Digitalradio Deutschland e.V.

System Concept

Management Summary

Emergency Warnings via DAB+

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1 Why Emergency Warnings via DAB+?

Emergency warnings help protect people. They offer important information and initial recommendations about the best ways for affected persons to react to sudden unexpected events. In Germany, a variety of different technical mechanisms are used to issue warnings to the population. This mix of warning mechanisms ensures that emergency warnings reach a broad swatch of the population.

Even if a person in the hazard zone misses a warning issued via one particular warning mechanism (such as television, radio, or smartphone), or if any specific warning mechanism breaks down, a variety of other warning mechanisms (such as city information boards, warning apps, loudspeaker vehicles, and internet pages) continue issuing the warning at the same time. The more warning mechanisms added to the coverage mix, the greater the number of affected persons that may be reached with warning messages.

The informational content of a warning issued via a warning app or radio is significantly higher than from a siren signal, for example. In particular, that extra content is necessary to deliver initial recommended actions, a crucial step in helping the affected protect themselves against danger starting from the first moment.

DAB+, the current digital radio standard, offers more than just clear sound and the ability to transmit music and voices. Thanks to its digital data services, DAB+ is also capable of serving as a reliable instrument for delivering alarms and emergency warnings. Emergency warnings issued via DAB+ supplement the familiar warning channels, including cell broadcast, warning apps, sirens, loudspeaker announcements, and classic analog FM radio.

Given its strong transmission strength and broad reach (“high tower, high power”), DAB+ also remains available in crisis situations even if the cellular network infrastructure fails, such as due to flooding or the loss of DSL switches.

With several major natural catastrophes observed in the recent past, including those in the Ahr Valley and parts of Upper Bavaria in 2021, as well as the tense international situation (such as the war in Ukraine), the members of Digitalradio Deutschland e.V. are calling for international standards for emergency warnings. The following system concept and description of potential implementations, collated into this management summary, reflect their efforts toward consensus. A more complete version is also available from Digitalradio Deutschland e.V. (c/o Deutschlandradio).

The members of Digitalradio Deutschland e.V. work in the following ways towards the safety of the populace:

1. Through work on **international committees**, such as WorldDAB and with internationally active partners from industry, applying Digitalradio Deutschland e.V.

recommendations to incorporate the **technical possibilities** for the DAB+ warning system into **standards** that will serve as the basis for ongoing international implementation

2. Developing, testing, and implementing a DAB+ warning system in Germany to **market readiness**
3. **Documenting** the necessary **steps** on the path to implementation in a manner **transparent** for third parties, made available **independent of industrial sector** and with a **low threshold**, preferably **license free**, with the goal of quick **market penetration** by broadcasters, network operators, industry, and ultimately the population
4. **Rolling out the DAB+ system internationally** to emphasize the benefits of "broadcast radio" and underscore its importance worldwide

2 DAB+ in the warning mix: Technology and new functions for radio receivers

The Federal Republic of Germany currently relies on the Federal Office for Civil Protection and Disaster Assistance (BKK) and its modular warning system (MoWaS) as a powerful, high availability warning and communication system. MoWaS emergency warnings are disseminated via stable satellite connections. A variety of so-called warning multipliers are connected to the MoWaS: radio studios, the BKK's Nina warning app, cell broadcast functionality for cellular service, as well as the Emergency Warning System (EWS) for DAB+.

The most important characteristics for the new DAB+ warning system are:

1. ***Real-time alarming*** with (automatic) program switchover and/or presentation by radio announcer:

   Emergency warnings can be played acoustically on the receiver within a few seconds of triggering the warning, and shown on the display: Alarm Announcement (AA)

2. ***Audio channel***:

   As previously with analog radio, an audio message is played. The receivers can potentially automatically raise the volume.

3. ***Ticker*** with short messages:

   The receiver displays a short text message of max. 128 characters in addition to the spoken message.

4. ***Wake-up function***:

   Receivers in stand-by mode (such as radio alarm clocks) are automatically turned on and issue the acoustic emergency warning. Further details can then be shown on the color display. The stand-by receivers search efficiently and automatically in the background, looking for any available emergency warnings.

