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Q Req_Frame_RRDN “Requirements and framework for rapid response to
sudden natural disasters in network” (Geneva, 10-19 May 2023)

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Abstract: This document is the initial output of draft new Recommendation ITU-T
Q Req_Frame_RRDN “Requirements and framework for rapid response to
sudden natural disasters in network”, resulting from discussion of Q3/11 meeting
on 10-19 May 2023.

This document is the initial output of draft new Recommendation ITU-T Q Req_Frame_RRDN:
“Requirements and framework for rapid response to sudden natural disasters in network”, resulting
from discussion of Q3/11 meeting on 10-19 May 2023.

This document is based on this meeting's discussion and results on the following contribution:

No.	Title	Source	Discussion
SG11-C217	Proposed new work item on "Requirements and framework for rapid response to sudden natural disasters in network"	China Unicom, China Telecom	Accepted

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Draft New Recommendation ITU-T Q.Req_Frame_RRDN

Requirements and framework for rapid response to sudden natural disasters in network

1. Scope

This draft recommendation specifies the requirements and framework for rapid response to sudden natural disasters. The scope of the draft Recommendation includes:

- 1) The requirements for the network capability to realize rapid response to sudden natural disasters, which reduce rescue time and increase rescue effectiveness and success.
- 2) The framework of network enable the rapid response system to achieve a series of functions.
- 3) Security Consideration

2. References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T Y.1271] ITU-T Recommendation Y.1271R1, *Framework(s) on network requirements and capabilities to support emergency telecommunications over evolving circuit-switched and packet-switched networks*

[ITU-T E.108] ITU-T Recommendation E.108, *Requirements for a disaster relief mobile message service*

[Editor's note: detailed features will be added and refined.]

3. Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 Disaster Relief [b-ITU-T E.108]: Information or action to be effective for reduction and suppression of a serious disruption of the functioning society. The disruption may be caused by accidents, natural phenomena or human activity, and results in a significant widespread threat to human life, health, property or the environment.

3.1.2 Disaster Relief System [b-ITU-T E.108]: A system that provides disaster relief (response) services to related parties, which include affected victims, rescue workers and systems.

3.1.3 Network Recovery [b-ITU-T L-Sup.35]: The process of recovering the service level of a given communication network after a disaster.

3.1.4 Network Resilience [b-ITU-T L-Sup.35]: The ability to provide and maintain an acceptable level of service in the face of faults and challenges to normal operation of a given communication network, based on prepared facilities.

3.1.5 Artificial Intelligence (AI) [ISO/IEC 2382-28]: An interdisciplinary field, usually regarded as a branch of computer science, dealing with models and systems for the performance of functions generally associated with human intelligence, such as reasoning and learning.

3.1.6 Victim [b-ITU-T E.119]: A person affected by a disaster.

[Editor's note: detailed features will be added and refined.]

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

[Editor's note: detailed features will be added and refined.]

4. Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AI	Artificial Intelligence
BSS	Business Support System
ML	Machine Learning
OSS	Operator Support System

[Editor's note: detailed features will be added and refined.]

5. Conventions

In this Recommendation:

The keywords "is required to" indicate a requirement which must be strictly followed and from which no deviation is permitted, if conformance to this Recommendation is to be claimed.

The keywords "is recommended" indicate a requirement which is recommended but which is not absolutely required. Thus, this requirement need not be present to claim conformance.

The keywords "can optionally" indicate an optional requirement which is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option, and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with this Recommendation.

6. Overview

With the development of mobile networks and changes in information technology, networks can take on more responsibility for rapid response to sudden natural disasters. Existing mobile network connectivity and data-enabled objects lack adaptability to rapid mitigation and rescue in sudden natural disasters. There are no common solutions, models and functional integration at the base network level, resulting in no effective emergency analysis and support in the event of a disaster. There are many limitations in the response to disaster, resulting in missing the best time to rescue and thus failing to further reduce the impact of the disaster.

Existing networks and rescue methods have four major limitations:

- a. Lack of historical data, which limited rapid and effective data analysis

- b. No emergency analysis models applicable to the scene.
- c. Inability to quickly assemble professional analysts.
- d. Complexity of implementing rescue methods.

Therefore, this draft Recommendation is to clarify the requirement and framework for rapid response to sudden natural disasters, which can be conducted based on real-time data collection and preset disaster models, and deploys in the network globally. However, personnel rescue can be quickly achieved within the best rescue time. In addition, functions such as disaster warning, affected people detection and buffer zone warning should be included.

7. Functional requirements

7.1 Rapid acquisition of real-time data and data processing

- It is required that the data source is from the user side and network side of the operation data.
[Editor's note: detailed features will be added and refined.]

7.2 Response to mobile network destruction

- It is required that the network can quickly identify the source of the destruction.
[Editor's note: detailed features will be added and refined.]

