Emergency Communications over Broadband Networks

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WARNING!
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Television Can Save Lives - An Emergency Warning System (EWS) Using DVB-T

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Despite the continuous increase in the quality of meteorological and geographical models, the lead time for natural disasters is still in the range of hours, if not minutes. To minimise the loss of lives, it is therefore of paramount importance that a broadcast system gets warning messages across in a fast, reliable and affordable way:

- Information gathering, processing and delivery infrastructure: due to DVB-T's worldwide adoption, a wide variety of competitively priced devices is available across the whole end-to-end chain.
- Signal delivery mechanism: DVB-T has excellent capabilities to deliver the alert signal to receivers through

(Transmission Parameter Signalling) bits in the modulation frame. This enables an automatic switch during the delivery of emergency warnings to a more robust transmission scheme. Assuming that the normal transmission modulation parameters were set to 64 QAM and FEC 2/3, when disaster strikes the system would automatically switch to QPSK and FEC 1/2 by simply changing the modulator configuration. The QPSK mode is the most robust mode requiring very low C/N flux density. This will insure that all receivers in the coverage footprint will automatically switch to ensure they are capable of receiving the disaster information.

during any event (advertisement or programme segment). This is realised by an announcement flag carried in the Adaptation Field of the Transport Stream packets carrying the announcement audio (**see Fig. 1**). If the announcement service is in a different multiplex, a proxy service in the current multiplex duplicates the announcement switching flag. Therefore it is, at all times, sufficient to monitor just one additional audio PID in order to stay on top of any announcements being broadcast.

EWS Implementation Aspects

Warning messages should ideally contain both visual and audio indications. The viewer might not be

standard through its robust and flexible modulation scheme (ETSI EN 300 744) and the use of the Service Information specification DVB-SI (ETSI EN 300 468).

The DVB Solution

RF & Modulation Aspects

Every DVB-T demodulator is automatically configurable by the modulator. The modulation parameters and the FEC are conveyed in the TPS

DVB supports audible announcements of several types which are indicated by the announcement support descriptor. This descriptor is carried in the Service Description Table (SDT) and points to one or more services (on the same or different multiplexes) which each carry one or more types of announcements. DVB-SI also provides for dynamic and automatic switching of the receiver to the announcement from any service

As the receiver knows which service the announcement audio belongs to, authorities and broadcasters have all the freedom to use any or all other components of the current or the announcement service to enrich their EWS message and make it clearer and intelligible to as large an audience as possible. That way, the DVB system helps to save as many lives as possible at minimal effort and cost.

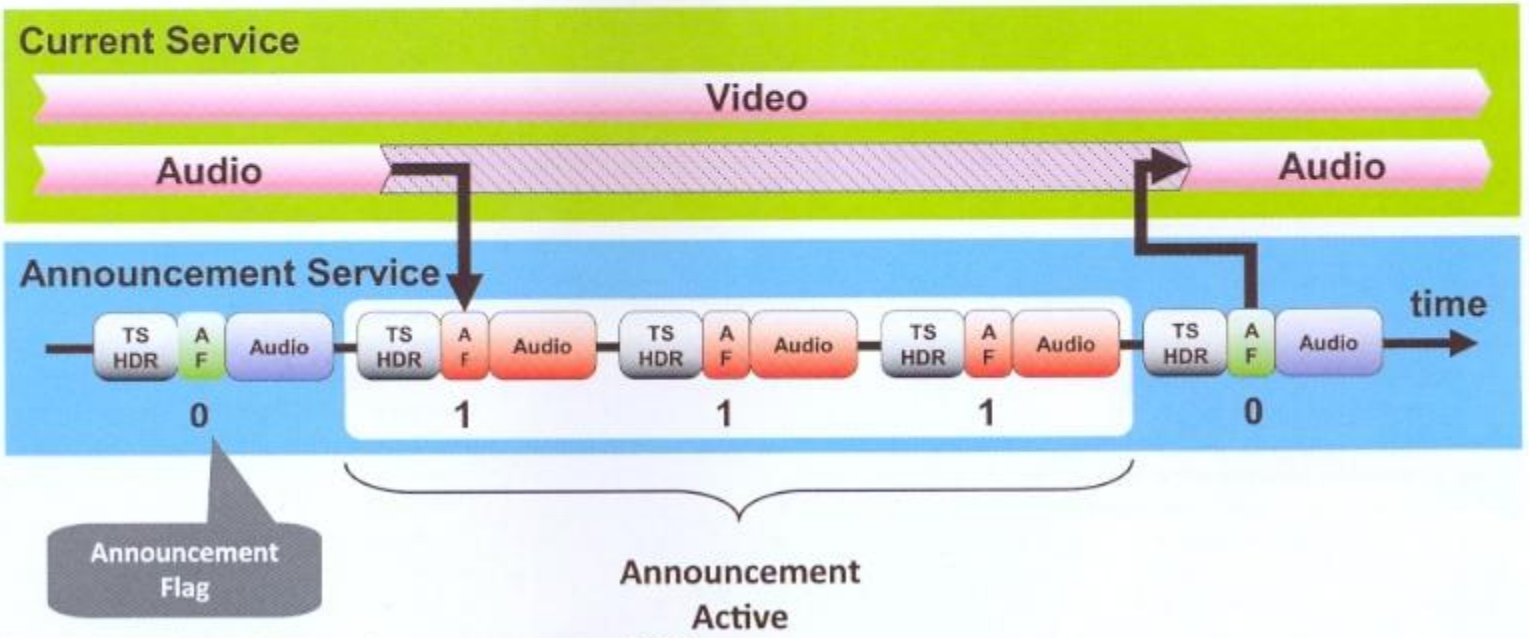
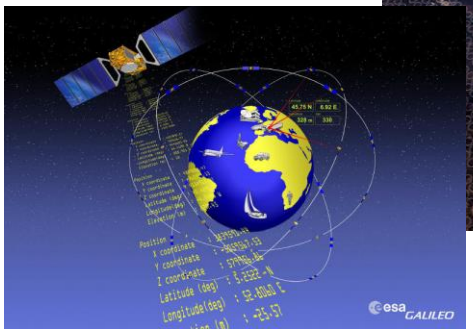


