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SATELLITE APPLICATIONS FOR THE

ALPS

SEARCH
AND RESCUE
EDITION

Conference Report Satellite Applications for the Alps Search and Rescue edition

This report is a summary of the Euryis conference Satellite Applications for the Alps: Search and rescue edition. The conference was held on the 11th and 12th of October 2017 and was Euryis's second conference in the Alpine space together with the partners IDM Südtirol and Satellite Navigation Cluster Berchtesgaden. The first day consisted of a Euryis conference hosted during the International Mountain Summit, a week-long annual international conference for the global mountaineering community and its relevant stakeholders. On the 12th, participants were invited to join a networking hike with technology demonstrations and a creative workshop to jointly address on the topics presented during the conference.

The conference built on Euryis's experience from the Satellite Application's for the Alps conference in Berchtesgaden the year before where one session focused on the topic of search and rescue. The starting point for the conference was the conclusions of the first event as well as the observations made in a series of open-ended interviews with Alpine search and rescue organisations which Euryis carried out in the time between the two conferences as part of the project satellite applications for search and rescue. Based on the expressed interest of the search and rescue community, three main sessions were selected focusing on the three main areas satellites can be used to assist search and rescue and alpine civil protection. These included satellite communication and navigation for emergency call services, team coordination systems and satellite imagery and remote sensing for risk mapping and post emergency imaging. A last session discussed how the present community could be "going forward" to address the challenges and seize the opportunities.

The sessions sought to include both presentations by search and rescue organisations or civil protection agencies representing different alpine regions that currently make use of satellite-based services, as well as at least one presentation by a satellite expert. The presentations by the users allowed them to both share how they make operational use of satellite-based services with their peers, but also to share what challenges and limitations they faced with experts and service providers from the space sector. Knowing their challenges in advance thanks to the interviews and previous conference allowed for the expert presentations to address the challenges and propose solutions.

The networking hike on the following day allowed participants to discuss what they had heard during the conference day in a more informal setting, while the demonstrations enabled service providers to showcase their products and some rescue organisations to demonstrate their systems.

Emergency Calls and Mountain Connectivity

The conference's first session looked at how satellites can benefit emergency call applications. In several European countries, including Austria, Germany, Switzerland, Italy and Slovenia, mobile applications exist that allow the user to report their geo-location using GNSS to the emergency response centre. The limitations expressed in Berchtesgaden or in the interviews included how lack of connectivity made it impossible to use the apps in several regions, that they relied on the hikers having downloaded a specific app for the region they visited and that information was not easily sent to the most nearby rescue unit if the user originally started their hike in a different region or country.

The limits of emergency calls

The first presentation, held by Daniel Sternig representing Bergrettung Carinthia, sent a clear message of the room for improvement with regards to locating emergency callers. It stressed first that understanding the location of the person in distress was a common challenge to the mountain rescue and second that obtaining this information as quickly as possible was highly beneficial to the rescuers. The presentation, titled "The limits of emergency calls", addressed how existing applications for locating emergency callers which they had tested and been used in other regions did not satisfy their needs. The main reason was that most hikers did not have the application installed and could therefore not use it. As a result of it only applying to a marginal number of emergency calls, it was too unreliable for the mountain rescue.

Their stated demand for a solution was one where the location of a person calling the standard emergency number would be automatically shared with the emergency response units. Their suggestion for an „ideal service“ was to have the SMS service found in other regional applications like „Notruf für Gehörlose“ (which sends GPS coordinates via SMS) be integrated with the normal emergency numbers. The presentation finished with an invitation to discuss why this has not already been done or why it is not possible.

Galileo contribution to emergency management: SAR, eCall, e112

The second presentation, held by Fiammetta Diani from the GSA, introduced existing and emerging European capabilities in satellite navigation. The presentation stressed how the addition of Galileo satellites are helping increase the accuracy and reliability of GNSS systems, which in turn can improve the quality of GNSS-dependent services. When asking who in the room were already familiar with GNSS and Galileo, nearly all were familiar with satellite navigation, whilst only a small amount – specifically the persons representing the space sector – were familiar with Galileo.

