EUROPEAN COMMISSION

pulse

Platform for European Medical Support During Major Emergencies

D2.2 Use Case Specification

skytek · CESS Centre for European Security Strategies · ONEST SOLUTIONS · TRILATERAL RESEARCH · UNIVERSITÀ CATTOLICA del Sacro Cuore · Selex ES A Finmeccanica Company · IAEMO

PULSE

Platform for European Medical Support during major emergencies

WP2_Scenarios and requirements

Deliverable D2.2-Use case specification

31/01/2015

Contractual Delivery Date:	Actual Delivery Date:	Deliverable Type*-Security**:
31/01/2015	31/01/2015	R - CO
607799	PULSE	Platform for European Medical Support during major emergencies

**Type: P: Prototype; R: Report; D: Demonstrator; O: Other.*

***Security Class: PU: Public; PP: Restricted to other programme participants (including the Commission); RE: Restricted to a group defined by the consortium (including the Commission); CO: Confidential, only for members of the consortium (including the Commission).*

Responsible:	Organisation:	Contributing WP:
Pasquale Mari	UCSC	WP2

Authors (organisation)
Reinhard Hutter (CESS), Pasquale Mari (UCSC), Sabina Magalini (UCSCS), Paolo Pucci (SES), Francesco Malmignati (SES), Peter Daly (HSE/IAEMO)

Abstract:

The purpose of this document is to describe Use-Cases referring to two Scenarios for the demonstrations of the PULSE Platform:

- Scenario 1; SARS-like event that can affect large numbers of people and is highly contagious and potentially lethal. This scenario takes into account weak signal detection, epidemiological spread of disease with cross border implications, medical emergency service and the hospital response.
- Scenario 2: Crush at a rock concert in a football stadium that essentially takes into account the triage, transport and medical assistance outside and inside the Hospital of trauma victims.

Scenarios are analysed to identify their general features in order to demonstrate their level of representativeness for a wider set of emergencies.
Use Cases, 9 for SARS Scenario and 8 for STADIUM crush Scenario, are built taking into account the need to implement PULSE Tools and to test them against the most important requirements provided in Deliverable D2.1-Requirements Specification following consultation with end users.

Keywords:
Major medical emergency, health services,preparedness, response, crisis management, scenario, Use Case, SARS, stadium crush, MPORG

D2.2-Use Case Specification REVISIONS:

Revision	Date	Description	Author (Organisation)

- **TABLE OF CONTENTS**

List of figures

List of Tables

1 Glossary

Table 1: Glossary

Term	Definition	Notes (examples from PULSE, explanations. ...)
CCS	Casualty Clearance Station	It is located at a safe distance away from the incident, to safely manage casualties delivered from the scene. It serves as a point for secondary triage and for provision of life saving treatments to safely package the casualties for transport to hospital
DoW	Document of Work	The official document, version 2013-10-11, that states PULSE project scope and content
ECDC	European Center of Desease Prevention and Control	
ECM	Event Medical Co-ordinator. The person with the clear task of overall control and coordination of medical/first-aid provision at the event. That person is not a public servant. They are the agent of the organisers and the single point of contact in relation to the event medical plan. That person is also the point of contact for the Regional Authority official agencies dealing with the planning and running of events.	
EHS	EU health system	
Ethical issues	Ethical issues refer to the issues concerning some aspect that raise ethical questions	
Ethics	Ethics is the systematic reflection on right and wrong conduct according to norms and values that we think should be adhered to	
EU	European Community	
Functionality	Any service that a product or a software can do for a user	
IHR	International Health Regulations The International Health Regulations (2005) are legally binding regulations (forming international law) that aim to a) assist countries to work together to save lives and livelihoods endangered by the spread of diseases and other health risks, and b) avoid unnecessary interference with international trade and travel	
Model (see also PULSE Model)	An abstraction of reality with the aims of better understanding it, mostly described in mathematical/ analytical, also sociological or philosophical terms and methodologies	
MoE	Measures od Effectiveness	
MPORG	MultiPlayer Online Role Playing Game are popular for both training and recreational gaming. People typically use an avatar to represent themselves in a virtual world where they can perform tasks in predefined scenarios. Multiple people participate and interact in the same virtual world in parallel. MPORG system are typically accessed via the internet and used by end users in disparate locations.	Within PULSE an MPORG system and environment will be used to train personnel within the stadium crush scenario where individuals will assume the roles of different resource personnel involved in such a scenario.
NGO	Non Governative Organization	
OSCE	Organization for Security and Co-operation in Europe	
Phase	A subset of a Scenario. It may be, for instance, identified, for instance, in terms of time (e.g. before the incident) and/or location (e.g. Hospital) and/or type of population involved(e.g. people in "uncertain" status in a SARS like epidemic), and/or purpose (prepare, recover)	Each PULSE Scenario is split in two Phases: Preparedness and Response.
Platform	see *PULSE Platform*	

(...)

Term	Definition	Notes (examples from PULSE, explanations. ...)
Policy	Documents that provide high level guidelines, in terms of actors and responsibilities; they may also specify key phases	The "*Decision No 1082/2013/EU of European Parliament and of the Council of 22 October 2013 on serious cross-border threats to health*" is an example of Policy
Preparedness phase	Activities that prepare and train responders and ensure that the needed mix of resources are ready to respond in case of adverse event	
PULSE	Platform for European Medical Support during major emergencies	
PULSE Model (see also Model)	A Software routine, based on mathematical models/algotythms for describing phenomena (e.g. processes, problems,...) and for helping to find solutions. In PULSE project, in order to avoid confusion with the genaral meaning of the term "Model" (see definition), the term "PULSE Model" is introduced	In te PULSE DoW (Document of Work) WP3 has the purpose to produce Models, meaning the "PULSE Models" here defined
PULSE Platform	PULSE System + PULSE SOP	
PULSE Project	The Project that will specify, design, implement and validate the PULSE Platform	
RCS	Recognised Current Situation	
Requirements	Justified characteristic needs, formulated by users and experts. For IT systems, usually one distinguishes between technical and operational (possibly strategic) requirements	
Response phase	Activities that are triggered by the adverse event, with the purpose to diminish/contain its effects	
RSI	Regolamento Sanitario Internazionale (italian term for IHR)	
SARS	Severe Acute Respiratory Syndrome	
SARS-like	Infectious respiratory desease	
Scenario	Description of an incident in terms of background, occurrence and the course of a incident, including response and other related processes of relevance	In PULSE we consider two Scenarios: SARS-like epidemics and Stadium crush-like incident
SOP	Standard Operational Procedures	SOPs may have different levels of detail: e.g. Policy, Actor/Activity tables, Procedures
Tactical Preparedness sub-phase	Activities that prepare the response to a specific adverse event ; the sub-phase starts when the situation that may generate the event is announced and ends when the event happens or the situation is no more in place. Lesson learning after the end of the response phase are included in the Tactical Preparedness sub-phase.	In Stadium Scenario the sub-phase may start when the authorization for the concert is asked.
Tool	Any helping software instrument, including input/output interfaces with users or other Tools or Systems (mostly software). A Tool may use PULSE Models. A software Tool may also be identified with a set of functionalities.	PULSE Platform includes 8 Tools.
Use Case	A sample materialization of a scenario quantitatively described, including hazardous event or attack event lines, organizations involved, response procedures, numbers and classes of victims, responder and health resources etc.	
USMAF	USMAF (Uffici di Sanità Marittima, Aerea e di frontiera), reporting to Ministry of Health in Italy	
WHO	World Health Organization	
WP	Work Package of the PULSE Project	

2 Introduction

2.1 Purpose of the Document

According to the PULSE Project DoW, PULSE Platform is expected to support decision makers in two Scenarios:

- Scenario 1; SARS-like event that can affect large numbers of people and is highly contagious and potentially lethal. This scenario takes into account weak signal detection, epidemiological spread of disease with cross border implications, medical emergency service and the hospital response.
- Scenario 2: Crush at a rock concert in a stadium that essentially takes into account the triage, transport and medical assistance outside and inside the Hospital of trauma victims.

The purpose of this document is to describe use-cases for the demonstrations of the PULSE Platform referred to in both scenarios.

Demonstrations will be done in WP7 (Trials & validation) and will act as proof of concept of the scientific concepts and technologies developed in WP2 (Scenarios and requirements), WP3 (Modelling), WP4 (tools), and WP5 (Methodologies/SOPs).

2.2 Scope of the Document

This document covers two key topics:

- **Scenarios**, as a - mainly qualitative – description of an incident describing the background, the occurrence and the course of a hazardous incident, including response and other related processes of relevance
- **Use Cases,** as a sample materialization of a scenario, including hazardous event or attack event lines, organizations involved, response procedures, responder and health resources etc.

Use Cases are expected to support Pulse tools implementation and their demonstrations.

As a consequence:

- their level of detail should be sufficient to provide the scope of the trials to be defined by Task 7.1 (Definition of Trials) in WP7
- they should ensure that requirements defined in Deliverable D2.1 (Requirements specification) will be tested during the demonstrations
- their focus will be on operational decisions to be taken during the Tactical Preparedness and Response Phases (see glossary).
- their scope includes lesson learning activities (and related Tool)

2.3 Structure of the Document

This document is structured in three logical sections:

- Scenarios description (chapters 3 and 4)
- Scenarios analysis (chapter 5); the analysis identifies the general features of the two scenarios in order to demonstrate their level of representativeness
- Use Cases description (chapters 6 and 7)

3 Scenario 1: SARS Scenario

3.1 SARS Scenario Summary

3.1.1 General Situation

It is holiday season in two metropolitan areas in neighbouring EU member states (MS1 and MS2)[1] with international airports, and one EU "Associated"[2] state (AS) with borders to both MS's. "Medium" alert status has been issued by the EU/WHO[3]for the whole EU healthcare systems (EHS)because of SARS-like incidents and (still few) casualties in two East Asian States. The total number of people with general infection risk in this European area is 20 Mio.

3.1.2 Hazard Identification

Three patients are delivered to one metropolitan hospital with serious pneumonia symptoms. They have been on holidays and/or business missions in East Asia where local SARS epidemics are roaming. They have returned in 3 different fully occupied airplanes,

[1] e.g. Italy/ Milan and Germany/ Munich

[2] e.g. Switzerland

[3] GORN Global Outbreak Alert and Response Network

unfortunately with stopovers in 3 different cities in neighbouring states. After 48 hours, diagnosis of a SARS-type infection is verified. EU and WHO organizations are informed. Origin from the Far East is confirmed by authorities,to have zoonotic (animal) based root.

Consultation with the neighbouring countries has to be initiated and coordination measures to be planned. WHO has issued guidelines for global surveillance, control and information exchange.

A total of 3 Mio people in the affected metropolitan areas are at risk. The total population to be put on alert is 9 Mio.

3.1.3 Hazard development [4]

The introduction phase of the disease in the local population of the cities affected starts when the first cases appear. Most likely in the beginning the disease will be under-diagnosed and many cases will go undetected as pneumonia. When the first reports appear and the media start to talk about an unknown disease that is killing people without any idea what is causing this outbreak, the detection phase commences.

Information exchange with affected Asian states is established and experts are tasked. The number of patients is growing. When the medics and scientists will see certain patterns in the disease they will become able to isolate and identify the causative agent. In parallel epidemiological teams will try to find out the mode of transmission and the source. With confirmation of the agent, focused treatment and containment measures are taken up. Infection reaches a peak, when infections of people reach the end of incubation time. Those infected include considerable numbers of healthcare people, which causes bottlenecks in treatment. After peaking, the overall the number of cases will steadily decline and within several months the outbreak will most likely be over. Several factors might work against this decline e.g. in cases of un-symptomatic spreaders or super-spreaders, of a new zoonosis in a local animal population with constant re-entry of the pathogen into the human population, and so on.

It is assumed that within two weeks after the first patients were identified, the number of patients gradually develops to a total of 75 infected and reported. 5 have died which increases the general alert of population and of the healthcare system. Within the next 4 weeks, the outbreak develops to a peak, leading to a cumulated number of 820 clinically confirmed cases and 32 deaths. The healthcare and other measures (see 4.) lead to a decline after 3 months and annihilation is reported after 5 months.

3.1.4 Protection and Response

The forecasts of a pandemic to develop are very demanding. They should include short, medium and long term prognoses and be scientifically supported. Precautionary and preparatory measures have to be taken immediately, and followed up and escalated according to forecast and the real development of the situation.
The set of coordinated measures will include but not be limited to:

- The health department, in coordination with federal health authorities introduces a range of public health control measures, including guidelines on epidemiologic investigation and treatment of cases and contacts, and on hospital admission, clinical management, and infection control arrangements for patients.
- Dispatching plans for hospital capacities and surge are issued

[4] summary numbers are assumed here which will be distributed across the affected countries and municipalities in the later concrete use case description

- WHO issues guidelines for protection and response
- Information exchange with affected East Asia state and health authorities
- A competent scientific institute[5]in a neighbouring state starts with disease spreading forecasts (indicators, numbers, seriousness etc.)
- Containment measures are taken locally
- Border control (including the "virtual" borders of airports) is arranged, particularly strong between the neighbouring states
- Public announcements and recommendations are issued on personal indicator observation, protection and behaviour patterns in cases of positive indicators
- Population consulting centres are established (both, physically and electronically)
- An international health disaster management and collaboration board (a physical centre and a virtual network) is established with tasks including
    - Fast and confidential information exchange
    - "Field" support from States, NGOs, WHO, ...
    - Mutual support in logistics and resources sharing (Medicines, medical doctors, hospital beds, transportation,...)
    - Harmonization of public information
    - Psychological care

The authorities and services involved will range from international and governmental agencies, the state healthcare systems, local and non-governmental organizations, through to law enforcement for ensuring public order.

3.1.5 The expected benefits of a PULSE-like system

The PULSE system is not a substitute to existing procedures, planning and decision support systems. It will be designed to fill obvious or assumed gaps in the existing EU health system (EHS). In this sense, it aims at contributing to harmonizing response procedures, improving decision making, harmonizing information management and controlling information distribution, improving training and feedback from lessons learned and enhancing the information exchange between authorities and people. Pulse is to provide a framework and interoperable platform for coordinated European response.

3.1.6 The typical requirements for a PULSE-like system

The vision of this PULSE support system is an integrated approach of innovative PULSE Models of patients and treatment effects, improved situational awareness (COP[6]) and sophisticated event evolution assessment and forecast, use of social media (e.g., via a special APP), logistics and surge capacity improvement, and powerful training and exercising tools.

For these very ambitious general objectives, the vision of a PULSE system with regard to the Scenario 1 describing SARS, a set of basic system requirements needs to be derived, which may include the following; (to name but a few samples here, for full details, see requirements document D2.1).

- Faster and more qualified early warning
- Better international/ cross border planning, cooperation and resource sharing
- Flexible and targeted use of hospital capacities and surge requirements
- Reduced bureaucracy and internal friction and drag
- Better use of volunteers and NGOs

[5] like the Robert-Koch-Institute in Berlin

[6] Common Operational Picture

- Flexible state-of-the-art and collaborative training and exercising

The main characteristics of this scenario are international propagation and collaboration and a time horizon of days to months.

3.2 SARS Scenario details

3.2.1 Context

Concerning the SARS agent, there are options on its characteristics: The Scenario 1 may be caused by a normal SARS-Virus like the last one or an **evolved, mutated form** may be assumed. In the latter case, at first the characteristics of the new disease should be defined as this could really turn out to become a disaster with a catastrophic international dimension.

Accordingly, the disease characteristics need to be further defined by Bio/Medical experts, as this will have major impact on the scenario characteristics as discussed below. One key question is: Do we speak about a standard SARS or something evolved? Some of the questions that need answering are for example:

- where will it come from?
- what is the host (only humans or also local animal populations)?,
- how contagious is it?
- what is the incubation period?
- how is it transmitted?

Table 2: Scenario 1 Context

Object(s)	Data	Explanations
Area/ environment/ propagation	At least 2 neighbouring EU Member States (MS). One major metropolitan area in each country (e.g., Milan, Innsbruck, Lugano, Munich). Remaining area rather densely populated	For instance: Northern Italy and Austria with some spill-over to Germany and Switzerland. Outbreak starts in the "Greater Milano" area. Area characteristics: 20% urban 15% commercial/industry 30% rural residential 35% unpopulated
Population at risk	Forecast of number of people with infection risk Italy:20Mio Austria: 2,5 Mio	Composition of population 35% elderly (over 65) 50% "working" 15% children (under 18)

	Germany: 1,5 Mio Switzerland: 1,2 Mio	
"Drivers"	Ethical and legal: ethical treatment of healthcare workers, individuals affected by the virus, patients already in the health system and the general public Political: Demonstrate preparedness and competence Avoid/ reduce danger of unrest and instability Economic: Limit damage of diminishing working force	Expected 6.000 infected and 500 dead
Hazards	A SARS or mutated SARS virus.	Propagation starts in the greater Milan area
Principal emergency services	Primary responsibility: County administrations The healthcare system (Paramedics; ambulance; hospitals; medical practices)	Secondary responsibility: State/federal government EU level authority (to be assumed/defined); Support: Police Fire brigade Armed forces (possibly)
Logistics supplies and infrastructure	Main importance: Vaccines and antidotes, storage and transportation Hospital infrastructure Street network helicopters	Limited importance: Rail Civil aviation Armed forces Water and food Power

3.2.2 Characteristics

3.2.2.1 Social, ethical and legal

There will most likely be a strong social impact especially in the beginning phase of an epidemic or pandemic, when there will be daily news about people falling ill and dying without any clue of what causes this new and unknown disease.

As soon as the causing agent will be identified and the countering measures show the first effects, the social disruption of the population may decrease until to some point when the

majority of the people will have gotten used to the situation or they believe that everything is under control know.

The contrary may also happen, with for example, increasing social unrest, developing thefts and black market of vaccines, of protective and of disinfecting material. Looting and hoarding will become possible as people don't want to leave their homes any more.

This will mainly depend on the seriousness of the damages, the psychological state, standard of living etc. of the society, and on the kind of communications between officials and the population.

Substantial efforts will be needed for psychological treatment and care for patients and relatives.

