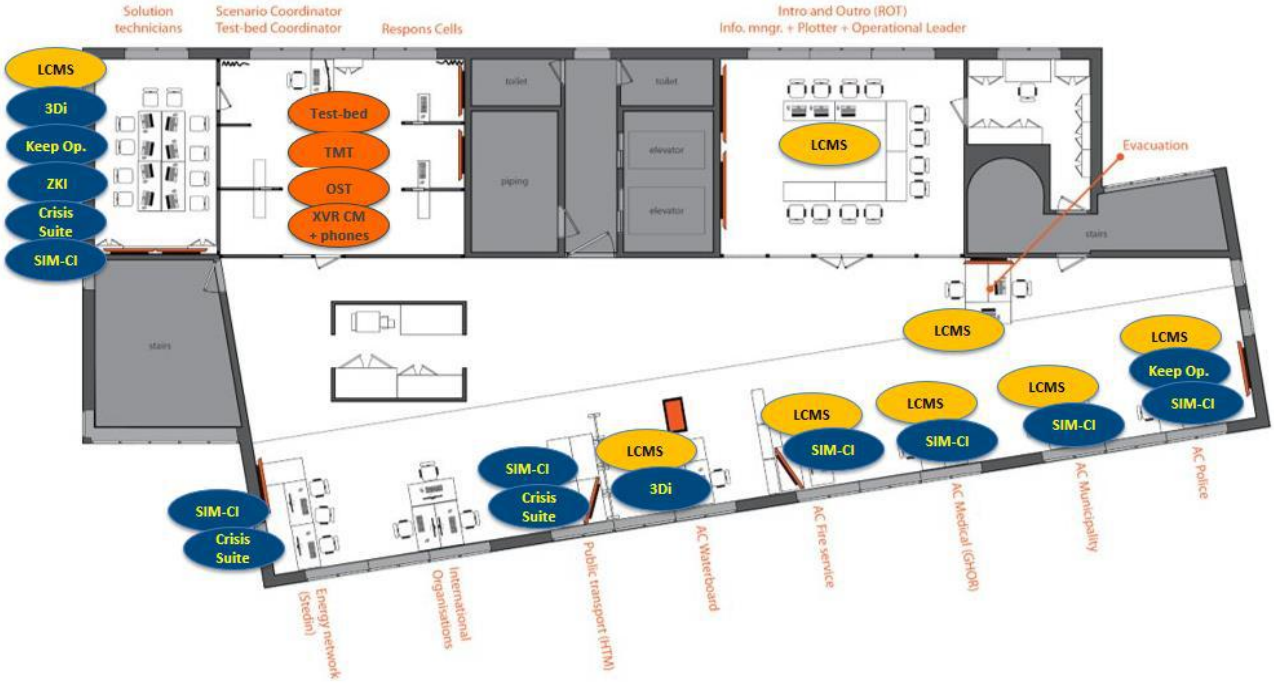

Figure 3.9: Physical layout Trial – The Netherlands – block 1

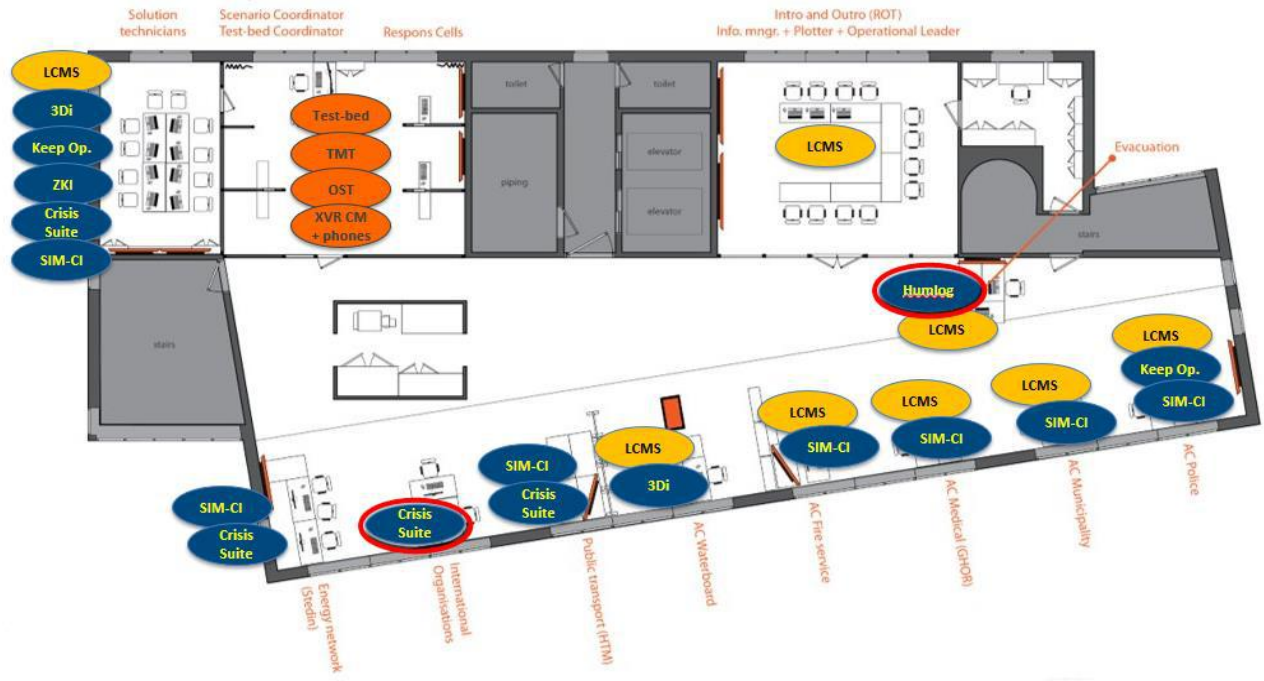

Figure 3.10: Physical layout Trial – The Netherlands – block 2

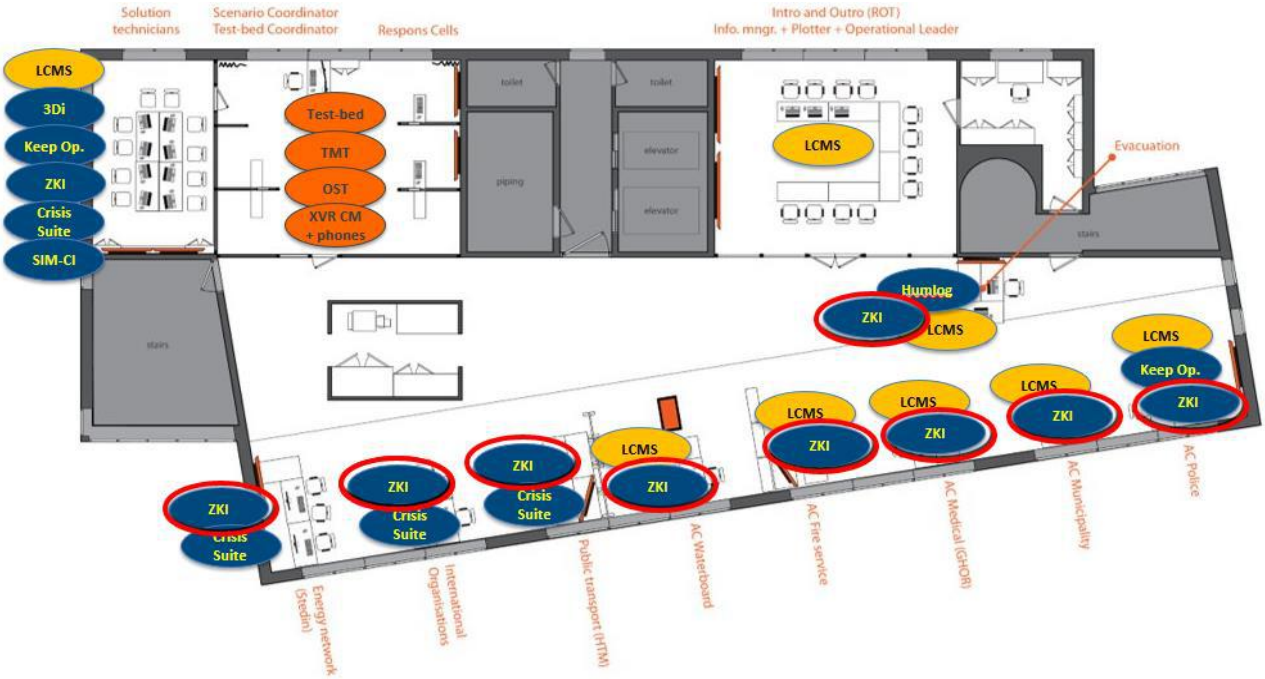

Figure 3.11: Physical layout Trial – The Netherlands – block 3

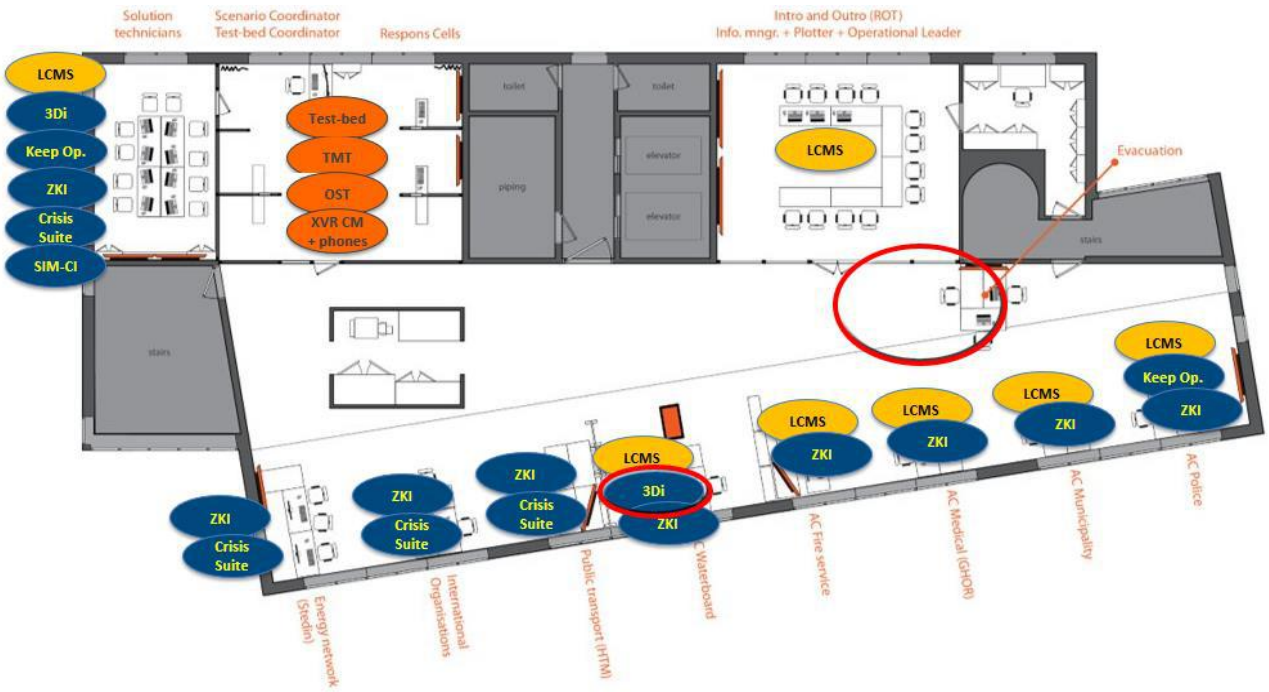

Figure 3.12: Physical layout Trial – The Netherlands – block 4

3.3.2 Solution Training

Day 1 of the Trial served as preparation day for installing the solutions, technical checks and play-through. At the beginning of day 2 of the Trial the solution trainings took place. Each of the six solutions gave an introduction of about ten minutes. The hands-on trainings had to be divided into several sessions for all participants taking about 30 minutes for each solution. Since the same training was conducted already during Dry Run 2 it was decided to shorten the sessions and to train only certain solutions and practitioners according to their needs. An online-survey was filled by all participants after the trainings and served as input for the upcoming deliverable **D942.31** ***Report on trainings for the selected Solutions*** (7).

3.3.3 Information flow and interactions of solutions

Table 3.2, Table 3.3, and Table 3.5 show how the solutions were used by the different actors during the four blocks of the scenario. The pictures of Figure 3.13 give an impression about how the solutions were used by practitioners during the Trial.

