AI Special Project

Final Report

Assessing how AI can improve Public Safety Answering Point (PSAP) services, and ensure a high quality of emergency services for citizens.

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AI Special Project Final Report

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Authors that contributed to this document:

This document was written by members of EENA

Authors

Gizikis Alexis – EENA

Lonergan Peter - EENA

Contributors

This document was prepared with the support of EENA's four corporate and ten PSAP project partners.

EENA

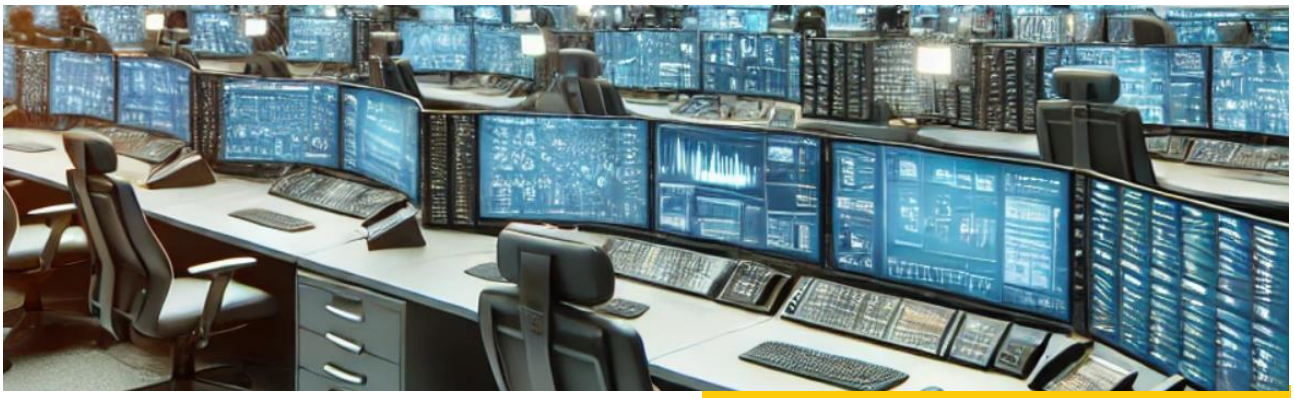
European Emergency Number Association

EENA 112

Avenue de la Toison d'Or 79, Brussels, Belgium

T: +32/2.534.97.89

E-mail: info@eena.org



EXECUTIVE SUMMARY

In 2024, EENA conducted a special project to assess if and how AI tools could be used to increase efficiency or otherwise improve Public Safety Answering Point (PSAP) services, and ensure a higher quality of emergency services for citizens. The project considered possible uses of AI in three areas; language detection, translation, and transcription; triage to prioritise emergency calls effectively; and noise cancellation to improve call clarity.

To achieve this, the project organised 10 pilots with PSAPs across Europe who each trialed a solution developed by one of the project's corporate partners; Augmented Hearing, Cestel, Gladia and LiveReader. The pilots demonstrated the potential impact of the tested tools on PSAPs and were used to develop recommendations for their future use in emergency communications.

Overall, the pilots found that AI had considerable potential to improve processes in PSAPs, though the partners reported that solutions need thorough experimentation and refinement before considering their integration into an operational environment. While the solution's benefits were widely acknowledged, their deployment readiness varied, and in some cases, will require additional adjustments before deployment. A key recommendation was that AI solutions be designed for the specific needs of PSAPs, which include the requirement to work with lower quality audio, and high data security.

The purpose of this project is to

- Assess how AI tools currently being developed for PSAPs operated in an emergency communications environment
- Consider how AI tools could change PSAP operations; and
- Develop recommendations for PSAPs and AI solution providers.

To achieve this, it is possible that AI's would need to be trained on emergency communications data held by PSAPs, and therefore PSAPs and companies will need to consider if and how any training of AI's could take place in the future.

All project partners concluded that AI will have a considerable impact on future PSAP operations and recommended that EENA continue its work on AI in the future.

1 | Introduction

The implementation of new Artificial Intelligence (AI) and Machine Learning (ML) solutions in professional services and consumer products has increased efficiencies and improved processes in multiple sectors of our society. Given these developments, in September 2023 EENA published a call for interest for Public Safety Answering Points (PSAPs), researchers, and companies which provide AI solutions to assess whether there was interest in experimenting with new AI solutions which could improve efficiencies and provide higher quality emergency services for citizens across Europe.

Call for interest

The call for interest was published on 5 September 2023. Companies were asked to outline what kind of AI services they offered or were developing which they believed would benefit PSAPs, while PSAPs were asked to indicate what potential AI solutions they believed would increase the efficiency of their work or improve the quality of emergency services for citizens. Potential services outlined in the call for interest reflected some of the challenges which many PSAPs face, including triage support services for dispatch decision making, language detection and translation, mental health support for staff, and algorithms to anticipate required resources for PSAPs.

The call for evidence received considerable interest from EENA members. Responses indicated that AI could provide the most value in language detection, transcription and interpretation, triage of emergency communications, recording and analytics of calls, background noise cancellation during emergency calls, proactive mental health management for staff, tools to improving staff retention and hiring, and chatbots for certain communications.

Call for applications

Following this call for interest, EENA issued a call for applications in November 2023, which asked companies, researchers, and PSAPs to describe their ideas for solutions which could be trialled during an EENA special project. The project would match companies with specific AI solutions, with PSAPs who had expressed an interest in experimenting with that specific solution. EENA members were invited to submit their applications by 12 January 2024.

Applications were evaluated based on their feasibility to be trialled within the planned timeframe of five months, their capacity to carry out the trials in a real PSAP environment to handle real emergency calls, when applicable, and the potential of an AI solution to change or improve PSAP responses to emergency communications. Priority was also given to AI applications which matched the priorities indicated by the PSAPs for AI in the call for evidence. The AI solutions would be provided by the company to the PSAPs free of charge for the duration of the pilot.