5. ***Automatic tuning to warning channels:***

   If an emergency warning is being broadcast on another ensemble, the active receiver switches automatically from the current program to the warning channel on the other ensemble: Other Ensemble Alarm Announcement (OE-AA)

6. Indication by receiver about alarms on other frequencies and **regionalization**:

   Other DAB+ ensembles can reference the alarming ensemble to trigger the receiver to switch frequencies to the alarm ensemble. Regionalization can be undertaken based on postal code and, where possible, georeferencing.

7. Accessibility, multilinguality, and detailed information above the warning scenario:

   Detailed information in multiple languages, including for staggered review via the Journaline text service.

8. ***Return option***:

   Users can interrupt playback of the active alarm notification and return to their previous radio program.

9. ***Test option***:

   Emergency warning-compatible radios should allow for functional tests, such as on Germany's nationwide emergency test day. During the test, it should be possible to distinguish between real alarms and the test version.

The technical specifications for these characteristics and services are described in detail in the full system concept. Differentiation is made between minimal and advanced characteristics, with the minimal specifications defined to ensure that even affordable devices are compatible with the fundamental warning options needed to protect the population, while advanced receiver supplementary functions address factors such as accessibility.

On the occasion of the IFA 2022, for example, device manufacturer Telestar and its partner Fraunhofer IIS presented an initial set of devices primarily developed and partially supported by Digitalradio Deutschland e.V. and offering full compatibility with the warning characteristics indicated above.

Warning apps via the cellular network cannot serve as the sole path for warnings since the technical parameters of the system have limitations that can involve decisive disadvantages in a crisis situation.

3 Networks and network operators

There are a variety of DAB+ networks in Germany. ARD operates its networks in part on its own, while Deutschlandradio and private broadcasters cooperate with companies such as Media Broadcast, Divicon, and regional network operators.

3.1 Networks

The individual program platforms (multiplexes/ensembles) that provide area coverage for the various networks are, however, constructed differently and are not fully contiguous, but often overlap. They differ in size, starting with Germany-wide coverage (Bundesmux 1) and near-Germany-wide coverage (Bundesmux 2). These include networks that are typically federal state-wide and orientated primarily toward the federal state borders. Beyond this, regional networks have in some cases been established in the federal states which, taken as a whole, ensure full coverage of that federal state.

For example, in Bavaria, there is both state-wide coverage as well as various regional coverage institutions that jointly deliver state-wide coverage. Beyond this, many regions also have local networks that typically tend to smaller units. In the case of Germany's city-states, a local network — comprised of just a few locations — provides state-wide coverage.

For example, in the federal states of Bavaria, Rhineland-Palatinate, and Saxony, mixed networks are in use. Commercial and public radio have different stakes in the multiplexes (infrastructure sharing). This can lead to mixed assignments, whereby the activation of an alarm announcement (AA) allows for “speak over” on all programs in the multiplex.

An overview of the various networks and their coverage can be found on the website www.dabplus.de/empfang.

3.2 Network operators and warning triggering

Broadcast network operator Media Broadcast is seeking to provide a complete depiction of the technical options for the existing DAB+ emergency warnings.

For full use of the warning data generated by MoWaS, MB recommends not only the familiar warning methods and alarm content (“warning,” “update,” and “all clear”), but also implementation of the following parameters for the DAB+ warning system.

1. Wake-up and alarming function
2. Alerting to active alarms on other ensembles (OEAA)
3. Test mode

4. Accessible EWS text components (Journaline)

The process for the emergency warnings by the broadcast network operator is fundamentally independent from the functionality or specifications of the DAB+ receiver. Special requirements apply for both *Other Ensembles Alarm Announcements* (OEAA) and for implementation of regionally deployed alarm messages. Differentiation must be made between three fundamental scenarios:

1. Direct connection of the broadcasters' studios with MoWaS and live presentation of emergency warnings via that program;
2. Connection of MoWaS to the distribution server of the broadcast network operator with direct interruption of the audio program of the respective network through automated voice and text function; and
3. A hybrid solution, comprised of a direct connection of the MoWaS to the broadcasters' studios, combined with an emergency warning via the broadcast network operator's distribution server.

