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Specifications for Digital Scenarios for Crisis Management Exercises

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European foreword

This CEN Workshop Agreement has been developed in accordance with the CEN-CENELEC Guide 29 “CEN/CENELEC Workshop Agreements – A rapid prototyping to standardization” and with the relevant provisions of CEN/CENELEC Internal Regulations - Part 2. It was approved by a Workshop of representatives of interested parties on YYYY-MM-DD, the constitution of which was supported by CEN following the public call for participation made on 2021-MM-DD. However, this CEN Workshop Agreement does not necessarily include all relevant stakeholders.

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The following organizations and individuals developed and approved this CEN Workshop Agreement:

- name organization/individual
- name organization/individual

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Introduction

This CEN Workshop Agreement (CWA) has been elaborated as part of the EU-funded research project STRATEGY, which received funding from the European Union's HORIZON 2020 research and innovation programme under grant agreement (GA) No 883520. More specifically, upon investigation of the standardisation universe across its thematic streams of research and prioritisation of the identified gaps against the operational perspective of end-users, STRATEGY underlined the need and supported the drafting of the CWA in discussion.

The main objective is to better support cross border and cross platform interoperability and to assist planners in exercise activities. Most of the crisis management exercises are currently following traditional approaches such as paper-based scenarios. This is an insufficient practice leading to complications in the design phase of an exercise due to the involvement of numerous actors and the existence of different types of exercises which make the preparation of exercises a particularly challenging issue. The design phase is also considered to be of key importance for the successful operation and completion of an exercise. However, exercise planners have currently limited options in terms of available digital solutions to enhance the preparation of the design phase but also to effectively guide a planner through the process of large-scale exercises in crisis management field where numerous scenarios and events exist.

EU funded initiatives aimed at the development of scenario building tools in an effort to improve the current traditional practice, support the design phase of exercises in planning realistic complex and multi-hazard scenarios and enhance collaborative preparedness in challenging crisis situations. However, there is currently no unified process to specify the digital representation of an exercise. As a result, the existing scenario building tools are currently using various data models customised to the needs of each tool which hamper their widespread and efficient application among main crisis management stakeholders.

An opportunity thus exists for the development of a digitised process which can provide a useful tool to exercise planners with regards to the planning and the implementation of crisis management exercises to enable their effective preparation.

1 Scope

This CEN Workshop Agreement (CWA) specifies a digital process for the planning of crisis management exercises. The CWA will provide recommendations on the type of digital information exchanged for scenarios in crisis management and the use of a data model for exchanging scenario characteristics. It also provides recommendations for the implementation of the data model to scenario building tools. This document is applicable to organizations responsible for planning and implementation of exercises and to technology providers focusing on the development of scenario building tools for crisis management activities.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp/>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

crisis management

coordinated activities to lead, direct and control an organization with regard to crisis

[SOURCE: ISO 22361:2022, 3.3]

3.2

exercise

process to train for, assess, practice and improve performance in an organization

[SOURCE: ISO 22398:2013, 3.5]

3.3

inject

scripted piece of information inserted into an exercise designed to elicit a response and facilitate the flow of the exercise

[SOURCE: ISO 22398:2013, 3.13]

3.4

observer

exercise participant who witnesses the exercise while remaining separate from exercise activities

[SOURCE: ISO 22398:2013, 3.15]

3.5

participant

person or organization who performs a function related to an exercise

[SOURCE: ISO 22398:2013, 3.16]

3.6

player

an individual that has an active role in the exercise by either discussing or performing a regular role and responsibility in response to a scenario

[SOURCE: USDHS, 2020]

3.7

preparedness

readiness

activities, programmes and systems developed and implemented prior to an incident that can be used to support and enhance prevention, protection from, mitigation of, response to and recovery from disruptions, emergencies or disasters

[SOURCE: ISO 22300:2021, 3.1.182]

3.8

scenario

pre-planned storyline that drives an exercise, as well as the stimuli used to achieve exercise project performance objectives

[SOURCE: ISO 22300:2021, 3.1.234]

3.9 training

activities designed to facilitate the learning and development of knowledge, skills and abilities, and to improve the performance of specific tasks or roles

[SOURCE: ISO 22300:2021, 3.1.280]

4 Symbols and abbreviated terms

- GUID: Globally Unique Identifier
- ID: Identifier

5 Data model specifications

5.1 General

The section provides the specifications of the proposed data model proposed for crisis management exercises. This involves the identification of scenario entities, attributes and their types and the relationship among different entities. Finally, and based on the aforementioned information included in the previous sections, the overview of the logical data diagram of the proposed model is provided.