2 | Project Description

The objective of the project was to assess if and how AI tools could be used to increase efficiency or otherwise improve PSAP services, and ensure a high quality of emergency services for citizens.

To achieve this, the project organised several pilots, which matched participating PSAPs with AI tools on a pilot basis. These pilots would demonstrate the potential impact of the tested tools on PSAPs and publish any lessons learned from their use. The results from these pilots would also be used to develop recommendations for PSAPs on how to utilise AI tools, while ensuring compliance with EU law, including the AI Act.

The potential use cases of AI in three critical areas were trialled during this project: language detection, translation, and transcription; triage to prioritize emergency calls effectively; and noise cancellation to improve call clarity.

More specifically the pilots assessed AI tools which provided:

- Identification, translation and transcription of emergency calls in real time;
- Synthesis of translated text in audio;
- Support for the call-taker with hints and recommendations; and
- A speech audio filter for noise reduction and audio filtering of recorded and live emergency calls.

These technologies were expected to streamline call handling processes, improve training, reduce stress for call-takers, reduce response times, and ultimately save lives.

Following EENA's call for applications in November 2023, EENA accepted applications from four companies and PSAPs from eight counties. Details on the tools offered by each company, and an overview of the participant PSAPs are outlined in the annex to this report.

Timeline of the Project

- EENA Published a call for interest in September 2024. As the results of this call for interest indicated support for an AI project, EENA published a call for applications in November 2024.
- The call for applications ended on 12 January 2024, with application selection, matchmaking between companies and PSAPs, and follow ups completed by the end of January.
- Kick off meetings took place in February and March, with pilots scheduled to begin in May.
- During the pilot phase, each partner submitted monthly reports to EENA. Several online meetings with all participants were also held.
- After the pilot phase ended, partners were asked to provide their final report by 7 October 2024.
- This report, along with the monthly reports submitted during the pilot phase were used by EENA as the basis for a final report, which was presented at the EENA AI Day event on 5 December 2024.

3 | Pilots involving language transcription and translation

(i) Cestel's AI solution in PSAP pilots: Overview and Results

PSAPs in Czechia and in the Basque Country and Andalusia in Spain tested Cestel's NataliA solution, a natural language processor which offers simultaneous language detection, translation, transcription and text to speech. The transcription service was tested by all three PSAPs, while the translation service was tested in Andalusia and Czechia. Voice to text was tested in Andalusia only.

The translation aspect of Cestel's AI solution was designed to overcome linguistic barriers between callers and PSAPs where the caller does not speak the local language. Cestel indicated that the solution could be particularly useful in countries with multiple official languages, or tourist hotspots where a significant number of people do not speak the local language. The Czech and Andalusian PSAPs noted that they received an increasing number of emergency communications from callers who did not speak the local language, due to the rise in tourism. This service would also rely on the text to speech service offered by Cestel.

The transcription aspect of the tool was intended by Cestel to facilitate reviews by supervisors or for predictive data analysis in the future. The Basque PSAP also noted that transcription would be useful in improving data collection during emergency communications.

Cestel's language detection solution was not tested during any of the pilots, but would be used to identify which language the solution needed to translate or transcribe during a call. Cestel noted that issues could arise in the current system, particularly when the caller switched languages mid-call. This often happened when the caller did not speak the official language of the PSAP but attempted to use words from the local language while speaking primarily in their native language. Problems similarly arose when callers spoke in a language which they were not fluent in, and mispronounced words. The accuracy of the solution also varied when processing less widely spoken languages.

The solution used during all three pilots was cloud based and was installed into the PSAP's CAD, along with a separate integration into the audio headset of the call taker to track the conversation between the caller and call taker. Voice data would then be routed through a PABX (a business telephone system), and simultaneously sent to a HelpServer platform, and to the operator's headset. Cestels AI solution would then process the data, the output of which would be displayed on the operator's screen. Cestel noted that the final system would also be available as an on-premise solution, to meet the data security needs of organisations like PSAPs. Due to the higher data security policies of PSAPs, Cestel encountered some difficulties in installing its cloud based system in PSAPs during the pilots.

Notwithstanding these issues in implementing the solution in PSAPs, the pilots encountered mixed results with Cestel's transcription, translation and text to speech solution.

In Czechia, trials took place on approximately 70 test calls in multiple languages. The test calls were not based on real emergency communications but instead were designed to verify the

functionality of the transcription and translation tools in different situations. The solution was initially limited to transcription and translation, with language interpretation added at a later stage. The PSAP also expressed its preference for an on-site solution, rather than the cloud based solution provided during the trial to ensure full compliance with their security policies.

To assess the impact of background noise on the AI, calls from a busy environment were also tested, though Czechia found that background noise did not have a noticeable impact on the quality of the service. This finding differed from those of Cestel, and both Spanish pilots, who claimed that background noise had a significant effect on the quality of the service. The difference in results between the three PSAPs and Cestel is likely due to differences in the way that background noise was created. While in Czechia calls were made from a busy location while not using a loudspeaker function, tests in the Basque country included a wider range of settings, including the use of the phones loudspeaker or hands-free functions, where the microphone of the phone may find it difficult to reduce background noise. More details on the impact of background noises on other pilots will be discussed later in this section.

Once the trials began on Cestel's translation tool, the Czech PSAP identified mistakes in translating the Czech language, while its tests in other languages indicated varying levels of errors. For example, the PSAP rated translations from Portuguese or Spanish to English highly, but offered a poor rating for translations from English to Portuguese. Translations involving other languages, including Czech, German, French and translations from English to other languages also received lower scores.