The presentation went in more detail on two applications relevant to the event, namely the eCall and e112 systems. Starting in April 2018, the EU eCall regulation will make it mandatory for new cars manufactured in Europe to include Galileo navigation systems. This will enable the car to respond to a crash by contacting the emergency services and wirelessly send airbag and impact sensor information, along with satellite positioning coordinates. As an example for how this could benefit the rescuers, Diani showed how the improvement in accuracy could mean the difference between knowing whether a car that had been in an accident was still on the road or if it may have fallen down a hill next to the road. Based on the experience with eCall, the EU is also aiming at implementing satellite navigation capabilities in the standard 112 emergency number. The e112 solution also brings

the accuracy down to a few meters, as compared to the kilometre level often provided by relying on cellular tower location which has been the common solution before. A user story from Lower Austria was then presented who have made use of the **Advanced Mobile Location service (AML)** which is embedded in the e112. The feedback so far has been only positive, stating that the emergency response centre is surprised over the accuracy of the locations they obtain as well as the reliability.

Iridium SAR applications

The third presentation of the session was given by Jason Abbott from Iridium. One of the most frequently expressed limitations with any emergency call application or coordination system is the lack of connectivity in mountainous regions. Whereas geostationary satellites will not provide a signal in a valley or on the wrong side of a mountain, a fleet of low earth orbiting satellites can. Iridium showed how satellites can provide a solution for the search and rescue teams by providing reliable connectivity.

Suggestions for how LEO satellites could benefit search and rescuers included handheld push-to-talk devices connected to the same server enabling any connected rescuer to have direct communications, as well as a portable satellite WiFi device to provide connectivity for other gadgets.

What to pay attention to regarding software when you have *cross-border collaboration* in the fields of search and rescue and civil protection

The final presentation of the session was given by Sandi Ravbar representing Xlab, who provide software for emergency call centres in Slovenia, Switzerland, Montenegro, Kosovo and Italy. The presentation showed what satellite systems the centres currently used together with their experienced obstacles and limitations. At the end, a list of suggestions were made for how Alpine search and rescue organisation and emergency response centres could make use of a common satellite-based platform to improve cross-border collaboration and sustain the use of the service jointly.

The satellite-based services provided include the **Smart Locator** system which enables the emergency call centres to see the geo-location of a caller made with a GNSS enabled device, as well as a **3D-GIS** desktop application to display the information in a realistic map based on satellite imagery. Ravbar listed a number of challenges related to providing a common platform including how different regions often spoke different languages, had different preferences, used different software, rarely shared data and had different laws. One mentioned example of different software being used was the emergency app **RetteMi.ch** in Switzerland. While the system worked in terms of sending an accurate location to any emergency call centre in Switzerland, it was downloaded only by 0-5% of the population, making it less reliable.

Among the suggestions to make a successful open platform were: to use web-based rather than desktop based system; to make the service work based on SMS so that any phone can provide its location without needing internet; to provide an application program interface (API) for app integration that connect the rescuers systems with those of the emergency call centres; and to make an agreement to share data between regional systems.

Team Coordination and Mountain Navigation

The conference's second session looked at how satellites can benefit team coordination systems for the search and rescue units working at the ground and between them and the coordination centres. Such systems have been tested and partially implemented by rescue teams at different regional levels in Italy, Austria, Germany and Slovenia. The limitations discussed prior to the conference included how the systems using different data-formats made it impossible for information to be shared between different organisations. A suggested opportunity for improvement was that a shared data platform could make cross border collaboration projects more efficient.

ICT and satellite communication support in crossborder mountain rescue missions Slovenia-Friuli-Venezia Giulia

The Slovenian Civil Protection Agency shared how they collaborate with the Civil Protection Agency of Friuli Friuli-Venezia Giulia to build and implement a shared coordination system for mountain rescue. The joint project was formed based on a need the two regions saw to improve collaboration for search and rescue missions near the borders of the two countries. The resulting **AlpSAR/ALPDRIS** project aims to implement a common protocol between the Slovenian and Italian mountain rescue services to improve coordination. To achieve this, they will establish a common information space where the geo-location of rescuers in the field as well as their recorded notes and images can be viewed by coordination centres and rescuers in both countries. This both to improve the safety of the rescuers during their mission and also to improve situation awareness of both the tactical and coordination teams by sharing mission based information. For the application to work in the field, satellite communication is needed.

The virtual world as digital deployment support

The German mountain rescue, Bergwacht Bavaria, shared how they make use of GNSS to in an application using 3D models. The system, **ELA 3D**, allows rescuers to get a detailed view of where they and their team members are. The mountain rescue may also bring cars carrying satellite communication equipment out in the field to provide connectivity to the search coordinators also in remote areas. One room for improvement mentioned was how the geo-location of a person calling the emergency number could not be shared directly from the systems used by the emergency call centres to the applications used by the rescuers on the ground due to different data standards.