5.2 Identification of scenario entities

This section provides recommendations about the entities that shall be identified during a scenario, which are presented in Table 1.

Table 1 – Entities to be identified for a given scenario and their description

Entity	Description of entity
Scenario	It groups one or more Scenario Instances into a specific scenario and refers to a specific objective(s).
Scenario Instance	The scenario or part of it that will be executed.
Participant	The individuals or organizations that execute a scenario or act within a scenario.
Role	The role of the participant that needs to be defined, e.g. player, observer, instructor etc.
Objectives	Every Scenario Instance or Participant has zero or more objectives that need to be accomplished.
Organization	The agency / department that the participant(s) belong to.
Resources	Various resources (e.g. vehicles, personnel, equipment) that are available by the participant for a specific scenario.
Category	The category of the current scenario
Inject	A basic functionality of the scenario building tool, which is employed to send different kind of messages to the platforms and participants involved.
Storyline	Provides information about a specific part of a scenario instance, e.g. exercise preparation, exercise starting/end phase, main storyline and side storyline etc.

Role Participant	Each participant can have one or more roles that can be set.
Participant Objectives	Each participant can have zero or more objectives that can be set.
Storyline Objectives	Each storyline can have zero or more objectives that can be set.
Instance Objectives	Each instance can have zero or more objectives that can be set.
Start Point	It is the start point of an Inject that needs to be stated in terms of date and timing, that defines when it should be sent to the relevant tools or participants
Assets	The entity that represents the possible files that could be part of a message (e.g. pdf, media, json files)
Inject Time Status	This represents the different time points that an Inject should be executed (e.g. Immediately, Manually at specific time)
Inject State	Entity to represent the different states of an Inject (e.g. In Progress, Executed, Cancelled)

5.3 Mapping of attributes and their types

Each attribute is assigned to a data type for storing sequential byte data. The types of attributes are provided in the following Table 2. An analytic description of the attributes that each entity may contain, is then presented in Table 3.

Table 2 – Types of attributes and their description

Data type of attributes	Description of data type
guid (ISO/IEC 9834-8, 2014)	Global Unique Identifier that is used to represent uniquely a record in the table.
string	Data type to hold a value that is a sequence of characters
integer	Data type that represents a range of mathematical integers
timestamp	Data type used to contain both date and time parts
blob	Type that stores any kind of binary data

Table 3 – Attributes of entities and their data types

Entity	Attributes	Data type
Scenario	Scenario Id	guid
	Scenario Title	string
	Category Id	guid
	Creation Date and Time	timestamp
	Update Date and Time	timestamp
Scenario Instance	Scenario Instance Id	guid
	Scenario Instance Name	string

	Scenario Ids	guid
	Description	string
	Start Time	timestamp
	End Time	timestamp
	To Do Start (i.e. actions that can be declared when an exercise starts)	string
	To Do End (i.e. actions that can be declared when an exercise ends)	string
Objectives	Objectives Id	guid
	Objectives Description	string
Participant	Participant Id	guid
	Participant Name	string
	Description (i.e. expertise in which a participant is specialised)	string
	Email	string
	Exercise_Email (i.e. attribute required only for the purpose of exercise)	string
	Mobile	string
	Phone	string
	Exercise_Phone (i.e. attribute required only for the purpose of exercise)	string
	Organisation Id	guid
Role	Role Id	guid
	Role Title	string
Organization	Organisation Id	guid
	Organisation Name	string
	Street	string
	City	string
	State	string
	Postal Code	string
	Country	string
Resources	Resources Id	guid
	Resources Title	string
	Resources Number	integer
	Participant Ids	guid
Inject	Inject Id	guid
	Inject Title	string