7.3 Exclusion of non-portable terminals and non-disaster victims in the affected area

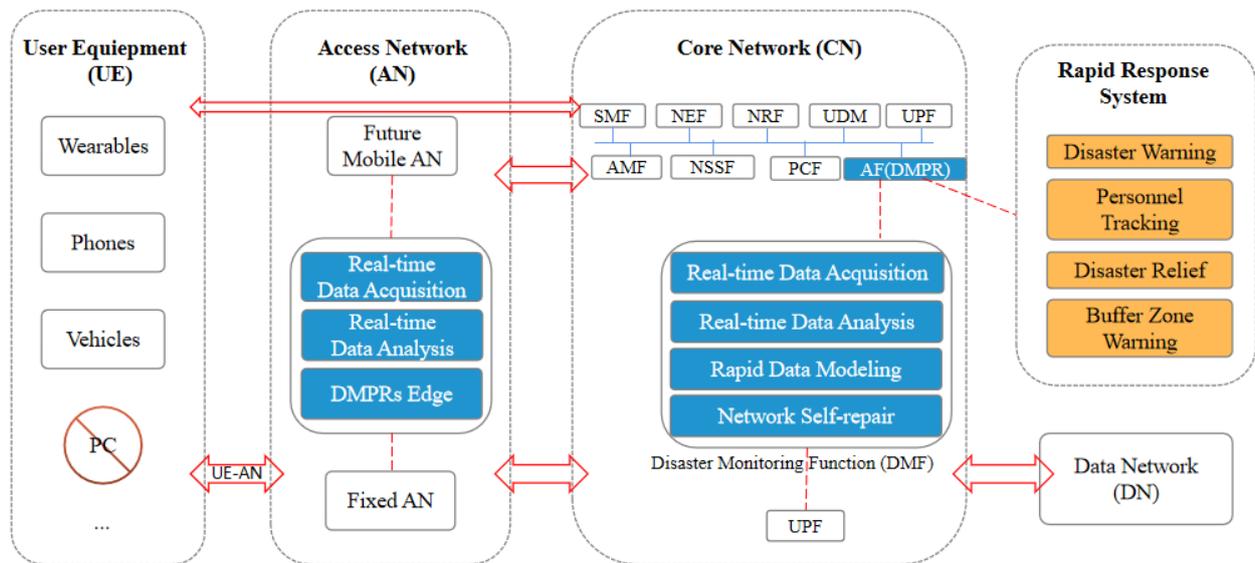
- It is required that the ability to identify trapped persons within the delineated disaster area, but excludes non-disaster trapped persons within the area such as rescue personnel.
[Editor's note: detailed features will be added and refined.]

7.4 Multiple analysis models for different disaster sources and scenarios

- It is required that the network can quickly identify disaster area and surrounding disaster buffer areas.
- It is required that the network to be able to obtain the GPS of trapped person, and tracking them.
- It is recommended to cluster analysis the trapped people, assess the situation to enable the maximum rescuers in the shortest possible time.
[Editor's note: detailed features will be added and refined.]

8. Framework

The framework is built over a future network with rapid response to disaster related capabilities. The access network consists of future mobile access network and fixed access network. The rapid response system supports different scenarios for pre-disaster and post-disaster application, which distributed among UEs, access networks, core network and Rapid Response System.



The description of the role of each component is as follows:

- Rapid Response System can be seen as an application function(AF) in future network, which can interact AF through service-based interfaces. It can also influence the disaster monitoring module by returning disaster data.
- Disaster Monitoring Function(DMF) is a component of the future core network(CN), interacts with both control plane(CP) and user plane(UP). The network self-recovery is included in the DMF to deal with network destruction caused by disaster. The machine learning based AI technologies can be used for the rapid data modeling in DMF.
- The future access network is able to support rapid response system with the requirements of real time data, real-time data acquisition and data analysis is supported in the future network.
- The rapid response system Edge is located near to the UEs, it is responsible for interaction with CN and rapid response system for personnel tracking and disaster relief. Thanks to the local access, computing, storage and bandwidth provided by the rapid response system Edge, an immediate and efficient data processing process is available for disaster monitoring. Consequently, when a disaster occurs, rapid response system can respond quickly to achieve disaster warning and personnel rescue.
- There are many different types of UEs with mobile access capabilities, the UE that is non-anthropocentric should be excluded from the network, such as PC.

[Editor's note: detailed features will be added and refined.]

9. Security considerations

The disaster mitigation and personnel rescue service system includes user equipment, access networks, and core network that are subject to security and privacy measures. Sensitive information should be protected as a high priority in order to avoid leaking and unauthorized access. Security and privacy concerns should be aligned with the requirements specified in [b-ITU-T Y.2701] and [b-ITU-T Y.3101].

[Editor's note: detailed features will be added and refined.]