A Search and Rescue Operating System

The Slovenian Mountain rescue, represented by Matjaz Serkezi and Dusan Pecek, gave their perspective on the existing coordination and mapping systems for the mountain rescue and how they envisioned bringing different satellite applications together in an operation system dedicated for search and rescue, **sarOS**. They explained how they used to depend on raw digital maps and how these were less useful because of limitation of different apps or due to too complicated software. They also stated that since everything was working manually without the support of any software or digital system, it took extra time and also mean that it was not 100% verifiable after an event. Finally, they stressed how all freeware software programs have too many limitations and that professional ones are too expensive or too complicated.

Their vision for an ideal tool for search and rescue coordination was a of a sophisticated system where everything is written as a protocol, there is a very good educational program with annual practical trainings all over Slovenia in different conditions and finally to have exchange of knowledge with other rescue services in and out of Slovenia.

Geo-Information and Satellite Imagery

The third session of the conference looked at how satellite derived geo-information and satellite imagery could help in risk assessment and post emergency response. While satellite imagery obviously plays a role in creating and improving maps used in the end by the search and rescue organisations, geo information on avalanche risk and environmental changes can also provide key insights. Furthermore, following a natural disaster, satellite imagery can provide up-to-date details and an overview of the disaster area useful to emergency response units.

Copernicus Emergency Management Service – Mapping

The session began with a presentation from Marco Broglia from the European Commission's Copernicus **Emergency Management Service (EMS)**. The presentation informed participants of how the Copernicus Emergency Management system can benefit civil protection in mapping and estimating risk. Broglia provided a series of examples of how the Risk and Recover Mapping were used to estimate the population risk, landslide risk, forest damage risk or erosion risk levels in different regions using Copernicus data. A main point for further work is how this intelligence on risk levels can easily find its way into the hands of civil protection agencies and search and rescue organisations at local levels working in these regions.

Copernicus Emergency Management Service – Response Operations

The second presentation, given by Arnd Berns from GAF, focused on how Copernicus earth observation data could also benefit post-emergency response operations. The presentation focused on the **Rapid Mapping** service which provides access to satellite imagery of an area hit by a natural disaster after an activation has been triggered by an authorized user. The presentation also showed one use case from Simbach on the border between Germany and Austria, where the Rapid Mapping was activated following a flash flood in the region.

Integrating Sentinel data to provide geo-information relevant to search and rescue

The map and geo-information providers to the Italian Mountain Rescue 3D RTE presented how they prepare the maps and geo-information for the mountain rescue. In their presentation, they also showed how Copernicus data, from Sentinel 2 in particular, could be added directly into their maps. The satellite-derived data was used predominantly for change detection in the landscape.

Going Forward

The final session, Going Forward, aimed to present some suggestions for how the participating search and rescue community could advance to address the discussed challenges and opportunities.

A test and training centre for geo-information and satellite-based emergency services

The last presentation of the session, presented by Gerd Waizmann from proTime, informed participants of their ESA feasibility project **TTG-Sat**. The project aims to create a test bed for search and rescue organisations interested in creating or implementing satellite-based systems. By having a competence network dedicated to satellites for search and rescue, the goal is to help ensure that state of the art technology reaches the relevant organisations as early as possible and that they have the opportunity to do the necessary training to allow successful implementation.

An Innovation Network for Rescue

The second presentation of the session was given by Giorgio Basile from the Italian Ministry of Interior, Fire search and rescue Branch. It introduced the **FIRE IN**-project, short for Fire and Rescue Innovation Network, is a Horizon2020 project with partners from all over Europe. It aims to help provide cheaper and faster access to state of the art technology for organisations involved in fire search and rescue. It also hopes to help save costs and to optimize R&D investments, reducing implementation time, and to simplify collaboration between practitioners in the EU and worldwide.

Based on their first meetings of fire rescue organisations, these were the suggestions so far: to provide products with common expectations and common standards; to have tests and experiments results shared at EU level; to see R&D investments based on practitioners expectations; for the technology to be state of the art; to increase innovation capabilities; to increase interactions between technology providers and practitioners for tailor-made solutions; and for lessons learned to be shared between regions. As a beginning of this process, the FIRE IN project participants are currently working to map capability gaps between rescuers needs and existing capabilities. Participating search and rescue organisations present at the conference was then invited to join the project.

The EU Strategy for the Alpine region

The last presentation of the session, held by Willigis Gallmetzer from the Civil Protection Agency of South Tyrol, introduced EUSALP, a European macro-regional strategy for the Alpine region. The general assembly of which gathers high-level political representatives of states and regions involved in the Strategy, the European Commission, and the Alpine Convention as observer. Gallmetzer represented the Action Group 8, focusing on improving risk management and enabling better management of climate changem uncluding major natural risks prevention.

