

# A New Emergency Notification System Developed by TÜRKSAT as Part Of EMYNOS Project Turkish Field Trials

Sami Yenice<sup>1</sup>, Mehmet Aktaş<sup>1</sup>, Fazıl Yaraşlı<sup>1</sup>, Tunç Durmuş Medeni<sup>2\*</sup>, Ahmet Savaş<sup>1</sup>, Halil Yeşilçimen<sup>1</sup>

<sup>1</sup> TÜRKSAT, <sup>2</sup> Ankara Yıldırım Beyazıt University, \* Corresponding author, tunccmedeni@gmail.com

## Abstract

Türksat, one of the leading operators in the satellite communication business as well as e- government and m-government operations in Turkey, is involved with nExt generation eMergencY commuNicatiOns (EMYNOS) project. EMYNOS project aims to design and implement a Next Generation platform capable of accommodating rich-media emergency calls that combine voice, text, and video, thus constituting a powerful tool for coordinating communication among citizens, call centers and first responders (<http://www.emynos.eu/>). Connecting EMYNOS infrastructure with m-Government applications in Turkey will allow warning messages to reach many citizens in accordance with three specific use case scenarios. With respect to the Use Case 1, Warning Over Satellite, based upon the emergency warning trigger from KATWARN (for instance an earthquake or terrorist attack warning), users will be able to see an emergency message on their TV screens. The warning message will be provided via Türksat satellite systems.

**Keywords:** Türksat, EMYNOS, Emergency warning systems, Satellite communications, M-Government applications.

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**Abstract**

Türksat, one of the leading operators in the satellite communication business as well as e-government and m-government operations in Turkey, is involved with nExt generation eMergencY commuNicatiOns (EMYNOS) project. EMYNOS project aims to design and implement a Next Generation platform capable of accommodating rich-media emergency calls that combine voice, text, and video, thus constituting a powerful tool for coordinating communication among citizens, call centers and first responders (<http://www.emynos.eu/>). Connecting EMYNOS infrastructure with m-Government applications in Turkey will allow warning messages to reach many citizens in accordance with three specific use case scenarios. With respect to the Use Case 1, Warning Over Satellite, based upon the emergency warning trigger from KATWARN (for instance an earthquake or terrorist attack warning), users will be able to see an emergency message on their TV screens. The warning message will be provided via Türksat satellite systems. According to Use Case 2, Warning Over m-Government Applications, based upon the previous emergency message, users will be notified via their mobile phones, following a location-based matching with respect to the nature of the emergency situation (for instance an earthquake in Gölbaşı area near Ankara). Finally, in accordance with Use Case 3, Failover Using Satellite, following the emergency case situation, it will be assumed that all terrestrial connections be down. As a result, use of a back-up failover emergency communication system will be demonstrated using VOIP via VSAT. Our work presents information on the system design on these use cases as an innovative public service development and provision.

**Key Words:** Türksat, EMYNOS, emergency warning systems, satellite communications, m-government applications

**Introduction**

Turksat, one of the leading operators in the satellite communication business, offers flexible solutions by providing its customers with cable and wireless broadcasting, high-speed internet, and direct TV services. Turksat has made it a mission to transform information technology into

services applicable to the everyday life. The company builds communication networks, and enhances innovative projects to provide seamless connectivity outside terrestrial network via Turksat satellites. It also develops and operates the E-Government Gateway.

Turksat also operates the public cable TV and satellite network widely used by its subscribers within and outside the country. By November 2016, Cable TV has 1.159.638 analog and 883.539 digital subscribers (BTK 2016 in [https://tr.wikipedia.org/wiki/Turksat\\_Kablo\\_TV](https://tr.wikipedia.org/wiki/Turksat_Kablo_TV)). While there are hundreds of TV channels owned by different institutions broadcasted to the subscribers/end users, specific channels are owned by and dedicated for Turksat itself.

The Turkish e-Government Gateway is a single point for citizens to serve public services. [www.turkiye.gov.tr](http://www.turkiye.gov.tr) is the main portal and there are 2 mobile applications available in Google Play Store and Apple AppStore. These 2 m-Government (m-gov) applications have already more than 11 million downloads in total. This means, m-Gov applications have more than 12.5% citizen coverage in Turkey considering a population of 78 million people.