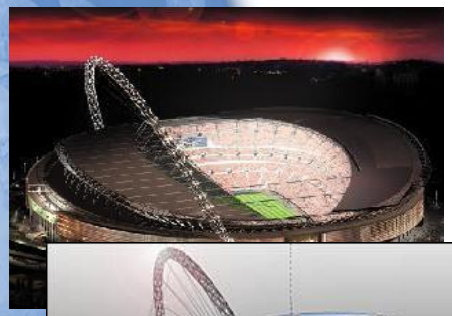
Fig. 1: Dynamic and automatic announcement switching

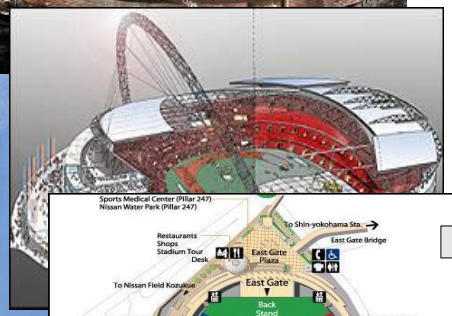
What we (can) do (4u)

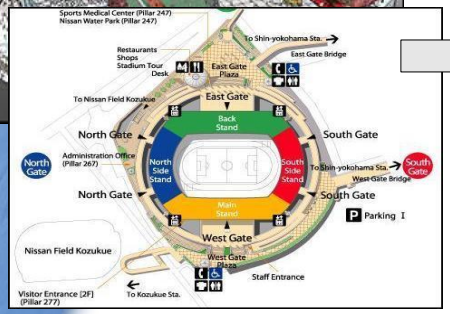
- Research & Development with the aim of combining the Internet world with DVB based broadcast and multicast transmission systems.
- Development of solutions and components (TX and RX) for IP/DVB data networks:
  - *IP/DVB de-, encapsulation*
  - *Data dissemination (TX-Hub Equipment, Terminals, SW)*
  - *Protocol development e.g. ULE (Ultra Lightweight Encapsulation), GSE (Generic Stream Encapsulation)*
  - *Multicast proxy/caching*
  - *DVB quality measurement and monitoring systems*