When testing Cestel's transcription tool, the Czech PSAP also noticed a considerable variance in quality among different languages. While Spanish and Portuguese language transcriptions received top marks and French and English scored quite well, transcriptions to German gained middling scores while Czech received bottom marks. In addition to this, while no significant delays in transcription were identified, the Czech PSAP noticed that the outputs of the transcript sometimes did not correspond with the chronology of the conversation, or included sentences which were not part of the conversation, particularly when the calls involved faster speech.

Another Czech specific problem which occurred was the inability of the AI to identify if a question was being asked; Czech questions are created based on voice intonation alone and the AI was unable to identify when this took place. The PSAP concluded that while the solution has achieved a certain level of reliability in transcription and translation, further improvements would be needed before the technology was ready for market.

Despite this, the Czech PSAP noted that continuing work on AI is necessary. It predicted that in the near future, AI solutions could help PSAPs communicate with people in other languages, and could also aid in analysing communication, or monitoring call taker's stress levels. However, it also emphasised that AI products need to be adapted to be suitable in a PSAP environment, where callers are stressed and may speak quickly. It also emphasised its preference for on premise AI solutions, though it conceded that the system could be run on a private cloud service.

In the Basque Country, tests on Cestel's transcription solution took place on 25 simulated calls in Spanish over the course of a month. Live emergency calls were not tested to avoid potential disruptions during calls, and due to privacy concerns over using a cloud-based solution. To fully test the service, calls were made in a variety of situations, such as from a hands-free device,

from inside a building and outside on a street. The transcriptions were then compared with a transcription made by a technician.

The Basque PSAP found that the AI effectively identified what each speaker was saying, used punctuation and good spelling, and generally interpreted conversation faithfully. The AI was also effective in identifying vehicle numbers and brands, and had moderate capabilities in identifying the names of specific diseases and medicines, and the names of roads. However, considerable issues in quality were encountered when transcribing the names of institutions, organisations and people, or when transcribing basic characters in Basque.

Similarly to the Czech PSAP, issues in the chronology of transcriptions were also identified. The Basque PSAP noted that the speech of each speaker was placed in separate paragraphs, even when this did not match the chronology of the conversation. While Cestel implemented some improvements in this area over the course of the trial, which the PSAP viewed positively, the issue continued to arise, particularly when the interlocutors overlapped during the dialogue. In addition to this, and in contrast to Czechia, background noise was found to have a considerable impact on the quality of transcription. For example, large parts of the conversation were not transcribed during hands free calls from a vehicle.

The PSAP concluded that while tools like NatalíA could improve the effectiveness of PSAPs in the future, further improvements to its accuracy, and particularly to recording the chronology of the conversation would need to be made to the AI before it could be used by PSAPs.

In Andalusia, the solution was tested on four calls in Spanish, two of which had background noise, four calls with German to Spanish translation, two of which had background noise, and two calls for English to Spanish translation. Background noise was provided by playing a recording of a busy street next to the phone. Tests took place on simulated calls to avoid any operational or privacy impacts. The PSAP noted that the shorter test period in the pilot, where calls were tested over the course of a day, made assessing its potential impact on day-to-day integration into PSAP operations more difficult.

The PSAP noted that the solution performed well when transcribing text, and also considered the overall context of the call when transcribing it. In addition, text to speech was tested in Spanish, English and German with positive results, though it suggested that the volume of the synthesised speech could be increased.

The PSAP was less satisfied with Cestel's translation service. The PSAP suggested that the translation engine provided an overly literal translation, and claimed that the AI did not sufficiently process the data to better understand the content and context of the conversation, or to construct logical phrases. In this regard, translations to German were found to be more effective than translations to English, which the PSAP suggested was due to the more literal structure of the German language. The PSAP also found that the system struggled to interpret emergency communications specific terms, and concluded that the system should be trained further on emergency communications specific data.

The Andalusian pilot also found that background noise had a considerable impact on the speed and quality of Cestel's translation and transcription services, though no impact was encountered on text to speech. In particular, background noise was found to significantly delay the receipt of information on the tool and the time needed to provide a response, making a

fluid conversation impossible. These delays could cause overlaps in the conversation, breaking its chronology. The PSAP concluded that noise cancellation or reduction tools should be added to the solution to reduce the impact of background noise.

As a result of the higher level of development of Cestel's transcription tool, the PSAP suggested prioritising the development of the transcription tool, with translation services being offered at a later stage. It justified this by noting that Cestel's transcription service was easier to implement, was very close to being ready for service, and could aid in the management of emergencies. It also noted that while each of the services provided by Cestel were quite advanced, they appeared to work on different processors, and recommended that Cestel improve the cohesion of these different services

The Andalusian PSAP concluded that before the system became operational, the cohesion of the different tools would need to be improved, in addition to other issues such as the lower quality of translation, the negative impacts of background noise, and the need for further training on emergency communication specific language. If these issues were resolved, the PSAP noted it would consider acquiring the tool in the future.

In Cestel's report on the pilots, it agreed that background noise could impact the accuracy of the translation and transcriptions, and that quality could be lower when the caller was stressed. Cestel claimed that changes to the AI to accommodate issues with background noise would considerably improve the tools accuracy.

Cestel's suggested that with further improvements, particularly on language detection and minor languages, their solution could be operational within the next months. It also claimed that as PSAPs were generally happy with the system and saw strong potential for their operations, the system was ready for tests on live emergency communications. Cestel recommended that PSAPs permit AI solutions to be trained on PSAP-specific data, such as recorded calls, so that the solution could more closely match the needs of emergency services.