The presentation also showed which Alpine regions were participating in different Alpine projects that could provide funding opportunities for collaboration projects related to search and rescue.

Creative Workshop output

Following the Eurisy conference on the 11th of October, participants still in Brixen joined a networking hike organised primarily by project partner IDM Südtirol. The hike worked both as a networking event where participants could further discuss what had been presented during the conference, but also gave service providers and rescue organisations the opportunity to present and demonstrate their technologies. The technology demonstrations were given by Realitymaps, 3 RTE, General Solutions, Fylax and MySnowmaps, demonstrating some of the technologies presented the day before. At the end of the hike,

participants engaged in a creative workshop to brainstorm and share what current needs they have and what ideal solution they would like to see.

When asked to state a vision for what an ideal rescue application would look like, the following points were mentioned:

- Individual SAR applications will be using standardized and shared data.
- A fully open and free policy for data.
- Complete interface interoperability and enabling nationwide cooperation
- A product that is fast, seamless and reliable.

When asked to expand on the final three key factors for a successful service, the following explanation was given:

Fast

Time is a key success metrics for any rescue operation. Therefore, for either the advanced emergency call applications or the team coordination systems to be effective, they must provide the rescuer or emergency response units with the information they need at least as fast as alternative solutions.

Seamless

For any technology to be successfully implemented and benefit the user, it needs to work seamlessly without added complications. A rescuer must be able to receive just the information he needs, well integrated into the tools that are already used.

Reliable

The solution needs to be reliable to the point where the rescuer can trust the informations they are given without second guessing. The location ought to be precise enough that they can know if the person is up on a hill, or down in a valley. The rescuer should also be able to look to the information displayed on their application directly and act upon that information without needing to consider possible inaccuracies.

Participants were also asked to note what needs and requirements they would have for new satellite-based applications. The answers included points such as:

- The ability to share data across all of the SAR Applications and to have interoperability across borders
- A common data base for geo-information and records.
- Independent Emergency call system
- Updated Data (DEM, DTM)
- Independent data & phone connectivity
- Systems and tools that are easy to use, kept simple.
- Automatic location with Ecall
- Small and light devices
- Long battery life for any devices to be used in the field
- Enable effortless cross border communication
- Transparent and accessible knowledge of resources and partners working to develop and implement these applications in the Alps.
- Low training effort needed

Conclusions and Recommendations

The presentations held by participating search and rescue organisations, as well as the notes coming out of the creative workshop, largely echoed some of the previously stated challenges and suggestions presented in Berchtesgaden and in the interview with search and rescue organisations. Most notably, perhaps, is the demand for quicker access to accurate and reliable location of emergency number callers and the need to enable information and intelligence exchange between different platforms more easily with common data standards. Based on the suggestions provided in the presentations by the participating experts, as well as suggestions made during the workshop, the following two recommendations are given by Eurisy.

Make location sharing when calling the emergency number a European standard

Knowing the location of a person in distress can be the difference between an hour long rescue mission and a four day-long search mission for the mountain rescue. To better enable this, the emergency number 112 should be standard across all EU regions. When calling 112, the location of the device should automatically be shared with the emergency response centre similar to how the Advanced Mobile Location Service by Android works. Different emergency response units should then be able to receive this information directly from the emergency response centre calling them into action, where their coordination software can integrate and display the data directly. Eurisy would support the initiative of organisations like the European Emergency Number Alliance (EENA) to make the Ecall or AML service a European standard.

Establishing common data standards to allow for team coordination systems to exchange information

Having a common standard for data can help different organisations exchange intelligence more efficiently. This would help during cross-regional search activities and also at a local and regional level. It would allow different organisations to exchange intelligence such as the GPS coordinates of helicopters, search dogs, mountain rescue teams or persons calling the emergency number. It may also apply to remote sensing data and geo-information from satellites or drones. This would also mean that different organisations can still have their own unique applications be tailored to their unique needs while at the same time exchange crucial information with other emergency response units provided that the data standards are the same. Common protocols and standards for training and use of services can also be coordinated on an Alpine level when the standards are similar and expertise is comparable. This would also make it easy to involve space experts to accompany the process of both training and implementation.

Since the conference, we've seen participating users interested in satellite applications go ahead with their follow up initiatives to address the challenges and opportunities discussed during the conference and in the interviews. For Eurisy, nothing is more important than that the users themselves see the relevance of satellite applications and manage to benefit from their capabilities to improve their work. Eurisy will look forward to following the progress of the conference participants as they work collectively to bridge the gap between the potential of satellite-based applications and how it is implemented and used in practice.