GeoBroadcast









Pre-processed Maps

IP Multicast Push Forwarding

Spatial Data Server

Storage and administration of spatial data

Spatial Server Engine

Processing of Spatial Information from many sources

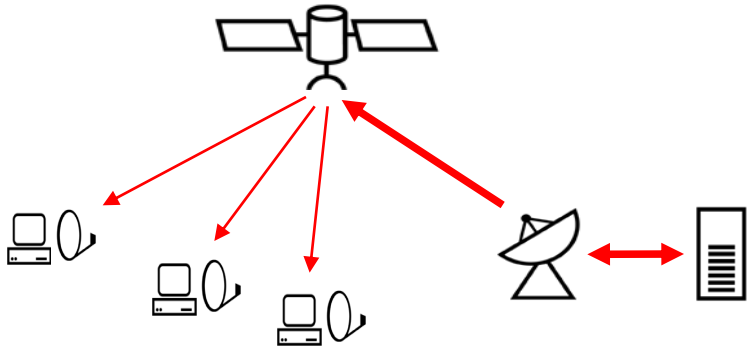
Content Management System

Integration of data and bundling of data items

support mass events with complementary location based services

Emergency Comm's over Broadcast networks

- How does it work?
  - Transmission of data over existing DVB*) based networks (satellite based DVB-S, terrestrial based DVB-T) established originally for TV distribution
  - Adaptation of existing networks for data transmission
  - Use of technology developed and manufactured for TV distribution services (antennas, transmit, receive technology, etc.)
  - Development of suitable data transmission technologies (servers, encapsulation-techniques, transmission protocols, applications, etc.)



*) Digital Video Broadcasting

Emergency Comm's over Broadcast networks

- Why using broadcast networks?
  - Broadcast networks transmit one to many – no extra transmit cost in case of additional users
  - Coverage especially when using satellite is much higher than other terrestrial technologies
- Why DVB?
  - Existing technology ⇨ cheap components produced for the TV mass market (antennas, LNBs, transceivers, chipsets, etc.) can be used
  - Open standard secures interoperability of components, ⇨ independence from manufacturers

Emergency Comm's over Broadcast networks

... and the return traffic?

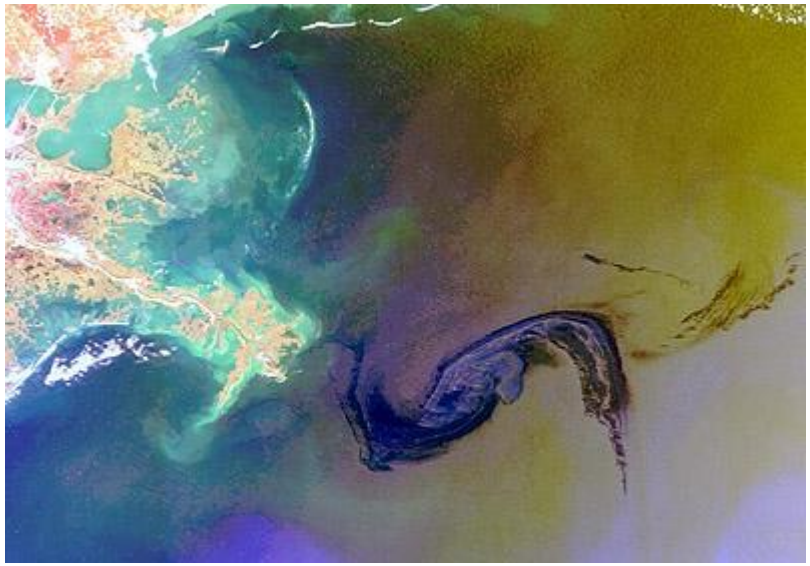
- System can be operated in receive-only mode
- Upstream (in case of error-free operation through re-transmissions) can be realised via any IP connectivity:
  - PSTN
  - 3G mobile communication
  - Satellite return channel systems (e.g. DVB-RCS)
  - any terrestrial web (IP) connectivity

Emergency Comm's over Broadcast networks

- Which data can be transmitted?
  - Earth observation data
  - Security alerts
  - Meteorological data
  - ....
- Are there any systems in operation or evaluated?
  - **DDS (ESA's Data Dissemination System)**
  - EUMETCast
  - FENGYUNCast
  - GEONETCast Americas
  - **ESD (Emergency Software Distribution - pilot trial in Austria via DVB-T)**

Emergency Comm's over Broadcast networks

- Example 1: DDS
  - Distribution of Envisat near-real time earth observation data (currently MERIS, AATSR, Sciamachy and MIPAS)
  - More than 110 users in Europe, Africa and South America
  - African and S-America operated in “Two-way” mode via DVB-RCS
  - More than 50GByte per day transmitted
  - More details on: http://dwlinkdvb.esrin.esa.it



Oil spilling into the Gulf of Mexico. Image acquired with Medium Resolution Imaging Spectrometer (MERIS) on 29 April. Credits: ESA

Emergency Comm's over Broadcast networks

- DDS Features
  - Based on gcs product DataCast®
  - Relies on robust multicast protocol ensuring high reliability and performance
  - Encrypted transmission
  - User group feature available (users/groups of users receive only registered products)
  - Error free transmission through re-transmission of corrupted data (only if upstream channel is available)