Typical numbers of infected and deaths can be identified from real historical cases, as shown in **Error! Reference source not found.**
(Source: http://en.wikipedia.org/wiki/Severe_acute_respiratory_syndrome#Treatment).

Table 3: SARS Historical Case Evaluations

Probable cases of SARS by country, 1 November 2002 – 31 July 2003.				
Country or Region	**Cases**	**Deaths**	**SARS cases dead due to other causes**	**Fatality (%)**
China *	5,328	349	19	6.6
Hong Kong *	1,755	299	5	17
Canada	251	44	0	18
Taiwan **	346	37	36	11
Singapore	238	33	0	14
Vietnam	63	5	0	8
United States	27	0	0	0
Philippines	14	2	0	14
Mongolia	9	0	0	0
Macau *	1	0	0	0
Kuwait	1	0	0	0
Republic of Ireland	1	0	0	0
Romania	1	0	0	0
Russian Federation	1	0	0	0
Spain	1	0	0	0
Switzerland	1	0	0	0

South Korea	4	0	0	0
Total	***8273***	***775***	***60***	***9.6***

**excluding Macau SAR, Hong Kong SAR*

***special information status; see source document*

There are a number of **ethical implications** of a SARS-like outbreak[7] affecting healthcare workers, individuals affected by the virus, patients already in the health system and the general public. Ethical values should be considered in making decisions in a SARS-like pandemic. Notable among these values are individual liberty, proportionality, privacy of personal information, the public right to know, duty to steward resources, trust, duty to provide care, protection of the public from harm, reciprocity and equity. Additional ethical issues include fairness of distribution of medication or vaccines, prioritisation of response and treatment and respect for religious beliefs. In addition, procedural values such as reasonableness, openness and transparency, inclusiveness, responsiveness and transparency inform the making of decisions. Accountability mitigation[8] is a crucial issue in the preparedness and response phases of major medical emergencies. Lawyers, public health practitioners and emergency managers must prioritise and resolve legal issues on the basis of incomplete information and guidance during emergencies. Indeed, in some instances, the exigencies of the situation may allow for a derogation of normal legal requirements, particularly regarding over-triage, balancing of individual liberties, privacy or personal and sensitive information, duty to manage resources and duty to provide care notwithstanding personal risks and accountability mitigation.

3.2.2.2 Economic

The economic impact of such an outbreak is highly dependent on the circumstances: E.g. is the outbreak somehow related to any economic sector, i.e. like tourism, or food industry. In the EHEC[9] outbreak of 2011, in Germany the declaration that Spanish cucumbers were the sources of the infections cost the EU over 500 Mio Euro and derogated the agricultural sector in Spain and other vegetable-producing areas. A mid-to-long-term economic effect may be that people stay away from work because they don't want to leave their homes.

3.2.2.3 Environmental

The impact on the environment can be manifold to none, depending on the definition of the causing agent. One impact could be, that the agent is brought in by infected humans and finds susceptible vectors and animal hosts in this ecosystem and thus becomes an endemic zoonotic disease. This would have a huge influence on the possible outbreak, propagation outcome and the measures that would have to be taken.

[7] Adapted from WP8 input to end-users workshop (Task 2.1 Health service user requirements gathering and reviewing including threat analysis) and D2.1 Requirements specifications (Section 8.6).

[8] This is an issue that came up at the end-users workshop - healthcare workers and others involved in responding to disaster situations are concerned about certain situations for which they feel they cannot be held accountable and so the issue of "mitigation" becomes relevant.

[9] Enterohaemorrhagic Escherichia coli

3.2.2.4 Infrastructural

Basic Supply: During an outbreak with a higher percentage of infected and ill people some supply chains might no longer work. In such a situation it might for example come to shortages of basic goods like food, and / or the collapse of the local healthcare system (medical practices; hospital emergency stations,…).

3.2.2.5 Political

Politics will have to demonstrate and prove the capability of planning, dispatching and controlling medical services, transportation and supplies. They will have to supervise the public and use law enforcement if things get out of control. Politicians need to intelligently cooperate with the media. International cooperation and coordination will be challenged.

3.2.3 Hazard Identification and early Forecast Process

In East Asia local SARS-type epidemics are roaming.

3 patients are delivered to a Milan hospital with serious pneumonia symptoms. Patients have been on holidays and/or business missions in East Asia. They have returned in 3 different fully occupied airplanes, unfortunately, with stopovers in Munich (2) and Innsbruck (1).

After 48 hrs, diagnosis of a SARS-type infection is verified. EU and WHO organizations are informed. Origin from the Far East is confirmed by authorities, to have zoonotic (animal) based root.

The forecasts of a pandemic to develop are very demanding. They should include short, medium and long term prognoses and be scientifically supported.

Precautionary and preparatory measures have to be taken immediately.

Consultation with the neighbouring countries has to be initiated and coordination measures to be planned.

WHO has issued guidelines for global surveillance, control and information exchange.

3.2.4 Development and dynamics

3.2.4.1 Time profile; major escalation milestones

The introduction phase of the disease in the local population starts when the first cases appear, and most likely in the beginning the disease will be under-diagnosed and many cases will go undetected as some other illness.

Then as the first reports appear and the media start to talk about an unknown disease that is killing people without any idea what is causing this outbreak, the detection phase commences.

The number of patients is growing and growing and still no one has a clue what really is going on.

When the medics and scientists will see certain patterns in the disease they will become able to isolate and identify the causative agent. In parallel epidemiological teams will try to find out the mode of transmission and the source / the beginning of the outbreak – this will be the identification phase. When the investigations have provided some sound answers to these questions and the mode of transmission is known, the number of new cases may reduce rapidly with the containment measures undertaken.

From there the numbers of cases might have another peak, when the illness appears in the

people infected later, after their incubation time. But overall, the number of cases will steadily decline and within several weeks the outbreak will most likely be over. Several factors might work against this decline e.g. in cases of un-symptomatic spreaders or super-spreaders, of a new zoonosis in a local animal population with a constant re-entry of the pathogen into the human population, and so on.

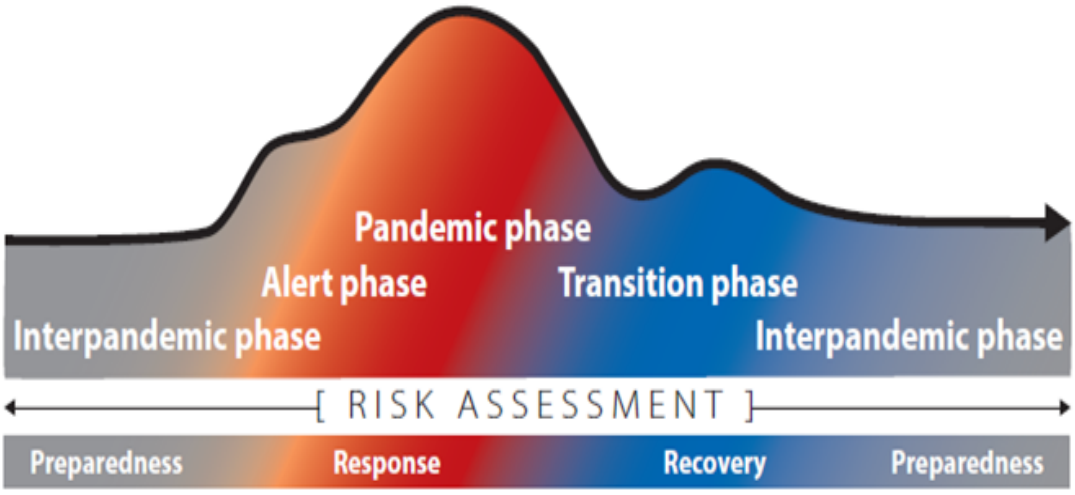

Figure 1: A Typical Pandemic Time Profile

Once the emergency is over, actors should analyse their behaviour during the emergency in order to extract learning lessons on decision making process to be applied in future emergencies.

3.2.4.2 Roles, responsibilities and preparedness of Response Forces

In the following the roles will be described according to the Italian and German disaster response systems. The system of other Member States will most certainly be different in certain aspects; this should be taken into account when designing the PULSE demonstrations (in WP7).

- **Government**

In Italy the key actors in the management of SARS-like epidemics are at national and regional levels:

- The Ministry of Health has national responsibility and directly interfaces European authorities and the WHO. It also gives directions and budget for vaccines procurement and storage.
- The scientific arm of the Ministry of Health is the Istituto Superiore della Sanità, that provides medical directions on how to deal with the epidemic in the Country.
- In each of the 21 Regions there is a Healthcare Department, that manages the healthcare expense of the entire Region and coordinates the Local Health Agencies
- In Italy there are 197 Local Health Agencies (ASL-Aziende Sanitarie Locali) at Province or sub-province Agency, that have direct authority on all the healthcare providers (Hospitals, family doctors, pharmacies, laboratories)
- In Italy there are two Lead Hospitals (Sacco in Milan, Spallanzani in Rome), with very high expertise and capacity in epidemic disease. Additionally, in each Province there is at least one Hospital with specific facilities suitable for isolation.
- In the case of a bottom up flow during the phase in which there is already an

international alert, the system will work as follows:

- Definition of case as suspect or probable, usually patients at this point are already in the Hospital (probable cases need a radiological or biochemical evaluation)
- Adoption of security measures (isolation room)
- In case of high impact disease such as SARS or SARS-like events (this has held true also for Ebola), referral or transport to Second Level or Lead Hospital (Centro di Riferimento Regionale CRR). If this is not possible the patient will stay
- Lead Hospital or other facility where the diagnosis is made and the patient is admitted must communicate to Local Health Agency the presence of SARS-like affected patient.
- Local Health Agency will communicate to Local Health Care Department who will communicate with Ministry of Health.

In the German system the counties have overall responsibility in case of a disaster.

- The local public health authorities will be in charge of the management of this outbreak.
- Only if they need and ask for help from state or federal level officials and institutions, like the German national institute of health the Robert Koch Institute (RKI), those will be able to bring in their expertise and resources.
- Besides the RKI a number of other national institutes might be involved in the working staff, like the German Federal Institute for Risk Assessment (BfR), the Federal Health Authorities or the German Federal Office of Consumer Protection and Food Safety (BVL).

In addition, there will be members of the State Ministries and institutions, regional representatives, members of international health care organizations like ECDC[10] and WHO, and representatives of the neighbouring states, with their roles and tasks to be defined as the pandemic develops.

- **Inter-agency organization/ inter-services cooperation**

In Italy in case of SARS-like epidemics there is strong collaboration between health care authorities and Police (Polizia di Stato), namely its branch in charge for controlling borders.

In Germany, depending on the presentation of the disease there will be a strong inter-agency organization, for example if there are strong hints that it is a food-borne disease (RKI + BfR + BVA). In a suspected bio-crime scenario a close cooperation with the Federal Criminal Police (BKA) and state / local police forces will be required.

- **International coordination**

Once the incident has reached dimensions where international help and/ or cross-border mutual support is required, the local administration will ask for specialised or general international support by first asking the state and then the federal level for assistance.

Only state or the federal government can go for international assistance. But once again, all the federal and state administration staffs can only support the local level, for they are the ones responsible for the disaster relief operations in their county. Cross-border liaison persons and offices may be created.

- **Local authorities**

As stated above already, the main responsibility for the disaster response lies with the county administrations. The local/regional coordination staff coordinates all the actions and

[10] European Centre for Disease Prevention and Control

deployed forces during the intervention. If and when they ask for expertise and assistance is up to them and the regional / county administrator.

Due to this it is likely that the specialised and professional forces will come in later and not be on the scene from the beginning.

- **Health services (Ambulance; Mobile medical care; Hospitals; ...)**

Depending on the situation, a number of public/private relief organisations can deploy large numbers of more or less well-trained and equipped volunteer units in addition to their regular forces (regular forces are health emergency services and hospitals. In addition, there are NGOS and volunteers).

The rest of the health care sector has lost many of their reserves in the past years due to cuts in the budgets. Personnel from the relief organisations might also be used to compensate high personnel default rates or shortages in other health care branches. They work under the coordination of the county disaster relief staff.

Hospitals need to start early planning and dispatching of their resources and capacities (see also recommendations of the WHO in[11]).

- **Fire services**

Germany, for example, has a very high number of volunteer personnel in the fire brigades and the relief organisations. Due to this fact, also the fire services should also be able to provide additional forces. Their forces might be used to assist in the maintenance of public order during an outbreak situation. They also have their own medical and ambulance service capacities.

- **Police**

The police does not have as large a reserve as the disaster relief organisations. To maintain public order they will need additional assistance e.g. from fire service personnel. Police, possibly supported by fire brigade, will be responsible for keeping public order, protecting sensitive sites like hospitals from mass rush demands, and for clearing transportation routes for ambulances and medical services, containment measures (see below), etc. They also need to watch for criminal actions and intervene as necessary.

- **NGOs**

NGOs like Red Cross and other private or semi-private services will mainly work in support of and coordinated with the Health Services. It will also include humanitarian and psychological care of the population

- **Public media; Social Media**

Press, radio social media, and particularly TV services need to be fed with information in a well-controlled way. Media treatment needs to follow a media policy which should be agreed upon before such hazardous events. They need to disseminate helpful information to the public, give advice on behaviour and support avoiding panic, unrest and crime. Social media will play an increasingly important role.

[11] WHO "Infection Control and Clinical Management of Severe Acute Respiratory Syndrome (SARS)"

3.2.5 Response characteristics

3.2.5.1 Provision (planning, dispatching, controlling) of resources and specialized equipment

All the disaster relief forces will be coordinated by coordination staff at county level. Should they see an urgent need to bring in additional forces or specialised expertise or equipment, they can ask for assistance.
But all deployed forces will be under their (county) control. It will include

- Personnel (by role; see 5.3)
- Vehicles
- Medication
- Hospital resources
- other...

3.2.5.2 Infrastructure Control

- Traffic/transportation/containment

Public Transport: Depending on the causative agent and its properties in this scenario, containment measures might very well include restrictions of movement and thus the stopping of all public transportation. Another reason for a breakdown of the public transport can be due to a high percentage of ill personnel within the transport organizations. Evacuation measures may be required. Traffic needs to be controlled and managed by police to clear routes for ambulances.

- Energy and Water

The energy and water supply like other technical infrastructures will most probably not be affected by this scenario. Only a shortage in personnel over a period of several weeks will have an effect on these systems – as long as nothing breaks, these systems should not pose a problem.

3.2.5.3 SOPs to be applied (if available)

There are no general standard operation procedures for the case management of an epidemic. But every local and / or county authority should be prepared for such a scenario. A typical local SOP, see[12]

In Italy every Region has its own Guidelines for management of patients with Suspect or Probable SARS (see: Linea Guida per la gestione di pazienti con sospetta o probabile SARS, http://www.asl.vt.it/Ospedaliera/DirSanPOC/Documentazione/procedure/sars.pdf)
But there are also National Guidelines available: Linee guida nazionali | CCM – Network (see http://www.ccm-network.it/pagina.jsp%3Fid%3Dnode/406)

In Germany every county should be prepared for a major epidemic and once the epidemic presents itself prepared programs should start – but many authorities never really finished these plans or even tested them for practical feasibility.

In some states in Germany there are existing treaties with other states for assistance in specific scenarios. For example in the case of a patient with a highly communicable disease in Thuringia, the state Saxony will take over the patient in its special containment and treatment facilities in Leipzig.

[12] http://www.fort-frances.com/sites/default/files/reports-policies/operations-facilities/SOP,%20Pandemic.pdf

3.2.5.4 Treatment of/communication with the Media and the public

The media should be involved as soon as possible. Although only validated information should be given to them. Also it is important to regulate the flow of information and to control the situation. This also means that unqualified scaremongering should be prevented.

Best Practices and Lessons to be learned

These are some of lessons learned which will pose specific challenges to the PULSE system:

- Thresholds for escalation: National, cross national (between neighbouring states) and international (EU-; WHO; OSCE- etc. levels)
- Reaction times and specific/ intolerable delays
- Requirements for / gaps in surge capabilities: Specific qualities, capacities, critical timelines
- Usefulness of the PULSE APP, but also counterproductive effects, false positives and negatives etc.
- Special benefits of weak signal detection and analysis
- Coordination of distribution and availability stocks of medication, vaccines etc.; local; national; international

4 Scenario2: Stadium Crush Scenario

4.1 Stadium Crush Scenario Summary

4.1.1 General Situation

A rock concert is taking place in a large stadium with a capacity of 60.000 visitors, located in the vicinity of a border between two EU Member States. Tickets are fully sold out with some 10% over-selling through a fake/ black market. A renowned rock-band is performing, with the schedule of 1 hr pre-performance of a local band and 2.5 hrs main performance.

The main band is politically active and based on precedent experiences may attract some violence-prone groups.

It is a hot mid-summer evening, but with heavy thunderstorms forecasted.

Access routes to the stadium are rather limited in number, narrow and some with stairways.

4.1.2 Hazard Identification

The access ways to the stadium are noticeably below capacity, which already before the start of the concert causes several scrambles and disputes.

Visitors start fighting for seating on the bleachers and good sighting in the bottom arena where visitors are standing.

This is exacerbated by the oversold number of tickets.

Some groups are already drunk when entering.

Alcohol is circulating and can be purchased inside the arena. Distribution of drugs is visible at many places.

When the pre-performance is finished, the appearance of the main band is delayed for more than one hour.

General mood becomes more and more aggressive.

After the second hit performed by the main band, very suddenly a heavy hailstorm breaks out; lightning flashes follow.

4.1.3 Hazard development

Within five minutes, approximately 50% of the visitors start rushing to the exits.

Local private security forces are completely overrun. At three narrow exit stairways, crowds severely crush. People fall and are trampled to death. One of the stairways is a provisional metal construction. With some 100 visitors on the stairs and many trying to enter the stairs by climbing the guardrail from the side, the whole stairway collapses, sending the whole construction and the people crashing into the crowd below.

After 25 minutes most of the visitors have fled the stadium in panic leaving a horror-scene of dead, dying and injured behind. Many lightly injured find their way home or consult emergency stations of adjacent hospitals. The final balance is 32 deaths, 91 severely injured and about 250 lightly injured.

