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Latest Technical Developments

beAWARE publishes the first version of its Crisis Management Ontology

Modelling domain knowledge adequately is of paramount importance for the effective management of information. In this context, the first version of the beAWARE ontology is an "all-around" lightweight crisis management ontology for climate-related natural disasters.

Designed and implemented within the close collaboration of CERTH and IOSB, the model is the core of beAWARE's semantic knowledge base and represents the following key aspects:

- Information relevant to climate-related natural disasters;
- Analysis of data from multimodal sensors;
- Rescue team assignments.

This design was based on domain experts' contributions with respect to common ontology design methodologies, such as the assembly of a competency questions set. As a result, the ontology is capable of hosting and representing most system information, while it enables the application of semantic reasoning and the discovery of new knowledge in the most efficient ways. An overview of the class hierarchy and relation types is demonstrated in the following figure.
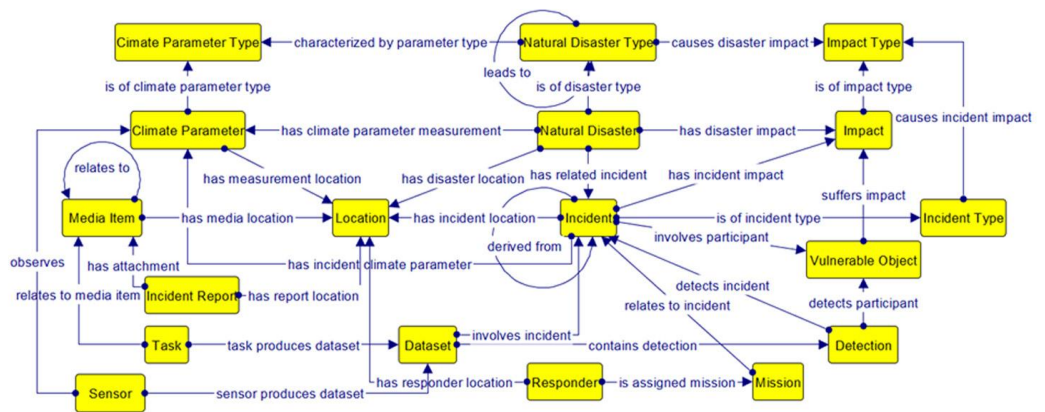
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The ontology specifications containing an extensive list of classes and properties with descriptions can be found here:
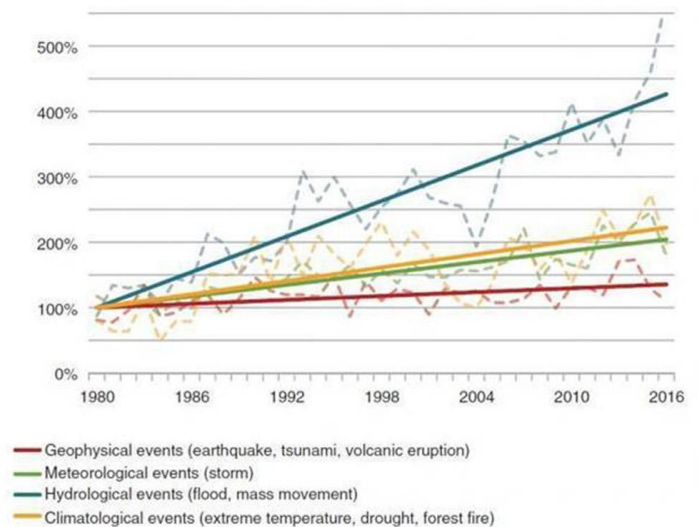https://github.com/beAWARE-project/ontology/blob/master/beAWARE-Ontology-Specifications.pdf

The ontology is hosted at IOSB's WebGenesis triplestore. A system component, known as Knowledge Base Service (KBS), is responsible for interfacing with the ontology and for instantiating high-level information. Incoming system knowledge is communicated to the KBS, where it is translated to instances and populated to the ontology, along with the appropriate interrelationships. Consequently, a set of semantic reasoning rules is applied, to uncover hidden relations and to calculate various metrics (e.g. severity levels) for reported incidents. Finally, the KBS retrieves vital information from the ontology to inform other system components, such as the PSAP and the Mobile App.

For the next version, the ontology is planned to incorporate aspects that are not adequately covered yet, like e.g. the semantic representation of rescue units and mission assignments.

NEWS

1. Extreme weather phenomena are becoming more and more frequent, a new study by EASAC reveals

New data show that extreme weather events have become more frequent over the past 36 years. The study conducted by the European Academies' Science Advisory Council, which is made up of the 27 national science academies in the European Union, Norway, and Switzerland, examined trends in extreme weather within Europe with a significant uptick in floods and other hydrological events compared with a similar study published five years ago.