	Storyline Ids	guid
	Topic (i.e. topic which identifies the specific inject)	string
	Inject Description	string
	Inject Content	string
	Start Point Id	guid
	isValid (i.e. the validation state of an inject, e.g. valid, invalid)	string
	Asset Id	guid
Storyline	Storyline Id	guid
	Storyline Title	string
	Scenario Instance Ids	guid
	Storyline Description	string
Category	Category Id	guid
	Category Title	string
Participant Objectives	Participant_Objectives Id	guid
	Participant Id	guid
	Objectives Id	guid
Instance Objectives	Instance_Objectives_Id	guid
	Scenario Ids	guid
	Objectives Id	guid
Storyline Objectives	Storyline_Objectives_Id	guid
	Storyline_Id	guid
	Objectives Id	guid
Start Point	Start Point Id	guid
	Start Point Title	string
	Type Id	guid
	Start Point Delay	integer
	Start Point Unit Delay (i.e. user indicates the unit in hours, minutes, seconds)	string
	State Id	guid
	Participant Id	guid
Assets	Asset Id	guid
	Asset Title	string
	Asset filename	string
	Asset Content	blob

Inject Time Status	Inject Time Status Id	guid
	Inject Time Status Title	string
Inject State	Inject State Id	guid
	Inject State Title	string

5.4 Relationship symbols and relationship among entities

The types of Entities may have one or several relationships among themselves. The different types of entity relationships employed in the data model are provided in the following Table 4.

Table 4 - Entity relationships and their descriptions

Entity relationship	Description of entity relationship
(1)-(1)	One to one relationship, e.g. one Inject has one Start point
(1)-(0,N)	One to None or many relationships, e.g. one Inject may have none, one or more Assets included
(1)-(1,N)	One to one or many relationships, e.g. a Scenario may have one or more Scenario Instances that will be executed
Single line	Simple relationship, e.g. one Inject has one Start Point set.
Line with white arrow in one end	Inheritance relationship, e.g. a Scenario Instance extends a Storyline

The relationship among entities describes how the latter relate to each other within a system. The entity relationship diagram for the proposed data model is provided in the following Figure 1.