4.1.4 Protection and Response

Security forces (mainly private) have not been trained to handle such a severe situation. The disaster develops in minutes without any noteworthy intervention – not to speak about help - by security personnel. Emergency is called and communicated by stadium management security guards and by mobile phones of visitors. Medical doctors[13]incidentally on site treat some injured patients. Emergency doctors/paramedics and ambulances arrive. First aid and triage start and so do first transportations to hospitals, according to SOPs. Stadium evacuation of remaining visitors is on-going. Another 8 dead are detected in more remote access/exit tunnels and stairways. 25 injured have reported to local hospitals.

A provisional incident control centre is installed in the stadium's communication centre. Command is taken by the head of the local fire brigade. Some hospitals report overload and lacking surgical capacity.

The incident commander asks the neighbouring city for support with paramedics and ambulances. A short-term tentative plan is agreed with the neighbouring police commander to arrange cross-border transportation, clearing of street traffic and sharing of hospital resources.

Fire brigades are securing unstable constructions and infrastructure

Police have started to search for criminal/ illegal behaviour of visitors, securing of evidence, and informing relatives of victims.

Media on site have reported and broadcasted on their own initiative. A first official media report is released 3 hours after the incident. Consultation starts with city, local and governmental authorities.

[13]there may be not that many in a concert

4.1.5 The expected benefits of a PULSE-like system

The PULSE system is not a substitute for existing procedures, planning and decision support systems. It will be designed to fill obvious or assumed gaps in the existing EU health system (EHS). In this sense it aims at contributing to harmonizing response procedures, improving decision making, harmonizing information management and controlling information distribution, improving training and feedback from lessons learned and enhancing the information exchange between authorities and people. PULSE is to provide a framework and interoperable platform for a coordinated European response.

4.1.6 The typical requirements for a PULSE-like system

The vision of this PULSE support system is of an integrated approach of innovative PULSE Models of patients and treatment effects, improved situational awareness (COP[14]) and sophisticated event evolution assessment and forecast, use of social media (e.g., via a special APP), logistics and surge capacity improvement, and powerful training and exercising tools.

For these very ambitious general objectives, the vision of a PULSE system with regards to that described in Scenario 2 Stadium Crush, a set of basic system requirements needs to be derived, which may include the following; (to name but a few samples; for details, see requirements document D2.1).

- Better monitoring of indicators
- Early on-site contingency planning
- Fast setup of disaster control (staffing, authorization, infrastructure)
- Fast and flexible on-site treatment and availability of first-aid material
- Cross border resource sharing and coordination
- Flexible and targeted use of hospital capacities, surge requirements
- Better use of volunteers and NGOs
- Flexible state-of-the-art and collaborative training and exercising

The main characteristics of this scenario are surprise, very short reaction times, local impact with limited cross-border collaboration.

4.2 Stadium Crush Scenario details

4.2.1 Context

In the last 20 years, numerous major stadium crushes or similar events in large venues have resulted in a large number of deaths and injuries. Deaths range between 12 and 300, and injuries usually 5 to 10 times as many. The main causes of deaths included;

- Collapse of stands, fences or barriers
- Poor crowd management
- Blocked emergency exits
- Narrow and overcrowded stairways and ducts
- Antagonizing fan groups
- Overreaction of police (e.g. with tear gas)

[14] Common Operational Picture

In most cases, a combination of several of these causes occurred. The PULSE approach will construct a generic scenario, which lies at the upper end of the historical spectrum.

A sample sports event scenario has been developed for similar purposes in the EU FP7 ValueSec[15] project. Respecting confidentiality restrictions, we have taken inspiration also from that case to build our context for the concert event (see Table 6).

Table 4: Scenario 2 Context

Object(s)	Data	Notes
Area/ environment/ propagation	Dublin, Ireland; big European Football stadiums: Capacity 82300 people	Filled with 82.000 fans
Population at risk	Composition of spectator population 8% elderly (over 50) 80% "fans" (15-50) 12% children (under 14)	
"Drivers" for security	Societal: Minimize fatalities and injured Ethical and legal: fair and just resource allocation, coordination of health services Political: Demonstrate preparedness and competence;Avoid escalation into the city Economic: Limit damage to infrastructure; limit damage to reputation and future business	
Hazards	Poor crowd management Collapses of stand, fences or barriers Blocked emergency exits Narrow and overcrowded stairways and ducts	Initiation: very suddenly a heavy hailstorm breaks out; lightning flashes follow Within five minutes, approximately 50% of the visitors start rushing to the exits.
Principal emergency services	Stadium security staff and stewards Local police Fire services	

[15] http://www.valuesec.eu/content/valuesec-use-cases

	Event ambulance service, Event medical centre at the stadium	
Logistics supplies and infrastructure	Main importance: Clearing of stands and access ways, tunnels etc.; Accesses/egress for transportation of patients out of the stadium and of additional principla emergency services into the stadium; Infrastructure of near hospitals; City street network; Helicopters; Limit damage to the stadium infrastructure	Limited importance: Political level above mayor

4.2.2 Characteristics

4.2.2.1 Social, ethical and legal impact discussion

The social consequences will be limited in geographical extension and number of people indirectly affected. The local consequences, however, may be rather serious: Deaths average around 75 per incident, reaching up into the hundreds, and injuries in the tens up to more than 500.

Substantial support for the psychological treatment of traumatized victims and of relatives of victims will be needed.

For further Stadium concert disasters also see http://matadornetwork.com/nights/10-deadliest-concert-disasters-of-the-last-50-years .

Table 5: Evaluation of Historical Stadium and Big Hall Crushes

Event	Location	year	Deaths	Injured; n.a.=n	Comment	Source
Victoria Hall disaster	Sunderland, UK	1883	183	?	Children panicking; emergemcy exits blocked	http://en.wikipedia.org/wiki/Victoria_Hall_disaster
Barnsley Public Hall d	Riding, UK	1908	16	>40	overcrowded galery &staircase	http://en.wikipedia.org/wiki/Barnsley_Public_Hall_disaster
Italian Hall disaster	Calumet, Mic, USA	1913	73	n.a.	Stampede of striking minersafte someone calling "Fire"	http://en.wikipedia.org/wiki/Italian_Hall_disaster#Aftermath
The Who concert disa	Cincinatti.Oh, USA	1979	11	26	Mismanagement of masses in entryways	http://en.wikipedia.org/wiki/The_Who_concert_disaster
Duisburg Tunnel disas	Duisburg, DE	2010	21	>510	Love Parade stampede: Undersize/ bottlenecks of entrance and exit tunnel and stairways	http://en.wikipedia.org/wiki/Love_Parade_disaster
Ibrox	Glasgow	1902	26	n.a.	collapse of wooden scaffold	http://www.stadiumguide.com/timelines/stadium-disasters/
Burnden Park	Bolton, UK	1946	33	400	oversold # of tickrts; metal barrier crush	http://www.stadiumguide.com/timelines/stadium-disasters/
Estado Nactional	Lima, Peru	1964	300	n.a.	Angry fans stampede after aggressive police action	http://www.stadiumguide.com/timelines/stadium-disasters/
Ibrox Stadium	Glasgow	1971	66	>200	Stampede at exit staircase	http://www.stadiumguide.com/timelines/stadium-disasters/
Luzhniki Stadium	Moscow, USSR	1982	66	n.a.	crush at staircase to Metro	http://www.stadiumguide.com/timelines/stadium-disasters/
Valley Parade	Bradford, UK	1985	56	>265	Wooden stand & debris caught fire	http://www.stadiumguide.com/timelines/stadium-disasters/
Heysel Stadium	Brussels, BE	1985	39	n.a.	Chasing of fans; collapse of perimeter wall	http://www.stadiumguide.com/timelines/stadium-disasters/
Hilsborough	Sheffield, UK	1989	96	n.a.	poor crowd management and police control	http://www.stadiumguide.com/timelines/stadium-disasters/
Stade Furani	Bastia, FR	1992	18	"hundreds"	Collapse of a temporarx stand; engineering errors, poor planning & safety management	http://www.stadiumguide.com/timelines/stadium-disasters/
Accra stadium	Accra, Ghana	2001	127	n.a.	Stampede after tear gas firing by police	http://www.stadiumguide.com/timelines/stadium-disasters/
Port Said Stadium	PtSaid, Egypt	2012	79	n.a.	Fans attacks chase and fights of fans and players	http://www.stadiumguide.com/timelines/stadium-disasters/
further sources						http://en.wikipedia.org/wiki/Categ
	Average	Mean	75,63			
		Median	61,00			

Resource triage raises significant **ethical issues**[16], i.e., how to go about allocating resources in a disaster situation while taking into account practical issues such as likelihood of benefit, change in quality of life and duration of benefit and ethical values such as fairness and justice. Guidance regarding acceptable over-triage rates is an important input into the development of tactical procedures. The issues of individual liberties and support for first responders warrant special attention in the design of processes and procedures. Legal issues relating to implementing crisis standards of care include questions concerning co-ordination of health services, liability and, where relevant, inter-jurisdictional co-operation.

[16] Adapted from WP8 input to end-users workshop (Task 2.1 Health service user requirements gathering and reviewing including threat analysis) and D2.1 Requirements specifications (Section 8.6)

4.2.2.2 Economic

The economic impact of such an event, particularly if repeated, may have serious local economic effects on future business of similar kind, reputation of the city and attractiveness for concert/promoters agencies.

4.2.2.3 Environmental

The impact on the environment is likely to be limited to none, depending on the panicking effects.

4.2.2.4 Infrastructural

Medium damages to the Stadium infrastructure. Medical practitioners and event medical emergency stations will be severely overloaded temporarily.

4.2.2.5 Political

Politics will have to demonstrate and prove the capability of planning, dispatching and controlling medical services, transportation and supplies.

They will have to supervise the spectators and use law enforcement if things get out of control. Local, up to regional politicians, need to intelligently cooperate with the media.

4.2.3 Hazard Identification

General mood has become more and more aggressive due to the delay of the main performance[17] , which has the characteristic of a final showdown.

Initiation: very suddenly a heavy hailstorm breaks out; lightning flashes follow.

Within five minutes, approximately 50% of the visitors start rushing and pushing to the exits.

4.2.4 Development and Dynamics

4.2.4.1 Time profile; major escalation

Stadium evacuation is ordered.

Security personnel are not prepared and have no chance of intervening effectively.

After 15 minutes, efforts to escape deteriorate, leaving 25 dead and 110 injured on the stand.

Medical doctors incidentally on site may present voluntarily and qualify themselves to the emergency service. It is probable that they are not emergency doctors and that they are not able to give substantial assistance; however, they may treat some injured patients.

The provisional incident control centre takes a decision, supported by the system.

Emergency doctors/ paramedics and ambulances arrive.

Triage starts in the stadium area and patients to be transferred to hospitals are selected.

Stadium evacuation is on-going.

Another 8 dead are detected in access/exit tunnels and stairways.

25 injured have reported themselves at local hospitals.

Once the emergency is over, actors should analyse their behaviour during the emergency

[17] Live Concert

in order to extract learnings to be applied in future emergencies.

4.2.4.2 Roles and responsibilities of Response forces

- Government: Has no authority for immediate response.
- Inter-agency organization/ inter-services: according to SOPs, mainly sharing and coordination of the work of private security personnel, police medical service on site and ambulances
- International coordination: None
- Local authorities: A provisional IC (incident command) is established in the control centre of the stadium
- Health services: Ambulance; Mobile medical care/ paramedics; and hospitals; are alerted and start operating according to SOPs (see also 4.2.5.3): First aid, triage, dispatching; hospital accommodation and treatment.
- Fire services: Called in to secure unstable constructions and infrastructure
- Police:Manages IC; assures public order; clears transportation routes for ambulances and emergency medicals. Possibly instructing relatives of victims
- NGOS: Mainly in support of Medical Services
- Media/ Social Media: Direct information from media on site. "Controlled" information of the public through on-site-PR agents. Avoidance of contradicting news.

4.2.5 Response characteristics

4.2.5.1 Provision

Planning, dispatching, controlling of resources and specialized equipment is taken over by the IC and coordinated with the other responder groups on site and between stadium and hospitals

- Personnel of the organizations involved
- Vehicles: Mainly the ambulances and police
- Helicopters of rescue services
- Medication: Under decision of local medical Doctors (antiseptics; pain treatment, ...)
- Hospital resources: Allocation of patients; surge plan;

4.2.5.2 Infrastructure control

- Stadium: Evacuation process; water supply to injured and other people
- Traffic/transportation: Clearing of streets by the police, for ambulances
- Energy: call for a and installation of diesel emergency power generators

4.2.5.3 SOPs to be applied (if available)

A typical generic SOP from FEMA[18] (USA) and SOP Center [19]includes the Command Officer staff to execute these tasks:

- Confirm that Central District headquarters is manned and prepared to initiate recall.
- Determine the need for and initiate additional staffing of the Alarm Room.
- Determine the need for a command officer to assume the Strategy Officer position at Alarm Headquarters.
- Confirm an FDEOC liaison is established and functioning at the incident command post(s).

[18] FEMA_FA-197.pdf

[19] http://www.sopcenter.com/downloads/doc_view/222-3-6-1-1-disaster-management

- Confirm that resource management has been opened and reserve apparatus and equipment is being prepared for service as necessary.
- Determine what apparatus needs to be placed in service and activate apparatus as deemed necessary.
- Determine what personnel resource needs to be recalled and initiate recall as deemed necessary.
- Determine/select reporting stations/locations for recalled personnel.
- Make personnel assignments as necessary

In Italy the SOPs are those of the individual EMS Services, that are different from Region to Region, and are in case of Concerts often of NGO and not official EMS Services. In mass gatherings Official EMS Ambulances are usually outside the Stadium.Basically however, the first most serious cases are taken to Level II Hospitals. When IC has taken place Triage and Transport is done according to MIMMS (Major Incident Medical Management and Support) (see: www.alsg.org/uk/MIMMS)

In Germany some SOP recommendations can also be derived from [20].

4.2.5.4 Treatment of/communication with the Media and the public:

- Formulation of public statement and release to the press and electronic media
- Information of relatives/ families of the dead and injured
- Organization of psychological support

4.2.6 Best Practices and Lessons to be learned

These are some of lessons learned which will pose specific challenges to the PULSE system:

- Lack of general risk awareness
- Deficiencies in risk perception and professional planning
- Underestimation of conflict escalation potential
- Reaction times (specify by organization involved)
- Usefulness of the PULSE APP
- Effectiveness of logistics, patient assignments
- Flexibility of surge capacities

5 PULSE Scenarios Discussion and Rationale

5.1 Starting Points

5.1.1 Scenario objectives

The purpose of the scenarios serving the PULSE project is (at least) twofold:

- The scenarios should set for the whole project a certain concrete framework for the discussions with stakeholders, for the specification of requirements and of the main functionality of the PULSE system. Nevertheless, the PULSE system will not be tailored too specifically towards the specifics of these scenarios. On the other hand, within the boundaries of budget and time of the PULSE project, it will not be

[20] http://www.dgkm.org/files/downloads/katastrophenschutz/Fuehrung_und_Leitung_im_Katastrophenschutz_in_der_BRD.pdf

possible to develop THE general purpose healthcare support system applicable to all thinkable hazardous situations. The system should, however, be expandable for scenarios different from those describe here.

- The scenarios will serve as baseline for the development of the two Use Cases which will comprise the detailed technical and operational framework in which the PULSE System will be demonstrated and evaluated. Use cases then will include the dedicated functionality, timelines, input data and required reporting schemes of the results.

PULSE, however, wants to cover a certain span of hazards and a representative set of typical scenario parameters like affected area, causes of threat/ hazard, dynamics over time, societal relevance etc.

Therefore PULSE has selected two scenarios which are characterised by substantially different sets of these attributes.

5.1.2 The two PULSE scenarios

PULSE will use two different scenarios as general framework and from there will develop two concrete scripts and data sets for the testing, demonstration and evaluation of the PULSE system:

1) a SARS-like event in Italy and
2) a major stadium 'crush' at a Dublin concert.

They were already pre-selected during proposal phase and accepted in the DoW.
Summary descriptions have been given in chapters 3 & 4. Detailed Use case descriptions derived from these scenarios are presented in chapters 6 & 7.

Different approaches exist for describing and evaluating hazardous scenarios. For the purpose of PULSE, the Irish reference documents[21,22]have been selected as forming some starting guideline. Other national approaches may differ, but to our knowledge, the basic elements are always mainly the same.[23]

5.2 Summary Classification of the Scenario Risks

In an early evaluation attempt, the basic risk features are evaluated here according to the classification schemes offered in the referenced Irish documents:

Scenario 1: SARS-like event
According to Table 5.4 of the reference1 document "A guidance to Risk Assessment", scenario1 is an "International Civil Hazard" of the type of "Epidemic/ pandemic"

Likelihood: Between likely and unlikely = once per 3-30 years
Impact: Between very serious to catastrophic = significant No's of fatalities;
>>25 Mio€ cost; cost for medical treatment, and for psychological and social care

[21] Ref.1: A Guidance to Risk Assessment;

seehttp://www.mem.ie/guidancedocuments/a%20guide%20to%20risk%20%20assessment.pdf

[22]Ref.2: A National Risk Assessment for Ireland;

see http://www.iaemo.ie/publications/documents/A_National_Risk_Assessment_for_Ireland.pdf

[23] For more information see also http://www.iaemo.ie/publications/index.shtml

Scenario 2: Stadium crush

According to Table 5.4 of the reference1 document, scenario 2 is a "Local Civil Hazard" of the type "Major Crowd Safety".

Likelihood: Likely= once per 1-10 years

Impact: Very serious= 5-50 fatalities; up to 100 serious injuries, up to 2000 evacuated; High medical and insurance cost; cost for social/psychological care

According to the reference 2 document, Figure 6 there, the SARS-Scenario of PULSE is Category "N" and the Stadium Crush scenario is Category "P".Figure below is taken from this document and is amended by an indication of the overall risk of the two PULSE scenarios.