In order to receive mobile notifications, users have to register their devices on the cloud messaging services. Turksat is in the process of developing a middle API called “PNS (Push Notification Service)” to handle registration and submission processes. This application is open source and available at <https://github.com/Turksat/pns>. When a user opens the app and logs in for the first time, the app will send user and device information to PNS. PNS processes and forwards the data to a related cloud messaging platform (Google GCM or Apple APNS). When this process is completed, the user is registered and ready to receive notification messages.

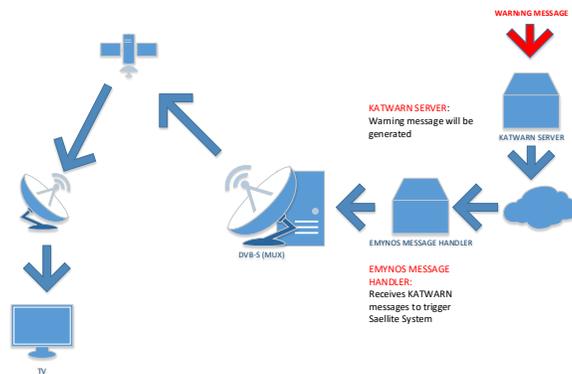
Turksat is involved with nExt generation eMergencY commuNicatiOns (EMYNOS) project. EMYNOS project aims to design and implement a Next Generation platform capable of accommodating rich-media emergency calls that combine voice, text, and video, thus constituting a powerful tool for coordinating communication among citizens, call centers and first responders (Yacine et al. 2018, <http://www.emynos.eu/>). Connecting EMYNOS infrastructure with m-Gov applications in Turkey will allow warning messages to reach many citizens.

As another important infrastructure to be utilized for the EMYNOS field trials, Turksat VSAT (Very-small-aperture terminal) is a satellite communication system. It provides high-speed internet, up to 8 Mbps on Ku-Band and up to 25 Mbps on Ka-Band. Compatible with the Voice - over -Internet -Protocol (VoIP), it can be used for disaster and emergency communication

- by anyone, who does not have a terrestrial connection at their location and wants to back up their existing communication network or who requires an emergency communication in a disaster;
- anywhere in the coverage area of Turksat 3A and Turksat 4B communication satellites.

### System Description

Turksat is providing services for voice, data, internet, TV, and radio broadcasting across a wide area extending from Europe to Asia through TURKSAT-3A, TURKSAT-4A and TURKSAT-4B satellites. In the EMYNOS project Turksat will broadcast a TV channel to warn citizens in case of emergencies. The TV channel is going to broadcast through TURKSAT-3A WEST coverage. The EMYNOS message handler server will be located at Turksat’s facilities and it will handle the warning messages provided by the KATWARN server. After receiving a message, the message handler server will determine the impact level of the message. If the message influence is wide enough to warn citizens all over the satellite coverage then the message handler server will trigger the satellite TV Broadcast station (MUX, multiplexer) with the associated warning message. When the EMYNOS message handler is received a warning message from KATWARN (<https://www.katwarn.de/en/system.php>), TV broadcast infrastructure (MUX) will add the warning message to the TV channel without interrupting the ongoing television program. The related topology is provided in Figure 1.



**Figure 1: Topology Satellite Based Public Warning System**

Citizens that are using satellite to receive TV transmissions can receive warning messages over satellite.

Each smartphone in Turkey which has the m-Gov application installed will be connected to a Location Server when the application runs for the first time. This connection will let smartphone