Figure 3.13: Usage of solutions during the Trial

The legacy tool used and supported by most of the practitioners is the LCMS (Dutch National Crisis Management System). Working with this tool has been trained and there are years of experience with the integration of this tool into the standard procedures of practitioners. For this reason, it was important to integrate LCMS as a core element into the Trial in order to keep the work of the practitioners as realistic as possible.

Not all parties that would be affected by such a flood in The Hague are connected to LCMS (e.g. transport or electricity companies or international organisations). Therefore, it is necessary to share crisis-related information with them and to collect similar information from them. CrisisSuite covers similar functionalities as LCMS and could be adapted to all needs arising during the preparation phase to act as a stand-in for LCMS. Thus, CrisisSuite was installed at the HTM and Stedin desks and the CT of international organisations to collect and share information from and with them.

The main function of 3Di was to generate flood scenarios and to evaluate possible mitigation measures. This solution was intended to support especially the water board. These flood scenarios results were forwarded to SIM-CI in order to be visualised and analysed with regard to cascading effects. The combination of these solutions was highly interesting for all ACs and CTs during the threat phase of block 1 and block 2. The results of the flood scenarios were also passed on to KeepOperational for calculating travel routes and times through the possibly affected areas used by the police. The evacuation desk used the flood information of 3Di and SIM-CI in combination with HumLogSim for logistical planning of evacuation activities. Once the impact phase started in block 3, the predictions of 3Di and SIM-CI were replaced by the assessments of ZKI. The flood masks and maps were passed on directly to the ACs and CTs, but also used as additional information for KeepOperational applied at the police and HumLogSim applied at the evacuation table.

Table 3.2: Use of solutions and their interactions during block 1

Users (AC / CT)	Solution	Input from	Output to
Information Management (information manager and plotter; part of Regional Operational Team)	LCMS	LCMS info from ACs / CrisisSuite info from CTs	LCMS / CrisisSuite
Water board	3Di / LCMS	None	SIM-CI / KeepOperational / HumLogSim / LCMS / CrisisSuite
Fire department	SIM-CI / LCMS	3Di (flood mask)	LCMS
GHOR (medical)	SIM-CI / LCMS	3Di (flood mask)	LCMS

Users (AC / CT)	Solution	Input from	Output to
Municipality	SIM-CI / LCMS	3Di (flood mask)	LCMS
Police	KeepOperational / SIM-CI / LCMS	3Di (flood mask)	LCMS / HumLogSim (already prepared road blockages)
HTM (public transportation)	SIM-CI / CrisisSuite	3Di (flood mask)	CrisisSuite / LCMS (indirect via CrisisSuite)
Stedin (power)	CrisisSuite / SIM-CI	3Di (flood mask)	CrisisSuite / LCMS (indirect via CrisisSuite)
Evacuation table	LCMS	LCMS	LCMS
ROT	LCMS	CrisisSuite / 3Di (flood mask)	LCMS / CrisisSuite

Table 3.3: Use of solutions and their interactions during block 2

Users (AC / CT)	Solution	Input from	Output to
Information Management (information manager and plotter; part of Regional Operational Team)	LCMS	LCMS info from ACs / CrisisSuite info from CTs	LCMS / CrisisSuite
Water board	3Di / LCMS	-	SIM-CI / KeepOperational HumLogSim / LCMS / CrisisSuite
Fire department	SIM-CI / LCMS	3Di (flood mask)	LCMS / HumLogSim
GHOR (medical)	SIM-CI / LCMS	3Di (flood mask)	LCMS / HumLogSim
Municipality	SIM-CI / LCMS	3Di (flood mask)	LCMS / HumLogSim
Police	KeepOperational / LCMS / SIM-CI	3Di (flood mask)	LCMS / HumLogSim (evacuation strategy)
HTM (public transportation)	SIM-CI / CrisisSuite	3Di (flood mask)	CrisisSuite / LCMS (indirect via CrisisSuite) / HumLogSim
Stedin (power)	SIM-CI / CrisisSuite	3Di (flood mask)	CrisisSuite / LCMS (indirect via CrisisSuite) HumLogSim
International organizations	CrisisSuite	3Di (flood mask)	-
Evacuation table	HumLog / LCMS	LCMS	LCMS
ROT	LCMS	CrisisSuite / 3Di (flood mask)	-