- Geophysical events (earthquake, tsunami, volcanic eruption)
- Meteorological events (storm)
- Hydrological events (flood, mass movement)
- Climatological events (extreme temperature, drought, forest fire)

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The study found that hydrological events, such as floods and landslides, have quadrupled worldwide since 1980 and have doubled since 2004. It also found that climatological events, such as extreme temperatures, droughts, and forest fires, have more than doubled since 1980. And it found that meteorological events, such as storms, have doubled since 1980, the council said in a statement.

https://easac.eu/publications/details/extreme-weather-events-in-europe/

Professor Michael Norton, EASAC's Environment Programme Director states: "there has been and continues to be a significant increase in the frequency of extreme weather events, making climate proofing all the more urgent. Adaptation and mitigation must remain the cornerstones of tackling climate change. This update is most timely since the European Commission is due to release its evaluation of its climate strategy this year."

It becomes evident of the necessity the European member states will require from holistic approaches and all-inclusive platforms that will assist the authorities into tackling the more and more frequent extreme weather events, similar to the one beAWARE project is currently developing.

Source: Boston Globe, EASAC

2. Almost all European countries have their climate change vulnerability and risk assessment plans ready, according to EES report.

Availability of national CCIV assessments

- CCIV ass. published
- CCIV ass. under development
- No CCIV ass.
- No response to survey
- Outside coverage

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Almost all European countries have performed climate change vulnerability and risk assessment plans in order to be ready to confront the consequences coming from climate change, according to a report from the European Environment Agency (EEA).

Performing the study upon 33 EEA member countries (including the 28 European Union Member States), the report examined the evaluation the risks from climate change, and how the European national policies have used this information in developing adaptation policies to address these risks.

The report outlines that "adaptation is key to ensure that the EU as a whole is better prepared to handle the impacts of heat waves, floods, droughts and storm". The report also proposes that "continued engagement with key stakeholders in sectors vulnerable to climate change is essential for improving assessment results and their uptake in adaptation policies".

beAWARE project is developing a platform and tools to assess these risks, assist the public authorities on the confrontation of the threats coming from climate-related hazards, and create the ground for the engagement of relevant stakeholder at a European level.

Source: EEA

3. Heatwave in Finland sends May temperatures over 30C

Varoitukset maa- ja merialueilla

ke 16.5. to 17.5. pe 18.5. la 19.5. su 20.5.

Varoitukset
18.05.2018

Päivitetty
16.05.2018
klo 11:37

Ilmatieteen laitos
Tulvakeskus
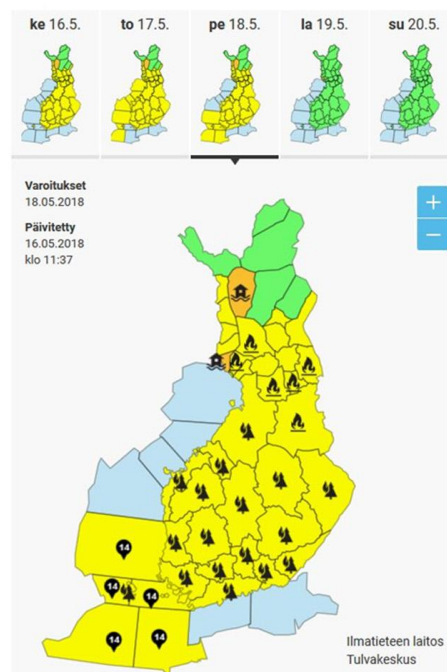
Finland has experienced an unusual rise of temperature higher than the normal level for the period of May. Our partner, the Finish Meteorological Institute (FMI) issued a warning for forest fire due to the dry terrain and temperatures that in some part of the country will exceed the 30C, a temperature far above normal compared to statistics between 1961 and 1990.

According to FMI, in Finland "hot days" are defined when the temperature goes above 25C. Normally, there are only a few hot days per year. This year, however, there have already been more than averages only starting from May! The record May temperature for Finland is 31C. This year's maximum so far has been 29.6C.

The main heatwave of hot days lasted 7 days, although all of May has been warm, sunny and dry – to the point that there is already a fire risk across most of Finland.

beAWARE system, except being present in this heatwave for its 4th Plenary meeting, will provide all the necessary tools for early warning and more efficient measures to tackle with this phenomena.