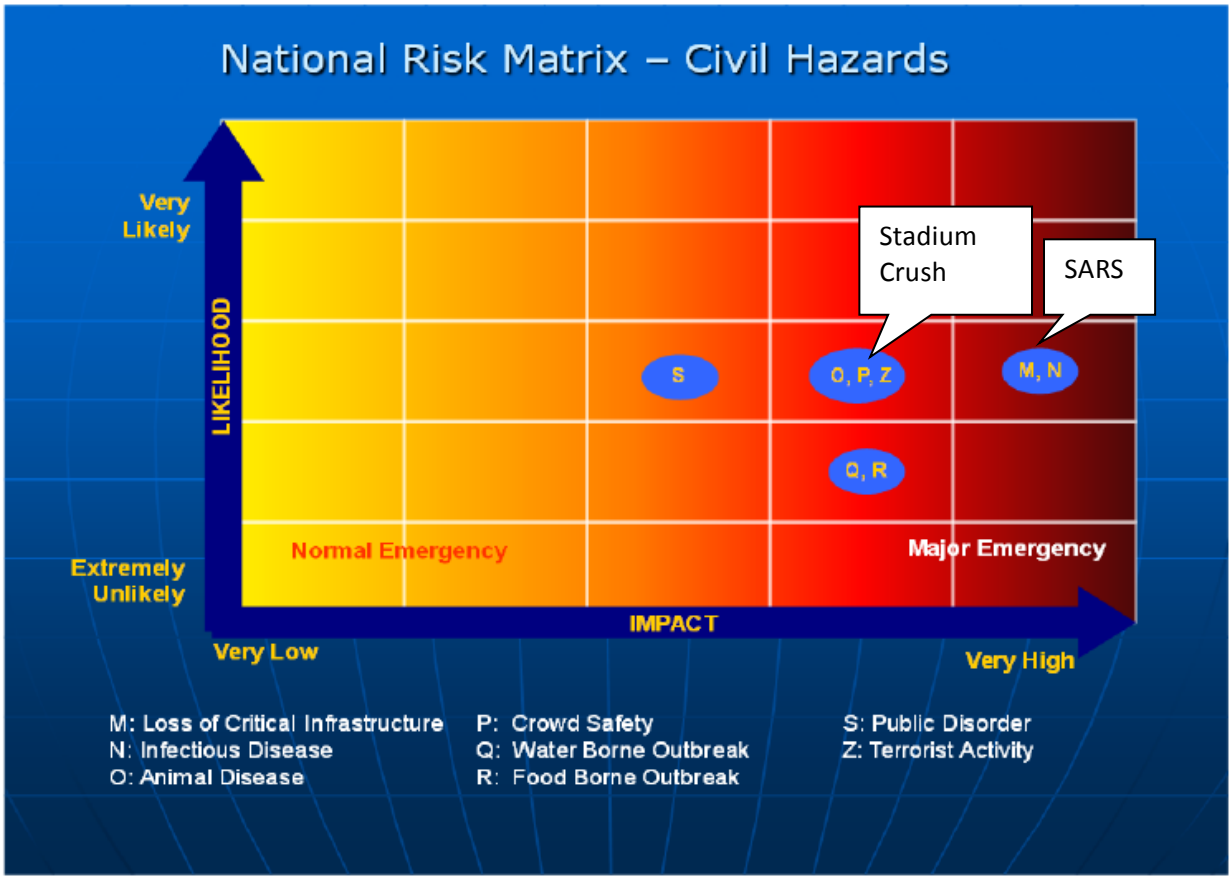

Figure 2: Risk Ranking of PULSE Scenarios

Risk ranking:

According to the Risk Matrix (fig. 2.1a of the reference document 1), both scenarios imply risks which fall into the regime of "**Major Emergency**".

5.3 Characteristics of the two Scenarios

Table 6: Comparison of main Scenario Characteristics

Characteristics	Scenario 1) SARS Incident	Scenario 2) Stadium crush
Likelihood	Between likely and unlikely	Likely
Impact	Very serious to catastrophic	Very serious
Total risk class	Major emergency	Major emergency
Affected area	From local up to international	Regional/national/international
Escalation time profile	Developing over days / weeks	Arising within minutes; lasting several hours maximum
Alerting of the public	Gradually progressing	No alerting possible
Alerting/ instructing responder services	Long preparation & pre-alerting phase	Immediately; through emergency dispatching centres
Importance of international coordination	Very extensive	Only if event is located close to a border
Type of international coordination/ collaboration	Sharing of the • Identification of source of agent • scientific investigation of the agent type • Investigation of infection route(s) • hospital resources • special treatment • resources like Medications (Vaccines; antibiotics; ...) • sharing/mutual support in transportation of patients, ...	Coordination: Search and Rescue-Teams; Equipment , and Know How; Transfer/ distribution/ allocation of very seriously injured persons
Political relevance	High; on local / national government to international level	Low to medium; High impact on local level if there had been pre-alerts of a threat[24]
Societal public perception	Very high	Limited
Societal reactions	Very intensive, depending on spread and seriousness of infections	Locally limited concerns
Societal consequences/ impact on social order, peace	May escalate to panicking; undue withholding of medication; hoarding; looting;	Limited
Ethical and psychological implications	Broad; may cause deep doubts and mistrust against	Limited; psychological treatment of relatives

[24] Depends on whether this scenario is caused by "internal" tensions or "external" trigger (e.g. terroristic)

	public admin. and healthcare system	
Economic impact	May be very serious (loss of working force, ...)	Locally limited
Environmental impact	Possible impact on local, regional animal populations (if susceptible to the disease)	None to minor
Impact on vital infrastructures	On hospitals and ambulance services Collapse of health care sector due to loss of work force on the one side and high numbers of patients in need of intensive care. Possible collapse of supply chains due to loss of work force	Local stadium and possibly some surrounding infrastructure
Priority requirements: **Preparedness**	Medication stocks Early warning indication system Capacity planning Quality of diagnosis Hospital surge capability Communication strategies International coordination regulations	Resilience of stadium and site infrastructure Quality of first responders Real-time indicator monitoring Adaptive response capability
Priority requirements:**Response**	Alerting of medical and public order services Forecasting of development and spreading Public communication Inter-services and international cooperation Monitoring of criminal escalations	Very short-term decision making On-site communication Monitoring of critical spots and events First aid capability Fast reinforcement of security staff

5.4 Summary Evaluation of the Scenarios

The selected scenarios show substantial differences in their basic characteristics and this way they facilitate to evaluate the PULSE system in a representative set of environments.

5.4.1 Characteristic Differences and Generalization

The two scenarios substantially differ in their basic characteristics which can be seen from the classification in Table 6 above. The basic differences concern the attributes of

- Geographical area
- Creation time and developing time-profile
- No. of victims
- Type of injuries and other damages
- Societal perception and impact

- Political and international relevance

This will also be reflected in the substantially different capability requirement for both, the preparedness and the response (see last two lines in Table 6).

Nevertheless, the two scenarios represent only a limited selection of possible future scenarios with high impact on lives and health of citizens and on the challenges implied, for direct responders and organizations in charge of responding[25].

Re-phrasing the Scenario naming, we can capture a wider set of emergencies where the PULSE Platform may be usable and improve performance:

- SARS scenario →Epidemics of SARS-like infectious respiratory disease
- Stadium crush scenario →Local incident with many casualties during a planned mass gathering

This means that PULSE fully applies not only to the two representative scenarios, but, for instance, also to:

- Seasonal influenza epidemics
- Localized outdoor or indoor crowd events (e.g., concerts, festivals, sporting events, parades, agricultural shows).

PULSE Platform may also be partially applied in case of some "non planned" events, using it during the Response phase (e.g., an incident in a big discotheque).

5.4.2 Adequacy to produce good PULSE Experiment Results

Although the final PULSE system should be capable of supporting any kind of hazardous disasters with health consequences, within the project it can be verified and validated only in a limited set of use cases. The system will be evaluated against a number of Measures of Effectiveness (MoE) which still need to be elaborated in detail. But the spread of the scenarios will allow to test a wide range of MoEs:

Table 7: MoEs samples covered by the 2 Scenarios

MoE	Scenario 1: SARS	Scenario2: Stadium
Fast reaction		X
Sustained support over a long time	X	
Saving of lives	X	X
Sharing of resources	X	
Cross-services coordination		X
International coordination	X	
Scientific and experts support	X	

Details of the evaluation methodology and MoEs will be worked out in WP5.

[25] For CBRN, see e.g. http://www.cato-project.eu/

6 SARS Scenario Use Case

6.1 Weak Signal detection and surveillance

ID	UC-SARS LIKE - 01
Title	**Weak signal detection and surveillance**
Related Scenario	SARS
Description	A weak signal is notified to the competent authorities that will take the decisions based on the WHO and ECDC guidelines
Pre-conditions	The country (Italy) can be in two possible stages: 1. WHO inter-pandemic phase 2 (level 0) – No assessed risk in the country 2. WHO inter-pandemic phase 3 (level 0) – No assessed infections in the country
Actors	- National Authority(Ministry of Health) - World Health Organization (WHO) - Regional Authority
PULSE Tools involved	- DSVT - IAT - ENSIR
Trigger	A weak signal is detected in Italy by the PULSE system. A weak signal is generated by analysing news articles from specialised official and unofficial medical sites, blogs and online newspapers. The analysis is based on the Natural Language Processing technique.[26]
Basic Path	1. The system (**DSVT**, **IAT**) automatically sends an e-mail and a SMS to the competent authorities' contact points (e.g. European Authority, National Authority, Regional Authority or WHO contact point) describing the main weak signal characteristics (e.g. the e-mail contains the weak signal approximate location, and a short description, the SMS contains the approximate location and a max 100 words summary) 2. The user that has received the notification logs on to the web-portal interface of the PULSE system (**DSVT**) 3. The **DSVT** based on the provided credentials, detects the user's role (e.g. National Authority, Regional Authority or WHO role). 4. If the user has the WHO role: a. The user selects the "weak signal detection" functionality on the **DSVT** web portal interface. b. The **DSVT** shows all the received weak signals. The weak signals that have not yet been analysed are marked in red, the other ones are marked in green. c. The user selects the last received weak signal and clicks on the button "more details". d. The **DSVT** shows a detailed description of the signal (e.g. description of the sources that generated the signal) and

[26] Regarding the weak signal generation functionality we are considering the possibility to integrate the PULSE system with the EMM (Europe Media Monitor) developed by the JRC in Ispra.

	localizes it on a dedicated map. e. The user clicks on the “Categorize signal” button, selects the event type (e.g. SARS, Ebola, etc.)and selects in a drop down menu list if the event is “relevant” or “not-relevant”: i. The user categorizes the signal as “relevant” 1. The system (**DSVT**, **IAT**) stores the information and correlates it with other previous signals for that specific event type (e.g. SARS). 2. If the correlation (based on e.g. the signal localization) states that several signals have been generated in the same zone (e.g. 10 km range), the system (**DSVT**) sends suggested guidelines to the Regional and National Authorities. 3. The user clicks on the button “See the possible evolution”. 4. The user moves a slider to set a future date. 5. The system (**ENSIR**)shows on a map a prediction of the possible spread of the disease based on all the stored signals marked as “relevant” for a specific event (e.g. SARS). ii. The user categorizes the signal as “not-relevant” 1. The system stores the information that will be used to optimize the weak signal detection in actual and future cases (**IAT**) 5. If the user has the Regional Authority role: a. He/she views in the “Suggested guidelines” the suggestion “Contact the laboratories“. The suggestion has been generated in the step e.i.2. b. He/she clicks on the “Ok” button. c. The system (**DSVT)** shows a new panelcontaining the list of contacts (e-mails, phone numbers) of national and regional laboratories ready to provide disease identification. The information is automatically generated based on the stored weak signals. d. He/she selects one or more laboratories and clicks on the “Send a message” button. e. The system (**DSVT)** shows a new panel containing a template of the communication to be sent to the provided laboratories asking for an upgrade of the diagnostic systems. f. The user, if necessary, modifies the text and then clicks on the “Send” button. g. The system (**DSVT)** delivers the communication to the selected laboratories via e-mail. 6. If the user has the Regional Authority role: a. He/she views in the “Suggested guidelines” the suggestion “Contact the health operators“. The suggestion has been generated in the step 4.e.i.2. b. He/she clicks on the “Get more info” button. c. The system (**DSVT)** shows a new panel containing a template of the communication to the health operators regarding the guidelines to be followed in order to identify a

	possible/probable/confirmed case. d. The user prints out the completed template on official headed notepaper and sends it to the Authority though appropriate channels (e.g. official letters) 7. If the user has the National Authority role: a. He/she views in the "Suggested guidelines" the suggestion "Activate surveillance protocol ".The suggestion has been generated in the step 4.e.i.2. b. He/she clicks on the "Get more info" button. c. The system(**DSVT)** shows a new panel with the information necessary (see http://www.who.int/influenza/resources/documents/WHO_Epidemiological_Influenza_Surveillance_Standards_2014.pdf) to activate surveillance protocol for foreign travellers, health operators working with probable disease patients, laboratories personnel manipulating viral samples and contacts of probable cases. All these procedures are handled through official National channels and the PULSE system only suggests the steps that should be followed.
Post-condition	The weak signal has been detected, classified and the suggested guidelines have been followed.

6.2 An airplane is landing in Italy. A probable case is now identified

ID	UC-SARS LIKE - 02
Title	**An airplane is landing in Italy. A probable case is now identified**
Related Scenario	SARS
Description	One person suffering from the usual SARS symptoms has been detected by the Malpensa Airport medical centre (USMAF) and the PULSE system gives recommendations on the procedure that needs to be followed.
Pre-conditions	WHO pandemic phase 3 (level 0) - No assessed cases in Italy WHO pandemic phase 3 (level 1) - No assessed cases in Italy but intense commercial connections (e.g. flights) with infected countries WHO pandemic phase 4 (level 0) WHO pandemic phase 4 (level 1) – Assessed cases of SARS in Italy.
Actors	- Airport Medical Centre (USMAF - Ufficio di sanità marittima aerea e di frontiera) - National Authority - IHR Contact Point - Aircraft personnel
PULSE Tools involved	- DSVT - Smartphone app - Logistic tool

Trigger	A person has just landed in Italy with high fever and the usual SARS symptoms
Basic Path	1. The pilot in command of an aircraft or the pilot's agent, in flight or upon landing at the airport, logs on to the system by using the system web interface (**DSVT**) or the **Smartphone app**. 2. The system (**DSVT)** based on the provided credentials, detects the user's role (e.g. Pilot). 3. The pilot completes the module "*Health Part of the Aircraft General Declaration*"[27],provided by the system (**DSVT**), stating that a probable case, suffering of the usual SARS symptoms has been noticed on the aircraft. 4. USMAF receives an alert, generated by the system (**DSVT**), via SMS, fax, e-mail and notification on the **DSVT** web interface. 5. USMAF logs on to the system (**DSVT**). 6. The **DSVT** based on the provided credentials, detects the user's role (e.g. Airport Medical Centre USMAF). 7. USMAF views the panel called "Alert"where the notification appears. 8. USMAF views the panel called "Probable cases" and clicks on the button "Create a new case". 9. <offline procedure>[28]USMAF personnel immediately prepares to get on board of the aircraft to make a preliminary diagnosis. a. If the patient's preliminary diagnosis is "SARS positive": i. USMAF views the "Confirmed disease" drop-down menu list and selects "SARS" ii. The system (**DSVT)** shows a new panel containing a form where it is possible to fill out the actual person symptoms, his/her personal information (e.g. name, last name, country, address etc.) and his/her travel history. iii. USMAF fills out the provided form. iv. If necessary, USMAF starts the procedure to verify the health status of the confirmed case's nearest contacts. 1. If the confirmed case lives in Italy: a. The system (**DSVT**) automatically sends a notification to the nearest Local Health Authority (e.g. in Italy ASL) based on the confirmed case's address (obtained in step 10.a.ii). The notification contains the request to verify the presence of SARS cases. 2. <offline procedure>USMAF obtains the flight

[27] Annex 9 of the WHO Health Regulations.

[28] The <offline procedure> does not foresee an interaction with the PULSE system and is performed through other official channels

	passengers list. 3. USMAF adds the passengers' data (e.g. name, last name, address, phone number) in the "Nearest contacts" menu provided by the system(**DSVT**). v. USMAF clicks on the "Send" button. vi. The system (**DSVT**) automatically sends a notification via SMS and email to the National Authority. vii. The system(**DSVT, SCGT, LT**) automatically generates, based on the patient symptoms, the possible patient destination (e.g. specialized hospital, major hospital). 1. The **LT**considers the following priority destination list in order to suggest the most efficient hospital: a. Nearest Specialized hospital b. Nearest Major Hospital with proper resources available viii. USMAF views in the "Suggested guidelines" panel the information regarding the possible patient destination. ix. <offline procedure> The probable case is brought with an ambulance to the suggested specialized hospital. b. If the patient's diagnosis is "SARS negative": i. USMAF views the "Confirmed disease" drop-down menu list and selects "No disease". 10. National Authority receives the notification and the logs on to the system (**DSVT**) 11. The system (**DSVT**) based on the provided credentials, detects the user's role (e.g. National Authority). 12. National Authority views the panel called "Alert" where the notification appears. 13. National Authority views the panel called "Confirmed cases" where the preliminary information (inserted by the USMAF) about the confirmed case appears. 14. The system (**DSVT)** shows a new panel containing a form where it is possible to fill out all the information included in the "*Decision instrument for the assessment and notification of events that may constitute a public health emergency of international concern*" [29]questionnaire. The form contains also the actual person symptoms, his/her personal information (e.g. name, last name, country, address etc.) and his/her travel history. 15. National Authority fills out the provided form and clicks on the "Send" button. 16. The system (**DSVT**) automatically delivers the questionnaire via e-mail and fax to the nearest IHR Contact Point.

[29]Annex 2 of the WHO Health Regulations.