(ii) LiveReader's AI solution in PSAP pilots: Overview and Results

Ludwigshafen PSAP tested LiveReader's ALTERNIS solution, a natural language processor which offers simultaneous language detection, translation and transcription. The solution can also convert transcribed language back to audio for call-responders, and can switch automatically between languages during calls if the language changes, although this feature was modified during the trial. The detection and transcription system runs offline and on-premises, ensuring security and reliability for PSAPs, as it does not store any data. The translation service is performed by an external service, accessible via a web browser, but also does not store any data. Any data from these calls was visible only to the call taker and the management overseeing the pilot.

The solution aims to overcome language barriers in emergency communications. Ludwigshafen PSAP recalled that previously translation was limited to the knowledge of individual call responders, while LiveReader reported 5-10% of all emergency communications now face communication barriers, with some calls unable to proceed due to a lack of mutual understanding.

The solution used real time data from emergency communications and required direct integration into the PSAP's communication software. It was not integrated into the PSAP management software used by staff, but instead was visible in a separate window on their system. All incoming calls were automatically registered on the on-site ALTERNIS server. Once a member of staff received a call in a different language, they would open the call in ALTERNIS' translation service through their browser, which would automatically begin translating. LiveReader noted that there would be a transcription delay of 1-2 seconds during calls, but Ludwigshafen PSAP claimed this did not create a notable delay.

ALTERNIS was installed into Ludwigshafen PSAP's systems in July, and introduced to call takers over the course of that month. The system was installed on 12 desktops, and could process up to four calls simultaneously. From mid-July, when the service began, ALTERNIS was used to translate 80 test calls and 600 emergency calls that were received in other languages, with positive results.

Initially problems occurred with the language detection software, which sometimes changed the detected language during calls with similar languages, such as from Spanish to Portuguese, or between Russian and Ukrainian. In addition, call takers noticed that some messages which required translation, such as to ask the caller to speak in their native language, were used very frequently during calls, and should therefore be communicated more efficiently. They therefore requested that LiveReader provide pre-set messages which could be initiated at the press of a button. As a result, following feedback from the PSAP in August, LiveReader updated the ALTERNIS system in September, allowing call takers to lock the language once identified by the AI solution, and introducing pre-set messages. This update was well received by the PSAP.

Overall, Ludwigshafen PSAP reported that its staff were "highly satisfied" with the solution, and that there had been a significant improvement in calls where translation was needed. LiveReader also claimed that the pilot had exceeded its expectations. Both the PSAP and LiveReader concluded that ALTERNIS is ready for use by PSAPs, with Ludwigshafen PSAP noting it will continue to use this solution in the future, and LiveReader adding that it could be easily integrated into other PSAPs. Another key takeaway for Ludwigshafen PSAP was that staff were generally happy to work with new technologies like ALTERNIS, and that initial fears of some staff that AI might replace them diminished once they began working with AI solutions.

(iii) Gladia's AI solution in PSAP pilots: Overview and Results

PSAPs from Italy, Sweden and Finland trialled Gladia's real-time transcription and translation AI solution. The service, which supports 99 languages, is implemented through websocket technology, allowing simultaneous two-way communications over a single Transmission Control Protocol connection.

The system was only available as a cloud system, and could not be used offline. This caused considerable issues in Finland and Sweden. In Finland, the Resue Department was unable to use the system on its communications recording server, which is not connected to the internet for security reasons. As a result of this, the Finnish pilot was only able to test around four hours of audio records, rather than test the solution on the full 1,000 hours of audio content which it had stored, to avoid extensive processing of potentially sensitive data.

Similarly in Sweden, due to data security concerns, the solution was tested on 40 pre-recorded calls instead of live calls. Unlike in Finland, where the server was entirely unconnected to the internet, the Swedish PSAP reported that a cloud-based solution could be used in the future, but that there was insufficient time during the pilot to fully assess whether the product was secure enough for the PSAP.

The lack of offline service also created complexities in Trento. These were resolved through NDA's and agreements not to use the data from the pilot to train the AI solution. In Trento, Gladia's system was implemented in a separate workstation which was placed beside the operator's workstation. This workstation then extracted audio from the headphones output of the operator and automatically transcribed, and where necessary, translated the audio once calls began.

Overall, the pilots yielded mixed results with the AI solution.

In Trento, Gladia's AI tool was used in approximately 2,500 emergency calls from mid-August until the end of September 2024. Call taker's experiences with the tool were evaluated by several means, including through the use of focus groups. The pilot found that while the tool was easy to employ and that Gladia offered great support for its implementation, the transcription technology was not sufficiently developed to work on emergency call audio, which often includes background noise, screams, low network coverage and overlapping speech. As a result, call takers rated the service poorly. Nevertheless, the PSAP expressed interest in using a transcription tool in the future, and noted that transcriptions could be used as inputs for Large Language Model AI tools to provide summaries of emergency calls, offer tips, or automatically input data into the CAD. Any such technology would need to be integrated into the CAD, and not in a separate workstation.

Trento PSAP concluded that the pilot had shown that new technologies did not necessarily require great economic efforts to test, and that AI tools had the potential to greatly impact PSAP operations. For companies, the PSAP recommended that AI developers consider the primary needs of PSAPs when developing tools for them. For example, a slight delay in transcription, rather than providing it as a real time service, might have been preferable if it resulted in a higher quality of transcription. It also emphasised that PSAPs should regularly seek feedback from call takers and closely monitor the implementation of new technologies during pilots. Lastly, it recommended that EENA consider having a longer timeline for future AI trials with PSAPs.