Source: FMI

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Information Technologies Institute · MOTOROLA SOLUTIONS · upf. Universitat Pompeu Fabra Barcelona · Fraunhofer IOSB · FMI · Autorità di Bacino DEI FIUMI ISONZO, TAGLIAMENTO, LIVENZA, PIAVE, BRENTA-BACCHIGLIONE · IBM · FREDERIKSBORG BRAND & REDNING

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4. Extreme weather events in the summer of 2018 in Europe

This year all around the European peninsula, extreme weather phenomena altered the ordinary life and habits of millions of Europeans during the summertime. Starting from Northern Europe, throughout Scandinavia, many areas in Norway, Sweden and Finland hit all-time highs this summer. By analyzing data from weather stations in northern Europe, the researchers found that a high barometric barrier prevented the jet stream from blowing in northern Europe and kept away the heavy Atlantic clouds.

As a result, for Denmark, June 2018 was the warmest of the last 26 years. July was the sunniest of all times, while the night of 30th to July 31st was the second warmest in the history of the country. In Finland, areas north of the Arctic Circle made a record of 33°C while the northern province of Lapland was hit by disastrous fires. Sweden experienced an unusually long heatwave and had only 13 mm of rain from the beginning of May to late July. Both months of May and July 2018 were the warmest months ever recorded in Sweden. As temperatures were more than 10°C above normal throughout July, Sweden faced severe repercussions from the hot weather, starting with the forest fires that destroyed more than 250 km2 of green forest of timber, an unprecedented event in the history of the country that activated the European Civil Protection Mechanism with many European countries sending firefighters and Canadair airplanes to assist the national authorities.

And if someone thinks that hot days may be pleasant news for a region that lacks sun and heat, then they should think again. Only in Denmark, hospitals have recorded 250 more elderly deaths this summer compared to the average, and tourists for the first time complained to hotels for the lack of air conditioning. In addition, there were even geological changes: Sweden lost its highest peak, as the glacier southern tip of Mount Kebnekaise in the Arctic lost 14 centimeters a day in July, losing its position as the highest peak of the country.

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Scandinavia, of course, was not the only part of the European peninsula to face this unusual, hot summer. In Austria, there were areas that had 85% less rainfall than 10 years ago. The majestic Dachstein glacier "is melting so fast you can see it with your naked eye," as meteorologist Klaus Reingruber told journalists. According to researchers at Innsbruck University, this summer was the hottest June on record since 1767, when the country started keeping track!

In France, the national electricity company had to close one nuclear reactor as the water temperature of the nearby river that is used to cool the system down had risen too much. More outstanding was the fact that some parts of France were hit by extensive heatwaves and droughts, and some others were suffering from torrential rains and violent thunderstorms.

In the Netherlands, the lack of rain severely affected its system of dikes because there was not enough fresh water countering the seawater. In Germany, temperatures were so high (up to 40 degrees) that the river Elvas dried up brining out to surface ammunition and grenades from the WW2!

In Switzerland the drought left the cows without water causing the death of hundreds of them from thirst. Farmers had to turn to the country's helicopter association and the Swiss Air Force to transport tens of thousands of gallons of water every week to keep the herds and the cows alive.

In Britain, it was the hottest summer of the last years, with the most severe drought since 1961. Some of the most iconic London parks like the Hyde Park turned into yellow. The lack of rainfall throughout June and July was so severe that the London Fire Brigade chief Danny Cotton made an unprecedented statement to journalists: "I'd never thought I'd say that, but we pray to rain".

Surprisingly hot days in Southern Europe were less frequent than previous years during this summer but several places in Portugal and Spain experienced record highs. Over the August, two people died in Spain from the high temperatures and a third in Portugal. Compared with last summer, however, when the lives of almost a hundred people were claimed, this year no period of long heatwaves and large wildfires was observed.

In Greece, the lack of extreme hot days was also very unusual (no days more than 40°C were recorded in Attica during this summer), but the consequences were far more dramatic. On July 23rd the gusts of westerly winds that reached 123 kilometers per hour in Parnitha (the highest gust recorded during the summer of 2018 all over Greece) alongside with the hot day and the dry terrain lead to a catastrophic forest fire that took the lives of 97 people, injured few hundreds and destroyed thousands of houses and properties. Coming only a day after the severe floods from heavy rains that had affected Northern Greece, this was the deadliest fire in the history of the country and one of the deadliest forest fires in Europe throughout the last century.

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In Italy, 11 people died from 'an valance of water' as it was described, caused by heavy rain in the southern region of Calabria. At the Raganello creek, part of the Pollino national park, at the bottom of a narrow, 1km-deep canyon in the mountain, 23 people were saved by rescue teams who used ropes to descend the sides to reach a group of hikers who were at the area at the time of the heavy weather.