Table 3.4: Use of solutions and their interactions during block 3

Users (AC / CT)	Solution	Input from	Output to
Information Management (information manager and plotter; part of Regional Operational Team)	LCMS	LCMS info from ACs / CrisisSuite info from CTs	LCMS / CrisisSuite
Water board	ZKI (flood mask) / LCMS	3Di, for generating the flood mask of ZKI (as if it were actual mask by ZKI)	KeepOperational / HumLogSim (evacuation strategy) / LCMS
Fire department	ZKI (flood mask) / LCMS	-	
GHOR (medical)	ZKI (flood mask) / LCMS	-	
Municipality	ZKI (flood mask) / LCMS	-	
Police	KeepOperational / ZKI (flood mask) / LCMS	Flood mask ZKI	LCMS / HumLogSim (evacuation strategy)
HTM (public transportation)	CrisisSuite / ZKI (flood mask)	-	CrisisSuite / LCMS (indirect via CrisisSuite)
Stedin (power)	CrisisSuite / ZKI (flood mask) / Output of SIM-CI (actual flood on a map)	-	CrisisSuite / LCMS (indirect via CrisisSuite)
International organizations	CrisisSuite / ZKI (flood mask)	-	-
Evacuation table	HumLog / LCMS	LCMS	LCMS
ROT	LCMS	CrisisSuite / ZKI (flood mask) / 3Di (flood mask)?	LCMS / CrisisSuite

Table 3.5: Use of solutions and their interactions during block 4

Users (AC / CT)	Solution	Input from	Output to
Information Management (information manager and plotter; part of Regional Operational Team)	LCMS	LCMS info from ACs / CrisisSuite info from CTs	LCMS / CrisisSuite
Water board	3Di (flood mask) / ZKI / LCMS	ZKI	LCMS / KeepOperational CrisisSuite
Fire department	ZKI (flood mask + floodmap)	KeepOperational	LCMS (indirect to CrisisSuite)

Users (AC / CT)	Solution	Input from	Output to
GHOR (medical)	ZKI (flood mask + floodmap)	KeepOperational	LCMS
Municipality	ZKI (flood mask + floodmap)	KeepOperational	LCMS
Police	KeepOperational	ZKI (flood mask)	LCMS
HTM (public transportation)	CrisisSuite / ZKI (flood mask and map)	-	CrisisSuite / LCMS (indirect via CrisisSuite)
Stedin (power)	CrisisSuite / Flood mask and map ZKI	-	CrisisSuite / LCMS (indirect via CrisisSuite)
International organizations	CrisisSuite / ZKI (flood mask and map)	-	-
Evacuation table (evacuation already ongoing)			
ROT	LCMS	CrisisSuite / ZKI (flood mask) / 3Di (flood mask)?	LCMS / CrisisSuite

4. Achievements and lessons learnt

During Dry Run 2 and the Trial dedicated debriefing sessions as displayed in Figure 4.1 were conducted with practitioners, observers as well as with solution providers to gather feedback, problems, new or open issues, and requests of the solution providers. They were also useful to get an idea of the general working atmosphere. These sessions went very productive and the results were also kept in the meeting minutes.

Figure 4.1: Debriefing sessions

Directly after the Trial event ARTTIC conducted an evaluation survey which was filled in by project external practitioners and observers, visitors and solution providers.

According to the TGM (4) the solutions were observed and measured by using defined Key Performance Indicators (KPIs). The completed evaluation of the solutions and their use during the Trial will be shared in **D946.12** ***Report on Trial Evaluation – Trial 4*** (3).

The following is a brief summary of remarks from the solution providers' perspective (and the practitioners' perspective in section 4.4) collected from telephone conferences, debriefings and the evaluation survey and personal discussions in order to support planning and conducting upcoming DRIVER+ Trials.

4.1 Organisational aspects feedback

The face-to-face meetings (TIM, Dry Run 1 and Dry Run 2) were recognized to be time-consuming, but very valuable for preparation. The TIM was the first possibility to get to know the other solutions directly, to exchange possible contributions of each solution and to assess if and how to connect to each other. Dry Run 1 and Dry Run 2 made the conduction and cooperation during the Trial much easier.