In Finland, tests were limited to four hours of selected audio clips of radio communications from previous rescue missions to evaluate the AI's performance in transcribing Finnish. The pilot found that Gladia's tool struggled with lower quality recordings. While it provided readable transcriptions for good quality recordings of Finnish, the Finnish radio network, Virve, is based on the outdated TETRA standard, which has slower data transmission rates compared to modern 4G/5G networks. The lower bitrate of this standard of radio recording was found to be insufficient for AI transcriptions. These recordings also often had unclear audio with background noise and overlapping speech, which further reduced the solution's accuracy and efficiency.

The Finnish pilot concluded that while there had been significant advances in AI technology in recent years, the AI tool provided by Gladia needed further work before being ready for use by emergency services. The Finnish pilot also called for companies providing AI solutions to PSAPs to consider the additional sensitivities that PSAPs face when handling sensitive data, and to take

into account the lower quality of audio records in emergency communications, AI limitations, and PSAP specific security issues. Despite this, the Finnish PSAP expressed openness to using the tool in the future once it was capable of transcribing emergency call data, and after the Finnish communications systems were modernised. It also suggested that effective noise filtering and speech enhancement would be very useful tools for PSAPs.

In Sweden, tests took place on 40 pre-recorded calls in Swedish. The pilot found that Gladia could easily recognise the language of the call, indicating that language identification services from solutions like Gladia could help PSAPs identify which interpreter is needed when receiving communications in other languages.

On the other hand, while the Swedish PSAP found that the level of translation and transcription might be useful in other environments, such as customer services, the solution was not sufficiently precise for emergency communications, where speed and precision are critical. The pilot encountered noticeable delays when processing content, or in separating speakers during calls. The Swedish PSAP also reported that technical issues on both sides, along with limited staffing and resources on the Swedish side, made fully testing the solution more challenging. Despite these challenges, the SOS Alarm noted that its work with Gladia had increased its understanding and interest in new technologies which could improve PSAP operations.

For its part, Gladia acknowledged that some errors had been found during the pilots, but reported that these issues were resolved through an update in October 2024. The company also noted that some lesser used languages had less accurate results, as the AI had been trained on English French and Spanish.

4 | Noise reduction and audio filtering

Augmented Hearing's AI solution in PSAP pilots: Overview and Results

PSAPs in Portugal and Sweden experimented with "Sharpi Box", an AI tool provided by Augmented hearing which filters out background noise during calls. This solution aims to improve the clarity of the caller's voice, and reduce physical and mental strain on call takers caused by certain background noises. The system was expected to lead to shorter call handling times, fewer errors due to background noise, and a reduction in stress-induced turnover among PSAP staff. The system runs offline and on premises, and does not store any data, ensuring security and reliability for PSAPs. The solution was trialled in Sweden by SOS Alarm, and in Portugal by the Lisbon and Porto PSAPs.

The solution was provided as an external piece of hardware which would be connected between the headset and the operator's phone. This device was used for demonstration purposes in advance of a future software version, and was composed of a small box attached to a Raspberry

Pi computer. During calls with disruptive background noise, call takers could activate the device and adjust the background noise without changing the audio level of the caller's voice. Augmented Hearing intends to provide the final version of its solution as a software product, and noted that the pilot solution had somewhat reduced capabilities due to the limitations of the Raspberry Pi.

The "Sharpi Box"

There were some practical issues for both pilots with the demonstration model, such as interference between the Sharpi Box and side tones in the headset, and some issues in procuring correct cabling. While the Sharpi Box was was a hardware-based demonstration model, and not a final solution for PSAPs, these procurement issues highlighted the need for demonstration hardware to be user friendly to ensure their smooth implementation during time limited trials

The Portuguese pilot also found the use of an external hardware solution, rather than a software solution which could be integrated into the CAD, to be disadvantageous. It concluded that the system would need to be software based to be considered for adoption in the future. The Portuguese PSAP also added that it preferred for new solutions to be certified by its voice services provider, and then integrated into that provider's solution, to ensure that the PSAP could deal with a single technical service provider when issues arose.

Despite these practical issues, pilots on the AI solution had positive results.

In Portugal, the pilots ran for two months, with initial tests taking place on training calls to ensure there were no unexpected impacts on live calls. In this regard, initial problems such as needing to change the parameters (side tones) of the telephone systems used in the PSAPs were encountered, while call takers also required some persuasion to see the advantages of using the technology. The Portuguese PSAP reported an overall constructive attitude from Augmented Hearing in investigating and resolving technical issues.

The solution was then installed into several call taker positions. Call takers were asked to fill in questionnaires evaluating their experience with the Sharpi box. Sixty-six surveys were completed over the course of the pilot. Surveys were completed at the end of each day, to ensure that call takers could easily recall their experiences with the solution. Out of 11,322 calls received during the pilot, 400 calls (3.5%) encountered strong background noise, prompting callers to use the Sharpi Box to improve voice clarity. While Augmented Hearing noted that its solution could be used in all calls, and automatically protect call takers from sudden loud noises, the Portuguese PSAPs preferred to manually activate the system, as background noise can provide additional contextual information to callers. An unexpected finding in the Portuguese pilot was that the solution was required in fewer situations than expected due to advances in unidirectional microphones in smartphones; for example, test calls in crowded bars were found to have less background noise than expected.

Call takers found that the solution was easy to use and made conversations more intelligible, facilitating call takers work, though some call takers noticed these improvements more than

others. The Portuguese PSAPs concluded that despite some initial technical issues, the Sharpi Box had a positive impact on noise cancellation and improved the clarity of emergency calls.

The Portuguese PSAPs also highlighted that strong cooperation between the PSAPs, Augmented Hearing, and Decunify, a Portuguese company that supports 112 platforms in Portugal had facilitated the pilot's success. As a result, they recommended that any PSAPs which wished to trial or integrate new AI solutions should involve all stakeholders that help maintain their technical platforms from the beginning of the process. The Portuguese PSAPs also recommended that PSAPs extensively test tools before deciding to adopt them, and to ensure the call takers who will use the technology are well motivated, and involved in the any pilots from the start.