Footprint (courtesy of Eutelsat)
Europe/African coverage
C-band

European coverage
Ku-band

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- Example 2: ESD - Emergency Software Distribution
  - Pilot trial for distributing security-relevant software (patches, virus signatures, updates for anti-virus SW, device firmware updates, malicious software removal/clean-up tools, etc.) via DVB-T
  - Users may be: public agencies/organisations, hospitals, government offices, civil protection offices, fire brigades, etc.
  - Project partners:
    - CERT.at (Computer Emergency Response Team Austria – content provider)
    - ORS (Austrian Broadcasting Services – provision of DVB-T network)
    - gcs (provider of dissemination solution DataCast®, encapsulator and receive equipment)

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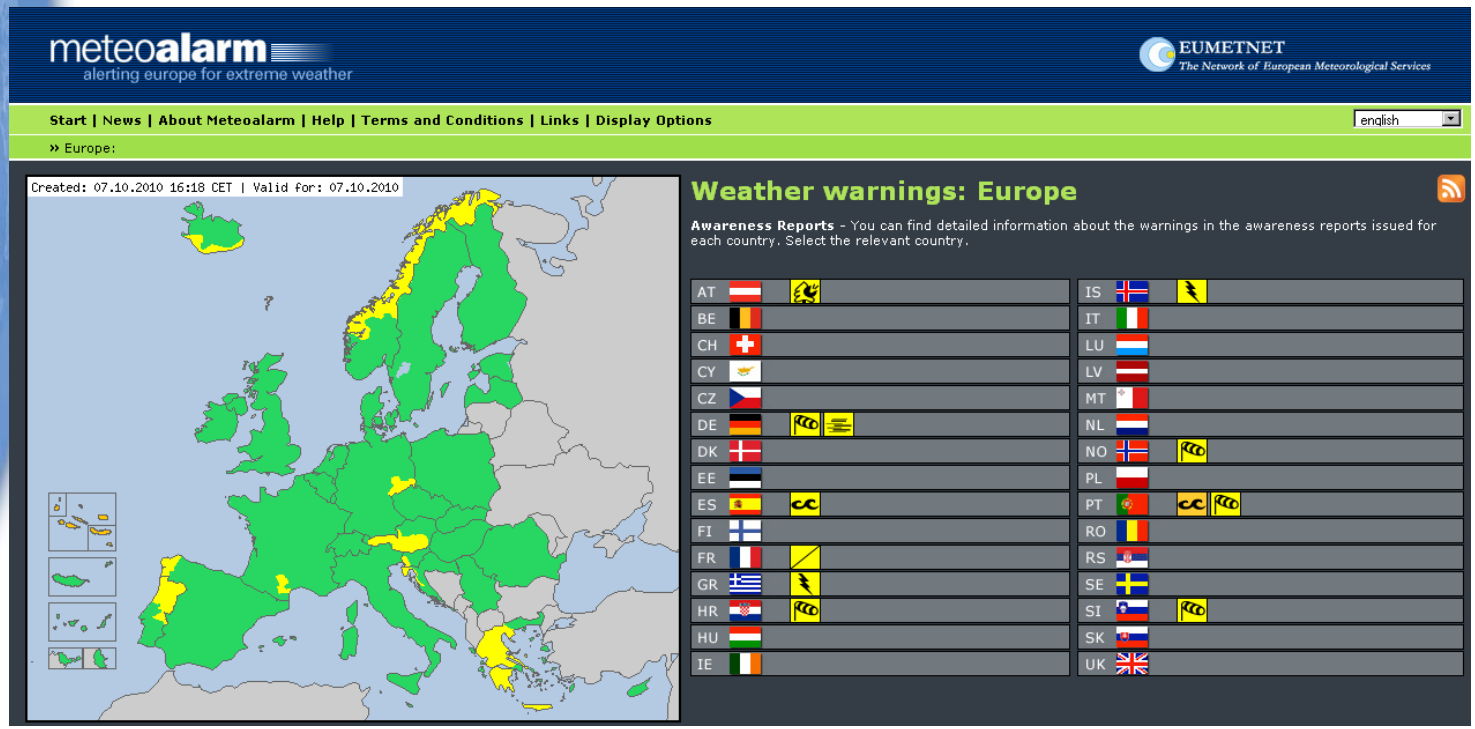
- ESD - Emergency Software Distribution
  - Additional service tested: distribution of RSS-feed www.meteoalarm.eu
  - Dissemination of other security-relevant content planned



Thank you for your attention!

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