The logistics and organisation of the meetings and the Trial was perceived as very well structured. However, communication was still perceived to be an issue. The amount of emails and information related to the project was stated to be too much. It was also criticized that contact persons were not always clear and information came from different people and were sometimes even contradictory due to communication problems amongst the Trial staff. It was also reported that changes between Dry Run 2 and the Trial led to some confusion. The scenario and functionalities of the solutions should be definitely frozen after Dry Run 2.

Regarding the scenario planning it was mentioned that the time schedule of the information exchange can have a big influence on the functionality of the solutions. It was a challenge to coordinate which information had to be shared at what point in time and how this interfered with the use of the solutions by practitioners. This should be thoroughly considered in addition to the purely technical functional connection. It was also stated that the scenario was a bit too simple and sharing only one flood mask was not very challenging for the solutions.

It was reported that it was very helpful to visualize the timeline in the room for technical staff during the Trial, but it would have also been very interesting to have the assignments of the ACs in English to understand the current tasks of the practitioners.

4.2 Technical feedback

It was unclear until after the TIM who the point of contact for technical support would be and which functionalities were expected to be connected and shared via the Test-bed.

The connection to the Test-bed required additional effort, but it was solved by all solutions without major issues. The necessary adapters were provided, and adjustments only had to be made for updates to new versions in the course of Test-bed development. There was existing documentation for adapters to connect to the Test-bed, but the level of detail was differing across the various existing adapters. In some cases, the documentation was insufficient in order to connect without help of the technical staff. It was recommended to add a functional example to each adapter, which has also the according documentation attached.

A technical environment like the Test-bed will probably always require individual and personal support, as the requirements of the solutions and practitioners are very specific. At the beginning the Test-bed did not run very stable and some issues could only be solved by restarting the whole Test-bed. This was improved during the preparation phase, but the Test-bed still seems to struggle with the exchange of large data. The capacities should be either extended or clearly communicated in an early state of use. In the case of Trial – The Netherlands, the personal support was always helpful and fast. The XVR mail tool has been used depending on the solutions' needs; it was reported to work quite well and was found helpful. Slack was used for discussing technical issues and progress, was used broadly and proved to be valuable.

Apart from the Test-bed connection, technical adaptions were raised and required from the solutions for the Trial. In one case this caused some dissatisfaction, because the additional feature was not used by the practitioners and the extra effort was perceived as waste of development time.

During Dry Run 2 problems with the internet connection occurred. This problem was solved before the Trial, but it is recommended to carry out a load test regarding internet connection and bandwidth beforehand. LTE routers solved the issue in this case.

4.3 Training aspects feedback

During Trial – The Netherlands practitioners were trained for working with the solutions during Dry Run 2 as well as during the Trial. Since the participants of Dry Run 2 were not equal to those in the Trial, the trainings had to be repeated. Due to personnel overlaps the training sessions in the Trial could be shortened and had much fewer participants. The change of personnel on the practitioners' side still led to some differences in the level of knowledge regarding the use of the solutions. Less fluctuation would have made training and work easier.

4.4 Added value for practitioners

Most practitioners were satisfied with the relevance of the Trial and the solutions for their respective organisation. It was stated that some solutions will be used by practitioners as a result of this Trial. Practitioners felt that their input before and after the Trial was taken into account by the solution providers. Some practitioners indicated that they would like to get in contact with specific solution providers for further cooperation.

The innovation of the solution and their readiness was perceived as low by some practitioners, and that the integration of different solutions must be improved. The influence of observations on further development

of the solutions was questioned. Some practitioners felt that the focus of the Trial was too much on the usage of the solutions and not on the operational demands of crisis managers.

4.5 Added value for solution providers

After taking part in a Trial, it is of course interesting to find out whether the expectations of the solutions with regard to added value have been fulfilled for them. They have stated to find it very valuable watching practitioners work with their solution. It helped them to identify room for improvements and implement additional functionalities and gave them the opportunity to connect to potential customers. In one case, the participation in the Trial enabled speeding up the integration into the existing CM procedures, which had been already worked on before. The good networking opportunities during the Trial were appreciated by all the solution providers and all of them wanted to stay in touch with practitioners who showed interest in their solution.

Finally, all of the solutions providers stated that they would recommend attending a DRIVER+ Trial to partner organisations and colleagues.