In Sweden, tests were conducted by SOS-Alarm on pre-recorded calls which had different types of background noise, such as wind, traffic, babies and children crying, sirens, and crowds. Due to time constraints, the solution was not tested in a production environment, and PSAP call takers were not involved in the tests. Calls were assessed subjectively, evaluating speech clarity and quality.

While SOS-Alarm found that while some technical issues were faced, and staffing, resource, and security issues made it impractical to fully test the solution, it was clear that Augmented Hearing's solution worked, and had the potential to assist PSAP operations. That being said, the PSAP noted that a larger test base would be needed to conduct a full evaluation of the system, and added that other aspects of evaluating the system, such as conducting an impact analysis, or assessing its costhad not taken place.

SOS-Alarm also found that the pilot had increased its understanding and interest in new technologies which could improve its operations. On the other hand, the PSAP noted that it had underestimated the data security challenges that PSAPs can face when trialling new technologies, and added that staffing and resourcing constraints can make it difficult to fully evaluate a solution during trials. The PSAP suggested that a longer pilot period would have made it easier to overcome these issues and fully test the solution.

Augmented Hearing, which gathered data from participating PSAPs, similarly reported that PSAPs reported fewer misunderstandings and repetitions during calls, shorter call handling times, faster dispatches, and reduced mental stress and hearing damage for call takers. On the other hand, it reported that the caller's voices could sometimes sound metallic, which could be mitigated by increasing the volume of the call. Augmented Hearing added that this issue would be mitigated in the final software product, which would use a more powerful computer than the demonstration model. Augmented Hearing is investigating how to integrate its AI tool as a fully integrated software solution with the phone solution provider of the Portuguese PSAPs.

Augmented hearing concluded more generally that while new AI tools had immense potential in improving working conditions in PSAPs, concerns and uncertainty over the maturity of these new technologies can make it difficult to weigh the benefits and risks of specific AI tools. To resolve this, it suggested that PSAPs conduct discussions on AI solutions in a more organised way. This could include sharing knowledge and experiences among PSAPs when working with new AI tools, to identify positive solutions and avoid repeating the same mistakes. The company also recommended that PSAPs develop common terminology and norms for discussing and comparing AI tools. Finally, Augmented Hearing acknowledged that it could be difficult for companies to

foresee the extent of collaboration challenges which could be caused by the very sensitive nature of PSAP data.

5 | Supporting call-taker with hints and recommendations

In addition to their main project testing the ALTERNIS language detection, translation and transcription service, LiveReader and Ludwigshafen PSAP also conducted a smaller, secondary pilot on LiveReader's NOTITIA AI tool. NOTITIA is a natural language understanding processing tool which is designed to support call-takers by suggesting questions and assisting in extracting data from calls.

The system uses data from the ALTERNIS AI tool, which transcribes conversations, to follow the conversation and then provide the call taker with hints and recommendations. In this way, the solution acts as a "co-pilot" to assist the dispatcher in its work.

As the tool would require a significant change to the PSAP operations, it was not tested on live calls. Instead it was assessed in a simulated trial with prepared questions and simulated cases. The trial involved 184 participants from across Germany, including 110 call-takers, 21 fire-fighters, 24 AI interested persons, 7 doctors, 4 police officers and 18 first responders, who worked on 1,319 simulated cases.

LiveReader reported positive results from the trial, with participants giving the solution an average rating of 4.1 stars out of five. The AI hints specifically received a score of 4.3 out of five. Participants rated the solution based on its question strategy, user interface, and the level of support which the AI hints provided. LiveReader claimed this indicated strong acceptance of the new technology.

Ludwigshafen PSAP agreed that the user interface was very good, but concluded that the solution, which was in beta format, was not yet ready for use. In particular, it noted that the use of generative AI had not worked out in this pilot, and that much more medical knowledge would need to be inputted in order to use an expert system in the future. That notwithstanding, both LiveReader and Ludwigshafen PSAP viewed the trial positively, with Ludwigshafen PSAP expressing openness to experimenting with new technologies such as this in the future.

LiveReader concluded that solutions like NOTITIA were a logical next step for integrating AI solutions into PSAPs. While implementing a tool like this would require changes to existing processes and some staff training, it could significantly reduce the staff workloads by offering suggestions to callers. In the future, it also claimed that other AI tools such as chatbots could even take over some tasks performed by PSAPs, such as booking ordinary patient transfers.

6 | Recommendations

The EENA AI Special Project identified several uses of AI which could improve PSAP processes and public safety. Transcripts of calls created by the transcription tools in this pilot could also be used as a basis for real time analysis by other AIs in the future, multiplying their potential benefits for PSAPs.

However, while all PSAPs recognised the potential benefits of AI for emergency communications, and all participating companies expressed openness to providing solutions to PSAPs, the project identified differences in approaches to data sharing which could inhibit the effective training and integration of AI solutions for emergency communications.

A key issue identified in this regard was the current need for AI solutions to be trained on emergency communications data which is country and language specific. Finding a resolution to this issue which respects the data security needs of PSAPs will be necessary for PSAPs and companies to fully take advantage of the potential uses of AI in emergency communications,.

Recommendations on how to overcome these differences, and further recommendations identified from the EENA AI Project are outlined below.

For PSAPs and Companies

- Companies and PSAPs should proactively consider solutions which might allow AI solutions to train on language and country specific emergency communication data, while respecting the sensitivity of that data.
- Longer trial periods may be necessary to fully assess the use of the AI tool, and to accommodate delays caused during the implementation of the system.
- Where appropriate Data Protection Authorities could provide guidance to ensure data protection regulations such as the GDPR facilitate, rather than inhibit safe data sharing by PSAPs.
- Companies and PSAPs need to cooperate proactively to identify if a cloud based or on-premises solution can meet the needs of both stakeholders.