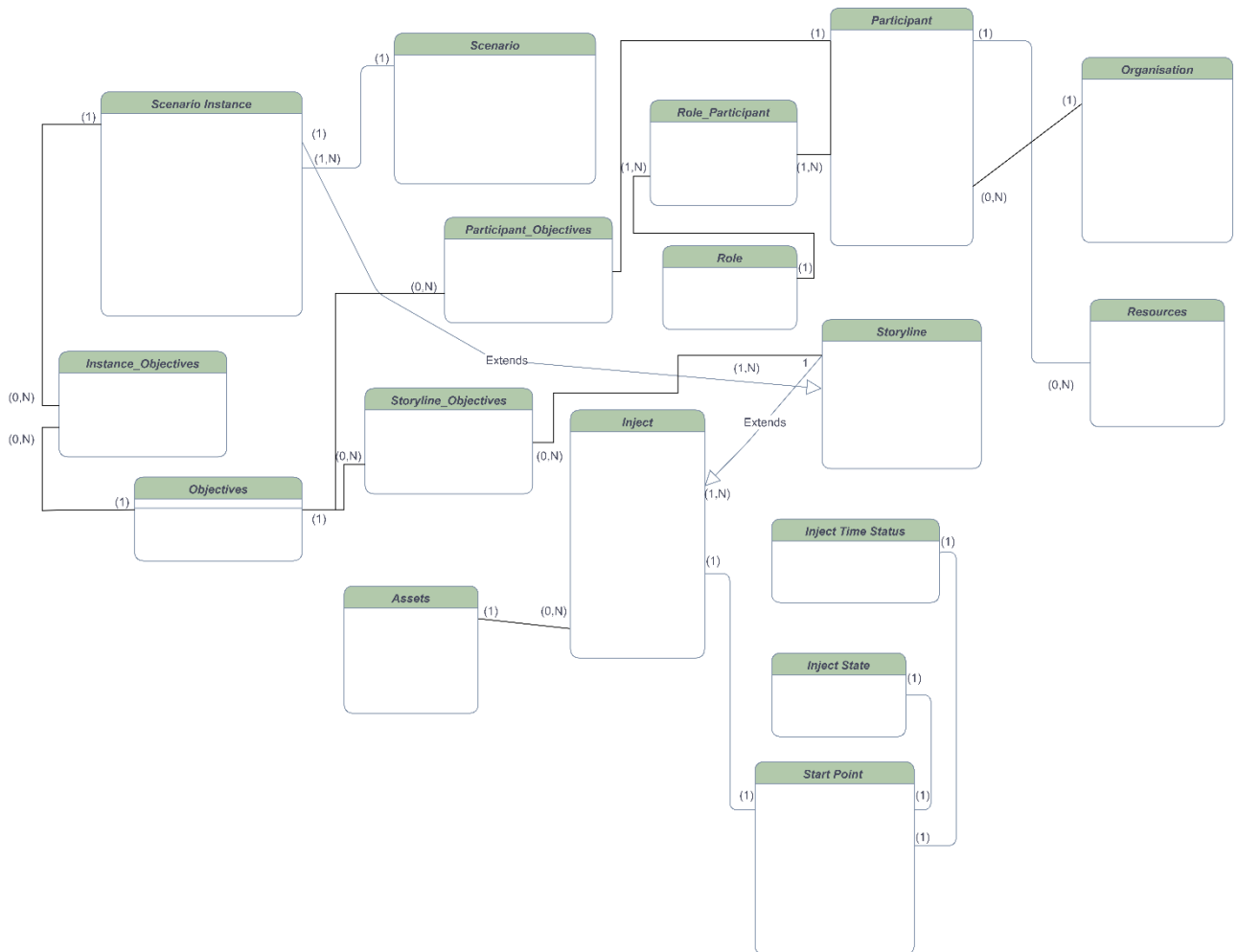


Figure 1 - Entities of proposed data model and entity relationship

5.5 Overview of conceptual data model

This section provides an overview of the conceptual data structure of a scenario. The proposed logical data diagram is provided in the following Figure 2. A demonstration of the proposed data model for scenario injects is also provided in Annex A.