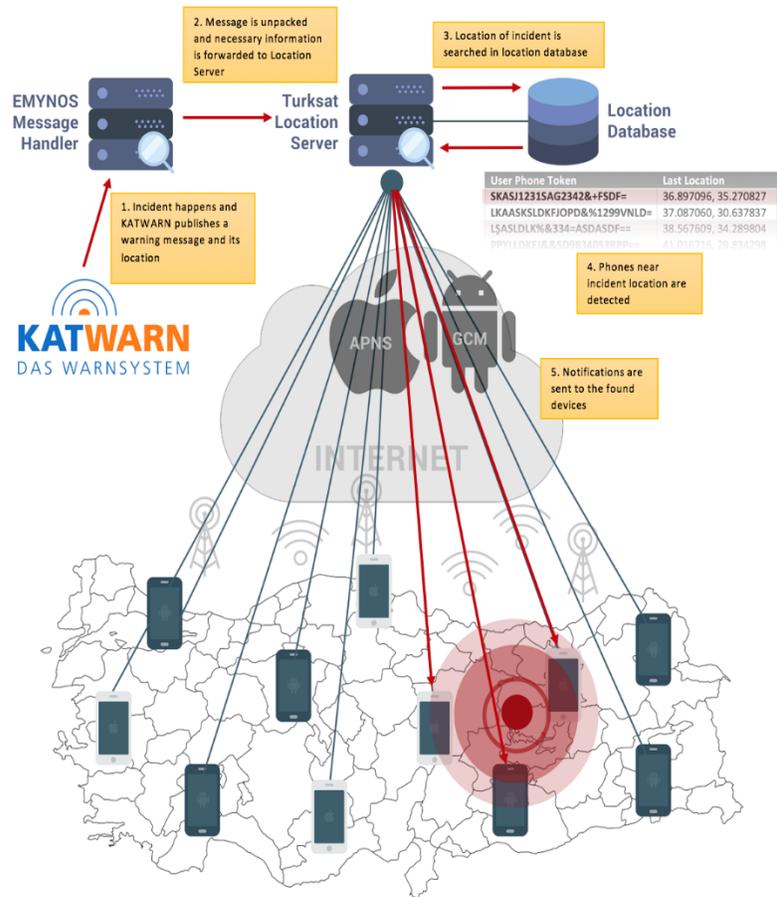
to send its location and its token to receive a notification. The time interval will be 10 minutes and this interval may change considering the circumstances. Every 10 minutes, the smartphone will send a “heartbeat” request to the server. The location server will be connected to a database which will store user token and user location information. By doing this, the location and device data will be anonymous.

In the EMYNOS Project, the Turkish e-Government mobile applications and their location storage infrastructure will also be used as a warning mechanism. In order to warn people in an event location area, KATWARN and M-Gov structures will be connected to each other, as illustrated in Figure 2.

When an incident happens in a certain area, KATWARN will publish a warning message to the EMYNOS Message Handler which is developed by Turksat and hosted in Turksat premises. The handler will process the warning message and take out the location information and incident details.

A warning message sent by KATWARN is provided in the Common Alerting Protocol (CAP) format. This makes the alert broadcast become plug-and-play and easy to integrate solution. The message is retrieved by the EMYNOS Message Handler in XML format and is parsed and passed to other components.

This data will be passed to the Turksat Location Server. Considering the predefined diameter of the warning circle, the Location Server will identify the devices which were in the incident location area within the last 10 minutes. The Turksat Location Server will then directly send notifications to the users in that area. Notification requests will be sent to Google GCM and Apple APNS to deliver the warning message to the users. Normally, the infrastructure of Google and Apple will immediately deliver the messages to the smartphones. The message will be received by the m-Gov application in the device and a warning message will be shown on the user’s smartphone. Devices will be registered to Location Database or retrieve notifications either using Wi-Fi or cellular connection.



**Figure 2 : Turkish e-Government Gateway Notification Integrated with KATWARN**  
 Finally, a VOIP (Voice over Inter Protocol) over VSAT between the field team and staff at Headquarters, working in conjunction with the EMYNOS systems will be demonstrated.

### Use cases and Interfaces for the EMYNOS Field Trials

Based upon the above descriptions, and complementing the system topologies and components, the below Use Cases will be used to implement the respective EMYNOS field trials.

#### *Use Case 1: Warning Over Satellite*

Based upon the emergency warning trigger from KATWARN (for instance an earthquake or terrorist attack warning), users will be able to see an emergency message on their TV screens. The warning message will be provided via Turksat satellite systems. The detailed flow is described below.