For PSAPs

- PSAPs should cooperate closely with their technological service providers while piloting new technologies. This will facilitate the quick resolution of technical issues as they arise.
- PSAPs should share their experiences and best practices when experimenting with new AI solutions. In this way, a common approach to assessing AI solutions can be developed, and common pitfalls can be identified and avoided.
- Before investing in a full trial of an AI solution, PSAPs should test the solution with realistic emergency call data without integrating the solution into their CAD. This preliminary test, which could use available emergency call data, would give PSAPs an early indication of

whether the proposed solution could meet their expectations before investing in a full trial to assess whether they should adopt the solution.

- PSAPs should ensure that the call takers who will use the technology are fully involved in the implementation of pilots, are motivated and understand it, and have opportunities to provide regular feedback.
- Providing regular feedback during the pilot can allow the company providing the solution to implement real time improvements to the system, enhancing the PSAP's experience.
- PSAPs should be aware that AI solutions for emergency communications may need to be trained on their own records of emergency communications, particularly when the PSAP uses a less widely spoken language. Due to the sensitive nature of emergency communications, PSAPs should consider if and how this training could take place without undermining their data protection obligations.
- PSAPs should be aware of the potential multiplying effects which certain AI's such as transcription tools may have. Transcribed calls may be used in the future as a real time data source which could be used by decision aiding AIs to create further efficiencies in emergency communications.

For companies:

- Emergency communications have several characteristics which differ from other types of communications, such as low-quality audio, significant background noise, or stressed voices. As a result, AI solutions offered for use by PSAPs may need to be trained with emergency communication specific data, such as recorded emergency calls or realistic training materials.
- Before trials, AI providers should clearly indicate the current level of development of their AI solution. In particular, the PSAP should be aware of whether the solution is considered ready or close to deployment, or if it is at an earlier stage of development before investing in a trial.
- Companies should be aware that many PSAPs will prefer to fully implement any AI solution into their CAD.
- LLMs may need to be trained by experts, and not rely on data gathered from other sources, before providing advice to PSAPs. This is especially the case for decision aiding AI's which could in the future provide call takers with medical or safety advice.
- Companies should consider unique concerns which PSAPs have, such as the need to protect sensitive data, to have the option to hear background noise, and the need for on premise solutions for security reasons.
- Seeking regular feedback from PSAPs during pilots can allow companies to make improvements to their solution during the pilot, improving the solution for the PSAP, and giving the company the opportunity to receive feedback from the PSAP on the improvements made during the pilot.
- A recurring issue in the project was that services had lower functionality than expected in languages which they were not primarily trained on. Companies should ensure that services in other languages are sufficiently tested in an emergency communications environment before adding it to their AI solution.

Annex to the Report

Annex I: List of Project Partners

Companies providing AI solutions

Augmented Hearing is a Danish audio startup which specializes in AI-powered speech enhancement technology. Its real-time digital signal processing software removes background noise and clarifies speech during 112 calls, resulting in more efficient collection of information, and reducing stress for the call-taker.

Cestel is a Spanish company with experience in integrated communication solutions for PSAPs. It has developed an AI tool, which will be on premise or cloud based, which provides automatic identification, translation and transcription of calls made to PSAPs. It can also provide Text To Speech services during emergency communications.

Gladia is a French company which provides AI powered speech to text and audio intelligence services. Its platform provides real-time, accurate, audio transcription and analysis services in multiple languages, and includes tools such as speaker diarization and automatic punctuation.

LiveReader GmbH is a German AI solution provider. Its ALTERNIS solution provides real translation and transcription services for PSAPs, and can analyse information transmitted during these phone calls to facilitate call-takers through other means. Its NOTITIA tool, which offers support to the call-taker in regards of the questions to ask and the extraction of data, was also tested during the trial on a secondary basis.

PSAPs Participating in the Projects

Germany - Integrated Control Centre in Ludwigshafen: This PSAP has in recent years dedicated itself to modernizing its control centre processes through modern technologies. The PSAP expressed an interest in solutions which could overcome language barriers, or more generally improve the quality of emergency call processing.

Italy - Provincia Autonoma of Trento: This PSAP manages 1st and 2nd level PSAP (firefighter department and medical department) in the North of Italy.

North Macedonia - **Crisis Management Center (CMC):** The CMC is the national crisis centre of North Macedonia. Within the Crisis Management centre, the State Operation centre functions on a national level through the Emergency Number E-112. The North Macedonia CMC pilot was ultimately unable to proceed.

Portugal – Lisbon and Porto PSAPs: These PSAPS are the largest PSAPs in Portugal. Their call takers receive 112 calls and other emergency communications, make the first triage and convey relevant information to the correspondent emergency services.

Spain - Emergencies 112 Andalusia: This PSAP is responsible for all emergency services in Andalusia, and supports callers until the emergency has been resolved or the operatives have ended their interventions.