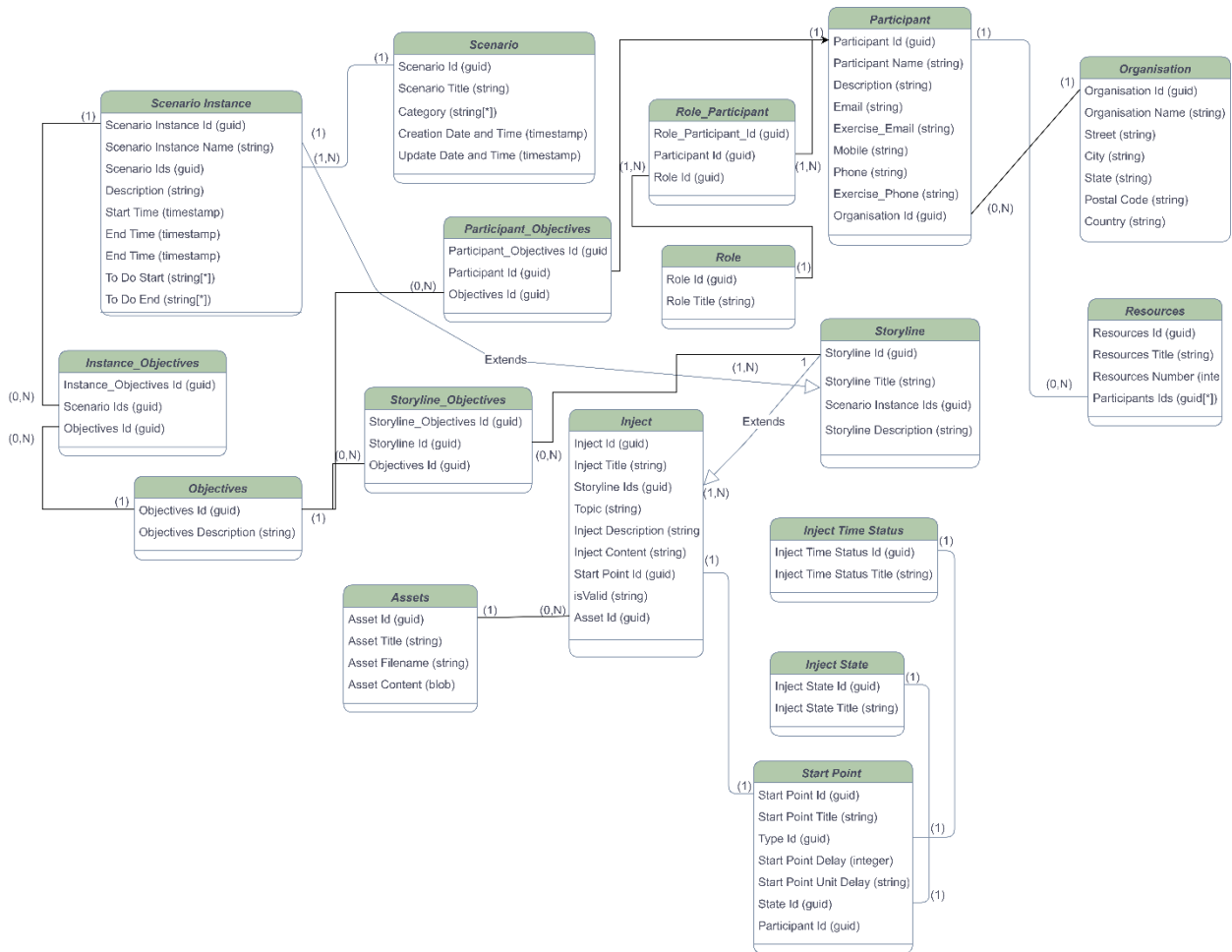


Figure 2 – Logical data diagram of proposed model

6 Recommendations for the implementation of the data model to scenario building tools

6.1 General

The section provides recommendations about the implementation of the proposed data model to scenario building tools and its future potential expansion and modifications.

6.2 Data model recommendations

The recommendations for the implementation of the data model and its future development/modification are listed as follows:

- Future development of the data model should consider the system's necessity to expand to future needs and requirements.
- Future development of the data model should comply with the current delivered functionalities and the desired features of system.
- The data model should support the ability of the system to enable exercise planners to define the information to be included in each event,

- d) The data model should use field datatypes to enable efficient interaction with other systems (e.g. timestamp).
- e) The data model should support the ability to embed in the event information both timestamp and the geographical coordinates.
- f) The data model should support the ability of the exercise planner to define placeholders in the information of the event to be replaced with the timestamp and geographical coordinates of the event.
- g) The system should support the ability to import and export a scenario of various file formats (e.g. json, xml, excel)
- h) The data model should support the localization (i.e. refers to the translation of text, speech, units, time zones) to users either by internal or external localisation models. When such ability is not feasible the system may opt either for keeping the original terms or to do the most approximate translation but including a tooltip warning of the difference between the countries.

Annex A (informative)

Demonstration of proposed data model for scenario injects

A.1 General

This annex aims to provide an overview of the implementation of the proposed data model for a given scenario. For demonstration purposes, the scenario is provided in inject type format as presented in Table A.1. The scenario involves an extreme flood event that is occurring within Greek territory and triggers several extreme weather phenomena incidents that involve extreme weather phenomena warnings in Attica region, alerts of occurring storms, tramped citizens and urgent calls for rescue and closure of critical transportation infrastructure. Key agencies involved in the fictional scenario are the Hellenic national meteorological service, Civil protection, Hellenic police, and Airport operator.

Table A.1 — Scenario injects and their characteristics provided as an example for the implementation of the proposed data model

Inject No.	Time (GMP)	Type	Location	Sender	Receiver	Message	Notes
1	09:00:00	Message	Western Attica	Hellenic National Meteorological Service	Civil Protection	Emergency extreme weather phenomena warning: There is a high risk for severe storms in the wider area of Attica, with emphasis on the North-western part.	
2	17:57:00	Message	Eastern Attica	Hellenic Police	Civil Protection	The Hellenic Police has to block the road leading to the airport and provide alternative routes in order to allow rescue activities and to facilitate the ambulances to approach the location.	Extra recipient: Airport operator