“Being part of DRIVER+ is not only interested to get feedback and ideas from users on your solution. It proved also to be very valuable to connect with other solution providers and discover the added value of combining your own solution with other solutions.”

(Statement of solution provider after Trial – The Netherlands according to evaluation summary by ARTTIC)

References

1. **DRIVER+ project.** *D946.11 Report on Trial Action Plan - Trial 4.* 2019.

2. —. *D942.12 Report on review and selection process (Trial 3-4-demo).* 2019.

3. —. *D946.12 Report on Trial Evaluation - Trial 4.* 2019.

4. —. *D922.21 - Trial guidance methodology and guidance tool specifications (version 1).* March 2018.

5. —. *D922.11 List of CM gaps.* March 2018.

6. —. *D934.21 Solution testing procedure.* March 2018.

7. —. *D942.31 Report on trainings for the selected Solutions.* December 2019.

Annexes

Annex 1 – DRIVER+ Terminology

In order to have a common understanding within the DRIVER+ project and beyond and to ensure the use of a common language in all project deliverables and communications, a terminology is developed by making reference to main sources, such as ISO standards and UNISDR. This terminology is presented online as part of the Portfolio of Solutions and it will be continuously reviewed and updated[1]. The terminology is applied throughout the documents produced by DRIVER+. Each deliverable includes an annex as provided hereunder, which holds an extract from the comprehensive terminology containing the relevant DRIVER+ terms for this respective document.

Table A1: DRIVER+ Terminology

Terminology	Definition	Source
Dry Run 1	First rehearsal of a Trial, focusing on the technical integration of solutions, reference implementation of the Test-bed, and scenario validation; it also serves as a readiness review to approve the maturity of technical solutions.	Initial DRIVER+ definition.
Dry Run 2	Full scale rehearsal of a Trial without external end-users participation, aimed at detection of technical issues and last second fine-tuning; Dry Run 2 is organised as a complete mirror of the Trial.	Initial DRIVER+ definition.
Legacy system	(Crisis management) system currently in operational use.	Initial DRIVER+ definition.
Operator	(human) operator: Person engaged in task performance, considered as a monitoring, controlling or directing element in a system or process capable of a dynamic response to system inputs and disturbances.	ISO 9996:1996(en) Mechanical vibration and shock — Disturbance to human activity and performance — Classification, 3.5. Link: https://www.iso.org/obp/ui/#iso:std:iso:9996:ed-1:v1:en:term:3.5
Portfolio of Solutions	A database driven web site that documents the available Crisis Management solutions. The PoS includes information on the experiences with a solution (i.e. results and outcomes of Trials), the needs it addresses, the type of practitioner organisations that have used it, the regulatory conditions that apply, societal impact consideration, a glossary, and the design of the Trials.	Initial DRIVER+ definition.

[1] The Portfolio of Solutions and the terminology of the DRIVER+ project are accessible on the DRIVER+ public website (https://www.driver-project.eu/). Further information can be received by contacting coordination@projectdriver.eu.

Terminology	Definition	Source
Scenario	Pre-planned storyline that drives an exercise, as well as the stimuli used to achieve exercise project performance objectives. DRIVER+ note 1: In the context of DRIVER+ scenarios are defined for Trials not for exercises.	ISO 22300:2018(en) Security and resilience — Vocabulary. Link: https://www.iso.org/obp/ui/#iso:std:iso:22300:ed-2:v1:en:term:3.217
Solution	A solution is a means that contributes to a crisis management function. A solution is either one or more processes or one or more tools with related procedures.	Initial DRIVER+ definition.
Test-bed Technical infrastructure	The software tools and middleware to systematically create an appropriate (life and/or virtual) environment in which the trialling of solutions is carried out. The Test-bed infrastructure can enable existing facilities to connect and exchange data. DRIVER+ Note 1: For a better understanding within the CM community the term "Test-bed Technical Infrastructure" replaces the term "Test-bed Infrastructure". These terms are synonyms.	Initial DRIVER+ definition.
Trial	An event for systematically assessing solutions for current and emerging needs in such a way that practitioners can do this following a pragmatic and systematic approach.	Initial DRIVER+ definition.
Trial Guidance Methodology (TGM)	A structured approach from designing a Trial to evaluating the outcomes and identifying lessons learnt.	Initial DRIVER+ definition.