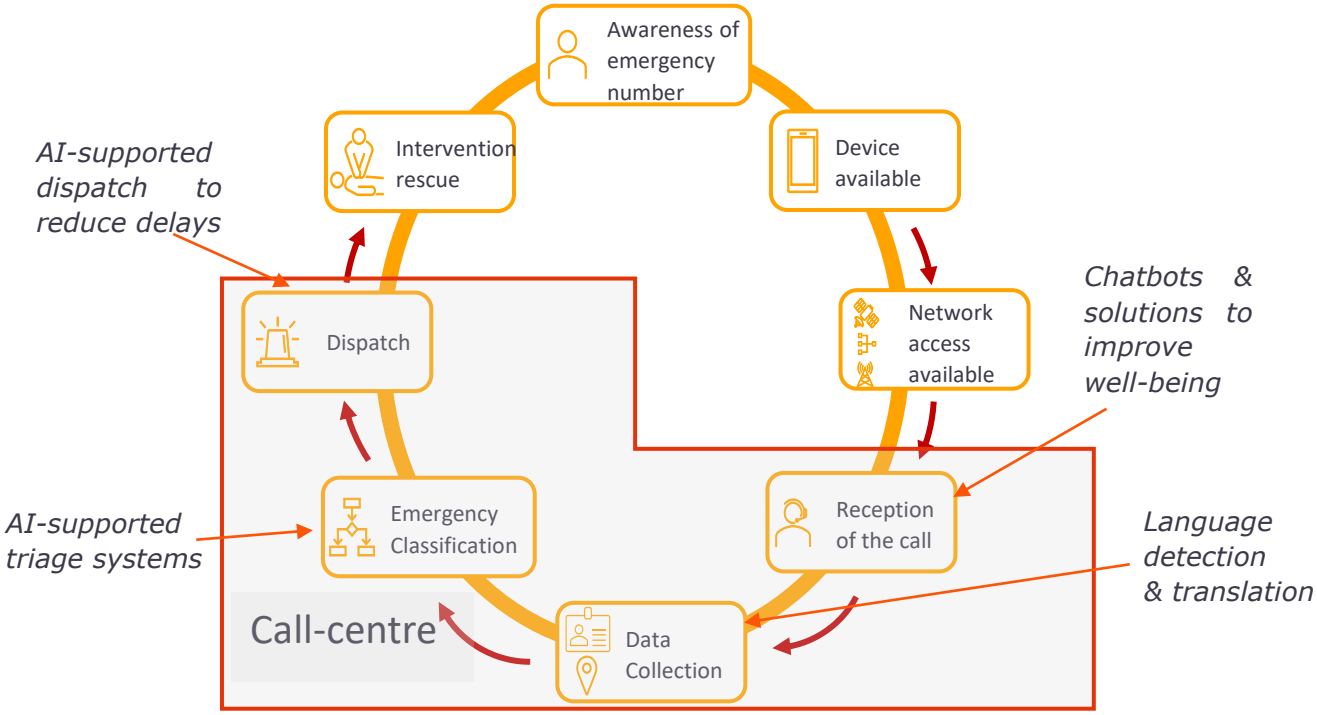
Spain – SOS Deiak Emergency Coordination Centre: This PSAP is responsible for all emergency services in the Basque Country. With over 100 staff, it receives more than 1 million calls per year, and is also responsible for transmitting public warnings.

Czechia – Fire Rescue Service of the Czech Republic: This PSAP receives all forms of emergency calls, and organises dispatches for all non-medical emergencies. With an average of 36 call taker and 86 dispatchers working there on a daily basis, the Fire Rescue Service responds to over 3 million calls per year, and is also repsonsible for transmitting emergency SMS public warnings.

Sweden - SOS Alarm Sverige AB: This government appointed PSAP is primarily responsible for emergency and rescue services in Sweden. It receives and forwards urgent 112 calls, and assists municipalities and regions in prioritising ambulance and fire brigade responses.

Finland - South West Finland Rescue Department: This rescue service is responsible for providing emergency services in an area of 20,000 square kilometres on land and water in Finland. Its 600 hundred staff is largely composed of firefighters and emergency medical personnel.

Annex II: AI in the Emergency Communications Supply Chain



AI and ML solutions have the potential to improve processes or create efficiencies in several stages of the emergency communications supply chain. Some of these potential uses are outlined below:

Supporting Effective Communication between Callers and Call Responders: Language barriers are a significant issue facing PSAPs. When responding to calls from a caller who does not speak the language of the PSAP, the call responder must first identify what language the caller is speaking, and then, if available, link the caller with an interpreter who can act as a relay between the caller and call responder. Overcoming language barriers takes time, and may not be possible if the call responder is unable to identify the language, or access an interpreter. An AI solution which automatically detects and translates the language used by the caller in real or close to real time could resolve this issue.

Removing Background Noise During Emergency Communications: Background noise during an emergency communication can impact on the call responder's ability to understand the caller, particularly in situations where the caller themselves are in a state of panic, and cannot communicate effectively. Certain background noises, such as crying children, can also have a negative impact on the mental health of the responder, reducing their ability to perform their role, and negatively affecting their mental health. A potential solution to this is an AI solution which automatically isolates the voice of the caller from other background noise, allowing the call responder to tune out background noises and more communicate more efficiently.

Triage of Emergency Call Dispatch: Certain types of triage could be performed by an AI solution when deciding which emergency communications should be prioritised. For example, during peak calling times, an AI solution could be used to prioritise calls which concern threats to life or property over other calls, or to deprioritise calls which it assesses to be non-emergency calls, such as calls with the purpose of asking PSAPs for information rather than seeking the aid of emergency services..

Recording and Analytics: AI tools could be used to automatically create transcripts of emergency communications, or analyse and categorise emergency communications. These records would be organised into databases which could be used for future analytical purposes, or to facilitate training and monitoring of calls.

Mental health: AI solutions could be used to detect triggers during calls which could have a negative impact on the mental health of the call responder, facilitate targeted supports for PSAP staff, and support positive mental health environments in PSAPs.

Staff Retention and Hiring: AI solutions could provide indicative tools for recruitment or reducing staff turnover.

Chatbots: Chatbots could be used to provide guidance to callers in times of peak usage of PSAPs, such as during floods or other natural disasters, or to provide guidance to persons contacting PSAPs for non-emergency purposes.