Post-condition	The IHR Contact Point and the National Authority have been notified about the confirmed case. The confirmed case is then transferred to the nearest specialized centre (in Italy e.g. Spallanzani in Rome and Sacco in Milan)

6.3 A ship is arriving in Italy. A passenger has been identified as probable case

ID	UC- SARS LIKE-03
Title	**A ship is arriving in Italy. A passenger has been identified as probable case**
Related Scenario	SARS
Description	One person suffering from the usual SARS symptoms has been detected by the master of a ship, or the ship's surgeon if one is carried,and the PULSE system gives recommendations on the procedure that needs to be followed.
Pre-conditions	WHO pandemic phase 3 (level 0) - No assessed cases in Italy WHO pandemic phase 3 (level 1) - No assessed cases in Italy but intense commercial connections (e.g. flights) with infected countries WHO pandemic phase 4 (level 0) WHO pandemic phase 4 (level 1) – Assessed cases of SARS in Italy.
Actors	- Port Medical Centre (USMAF - Ufficio di sanità marittima aerea e di frontiera) - National Authority - IHR Contact Point - Ship personnel
PULSE Tools involved	- DSVT - Smartphone app - Logistic tool
Trigger	A person on a ship shows the usual SARS symptoms .
Basic Path	1. The master of a ship, or the ship's surgeon if one is carried, logs-in into the system by using the system web interface (**DSVT**) or the **Smartphoneapp**. 2. The system (**DSVT)** based on the provided credentials, detects the user's role (e.g. Ship master). 3. The master of the shipcompletes the "*Model of maritime declaration of health*"[30], provided by the system(**DSVT)**, stating that a probable case, suffering of the usual SARS symptoms has been noticed on the ship. 4. USMAF receives an alert, generated by the system (**DSVT**), via

[30] Annex 8 of the WHO Health Regulations.

	SMS, fax, e-mail and notification on the system web interface (**DSVT**). 5. USMAF logs on to the system (**DSVT**). 6. The **DSVT** based on the provided credentials, detects the user's role (e.g. Airport Medical Centre USMAF). 7. USMAF views the panel called "Alert" where the notification appears. 8. USMAF views the panel called "Probable cases" and clicks on the button "Create a new case". 9. <offline procedure> USMAF personnel immediately prepares to get on board of the ship to make a preliminary diagnosis. a. If the patient's preliminary diagnosis is "SARS positive": i. USMAF views the "Confirmed disease" drop-down menu list and selects "SARS" ii. The system (**DSVT)** shows a new panel containing a form where it is possible to fill out the actual person symptoms, his/her personal information (e.g. name, last name, country, address etc.) and his/her travel history. iii. USMAF fills out the provided form. iv. If necessary, USMAF starts the procedure to verify the health status of the confirmed case's nearest contacts. 1. If the confirmed case lives in Italy: a. The system (**DSVT**) automatically sends a notification to the nearest Local Health Authority (e.g. in Italy ASL) based on the confirmed case's address (obtained in step 10.a.ii). The notification contains the request to verify the presence of SARS cases. 2. <offline procedure> USMAF obtains the ship passengers list. 3. USMAF adds the passengers' data (e.g. name, last name, address, phone number) in the "Nearest contacts" menu provided by the system (**DSVT**). v. USMAF clicks on the "Send" button. vi. The system (**DSVT**) automatically sends a notification via SMS and email to the National Authority. vii. The system(**DSVT, SCGT, LT**) automatically generates, based on the patient symptoms, the possible patient destination (e.g. specialized hospital, major hospital). 1. The **LT**considers the following priority destination list in order to suggest the most efficient hospital: a. Nearest Specialized hospital b. Nearest Major Hospital with proper

	resources available viii. USMAF views in the "Suggested guidelines" panel the information regarding the possible patient destination. ix. <offline procedure> The probable case is brought with an ambulance to the suggested specialized hospital. b. If the patient's diagnosis is "SARS negative": i. USMAF views the "Confirmed disease" drop-down menu list and selects "No disease". 10. National Authority receives the notification and logs on to the system (**DSVT**) 11. The system (**DSVT**) based on the provided credentials, detects the user's role (e.g. National Authority). 12. National Authority views the panel called "Alert" where the notification appears. 13. National Authority views the panel called "Confirmed cases" where the preliminary information (inserted by the USMAF) about the confirmed case appears. 14. The system (**DSVT)** shows a new panel containing a form where it is possible to fill out all the information included in the "*Decision instrument for the assessment and notification of events that may constitute a public health emergency of international concern*" [31]questionnaire. The form contains also the actual person symptoms, his/her personal information (e.g. name, last name, country, address etc.) and his/her travel history. 15. National Authority fills out the provided form and clicks on the "Send" button. 16. The system (**DSVT**) automatically delivers the questionnaire via e-mail and fax to the nearest IHR Contact Point.
Post-condition	The IHR Contact Point and the National Authority have been notified about the confirmed case. The confirmed case is then transferred to the nearest Specialized centre (in Italy e.g. Spallanzani in Rome and Sacco in Milan)

6.4 Identification of a new probable case in a community

ID	UC-SARS LIKE - 04
Title	**Identification of a new probable case in a community**
Related Scenario	SARS
Description	One person coming from a community is suffering of the usual

[31] Annex 2 of the WHO Health Regulations.

	SARS symptoms. The PULSE system gives recommendations on the procedure that needs to be followed. There are already assessed cases of SARS in Italy.
Pre-conditions	WHO pandemic phase 4 (level 1) WHO pandemic phase 5 (level 0)
Actors	- General Practitioners - EMS (118) - Hospital Emergency Medical Department - Regional Authority - National Authority - Specialized hospitals - Major Hospitals - IHR Contact Point
PULSE Tools involved	- DSVT - SCGT - Logistic Tool
Trigger	A person in a community is suffering of the usual SARS symptoms and has been detected by a general practitioner, the EMS (118 in Italy) or an Hospital Emergency Medical Department.
Basic Path	1. The user logs on to the web-portal interface of the PULSE system (**DSVT**). 2. The system (**DSVT)** based on the provided credentials, detects the user's role (e.g. GP, EMS, EMD, Major Hospital, Specialized hospital). 3. If the user's role is "GP", "EMS" or "EMD": a. The userviews the panel called "Probable cases" and clicks on the button "Create a new case". b. The **DSVT** shows a new panel containing a form where it is possible to describe the actual person symptoms, his/her personal information (e.g. name, last name, country etc.). c. The userfills out the provided form and clicks on the "Send" button. d. The system(**DSVT, SCGT, LT**) automatically generates, based on the patient symptoms, the possible patient destination (e.g. specialized hospital, major hospital). i. The **LT**considers the following priority destination list in order to suggest the most efficient hospital: 1. Nearest Specialized hospital 2. Nearest Major Hospital with proper resources available e. The user views in the "Suggested guidelines" panel the information regarding the possible patient destination. f. <offline procedure>The probable case is brought with an ambulance to the suggested specialized hospital. g. <offline procedure>The specialized hospital makes a diagnosis of the patient within 12 hours. 4. If the user's role is "Major Hospital or "Specialized hospital". a. The system (**DSVT)** shows a panel called "Probable cases". b. The hospital manager writes the Patient name and clicks

	on the button “Search”. c. The hospital manager views the information filled out by the GP, EMS or EMDand clicks on the button “Update information”. d. The hospital manager updates the patient diagnosis information. e. The hospital manager clicks on the button “Send an alert”. A new panel is shown where the hospital manager can classify the patient as “SARS” or “NOT-SARS”: i. If the patient’s diagnosis is “SARS positive”: 1. The hospital manager views the “Confirmed disease” drop-down menu list and selects “SARS” 2. The system (**DSVT)** shows a new panel containing a form where it is possible to fill out the actual person symptoms, his/her personal information (e.g. name, last name, country, address etc.) and his/her travel history. 3. The hospital manager fills out the provided form and clicks on the “Send” button. 4. The system (**DSVT**) automatically delivers the questionnaire via SMS and e-mail to the National Authority. ii. If the patient’s diagnosis is “SARS negative”: 1. GP, EMS or EMDviews the “Confirmed disease” drop-down menu list and selects “No disease” 5. If the user’s role is “National Authority”: a. National Authority views the panel called “Alert” where the notification appears. b. National Authority views the panel called “Confirmed cases” where the preliminary information (inserted by the GP, EMS or EMD) about the confirmed case appears. c. The system (**DSVT)** shows a new panel containing a form where it is possible to fill out all the information included in the “*Decision instrument for the assessment and notification of events that may constitute a public health emergency of international concern*” [32]questionnaire. The form contains also the actual person symptoms, his/her personal information (e.g. name, last name, country, address etc.) and his/her travel history. d. National Authority fills out the provided form and clicks on the “Send” button. e. The system (**DSVT**) automatically delivers the questionnaire via e-mail and fax to the nearest IHR Contact Point.
Post-condition	The patient has been treated at the Specialized centre and, in case of SARS positive, the IHR Contact Point and the National

[32]Annex 2 of the WHO Health Regulations.

	Authorityhave been notified about the confirmed case.

6.5 Assessment of the available medical resources during the pandemic phase

ID	UC-SARS LIKE - 05
Title	**Assessment of the available medical resources during the pandemic phase**
Related Scenario	SARS
Description	National Authority declares SARS as a pandemic disease and requires information on the availability of medical resources from health facilities.
Pre-conditions	WHO pandemic phase 5 (level 1) WHO pandemic phase 6 (level 1)
Actors	- Hospital - National Authority
PULSE Tools involved	- DSVT - SCGT - LT
Trigger	WHO declares SARS as a pandemic disease
Basic Path	1. The user logs on to the system (**DSVT**) 2. The system (**DSVT)** based on the provided credentials, detects the user's role. 3. If the user's role is "*National Authority*": a. The DSVT shows a panel called "Resources assessment". b. The National Authority clicks on the button "Send a request to all the hospitals" c. The system (**DSVT**)sends a communication (via SMS and email) to all the Hospitals asking for an assessment of the available medical resources and asks to log-in to the PULSE system. d. The system (**DSVT**) provides a table describing the current status of the medical resources. (The system also provides more specific information based on the user request) 4. If the user's role is "*Hospital*": a. The system (**DSVT)** shows a panel called "Resources" containing the current hospital medical resources. i. The system(**DSVT**)provides an interface to the

	tools involved in the medical resources management (**LT, SCGT**) b. The hospital manager updates the current resources. c. The system (**DSVT**, **LT**) stores the updated information. d. The hospital manager views the "Surge capacity Evolution" panel provided by the system (**DSVT, SCGT**) and click on the button "Execute". i. The **DSVT**asks the **SCGT** a surge capacity evolution during the following 48 hours. ii. **DSVT** shows the results returned by the **SCGT**. e. <offline procedure>The Hospital manager according to the provided results, updates the current medical resources outside the PULSE system: i. implements early discharge ii. obtains new equipment resources (e.g. ventilators) iii. (not mandatory) asks for new resources (delivery of email to the competent department not handled by the PULSE system). f. The Hospital manager updates the currentstate by using the "Resources" panel provided by the PULSE system (**DSVT**, **LT**). g. The system (**DSVT**) stores the information coming from the hospitals and sends a notification to the National authority that the hospital resources have been updated. 5. If the user's role is "*WHO*": a. the system(**DSVT**) provides a panel called "Actual resources" describing the current status of the medical resources. (The system also provides more specific information based on the user request)
Post-condition	National and Regional authorities can take a decision on the social/economical/logistic impact of the pandemic current status.

6.6 ECDC recommendations

ID	UC-SARS LIKE - 06
Title	**ECDC recommendations**
Related Scenario	SARS
Description	Assessment of the epidemic evolution during ECDC periodic meetings and creation of recommendations.
Pre-conditions	WHO pandemic phase 4 (level 1) WHO pandemic phase 5 (level 1) WHO pandemic phase 6 (level 1)

Actors	- ECDC - Robert Koch Institute - IsitutoSuperiore di Sanità (ISS) - Norwegian Institute of Public Health - Health Protection Agency (HPA) - … and other similar agencies
PULSE Tools involved	- DSVT - ENSIR
Trigger	1. Identification of a novel virus with deadly cases 2. WHO report of world-wide infection
Basic Path	1. The user logs into the system (**DSVT**) 2. The system (**DSVT**) based on the provided credentials, detects the user's role (e.g. see actors). 3. The user views the available information of the on-going crisis: a. A map showing the distribution of probable and confirmed cases in Europe. b. The warnings coming from the WHO. c. A graph showing the trend of the epidemic evolution (comparison of the epidemic stages during the days of the epidemic growth) d. If available, the virological information of the probable and confirmed cases. 4. The user can customize the observation period by using a slider (or date-time pitcher) provided by the system (**DSVT**). 5. The user clicks on the button "See the possible evolution" and moves a slider to set a future date. 6. The system (**DSVT**, **ENSIR**) shows on the map a prediction of the possible spread of the disease based on the trend and on the probable and confirmed cases.
Post-condition	The Advisory Forum of ECDC, based on the results provided by the PULSE system, issues recommendations and publish them by using the official communication protocols

6.7 National Authority periodic assessment

ID	UC-SARS LIKE - 07
Title	**National Authority periodic assessment**
Related Scenario	SARS
Description	Assessment of the epidemic evolution during national meetings and communications to the media
Pre-conditions	WHO pandemic phase 5 (level 1) WHO pandemic phase 6 (level 1)
Actors	- National Authority - Hospitals - Italian medicines Agency (AIFA)

PULSE Tools involved	- DSVT - LT
Trigger	A meeting amongst the National steering group is organized during the crisis evolution in order to assess the epidemic evolution
Basic Path	1. The National Authority logs-in into the system (**DSVT**) 2. The system (**DSVT**) based on the provided credentials, detects the user's role (e.g. National Authority, Emergency management). 3. The National Authority views the available information of the on-going crisis: a. A map showing the distribution of probable and confirmed cases in Italy. b. The status of the hospitals' resources (e.g. ventilators, vaccines, anti-virals, ppe, staff) shown directly on the map and/or described in a proper table view (**DSVT**, **LT**). c. The warnings coming from the WHO and ECDC about the epidemic situation worldwide. d. A graph showing the trend of the epidemic evolution (comparison of the epidemic stages during the days of the epidemic growth) 4. The National Authority can customize the observation period by using a slider (or date-time pitcher) provided by the system(**DSVT**). 5. The system (**DSVT**) provides a panel called "Recommendations" where the user can views: a. A suggestion of a new resources assessment if the actual information is not updated (e.g. enforcing hospital to re-assess their resources if their last assessment is dated). See UC-5. b. Based on the trend analysis, suggestion for major resources procurement 6. The system (**DSVT**) provides a panel called "Scenario evolution" where the user can views: a. The map showing the distribution of probable and confirmed cases in Italy. b. The status of the hospitals' resources (e.g. ventilators, vaccines, anti-virals, ppe, staff) shown directly on the map. 7. The user clicks on the "Start evolution" button. a. The simulation consists in the visualization of the epidemic evolution taking into account the actual hospital resources. 8. The user views in the "Recommendations" panel a new recommendation on resources procurement. a. The results consists of the quantity of necessary drugs, ventilators, hospital beds and staff in a specific zone that the evolution suggests will risk the epidemic spread. 9. <offline procedure>The National Authority, based on the generated recommendations, contacts the Italian medicines

	Agency (AIFA) to procure drugs and delivers them to the hospitals in the “risk” zone. 10. The National Authority clicks on the button “Send an alert” and specifies the number of suggested resources (e.g. beds, ventilators and staff). 11. The system (**DSVT**) automatically delivers the notification, via e-mail, to all the hospital in the “risk” zone. 12. <offline procedure>The National steering group (composed of the National Authority and the Emergency managers) creates a new updated plan based on the retrieved information. 13. The National steering group decides to share the current situation with the media and with the social networks (e.g. Twitter). 14. The National Authority clicks on the “Send a communication” button and the system(**DSVT**) opens a new panel containing a possible template for the communication to the public. 15. The National Authority, if necessary, updates the message and select the news agencies that will receive the communication. 16. The National Authorityclicks on the “Send” button and the system(**DSVT**) shares the communication with the social networks and with the selected news agencies.
Post-condition	An optimization of the resources has been carried out, a new plan has been issued based on the information provided by the PULSE system and a communication has been delivered to the social and news media.

6.8 Post emergency learning at national level

ID	UC-SARS LIKE - 08
Title	Post emergency learning at national level
Related Scenario	SARS
Description	The National Authority evaluates how the country responded to the epidemic
Pre-conditions	Inter-pandemic WHO pandemic phase 6 (level 1)
Actors	- National Authority
PULSE Tools involved	- DSVT - PCET
Trigger	Conclusion of a world-wide epidemic
Basic Path	1. The National Authority logs on to the system (**DSVT**) 2. The system (**DSVT**) based on the provided credentials,

	detects the user's role (e.g. EDCD). 3. The National Authority views the information regarding the crisis: a. Map of the epidemic spread distribution. b. A table containing resources that have been used for the crisis management and mitigation. 4. The National Authority clicks on the button "Correlate with past crisis". 5. The system (**DSVT**) shows a possible selection of past crisis. 6. The National Authority selects one of the past crisis and clicks on the button "Ok". 7. The system(**DSVT**) shows a new graph containing a correlation of the epidemic data extracted from the last and the past crisis (e.g. correlation of the mortality data including cause of death)
Post-condition	The National Authority has updated its lesson learned by exploiting the results provided by the PULSE system.

6.9 Post emergency learning at WHO level

ID	UC-SARS LIKE -09
Title	**Post emergency learning at WHO level**
Related Scenario	SARS
Description	The WHO evaluates how the epidemic has been handled and compares its evolution with past crisis
Pre-conditions	Inter-pandemic WHO pandemic phase 6 (level 1)
Actors	- WHO
PULSE Tools involved	- DSVT - PCET
Trigger	Conclusion of a world-wide epidemic
Basic Path	1. The WHO logs-in into the system (**DSVT**) The system (**DSVT**) based on the provided credentials, detects the user's role (e.g. WHO). 2. The WHO views the information regarding the crisis: a. Map of the epidemic spread distribution. b. A table containing resources that have been used for the crisis management and mitigation. c. A list of the decision points taken during the course of the crisis. A click on one of the decision point will open a new panel containing the correlation between event and data (e.g. trend of the death cases after the decision point) 3. The WHO clicks on the button "Correlate with past crisis".

	4. The system (**DSVT**) shows a possible selection of past crisis. 5. The WHO selects one of the past crisis and clicks on the button “Ok”. 6. The system (**DSVT**) shows a new graph containing a correlation of the epidemic data extracted from the last and the past crisis (e.g. correlation of the mortality data including cause of death) 7. The WHO can decide to evaluate the effectiveness of the plans implementation by simulating the spread of the disease in case of parameters variation. 8. The WHO views the panel called “Epidemic evolution” and clicks on the button “See the possible epidemic evolution”. 9. The system (**DSVT**) shows a new panel where the user can customize the simulation initial parameters. 10. The WHO clicks on the button "Start simulation” 11. The system (**DSVT**, **ENSIR**) shows a possible evolution of the epidemic on a dedicated map.
Post-condition	The WHO has updated its lesson learned by exploiting the results provided by the PULSE system.