In the estimation of MB, a hybrid solution would be most effective, since it seizes upon the full advantages of both dissemination models. However, the editorial quality of the message is of crucial importance as well. Further harmonization between the stakeholders is required here.

3.3 ARD and Deutschlandradio networks

Based on the current state of discussions, an alarm should fundamentally always be issued via the individual multiplexes of the ARD state radio organizations. This presumes binding agreements between the broadcasters/multiplex operators and the assurance of the credibility and integrity of the alarm by the first triggering multiplex. For the Germany-wide Deutschlandradio multiplex, it remains to be clarified whether OEAA signaling of active emergency warnings on regional multiplexes can be implemented:

1. How will the information about a regionally activated EWS alarm be transmitted into the multiplexes of the Germany-wide ensemble?
2. Can multiple ensembles be addressed per OEAA?
3. Will a test mode be available to review the functionality of certified terminal devices?

The test mode was successfully tested using Telestar receivers during the Germany-wide warning day 2022. It allowed for a test scenario using correspondingly configured receivers without the risk of unnecessarily worrying the population during peacetime. Device-side implementation of a test mode is thus urgently recommended.

4 Broadcasters

4.1 Legal framework

All public and many commercial radio broadcasters (so-called warning multipliers) are connected to MoWaS. The media laws include an announcement right for the federal government and federal states on public and commercial radio broadcasters in the event of catastrophes and other significant hazards. Radio broadcasters are obligated to broadcast the warnings.

FM

For FM broadcasts, the emergency warning and all clear are transmitted to the connected broadcaster via the modular warning system (MoWaS). Depending on the nature of the threat, the individual broadcasters decide when and in what form the message should be broadcast. In principle, the messages must be broadcast immediately and unchanged. The warning message is transmitted only via the respective radio station's program. In many cases, radio broadcasters have negotiated a working process with oversight agencies. The current MoWaS agreement is not publicly available.

DAB+

For DAB+, all programs within a multiplex are broadcast on one frequency. The program is delivered to network operators who then consolidate them into the DAB+ multiplexes.

Warning messages by a government agency

In an alarm situation, the "*Official Warning Announcement*" (alarm and warning channel) is transmitted to the network operators, who then disseminate it directly into the multiplex. Any radio that is turned on automatically switches to the warning station (*alarm announcement*). Responsibility for the emergency warning and all clear lie with the government agency issuing the warning.

Warning messages by radio broadcasters

BKK (Bundesamt für Bevölkerungsschutz und Katastrophenhilfe) also allows for the dissemination of emergency warnings by a broadcaster. In this case the emergency warning is transmitted directly to the broadcaster. As part of an agreement between the Federal Ministries of the Interior, the BKK, and radio broadcasters, the opportunity has been provided for the broadcasters to adjust the message (announcement request) to the requirements of radio. The agreement specifies that in this case the "requesting office" bears legal responsibility.

What remains unregulated to date is how the broadcasters will use the *Alarm Announcement* and *Other Ensemble Alarm Announcement* to interrupt the programs of other broadcasters and switch them to the emergency warning. This step is not covered by the existing announcement law.

There are two potential paths for achieving this.

The radio broadcasters within a multiplex can reach mutual agreement at the broadcaster level about the triggering of the *Alarm Announcement*. This process would also be possible for the *Other Ensemble Alarm Announcement*. A solution could come whereby the individual radio broadcasters mandate their associations to form such agreements based on the model of their contracts with the performing rights societies.

The other option is that a broadcaster in a multiplex is assigned authority to undertake sovereign activities by the government agency issuing the warning ("commissioning"). This presumes the existence of a legal authorization. The commissioned broadcaster would then be treated as a government agency and bear responsibility for their own actions. This would apply in the event of late, incomplete, imprecise, or false messages, if causal damages can be proven as a result.