1. When an emergency event occurred, KATWARN calls the handler service of EMYNOS Message Handler.
2. EMYNOS Message Handler extracts severity, event information and time to live from the received warning message.
3. If severity of the message is greater than or equal to “Severe”, event information is escalated to Multiplexer to start broadcasting process.
4. Text message to be shown on TV is created.
5. Extracted text message is put to broadcast as subtitle
6. Broadcast with subtitle is transmitted to Turksat Satellite.
7. Any user opens TV Receiver to watch any channel.
8. User open the channel with subtitles
9. Broadcast is received by the receiver.
10. The channel which has warning message as subtitle is shown on TV.
11. If time to live parameter first sent by KATWARN expires, subtitle is removed from broadcast.
12. New broadcast without subtitle is transmitted to satellite.

#### *Use Case 2: Warning Over mGovernment Applications*

Based upon the previous emergency message, users will be notified via their mobile phones, following a location-based matching with respect to the nature of the emergency situation (for instance an earthquake in Golbasi area near Ankara). The detailed flows are provided below.

#### **Sending warning message:**

1. When an emergency event occurred, KATWARN calls the handler service of EMYNOS Message Handler with CAP formatted warning message.
2. EMYNOS Message Handler extracts location and event information from the received warning message.
3. Notification process is triggered and Turksat Location Handler starts its processes.
4. Push notification tokens of the users within given location are retrieved from Turksat Location Database.
5. Tokens are retrieved from database.

6. Event information is sent to Turkish mGovernment Apps which have correct push notification tokens.
7. Notification with event information is shown on the screen of devices.

**Location changes:**

1. When mGovernment Application runs for the first time, it generates a push notification token and stores it.
2. When user location changes, this triggers a set of events. User location is requested from devices' internal APIs.
3. Location is retrieved.
4. Latest user location is sent to Turksat Location Handler to store as current user location. Token and location couple is sent.
5. It is requested if token is stored before in Location Database.
6. Previous storing information is retrieved.
7. If token(user) location is not stored before, location is stored with related token.
8. Else, token(user) location is updated

*Use Case 3: Failover Using Satellite*

Following the emergency case situation, it will be assumed that all terrestrial connections be down. As a result, use of a back-up failover emergency communication system will be demonstrated using VOIP via VSAT. The detailed flows are provided below.

1. A warning event is triggered from any warning source like KATWARN or social media and PSAP is informed about the location.
2. PSAP checks whether the connection is available in given location. Connection problem is detected.
3. Public Safety Answering Point (PSAP) operators request VSAT terminal from VSAT Operator to send a VSAT terminal to necessary location in order to re-establish Internet connection.
4. VSAT Operator sends available vehicle which carries a VSAT Terminal.
5. VSAT Terminal arrives at given location and is set.
6. User connects the hotspot provided by VSAT Terminal.
7. Terminal establishes Internet connection using connected satellite.
8. Internet connection is established.

9. SIP client can access Internet.
10. User makes an emergency call to PSAP using SIP client using Internet connection provided by VSAT Terminal and satellite.

Based upon these Use Case scenarios, there will be no collection of personal, and private data:

- 1- Use Case 1: no personal data collection or import is under consideration.
- 2- Use Case 2: The users are already registered end users of Turkish m-government applications and the notification will be provided as an information service as part of the established service system. The system is established in accordance with the Turkish legal and administrative regulations, based upon which related consents are already taken. No personal data collection for the purposes of EMYNOS project is under consideration. For reporting purposes, however, certain anonymised statistics could be gathered and shared with the rest of the consortium, if requested. All data collected for the purposes of the project trials will also be deleted from the system after the end of the project.
- 3- Use Case 3: For this testing of emergency calls over satellite communications, if necessary, certain dummy accounts will be used. Thus again, no personal data will be collected and imported.

## **Conclusion**

All these use cases have been demonstrated in the EMYNOS Special Session in ICEBEG 2017 ([www.icebeg.net](http://www.icebeg.net)) as part of Turkish pilot showcase, and approved by the project management and review. As a result, the warning system application demonstrated by Türksat as part of EMYNOS pilots can be deployed as an innovative approach to warning systems, and can be used by other public agencies in other parts of the world for the safety of their citizens and non-citizens. The full results from the pilots are now officially available at project website, <https://www.emynos.eu/en/emynos/pilots/turksat-pilot> .

## **Acknowledgement**

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