7 Stadium Crush Scenario Use Cases

7.1 Scoring System in the Event Medical and Other Plan Preparation Phase

Use Case ID	UC - STADIUM CRUSH -01
Name	**Scoring System in the Event Medical and Other Plan Preparation Phase**
Related Scenario	Pulse Crowd Crush at a stadium
Description	Scoring of an event to establish parameters for an event medical plan ‘0’ score is also included to ensure that checkboxes are not omitted accidently The PULSE platform will provide a combination of three tools to facilitate Web App Display RCS DSV-T
Pre-conditions	Crowd Event is planned that requires specific medical plans to be prepared and submitted to a regional authority for permission and to

	provide the regional authority with a means of accessing the risk likely for a specific event.
Primary Actors	1. Event Medical Co-ordinator [EMC] 2. Regional Authority
Primary Actor Definition	1. Event Medical Co-ordinator: The person with the clear task of overall control and coordination of medical/first-aid provision at the event. That person is not a public servant. They are the agent of the organisers and the single point of contact in relation to the event medical plan. That person is also the point of contact for the Regional Authority official agencies dealing with the planning and running of events. 2. Regional Authority is the official organisation who grants permission for the crowd event, or who is required to make preparations for the event or who will be responsible for co-ordination of the response.
Trigger	Requirement to notify a planned event to the regional authority
Basic Path or flow	Primary Actor 1 logs onto the Web App and enters data into a series of fields. User selects field 1, a satellite image of an area is displayed, the user zooms into the area where the stadium is located. An outline tool is selected and user draws a bounding box around the area. An image of the area is displayed on screen and the GPS location of the event displayed in the field. User selects Field 1, a satellite image of an area is displayed the user zooms into the area where the stadium is located. An outline tool is selected and user draws a bounding box around the area. An image of the area is displayed on screen onto the Display RCS. There is no score applied to Field 1. The data is transferred to the satellite image of the area displayed. User selects field 2, User selects relevant checkbox from list below. Each selectionis given an individual score.These scores are from 0 to 5 .As each is selected a running total score for field 2 is displayed on screen as a total and an increasing bar. — Urban — rural — New site — existing site — Stadium — Outdoor in confined location, e.g. park, other outdoor, e.g. festival — widespread public location in streets — Temporary outdoor structures — Includes overnight camping — Seated, Standing or Mixed. — All daylight event

	— Begins in daylight and ends after dark — Begins in dark and ends in daylight — Dependant on fair weather conditions — All dark event, — Lighting User selects Field 3 which relates to the anticipated health response capability in the geographic area for potential emergency response to the event. User selects relevant checkbox from list below. As each checkbox is selected a score between 0 and 5 is inserted and a running total score for field 3 is the displayed on screen/increasing bar — Nearest AcuteHospital or hospitals — Size — By-pass protocols — likely activity at the proposed time — Nearest Ambulance Bases, size, alternatives and back- up, — likely activity at the proposed time — Other health care facilities and resources — Existing population These individual scores are aggregated into a total score for Field 3. User selects field 4 which relates to the anticipated size of the crowd and example scores are — <2,000 - Score between 1 - 5 — >2,000 - Score between 5 - 10 — > 5,000 -Score 15 - 20 — >20,000 - Score 20+ and then pro rata in steps of + 5 per 5,000 User selects relevant checkbox from list above. As each is selected a total score for field 4 is displayed on screen These individual scores are aggregated into a total score for Field 4. User selects Field 5 which relates to the Nature of the event and event dynamics. User selects relevant checkbox from list below providing individual score. — Classical performance — Public exhibition — Pop/rock concert — Dance event — Parade — Agricultural/country show — Equestrian event — Marine — Motorcycle display — Aviation — Motor sport,

	— State occasion, — VIP visit/summit, — Music festival, — Bonfire/pyrotechnic display. — Demonstration, marches, political events **Additional hazards such as** — Carnival or funfair, — Helicopters — Motor sport — Parachute display — Street theatre — Time of the year. These individual scores between 0 and 5 are aggregated into a total score for Field 5. User selects Field 6 which relates to the nature of the crowd and crowd dynamics. User selects Each checkbox from list below if applicable which if selected, is given an individual score; — Risk of disorder, Low/ Medium/High, — Opposing factions involved, — Event Intelligence, — Alcohol on sale, available, permitted, — Similar event experienced public disorder, — Police warning **Audience Profile:** — Full mix, in family groups , — Full mix, not in family groups, — Predominately young adults, — Predominately children and teenagers, — Predominately elderly , — Full mix, — Predominately Male, — Predominately Female. These individual scores between 0 and 5 are aggregated into a total score for Field 6 The user review the running score that was generated during the input A particular field is highlighted in red to an amplification effect of a score. The user then input the score into a look-up table to generate an estimated medical cover required for the event.
Alternative path or flow	Closer to the day and closer to the time of the event the user logs into the system and enters updated or real-time data . This generates new panel scores and a new total score. The user sees summary score changing over time when more info is added and if the trend is steeply

	increasing/reducing. A pre-set alarm is included such that when a threshold score is exceeded then an alarm e-mail and or text is generated and this is sent to: 1. the event organiser 2 the Regional Authority. An additional panel can be added for that purpose if required.
Post-condition	This will provide a resource triage capability for the planner as set out in requirements in D2.1
Exceptions	Not for use once an event has moved into an emergency mode
Includes	All preparation leading to approval of the proposed site specific medical plan Evacuation Procedures
Assumptions	That the information provided is representative of the event
Frequency of Use	Once per planned event but re-run on at least four occasion leading up to the start of the event and at least once per 30 minutes during the event.
Notes	1. The scores to be applied are variable for each location , county, region and can be applied as required 2. The current score can be displayed on the RCS as a colour code. 3. The increasing score can be used in the DSV-Tool to prompt decisions. 4. There is the need to distinguish clearly between Event Medical/Event Ambulance Resources and the Principal Emergency Services. In Ireland and in many EU countries these Event Medical/Event Ambulance Resources are different from the State or Government medical/ambulance resources. These are private or NGO organisation who provide cover at events and are different from the national ambulance service. It is the same difference between “private security” and the police. The purpose of this UC - STADIUM CRUSH -01 is to determine the level of Event Medical/Event Ambulance Resources that should be required of the organiser that should pay for and put in place. The same use case UC - STADIUM CRUSH -01 will help the authorities determine what (additional) Medical/ Ambulance resources that the Principal Emergency Services might need to pre-deploy in addition to what is put in place by the private or NGO organisation.

7.2 Usage of a (serious) Multi-user Online Role-Playing Game as a Simulation Training Tool

Use Case ID	UC –STADIUM CRUSH -02
Name	**Usage of a (serious) Multi-user Online Role-Playing Game as a Simulation Training Tool**
Related Scenario	Pulse Crowd Crush at a stadium
Description	Usage of a (serious) Multi Player Online Role playing Game as a Simulation Platform in the Management of an Emergency and as a means of acquiring the skills and thought processes needed to respond appropriately under pressure during a simulated Crowd Crush at a stadium. Given that change is more likely when individuals are required to explain, elaborate or defend their positions to others as well as to themselves in the early stages of the games a standard challenge is included at each decision point that is addressed. Game must be tailored to Country based Response Model in Emergency Situations. The MPORG has two main aims. 1. Training for First Responders on Triage and management of single victims The Roles of different First Responders will be simulated through the creation of avatars that will operate in a 3D field game interacting among each other with the aim of triaging and assisting crush trauma victims. user selects role in MPROG, user walks around environment, user reviews the health of avatars displayed with injuries and selects the medical response to be applied. User selects the medical facility that a person should be transported to. Given that change is more likely when individuals are required to explain, elaborate or defend their positions to others as well as to themselves in the early stages of the games a standard challenge is included at each decision point that is addressed. Game must be tailored to Country based Response Model in Emergency Situations. 2. Training for First Responders on Triage and management of single victims The Roles of different First Responders will be simulated through the creation of avatars that will operate in a 3D field game interacting among each other with the aim of triaging and assisting crush trauma victims. user selects role in MPROG, user walks around environment,

	user reviews the health of avatars displayed with injuries and selects the medical response to be applied. User selects the medical facility that a person should be transported to. Recognition by decision makers of the best policies for management of crowd event during a crush scenario. Multiple decision maker roles will be simulated. Incident Commander, EMS Commander, Regional Command Center, Hospital Command Centerm (put Irish Roles to be simulated) A series of injects, chosen from an Event list (events that could possibly occur), will be generated to provide a simulated environment of a developing situation and that by seeking the appropriate information and understanding it a player will be able to either: a. Legitimately seek more relevant data b. Be given a mix of relevant and irrelevant data c. Analyse the data and project a future outcome based on the available data.
Pre-conditions	Crowd Event is planned which requires specific medical plans to be prepared and submitted to a regional authority for permission and to provide the regional authority with a means of accessing the risk likely for a specific event.
Primary Actors	1.Private Organisers 2.Regional Authority of the affected Area 3.Potential responders and potential response organisations 4. On-site Co-ordinators
Primary Actor Definition	1. The main private organisers or agent of the organisers including the private event medical plan co-ordinator 2. Regional Authority official agencies dealing with the planning and running of events. 3. Managers or commanders of potential response organisations 4. The on-site Co-ordinators or on-site commanders who will have responsibility to respond to an emergency. 5. First responders
Trigger	Requirement to conduct some pre-event exercises by regional authority.
Basic Path or flow	The Primary Actors begin by viewing a short video in the form of simulated TV news program to set the scene for MPORG game and

	allow the actors to all enter the game with the same RCS picture. This can be in simulation or "apparent" real. a) The Primary Actors begin by viewing a short video in the form of simulated TV news program to set the scene for MPORG game and allow the actors to all enter the game with the same RCS picture. This can be in simulation or "apparent" real. b) First responder trainee will log into the system and choose his avatar (role). c) The avatar will be put in a situation of crush event in the stadium (scenario will be generated as similar as possible to real scenario for which the training is taking place) d) The avatar can walk around and survey surroundings and victims e) A series of victims will be shown and the player will show his competency in triaging and managing victims while interacting (multiple online role playing) with other figures such as Incident Commander, other Forces (Police, Medical, Fire Fighters, Volunteers). f) Avatar selects appropriate medical therapy. g) Feedback on correct triage and management of victims will be given. A summary of personnel saved through the decisions made are displayed at the end of the game. Player launches the tactical decision making MPORG. Players enter the game on the time-line of approx 30 minutes before the event and the game ends when all key players recognise that that a major emergency is about to occur. a) Decision maker selects role. b) High level description of the incident is given on a map with easily interpretable interface as to presence of victims, ambulances and other services is shown c) A filter panel will be provided for when the player needs to reduce the displays of all the interactions from a complex scenario as the display may be cluttered and difficult to read. d) Player will take decisions and interact with other role players if present. (Actual role players if present or simulated role players if player is alone). e) Feedback on decisions taken in terms of patient survival, time of transport to the hospital, deaths, resources consumed, etc.
Alternative path or flow	In later re-runs of the MPORG the player may play a different role. In later re-runs of the same game players will be required to enter at variable time intervals and with an incomplete RCS picture. In later re-runs of the MPORG game a limited degree of free play will

	be permitted. An option will exist for a mediator to be on line but not in play (Exercise manager).
Post-condition	None
Exceptions	Will be demonstrated for use from just before the event commences and stops once an event has moved fully into emergency response mode.
Includes	
Assumptions	The PULSE MORPGs can be used as an emergency simulation platform if: 1. The game duration fits the participants' attention span because this becomes a factor without the other prompts of a real -life situation that cannot be mimicked in MPORG 2. The original training of the participants fits that of the role requirements of the simulation so that their in-game behaviour will not be negatively influenced by any lack of real-life experience of similar events. 3. Preliminary sessions are run to determine ideal attention span, data skewing factors and individual experience can be
Frequency of Use	It can be run as often as necessary
Notes	1. It can be run and re-run in preparation for the event if the necessary input is available. 2. The design approach of this collaborative learning technology is based on the principles of goal-based learning where students are allowed the opportunity to acquire the intended learning outcomes by making mistakes in safe environments.

7.3 User wishes to mobilise additional resources from Public, Private, Voluntary and Response Assets from other member states. Via surge capacity tool.

Use Case ID	UC STADIUM CRUSH -03
Name	**User wishes to mobilise additional resources from Public, Private, Voluntary and Response Assets from other member states. Via surge capacity tool.**

Related Scenario	Pulse Crowd Crush at a stadium
Description	A tool on the Pulse Platform to provide for mobilisation of additional response resources. This will be for mobilisation of a pre-arranged "declared" resource and for an "as available" resource and for response to a general request and also for unsolicited offers that can be validated within agreed legal and ethical parameters. The main tool to be used is the Web App but the Display RCS and the DSV-T will also be employed. The on-going data flow will turn the "estimate of demands" into an increasingly accurate list and needs and availability. One of the existing barriers to international support is the early absence of details in requests for assistance or mutual support. Permission will be in place to ensure that access to patients' names and details is controlled.
Pre-conditions	A major event has occurred at a stadium leading to a crowd crush User must have GPS smart phone
Primary Actors	1.Resource Providers 2.Regional Authority of the affected Area 3. The on-site Co-ordinators
Primary Actor Definition	1. Managers or commanders or units or members of potential response organisations 2. Regional Authority official agencies dealing with response at strategic level. 3. The on-site Co-ordinators or on-site commanders who will have responsibility to respond to an emergency.
Trigger	Requirement to respond to a major emergency
Basic Path or flow	The **Basic Path** is as follows: [See assumptions] The First Response Organisation user logs on to the system The First Response Organisation user initiates a text alert to all registered personnel and requests those registered to confirm their availability status by logging onto the Web App.

	The First Response Organisation user initiates a general request by Broadcast Media and Social Media and via the various bodies pre-arranged alerting procedures and requests those registered to confirm their availability status by logging onto the Web App The data will be assembled in a standard data format which will include geo-referenced information so that it can be displayed on a map as well as in the RCS display Each Responder logs on to the system via the GPS enabled Smartphone and is recognised by the system. Each Responder indicates availability by selecting options from a drop down menu. Each Responder is asked to review their details in the data base and upload their completed form . The Requesting Organisation user reviews the data provided with icons representing each responder on a map display The Requesting Organisation user issues instructions as to reporting. Roles and task are allocated and communicated to each responder to their GPS enabled Smartphone. Each Responder acknowledges the instructions via the Web App. The status of responders allocated to a task is show as “tasked” on a map display. The system will poll each GPS enabled Smartphone and update their location at intervals appropriate to the estimated travel time. This interval is set by the Requesting Organisation user Each Responder receives additional instructions via the Web App. Each responders reports completion of the task allocated and the status is altered to “ available for tasking”
Alternative path or flow	An alternative path is when responses are asked from or received from qualified but not previously known responders they are processed by

	providing them with on-line registration. The volunteer responder fills in the registration from allowing them to be added to the database [See Assumption 1] The volunteer responder uploads their completed on-line registration. The Requesting Organisation user reviews the data provided with icons representing each responder on a map display The Requesting Organisation user issues instructions as to reporting. Roles and task are allocated and communicated to each responder to their the GPS enabled Smartphone. Each Responderacknowledges the instructions via the Web App. The status of responders allocated to a task is show as “tasked” on a map display. The system will poll each GPS enabled Smartphone and update their location at intervals appropriate to the estimated travel time. This interval is set by the Requesting Organisation user Each Responderreceives additional instructions via the Web App. Each responders reports completion of the task allocated and the status is altered to “ available for tasking”
Post-condition	None
Exceptions	Tracking multiple GPS enabled Smartphone not considered. See Note 1
Includes	That much of the preliminary registration will be completed by way of training and exercises in advance of any real event.
Assumptions	1. A data base is created of additional resources of managers or commanders or units or members of potential response organisations from Public, Private and Voluntary response agencies. This is created by providing a web based registration facility. 2. The information required to be provided will include; names, qualifications Available equipment, clinical equipment and related resources including drugs, consumables and locations of same.

	3.Contact to and from the PULSE Platform will be via a GPS enabled Smartphone. All responders will be given a unique identifier as part of the data collection process. 4.That a means of request for assistance already exists or a means of alert such as text alert or social media to a 'trusted crowd' 5.That the process of data base of registered responders is competed in Member States[MS] such that in response to a request for assistance from a neighbouring state that the responding MS carries out the initial mobilisation and pushes the necessary data to the requesting MS. 6. The data will be assembled in a standard data format which will include geo-referenced information so that it can be displayed on a map as well as in a spread sheet.
Frequency of Use	It can be run as often as necessary
Notes	1. Software tools already exist to track multiple GPS enabled Smartphone and this feature can also be exploited but does not form part of this PULSE mobilisation tool.