Table A.2 — Input information for the Scenario entity

Attribute	Data type	Information to be inserted
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Scenario Id	Guid value	N/A (ID generated by the system)
Scenario Title	String value	Example Scenario
Category	Guid value from Category entity	Flood
Creation Date and Time	Timestamp value	N/A (generated by the system)
Update Date and Time	Timestamp value	N/A (generated by the system)

Table A.3 — Input information for the Scenario Instance entity

Attribute	Data type	Information to be inserted
Scenario Instance	Guid value	N/A (ID generated by the system)
Scenario Instance Name	String value	Extreme weather events in Attica region
Scenario Ids	Guid value from Scenario entity	Scenario Guid that this instance is part of
Description	String value	Two parallel events that are occurring in Greek territory
Start Time	Timestamp value	N/A (generated by the system)
End Time	Timestamp value	N/A (generated by the system)
To Do Start	String value	Send alerts
To Do End	String value	N/A (Defined by users)

Table A.4 — Input information for the Storyline entity

Attribute	Data type	Information to be inserted
Storyline Id	Guid value	N/A (ID generated by the system)
Storyline Title	String value	Flood event
Scenario Instance Ids	Guid value from Scenario Instance entity	Scenario Instance GUID that this storyline is part of
Storyline Description	String value	Flood event occurring in the urban region of Western Attica

Table A.5 — Input information for the Organisation entity

Attribute	Data type	Information to be inserted
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Organisation Id	integer	N/A (ID generated by the system)
Organisation Name	string	Value entered by user
Street	string	Value entered by user
City	string	Value entered by user
State	string	Value entered by user
Postal Code	string	Value entered by user
Country	string	Value entered by user

Table A.6 — Input information for the Resources entity

Attribute	Data type	Information to be inserted
Resources Id	guid	N/A (ID generated by the system)
Resources Title	string	Value entered by user
Resources Number	integer	Value entered by user
Participant Ids	guid	Participant Id that the Resource belongs to

Table A.7 — Input information for the Participant entity

Attribute	Data type	Information to be inserted
Participant Id	guid	N/A (ID generated by the system)
Participant Name	string	Value entered by user
Description (i.e. expertise in which a participant is specialised)	string	Value entered by user
Email	string	Value entered by user
Exercise_Email (i.e. attribute required only for the purpose of exercise)	string	Value entered by user
Mobile	string	Value entered by user
Phone	string	Value entered by user
Exercise_Phone (i.e. attribute required only for the purpose of exercise)	string	Value entered by user
Organisation Id	guid	The organisation that the participant is a member of

Table A.8 — Input information for the Inject 1 entity

Attribute	Data type	Information to be inserted
Inject Id	Guid value	N/A (ID generated by the system)
Inject Title	String value	Alert
Storyline Ids	Guid value from Storyline entity	Storyline GUID that this inject is part of
Topic	Simulation_entity_post (topic created in broker)	Selection through Broker Topic list
Inject Description	String value	Send email
Inject Content	{"POST_MESSAGE":{"type":"MAIL"(2),"recipients:[Participant GUID (4)],"ParticipantId":Participant GUID (3),"title":String value,"description":"Mail content" (5)}	JSON message format
Start Point Id	Guid value from Start Point entity	09:00:00
Is Valid	String value	Value entered by the user
Asset Id	Guid value from Assets entity	Asset GUID that this inject contains

Table A.9 — Input information for the Inject 2 entity

Attribute	Data type	Information to be inserted
Inject Id	Guid value	N/A (ID generated by the system)
Inject Title	String value	Road blocked
Storyline Ids	Guid value from Storyline entity	Storyline GUID that this inject is part of
Topic	Simulation_entity_post (topic created in broker)	Broker Topic
Inject Description	String value	Send mail
Inject Content	{"POST_MESSAGE":{"type":"MAIL"(2),"recipients:[Participant GUID (4)],"senderId":Participant GUID (3),"title":String value,"description":"Mail content" (5)}	JSON message format
Start Point Id	Guid value from Start Point entity	17:57:00
Is Valid	String value	Value entered by the user

Asset Id	Guid value from Assets entity	Asset GUID that this inject contains
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