Given the intervention into the broadcast freedoms of a broadcaster, the commission and instructions by the government agency issuing the warning to a radio broadcaster ("administrative helper) would be excluded from exercise of *Alarm Announcements* and *Alarm Announcements Other Ensemble.*

4.2 Transmission of emergency warnings

In the event of transmission of the emergency warnings via radio signal and the acquisition and implementation of information, the following items are seen as bearing overarching importance from the broadcasters' standpoint:

1. **Purpose of the emergency warning:** Clear and geographically relevant content, that is authorized and provides a clearly formulated warning to the population.
2. **Editorial basis:** Texts "written for the ear," especially in the event of an automated transmission of warning texts. Quality should be controlled in advance, such as through a modular system of curated text blocks.
3. **Legal basis**: Freedom of broadcast for broadcasters, but also a clear desire for mutual cooperation. Automated program interruptions only by prior agreement. No obligation for all commercial radio broadcasters to participate in MoWaS.
4. **Technical foundation**: Redundant structured studios, secure IT systems, clear technical switching processes within studios, networks, and multiplexes.
5. **Accounting for regional relevance**: Broadcasters are calling for a minimum consensus that the smallest possible coverage be activated to avoid 'overwarning'

the population. In an ideal case, additional regional attributes would further restrict the emergency warning.

5 Standardization and internationalization

Numerous EU countries have expressed significant interest in Germany's plans. For example, the WorldDAB global association decided at its Steering Board meeting in September 2022 that its technical committee should investigate the suggestions from German manufacturers. It is thereby seeking to promote a worldwide norm of minimum standards.

The WorldDAB technical committee has founded a working group to gather the proposals for international stakeholders and to issue comment on the approaches being explored in Germany. The technical committee has three tasks: First, durable standards should be set that are acceptable at an international level and which work with the lowest common denominator. Second, international participation should be leveraged to ensure that the international community is being listened to. WorldDAB members have themselves entered into dialog with their respected central offices, seeking to ensure a smooth certification process. Third, contested topics can be addressed in working sessions to allow for consensus to be communicated externally.

Digitalradio Büro Deutschland has received letters of interest from the Netherlands, Switzerland, Czech Republic, and Austria, seeking to review feasibility of implementation parallel to Germany in those countries. The prerequisite is written recommendations from the technical committee and confirmation that implementation is planned to proceed in Germany, Europe's most populous nation. Where possible, the situation should be avoided whereby neighboring countries wait and watch the success in Germany. Parallel rollout in multiple European countries would also heighten the interest of device makers to produce in corresponding scale, and enlarge the diversity of devices available. At the same time, this scaling effect would also result in better pricing for the receivers. This ultimately services to promote rapid market penetration of warning-compatible DAB+ radios.

FrontierSmart, a company that is responsible for roughly 70 percent of the global chip market for DAB+ Radios, has provided assurances over the course of the preparatory efforts that it will undertake the necessary steps for development and implementation. The first market-ready devices based on the new chipset are expected in early 2025. Today's chipsets at least allow for the already standardized alarm announcement.

6 Timing

2023:

- Germany-wide warning exercise day in September, including DAB+
- Chipsets: Development of first chipsets following establishment of standards
- Integration of committees and stakeholders for further activation, both national and international (VAUNET, APR, ZVEI, etc.)
- Development of norm-based test scenarios
- Establishment of test labs and creation of test files
- Clarification of automatic vs. manual radio announcements by broadcasters
- Cooperative agreements between BBK, program broadcasters regarding MoWaS
- Cost/benefit analysis for “basic” and “advanced” receivers by technical committee and manufacturers
- Standards: ETSI standards via WorldDAB Technical Committee
- Statement of interest by broadcasters at international level

2024:

- Start of test and specification trials
- Germany-wide warning exercise day
- Chipsets: Alternative chipsets with warning function based on defined specifications
- Chipsets: First provision to terminal device makers for market rollout in 2025
- Chipsets: Finalization of requirements and production launch
- First implementation steps for broadcasters at international level

2025 and thereafter.:

- Wider availability of EWS-compatible devices
- Active tests and warnings in Germany
- Best cases will be provided for program broadcasters abroad

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