7.4 Hospital Surge Capacity and Bed Management

Use Case ID	UC – STADIUM CRUSH -04
Name	**Hospital Surge Capacity and Bed Management**
Related Scenario	Pulse Crowd Crush at a stadium
Description	Usage of PULSE Platform tools which include a Web App, the LT, the Display RCS Web App and DSV-T to provide summarised information to support decision making by Hospital controllers and regional authorities and crisis management teams in regard to hospital admissions. There are clear definitions of what constitutes a bed and that types of bed exist and are agreed in the application of the use case. The types of bed will include; • Critical Care Beds

	• Intensive Care Beds • General beds • General beds suitable to decant exiting patients
Pre-conditions	An exercise or an event has taken place and that the necessary hardware and communication pathways and networks are in place
Primary Actors	1. On-site Coordinator controllers 2. Hospital controllers and bed managers 3. Regional Authorities 4.Crisis Management Teams at Hospital ,Regional, National and International Levels
Primary Actor Definition	1. On-site Coordinator controls or co-ordinates resources at the site of an incident. 2. Hospital controllers and bed managers who have responsibility for co-ordination hospital resources. 3. Regional Authority is the official organisation who are required to make preparations for the events or which will be responsible for co-ordination of the response. 4. Crisis Management Teams [CMT] at Hospital, Regional, National and International Levels. These can be either pre-existing CMTs or one set up as a result of the incident to create additional hospital capacity either in the region or nationally or in the hospital of adjacent or other MS.
Trigger	Major Incident or exercise required for the use of Hospital Surge Capacity and Bed Management
Basic Path or flow	The **Basic Path** is as follows: [See assumptions] The user at the incident inputs triage information into the system selecting priority from a drop down menu. The user at the hospital triage point inputs triage information into the system selecting priority from a drop down menu. The receiving hospital user inputs the current status and availability under the following categories; • Types of bed • Available When • Available if additional staff can be sourced The regional authority can then allocate patients to each hospital by matching bed type availability with patient acuity. The regional authority can issue specific instruction directly from the

	matrix created by the pulse tool.
Alternative path or flow	There is a push-pull aspect to this use case whereby there are requests for capacity and offers of capacity.
Post-condition	This provides a resource triage capability meeting the requirement of D2.1
Exceptions	
Includes	
Assumptions	1. That a data base of existing bed capacity has been created to include types of bed 2. That the players will give accurate answers in relation to availability which is a more complex issue in reality. 3.That patient transport is not part of this use case. 4. Not all casualties will require hospital admission but P1 and P2 are very likely to require admission so that aggregate should be used to create an "estimate of demands" to allow the Hospital Surge Capacity tools to be initiated as soon as possible in the incident. That treatment and duration of bed occupancy is not part of this use case
Frequency of Use	As part of the preparation for a major planned event or in an exercise or in response to a serious incident.
Notes	1. Some form of “person-in-loop" will be required to filter and update the final data that has been offered for display. 2. That the type of bed requested will always be the one actually required which may not be true for all situations. Patients can deteriorate or improve.

7.5 Triage in Casualty Clearing Station [CCS] and links to PULSE proposals on ePCR.

Use Case ID	UC- STADIUM CRUSH -05
Name	**Triage in Casualty Clearing Station [CCS] and links to PULSE proposals on ePCR.**

Related Scenario	Pulse Crowd Crush at a stadium
Description	Usage of PULSE Platform tools which include a Web App and the Display RCS Web App and DSV-T to provide summarised information to support decision making by the on-site co-ordinators and commanders. The Primary Actor is theCCS Officer who uses the PULSE Platform Web App to input specific patient information. However, as Triage is on on-going process and over- Triage or under-Triage is an on-going challenge and the patient condition may well deteriorate/improve. Triage is dynamic, as the patient's condition progresses, so too his/her need for intervention alters. As it is a Web based app the triage category can be updated at any time.
Pre-conditions	An exercise or an event has taken place and that the necessary hardware and communication pathways and networks are in place
Primary Actors	1.CCS Officer 2.Triage Officer 3. On-site Coordinator
Primary Actor Definition	1. The Casualty Clearing Officer is an Officer of the Medical Response Service who is in charge of the casualty clearing station. 2. The Triage Officer is a medical professional who triages the casualties into priorities and 'sieves and sorts' the casualties. There may be more than one triage officer and these additional triage officers work under the direction of the principal Triage Officer. 3. On-site Coordinator controls or co-ordinates resources at the site of an incident.
Trigger	The setting up of a CCS.
Basic Path or flow	The **Basic Path** is as follows: The user employs a bar reader to read the bar on the triage label. This action link the patient with the ePCR form and a unique identifier is created. The user inputs the following from a drop-down menu. - Chief Complaint

	-Mechanism of injury/Nature of illness -Associated signs and symptoms/pertinent negatives -Location of patient when first encountered -Rescue and treatment by bystanders/first responders -Patient history including meds, allergies, pertinent info to chief complaint -Physical findings not listed in check-off area As triage is an on-going but time consuming process only the key data of patient triage priority is required at the outset. At pre-set interval the app will update data in the ePCR with current information As data is added to the Web App , key information is automatically extracted and identical data is presented to key users. • On-site Coordinator • Ambulance Mobilisation and Dispatch Centre • Hospital Controllers • Regional Authority RCS Display where totals only need to be displayed in the form of a casualty board which has the following information displayed . 1. Total of Each Priority (triage category) 2. Still at scene 3. En Route to Hospital 1, 2,3etc 4. In Hospital 1, 2,3etc 5. En route to health care facility 1, 2, 4 etc [Priority 3- Minor Injury] 6. En health care facility 1, 2, 3 etc 7. Diseased - Still at scene or in mortuary or en route to mortuary
Alternative path or flow	None envisaged
Post-condition	Final casualty board in summary form and with specific patient detail available on interrogation of the data.
Exceptions	
Includes	Details appropriate to the Crowd Crush at a stadium only for the purpose of demonstration of the tools.
Assumptions	1.An existing triage labelling system and ePCR form will be used. This will provide the inputs required and include:

	2. A geo referenced data base is prepared listing existing bed capacity That the players have training in triage or have written injects (for exercise situation) of signs and symptoms. 3. Permissions will be in place to ensure that access to patients' names and details is controlled.
Frequency of Use	As part of the preparation for a major planned event or in an exercise or in response to a serious incident.
Notes	1. Triage is the tool adopted in such situations, which allocates a priority to each patient in terms of their condition. Triage may take many different forms, and operates at a number of different levels. It aims to give the right patient the right care at the right time in the right place. This USE Case used the P1 to P5 RED YELLOW, GREEN,BLUE and WHITE system. 2. This USE case is related to the pulse deliverable listed as a commentary on electronic patient care records [ePCR] listed in the DoW.

7.6 Input critical data for the RCS on Site and from other relevant off-site sources

Use Case ID	UC- STADIUM CRUSH -06
Name	**Input critical data for the RCS on Site and from other relevant off-site sources**
Related Scenario	Pulse Crowd Crush at a stadium
Description	Usage of a PULSE Platform tools which includes a Web App and the Display RCS Web App and DSV-T to provide summarised information to support decision making by the on-site co-ordinators and commanders.
Pre-conditions	An exercise or an event has taken place and that the necessary hardware and communication pathways and networks are in place
Primary Actors	1.On-site Co-ordinators and Commanders 2.Regional Authority 3. Ambulance Mobilisation and dispatch services

Primary Actor Definition	1. Regional Authority is the official organisation responsible for co-ordination of the response to an incident or for commissioning the exercise. 2. The On-site Co-ordinators and Commanders are those who either command, control or co-ordination resources at the site of an incident.
Trigger	Can be either as an on-going Recognised Current Situation [RCS] monitoring process for a planned event or set up at scene with the arrival of a dedicated C3 vehicle or equivalent.
Basic Path or flow	The **Basic Path** is as follows; User views a satellite image where it has the emergency symbology displayed. The user input that information via trusted or certified smart phones only or from 'official' trusted inputs.an official trusted phone is a phone which is pre –registered by the organisation and assigned a degree of reliability on registration (low, medium, high). The user inputs available geo-referenced information using a drop down menu. The Information will be displayed in on a map as a priority. The user can select and display public Information such as weather information, traffic, information from utilities and other trusted and relevant information. The user can turn these layers on and off. The users will input casualty location the triaged priority and GPS location and can then see the display as a colour coded dots on the map. The zoom level will provide a snapshot of the number of casualties in the overall incident or at a specific location. The same information will be summarised in short tabular form. The user can be presented with data from other areas such as at the scene the hospitals and can accept or reject that info for display on the RCS by ticking the accept/reject option.

	The user can access Ambulance data showing resources en route to the scene, at scene or en route to hospital with information inputted from each individual ambulance including a geo-reference and the user show that as a layer that can be turned on or off.
Alternative path or flow	None envisaged
Post-condition	That a draft report will be available for review and that lessons to be learned will be derived from that report and for comparison with similar reports.
Exceptions	Not intended for judicial review
Includes	Details appropriate to the Crowd Crush at a stadium only for the purpose of demonstration of the tools.
Assumptions	That a Display RCS has a map display facility, a real -time video display facility
Frequency of Use	During an exercise, as part of the preparation for a major planned event or in response to an incident.
Notes	1. Some form of “person-in-loop" will be required to filter and update the final data that has been offered to form display. 2. Information becomes more and more reliable as the event progresses and cross checks between figures is possible. A current reliability factor will be displayed next to some information when a cross-check of information is not within expected parameters. An example is the Ambulances dispatched to the scene together with their ETA predicts that a certain number of ambulances should be at scene at a certain time. If the actual number reporting on scene is much less then that prompts a reliability warning on that information at that specific time.

7.7 Post- Event, Post Exercise Evaluation Tool to identify lessons to be learned.

Use Case ID	UC STADIUM CRUSH -07

Name	**Post-Event, Post Exercise Evaluation Tool to identify lessons to be learned.**
Related Scenario	Pulse Crowd Crush at a stadium
Description	Usage of a PULSE Platform tool which is a Web App and Display RCS to ensure feedback from participating players and that the final report is completed promptly, as it is the principal means of ensuring that lessons identified can be used to provide material from which the exercise or incident can be evaluated. The use of the tool will allow for a greatly expanded analysis The Display RCS will be used twice in this Use Case. First to present the RCS to the participants to highlight various stages of the exercise or incident. The Display RCS will be used to shown the progress and results of the process of identifying lessons to be learned and to clarify issues. The primary use of the tool is in the immediate aftermath of an exercise often referred to as a "hot-debrief".
Pre-conditions	An exercise or an event has taken place and that all those involved in the exercise are available to complete the post exercise evaluation and to provide Participant Feedback
Primary Actors	1.Regional Authority 2.Emergency Management 3.Exercise Players or Incident Officials 4.Official Umpires or Observers
Primary Actor Definition	1. Regional Authority is the official organisation responsible for co-ordination of the response to an incident or for commissioning the exercise. 2. The part of each participating organisation whose role it is to deliver the major emergency planning function 3.Exercise Players or Incident Officials are those who were actively involved 4. Official Umpires or Observers are those appoint to observe or validate an exercise
Trigger	Requirement to conduct some pre-event exercise by region authority.

Basic Path or flow	The **Basic Path** is that each participant will be able to use the Web App to complete a guided response to the exercise or incident. Each participant will be able to log on individually and complete a detailed review document. User is displayed a document with the following fields. User selects the checkbox next to each question and selects submit to elicit specific information such as: Were the documented procedures followed? Were the procedures adequate? Did personnel demonstrate a good knowledge of the procedures? Were Procedures readily available? Were contact details available and up to date? Were means of communications operational? RECOMMENDATIONS AND CORRECTIVE ACTIONS CAN BE INCLUDED. The PULSE web app should also contain an evaluation section in which the positive and negative observations are recorded and recommendations made Specific question can be put to participants such as: 1. Based on the exercise today and the tasks identified, list the top 3 areas that need improvement? 2. Is there anything you saw in the exercise that the umpire(s) might not have been able to experience, observe, and record? 3. Identify the corrective actions that should be taken to address the issues identified in 1. above. For each corrective action, indicate if it is a high, medium, or low priority. 4. Describe the corrective actions that relate to your area of responsibility. Who should be assigned responsibility for each corrective action? 5. List the applicable equipment, training, policies, plans, and procedures that should be reviewed, revised, or developed. Indicate the priority level for each. The report web app should also contain an evaluation section in which the positive and negative observations are recorded and recommendations made.
Alternative path or flow	None envisaged

Post-condition	That a draft report will be available for review and that that lessons to be learned will be derived from that report and for comparison with similar reports.
Exceptions	Not intended for judicial review
Includes	Details appropriate to the Crowd Crush at a stadium only for the purpose of demonstration of the tools.
Assumptions	That a Display RCS was used throughout the exercise or incident and that the timelines was logged and recorded. That ground rules are set which will be broadly similar to those that apply in air accident investigation
Frequency of Use	In the immediate aftermath of an incident or an exercise which is a "hot-debrief" and at a planned review session.
Notes	1. The report should contain the aims, objectives and planned outcomes of the exercise, along with an outline of the scenario and the planning process so that it can be cross check to see if these were met. 2. The exercise evaluation report form will be developed as part of the exercise planning and preparation for crowd crush exercise.

7.8 Casualty Bureau Operation searchable data base created for specific multi casualty incident.

Use Case ID	UC- STADIUM CRUSH -08
Name	**Casualty Bureau Operation searchable data base created for specific multi casualty incident.**
Related Scenario	Pulse Crowd Crush at a stadium
Description	This web app is aimed mainly at police users. The input from the general public would normally be acknowledged verbally by telephone or in the case of a fatality by a family liaison officer. Usage of a PULSE Platform tool which is a Web App and Display RCS to meet the immediate requirement to create a central contact point for

	the matching of information available on casualties with requests from all those seeking or providing information about persons involved in the incident. In the event of a major emergency involving significant numbers of casualties, the appropriate authorities [usually the police] will establish a Casualty Bureau to collect and collate the details (including condition and location) of all casualties and survivors. To facilitate this process, a liaison/casualty officer will normally be sent by the appropriate authorities to each location or facility where casualties are being treated or displaced persons are gathered. All other services should ensure that any information collected on any casualty is transferred via then appropriate authorities to the Casualty Bureau. The Pulse platform Web App will be used to collect and collate the relevant data. The average time to set up a 'help-line' or information line is more than two hours. This PULSE tools can reduce that time lag to about 15 minutes from the decision to set up. The system however will distinguish between types of disasters as all this data is not required at a very early stage in the aftermath of a major emergency such as a crowd crush where identification might be simpler than in a disaster like an earthquake. This will provide a major improvement on the current situation whereby scarce call-taking resources can be re-focused onto data collation and proactive inquiries.
Pre-conditions	Crowd Event disaster which generates a large number of fatalities, casualties and displaced or missing persons.
Primary Actors	1. Police 2. Civil Protection 3 Regional Authority official 4.Interpol linking to **FASTIDFast** and Efficient **I**nternational **D**isasterVictim**ID**entificationProject
Primary Actor Definition	1. That police asset responsible for Casualty Identification Role and or **DVI** 2. Civil Protection asset responsible for Casualty Identification Role and or **DVI**

	3.Regional Authority officials responsible for Casualty Identification Role and or **DVI** 4.Interpol - INTERPOL is the world's largest international police organization, with 190 member countries
Trigger	Requirement to conduct some pre-event exercise by region authority.
Basic Path or flow	The **Basic Path** is that User enters the Interpol Disaster Victim Identification under the following categories - Section A: Personal data (AM only), - Section B: Recovery of a body (PM only), - Section C: Description of effects (clothing, jewellery, etc.); - Section D: Physical description, - Section E: Medical information. - Section F: Dental information, - Section G: Any further information. Using checkboxes/drop down menus/free text/camera images/video/audio recording as appropriate. The web app will identify matching entries and highlight suggestions to the user. The user can then accept or reject the proposed match. The user can send the current and most up to date Casualty Bureau collated database an e-mail attachment to wherever it needs to go e.g. a Police HQ or another MS and it can be displaced in summary form in the RCS display
Alternative path or flow	Can be re-run when the initial matching and ID has been completed to focus on these victims often deceased and where ID is complex but nature of the incident or the injuries
Post-condition	None
Exceptions	
Includes	That trained DVI specialists are at the core of the process
Assumptions	1.There will be a degree of decision support in the Casualty Bureau collation software but it will always require a "person-in-the-loop" to confirm or reject what the database analysis proposes. An example can be multiple enters for the same victim and the software would suggest; "it looks like these five entries all refer to the same victim, please

	nominate one entry as the primary entry". 2. That sufficient infrastructure is still in place . 3. The web based app will allow entries to be made by police, other civil authorities, responders, next of kind , worried relatives or even displaced or affected persons themselves.
Frequency of Use	In the aftermath of a disaster
Notes	1. Calls to 'help-lines' can still be used as the call-taker can used the PULSE Platform tool to enter collect and enter data. 2. From note 1 it follows that call-takers in existing commercial call centres can be quickly assigned to Casualty Bureau Operations merely by proving them with the PULSE Platform tool.

8 Conclusions

This document describes the two Scenarios and relevant Use Cases that set the stage for the PULSE Platform Demonstration, to be completed by month 30 of the PULSE Project (November 2016).

Relationship between each Use Case and PULSE Requirements (as listed in Deliverable D2.1) is provided in Annex 1 and Annex 2.

This document also shows that, should the PULSE platform pass the demonstration, its field of application would be wider than the pure SARS-like and STADIUM-crush emergencies (e.g., seasonal influenza epidemics; planned or unplanned localized outdoor or indoor mass gathering events).

9 Relationships to other Deliverables and WPs

This deliverable **gets input from**

- **Deliverable D2.1-Requirements Specification**.

  In D2.1 Scenarios had already been described at a high level, in order to contextualize the questions that were addressed to end users to get their requirements.

  From D2.1 two key inputs are taken:

  - Scenarios high level description
  - Key requirements to be tested, in order to ensure that the Use Cases clearly provide room for key requirement testing.

This deliverable **provides input to:**

- **WP3 (Modelling), WP4 (Tools) and WP5 (Methodology/SOPs)** because:
  - It sets realistic situations to which PULSE Models and Tools may be referred to
  - It sets a first hypothesis of MoE (Measures of Effectiveness, see 4.4.2) that may drive the detailed design of PULSE Models, Tools (including MPORG) and assessment/design of Methodologies/Procedures .

  Details of the evaluation methodology and MoEs will be worked out in WP5

- **WP7 (Trials & validation)**.

  Demonstrations will be done in WP7 and will act as proof of concept of the technologies and scientific concepts developed in WP2 (Scenarios and requirements), WP3 (Modelling), WP4 (tools), and WP5 (Methodologies/SOPs).

  More precisely, this document **provides input to Task T7.1-Definition of Trials.**

  This task shall define in detail all aspects of the two trials for the PULSE project. These include the detailed plan, timing, personnel, equipment and legal and ethical aspects of:

  - A SARS event in Italy; and
  - A crush within a stadium staging a rock concert held in Dublin.

  The result of this task will be a detailed trials plan for both events.

ANNEX 1-Cross reference table SARS UC vs Requirements

Following table links (with a “x”) the requirements that have been identified in Deliverable D2.1-Requirement Specifications with each of the nine Use Case of the SARS Scenario:

USE CASE ID	USE CASE NAME
UC-SARS LIKE - 01	Weak signal detection and surveillance
UC-SARS LIKE - 02	An airplane is landing in Italy. A probable case is now identified
UC-SARS LIKE - 03	A ship is arriving in Italy. A passenger has been identified as probable case
UC-SARS LIKE - 04	Identification of a new probable case in a community
UC-SARS LIKE - 05	Assessment of the available medical resources during the pandemic phase
UC-SARS LIKE - 06	ECDC recommendations
UC-SARS LIKE - 07	National Authority periodic assessment
UC-SARS LIKE - 08	Post emergency learning at national level
UC-SARS LIKE - 09	Post emergency learning at WHO level

PULSE Tools Functional Requirements			SARS USE CASE #								
Req. ID	Req. Force	Requirement Text	1	2	3	4	5	6	7	8	9
PT-RQ-001	Must	The system must have functions to open and manage a new incident, to display the current operational situation and to manage the available resources.		x	x	x	x	x	x		
PT-RQ-002	Must	The system must have functions to define categories of incidents, resources, wounds, threats, risks.		x	x	x					
PT-RQ-003	Must	The system must have functions in order to record and display the number and code(s) of the wounded/infected people.		x	x	x	x	x	x	x	x
PT-RQ-004	Should	The system should have maps support and the capability to geo-localize both mobile and immobile resources as well as the location of the incident(s), wound(s) etc	x				x	x	x	x	x
PT-RQ-005	Should	PULSE should offer automatic guidance of the mobile resources in order to reach de incident scene on the shortest time by taking into consideration: the incident position, resource position, traffic estimation, blocked roads etc.									
PT-RQ-006	Must	The system must have decision support capabilities based on data collected from previous similar incidents (what kind of resources were used in similar incidents, what risks/threats are relevant etc.).							x		
PT-RQ-007	Must	The system must perform automatic estimation of the time to intervention for the mobile resources (mobile emergency units, relevant drugs /equipment in transit to the incident scene etc);									
PT-RQ-008	Must	The system must provide a general view of the resources available and real time update of their availability, based on the incident location, resource updated availability etc.					x	x	x		
PT-RQ-009	Must	The system must have frameworks (tools and SOPs) to record the current incident data and to manage and develop a database with similar incidents information.		x	x	x			x	x	x
PT-RQ-010	Should	Upon defining a new incident, the system should provide automatically information from previous incidents, relevant for the current incident commander.							x		
PT-RQ-011	Should	The system should automatically record the data related to the decisions made during the incident, the resources evolution/availability etc		x	x	x	x		x	x	x
PT-RQ-012	Should	The system should perform data fusion and provide the information to the people/role in accordance with their operational/strategic role.	x	x	x	x	x	x			
PT-RQ-013	Must	The system must offer coherent information exchange mechanisms in order to support the incident management.	x	x	x	x	x		x		
PT-RQ-014	Should	The system should have tools to record a database with laws/regulation constrains (European, national, regional) and to make this information available in accordance with the incident typology.		x	x	x					
PT-RQ-015	Must	The system Must perform automatic backup of the database(s)									
PT-RQ-016	Should	The system should have mechanisms to record and maintain a threats database and to implement mechanisms to automatic warn the relevant roles/people whenever a threat goes above a threshold.	x	x	x	x					
PT-RQ-017	Must	The graphic user interface must have support for maps, area of events as well as the geo-localization of the teams/wound/resources.	x				x	x	x	x	x
PT-RQ-018	Should	The system should provide tools to define threats and associated risk categories									
PT-RQ-019	Should	To system should offer tools to classify the risk according to the people, the type of event, the place, the population density of the area, weather etc.	x	x	x	x			x	x	x
PT-RQ-020	Should	The system should offer support for risk analysis and to build mitigations plans(predefined list of actions / resources needed in order to avoid the unwanted results of a materialized risk)	x				x	x	x		
PT-RQ-021	Should	The system should offer support for definition of the event categories									
PT-RQ-022	Should	The system should provide support in order to associate threats to an event	x								
PT-RQ-023	Should	The system should provide support for event planning, in order to estimate the number/amount and type of the resource needed based on the event type and the associated threats.	x				x		x		
PT-RQ-024	Must	The system must offer tools and associated SOPs in order to capture post incident data and to record relevant key-aspects of an incident in a structured way.								x	x
PT-RQ-025	Should	Based on records from similar incidents, the system should offer predictions of the threats towards a planned event and give an estimation of the needed resources							x		
PT-RQ-026	Must	The system must be able to predict the incident evolution and may automatically update the prediction when the operational context is changing.						x	x		
PULSE Tools Interface Requirements											
PT-RQ-027	Should	The system should provide open interfaces in order to share the record data as well as the information related to the ongoing incidents with authorized European organizations/ structures.						x			
PULSE Tools Usability Requirements											
PT-RQ-028	Must	The graphic user interface must use graphics and colors in order to offer a simple, intuitive, schematic view of the incidents. The interfaces must be easily understood by non-technical personnel.	x	x	x	x	x	x	x	x	x
PT-RQ-029	Should	Usage of predefined interface patterns should be available in order to quickly change/adapt the interface to user role and/or operational situation.		x	x	x	x	x	x	x	x
PT-RQ-030	Must	The system must implement a standard reporting system for all its modules. The reporting system must include both texts/numbers as well as synthetic information representations (graphics, bar-charts, color codes etc).	x	x	x	x	x	x	x	x	x
PT-RQ-031	Must	The graphic user interface must have support to clearly signal changes into the operational situation both graphically (even including video, if available) and with numeric data.		x	x	x	x	x	x	x	x
PT-RQ-032	Should	The tools to input data should use checklists rather than texts.	x	x	x	x	x	x	x	x	x

Smartphone App Functional Requirements			SARS USE CASE #								
Req. ID	Req. Force	Requirement Text	1	2	3	4	5	6	7	8	9
SM-RQ-001	Must	The smartphone app must provide for the recording of the severity of individual patients injuries.									
SM-RQ-002	Must	The smartphone app must provide for the recording and viewing of the number of victims at an incident.									
SM-RQ-003	Must	The smartphone app must provide for the recording and viewing of the hospital bed capacity.									
SM-RQ-004	Must	The smartphone app must provide for the recording and viewing of the medical resources available.									
SM-RQ-005	Could	The smartphone app could provide for access to a database of historical records.									
SM-RQ-006	Should	The smartphone app should provide for recording and viewing of amount and type of ambulances available.									
SM-RQ-007	Should	The smartphone app should provide for recording and viewing specific alert messages.									
SM-RQ-008	Should	The smartphone app should provide for recording and viewing alternative sites of care.									
SM-RQ-009	Should	The smartphone app should provide for reporting on different triage categories for patients.									
SM-RQ-010	Could	The smartphone app could provide for displaying 3rd party information.									
SM-RQ-011	Should	The smartphone app should provide for recording and viewing details on unconscious patients.									
SM-RQ-012	Should	The smartphone app should provide for recording and viewing details on patients without documents.									
SM-RQ-013	Must	The smartphone app must provide for recording the hospitals patients sent to.									
SM-RQ-014	Must	The smartphone app must provide for recording of scene specific details.									
SM-RQ-015	Must	The smartphone app must provide for picture/video recording of the scene.									
SM-RQ-016	Must	The smartphone app must provide for picture/video recording of the casualties.									
SM-RQ-017	Could	The smartphone app could provide for live video streaming to a remote C&C room.									
SM-RQ-018	Could	The smartphone app could provide for access to maps of emergency area.									
SM-RQ-019	Could	The smartphone app could provide a chemical decoder.									
SM-RQ-020	Could	The smartphone app could provide a GPS location sensor..									
SM-RQ-021	Could	The smartphone app hardware could provide an interface to medical equipment.									
SM-RQ-022	Could	The smartphone app hardware could provide access to pre-emergency plans of emergency sites.									
SM-RQ-023	Could	The smartphone app hardware could communicate over an emergency response phone network or local emergency zone wifi.									
Smartphone App Interface Requirements											
SM-RQ-024	Must	The smartphone app must be accessible on an iOS tablet.		x	x						
SM-RQ-025	Must	The smartphone app must be accessible on an Android tablet.		x	x						
SM-RQ-026	Could	The smartphone app could exchange information with the *KEMLER/ONU system.*									
SM-RQ-027	Could	The smartphone app could exchange information with the *GETR system.*									
SM-RQ-028	Could	The smartphone app could exchange information with the *WISM system.*									
SM-RQ-029	Could	The smartphone app could exchange information with the *REACT Satellite Communication system.*									
SM-RQ-030	Could	The smartphone app could exchange information with the *Police system.*									
SM-RQ-031	Could	The smartphone app could exchange information with the *118 system.*									
SM-RQ-032	Could	The smartphone app could exchange information with the *Italian Protezione Civile system.*									
ALL MPORG REQUIREMENTS AS STATED IN DELIVERABLE D2.1											

ANNEX 2-Cross reference table STADIUM UC vs Requirements

Following table links (with a “x”) the requirements that have been identified in Deliverable D2.1-Requirement Specifications with each of the eight Use Case of the STADIUM Scenario:

USE CASE ID	USE CASE NAME
UC - STADIUM CRUSH - 01	Scoring System in the Event Medical and Other Plan Preparation Phase
UC - STADIUM CRUSH - 02	Usage of a (serious) Multi-user Online Role-Playing Game as a Simulation Training Tool
UC - STADIUM CRUSH - 03	User wishes to mobilise additional resources from Public, Private, Voluntary and Response Assets from other member states. Via surge capacity tool.
UC - STADIUM CRUSH - 04	Hospital Surge Capacity and Bed Management
UC - STADIUM CRUSH - 05	Triage in Casualty Clearing Station [CCS] and links to PULSE proposals on ePCR.
UC - STADIUM CRUSH - 06	Input critical data for the RCS on Site and from other relevant off-site sources
UC - STADIUM CRUSH - 07	Post-Event, Post Exercise Evaluation Tool to identify lessons to be learned.
UC - STADIUM CRUSH - 08	Casualty Bureau Operation searchable data base created for specific multi casualty incident.

PULSE Tools Functional Requirements			STADIUM USE CASE #							
Req. ID	Req. Force	Requirement Text	1	2	3	4	5	6	7	8
PT-RQ-001	Must	The system must have functions to open and manage a new incident, to display the current operational situation and to manage the available resources.			x	x	x			
PT-RQ-002	Must	The system must have functions to define categories of incidents, resources, wounds, threats, risks.	x		x	x	x			
PT-RQ-003	Must	The system must have functions in order to record and display the number and code(s) of the wounded/infected people.				x	x	x		
PT-RQ-004	Should	The system should have maps support and the capability to geo-localize both mobile and immobile resources as well as the location of the incident(s), wound(s) etc	x		x			x		
PT-RQ-005	Should	PULSE should offer automatic guidance of the mobile resources in order to reach the incident scene on the shortest time by taking into consideration: the incident position, resource position, traffic estimation, blocked roads etc.								
PT-RQ-006	Must	The system must have decision support capabilities based on data collected from previous similar incidents (what kind of resources were used in similar incidents, what risks/threats are relevant etc.).	x							
PT-RQ-007	Must	The system must perform automatic estimation of the time to intervention for the mobile resources (mobile emergency units, relevant drugs /equipment in transit to the incident scene etc);								
PT-RQ-008	Must	The system must provide a general view of the resources available and real time update of their availability, based on the incident location, resource updated availability etc.			x	x		x		
PT-RQ-009	Must	The system must have frameworks (tools and SOPs) to record the current incident data and to manage and develop a database with similar incidents information.							x	
PT-RQ-010	Should	Upon defining a new incident, the system should provide automatically information from previous incidents, relevant for the current incident commander.	x							
PT-RQ-011	Should	The system should automatically record the data related to the decisions made during the incident, the resources evolution/availability etc							x	
PT-RQ-012	Should	The system should perform data fusion and provide the information to the people/role in accordance with their operational/strategic role.				x		x		
PT-RQ-013	Must	The system must offer coherent information exchange mechanisms in order to support the incident management.			x	x	x	x		
PT-RQ-014	Should	The system should have tools to record a database with laws/regulation constrains (European, national, regional) and to make this information available in accordance with the incident typology.	x							
PT-RQ-015	Must	The system Must perform automatic backup of the database(s)							x	
PT-RQ-016	Should	The system should have mechanisms to record and maintain a threats database and to implement mechanisms to automatic warn the relevant roles/people whenever a threat goes above a threshold.	x						x	
PT-RQ-017	Must	The graphic user interface must have support for maps, area of events as well as the geo-localization of the teams/wound/resources.	x		x			x	x	
PT-RQ-018	Should	The system should provide tools to define threats and associated risk categories	x							
PT-RQ-019	Should	The system should offer tools to classify the risk according to the people, the type of event, the place, the population density of the area, weather etc.	x						x	
PT-RQ-020	Should	The system should offer support for risk analysis and to build mitigations plans(predefined list of actions / resources needed in order to avoid the unwanted results of a materialized risk)	x							
PT-RQ-021	Should	The system should offer support for definition of the event categories	x							
PT-RQ-022	Should	The system should provide support in order to associate threats to an event	x							
PT-RQ-023	Should	The system should provide support for event planning, in order to estimate the number/amount and type of the resource needed based on the event type and the associated threats.	x							
PT-RQ-024	Must	The system must offer tools and associated SOPs in order to capture post incident data and to record relevant key-aspects of an incident in a structured way.							x	
PT-RQ-025	Should	Based on records from similar incidents, the system should offer predictions of the threats towards a planned event and give an estimation of the needed resources	x			x				
PT-RQ-026	Must	The system must be able to predict the incident evolution and may automatically update the prediction when the operational context is changing.								
PULSE Tools Interface Requirements										
PT-RQ-027	Should	The system should provide open interfaces in order to share the record data as well as the information related to the ongoing incidents with authorized European organizations/ structures.			x	x	x			
PULSE Tools Usability Requirements										
PT-RQ-028	Must	The graphic user interface must use graphics and colors in order to offer a simple, intuitive, schematic view of the incidents. The interfaces must be easily understood by non-technical personnel.				x		x	x	
PT-RQ-029	Should	Usage of predefined interface patterns should be available in order to quickly change/adapt the interface to user role and/or operational situation.				x				
PT-RQ-030	Must	The system must implement a standard reporting system for all its modules. The reporting system must include both texts/numbers as well as synthetic information representations (graphics, bar-charts, color codes etc).	x		x	x		x	x	
PT-RQ-031	Must	The graphic user interface must have support to clearly signal changes into the operational situation both graphically (even including video, if available) and with numeric data.	x			x		x		
PT-RQ-032	Should	The tools to input data should use checklists rather than texts.	x		x	x	x		x	x

Smartphone App Functional Requirements			STADIUM USE CASE #							
Req. ID	Req. Force	Requirement Text	1	2	3	4	5	6	7	8
SM-RQ-001	Must	The smartphone app must provide for the recording of the severity of individual patients injuries.				x	x			x
SM-RQ-002	Must	The smartphone app must provide for the recording and viewing of the number of victims at an incident.				x		x		
SM-RQ-003	Must	The smartphone app must provide for the recording and viewing of the hospital bed capacity.			x	x		x		
SM-RQ-004	Must	The smartphone app must provide for the recording and viewing of the medical resources available.			x	x		x		
SM-RQ-005	Could	The smartphone app could provide for access to a database of historical records.							x	
SM-RQ-006	Should	The smartphone app should provide for recording and viewing of amount and type of ambulances available.			x			x		
SM-RQ-007	Should	The smartphone app should provide for recording and viewing specific alert messages.			x					
SM-RQ-008	Should	The smartphone app should provide for recording and viewing alternative sites of care.			x	x		x		
SM-RQ-009	Should	The smartphone app should provide for reporting on different triage categories for patients.				x	x			
SM-RQ-010	Could	The smartphone app could provide for displaying 3rd party information.						x		x
SM-RQ-011	Should	The smartphone app should provide for recording and viewing details on unconscious patients.				x	x			x
SM-RQ-012	Should	The smartphone app should provide for recording and viewing details on patients without documents.								x
SM-RQ-013	Must	The smartphone app must provide for recording the hospitals patients sent to.				x				
SM-RQ-014	Must	The smartphone app must provide for recording of scene specific details.	x							
SM-RQ-015	Must	The smartphone app must provide for picture/video recording of the scene.								x
SM-RQ-016	Must	The smartphone app must provide for picture/video recording of the casualties.								x
SM-RQ-017	Could	The smartphone app could provide for live video streaming to a remote C&C room.								x
SM-RQ-018	Could	The smartphone app could provide for access to maps of emergency area.								
SM-RQ-019	Could	The smartphone app could provide a chemical decoder.								
SM-RQ-020	Could	The smartphone app could provide a GPS location sensor..								
SM-RQ-021	Could	The smartphone app hardware could provide an interface to medical equipment.								
SM-RQ-022	Could	The smartphone app hardware could provide access to pre-emergency plans of emergency sites.								
SM-RQ-023	Could	The smartphone app hardware could communicate over an emergency response phone network or local emergency zone wifi.								
Smartphone App Interface Requirements										
SM-RQ-024	Must	The smartphone app must be accessible on an iOS tablet.								
SM-RQ-025	Must	The smartphone app must be accessible on an Android tablet.								
SM-RQ-026	Could	The smartphone app could exchange information with the *KEMLER/ONU system.*								
SM-RQ-027	Could	The smartphone app could exchange information with the *GETR system.*			x	x	x	x		
SM-RQ-028	Could	The smartphone app could exchange information with the *WISM system.*			x	x	x	x		
SM-RQ-029	Could	The smartphone app could exchange information with the *REACT Satellite Communication system.*			x	x	x	x		
SM-RQ-030	Could	The smartphone app could exchange information with the *Police system.*			x			x	x	x
SM-RQ-031	Could	The smartphone app could exchange information with the *118 system.*	x		x	x	x	x	x	x
SM-RQ-032	Could	The smartphone app could exchange information with the *Italian Protezione Civile system.*	x		x	x	x	x	x	x
ALL MPORG REQUIREMENTS AS STATED IN DELIVERABLE D2.1				x						