This summer was not only extreme for Europe but for the entire northern hemisphere. Japan suffered from devastating floods, strong thunderstorms and long heatwaves in a period of a month! In California, 8 civilians and 6 firefighters were killed in a series of wildfires (6.004 different fires) that have burned an area of 5,808.30 km2, causing over $2.5 billion in damages, including $1 billion in fire suppression costs, thus, becoming the largest wildfire in the state's history. In Canada, more than 70 people died due to the high temperatures in the Quebec province during the first week of July, when the heat index hit the record high of 47°C. Across the planet, June was the second warmest on record, and considering that we are close to the La Niña period, in 2019 the temperatures are expected to rise even further.

Finally, humans were not the only ones affected by the weather change. The impact on the biosphere is dramatic, as happened with the largest colony of royal penguins, which has been shrunk by 90%. According to the New York Times, satellite photos show that from the 500,000 pairs of penguins seen by scientists in 1982, only 60,000 couples remain in the South Island of Phorouni a French territory in the southern Indian Ocean. Scientists predicted that climate change would wipe out the royal penguins of the archipelago before the year of 2100.

Sources: Kathimerini, The New York Times, CNN, The Guardian, BBC
Photo credits: AFP/GETTY IMAGES

5. Drones to the rescue – bringing muscle to weather crisis management

Barely a week goes by that we don't see a hurricane, heatwave, earthquake, flood, or other catastrophic weather anomaly reported in the world news. Extreme weather phenomenon are becoming more and more prevalent, and I often wonder what technology local governments use to coordinate warnings, efforts, and instructions to civilians.

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Are they incorporating more recent tech like IoT, AI, wearables, drones, and crowdsourcing to handle crisis-management more efficiently? This past year I got my chance to find out and begin contributing to this transformation, along with colleagues from IBM Research and the EU.

The beAWARE-EU funded consortium seeks to augment existing crisis management solutions with innovative technology that integrates improved forecasting, early warning systems, data aggregation, and management coordination for first responders and authorities.

Where the drones come in

Crisis management isn't new, but we can push its envelope in terms of what data we collect, what systems we connect to, and how we analyze and share that data to boost decision-support and coordination in times of emergency. Our team at IBM Research-Haifa specializes in building platforms that collect and analyze data—andnow we're bringing drones in to play a starring role.

In recent years, drones have quickly gone from military use to public and private ownership, with their popularity multiplying at supersonic speed. We're now seeing them being used for logistics, security, monitoring, farming, insurance, and more. Scientists at the IBM Haifa Research lab have been working on algorithms that go a long way toward enhancing their capabilities for navigation, object recognition, accuracy, and monitoring.

The challenge in working with drones is in managing and maintaining them. Aside from purchasing the drone itself, it must be equipped with the right sensors, paired up with a skilled pilot and license, have the ability to accurately capture videos and photos, meet safety and privacy regulations—and then there is the more complex stage of collecting, storing, and analyzing their data.

Haifa scientists have developed a cognitive cloud-based platform, offering a framework for the management, provisioning and operation of drones, and drones services.

Using the drones platform:
• Drone owners can easily register their drone/ drone fleet
• Developers and service providers can offer their services
• Drone flights and services are fully autonomous and automated
• Data is instantly available to consumers via IBM's cloud
• Cognitive services can be used to analyze the data collected
• Consumers who are not drone owners can access drones services

Thus, our long-term vision is for civilians to be able to register their drones to the platform and contribute to the crisis management, through autonomous mission managed by the platform.

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For example, John would leave his drone on his terrace, make it available to the platform, and in time of crisis the municipality would be able to make use of John's drone to stream video from an affected area. In return, John will be paid for the provided services.

The platform itself can support a services marketplace containing building blocks for easily creating solutions. For example, an automatic pilot service and another service counting cars in the water can be combined to an application that monitors the amount of cars in a flooded area.

Taking a shine to coordinated IoT

beAWARE is all about giving municipal authorities and decision-makers a richer big picture through updated information on weather crises. This is accomplished by collating and analyzing input from different origins, such as citizens that post relevant twitter updates, or send video or photos. The drones provide another vital layer of information that completes the big picture. For example, the technology developed in Haifa allows users to provide coordinates defining a 'geo-fenced' area of specific interest. The drones can then proceed with autonomous flight over the area at a precise elevation and collect video data that can be relayed instantly to emergency coordinators. Raw footage can be made readily available, in addition to analyzed feeds.

Say, for example, we have an area in Italy that is likely to experience flooding when it rains heavily in the nearby mountains. As the rain gets stronger, the weather forecasts and water level sensors warn of possible flooding. At this point, the information starts coming in to the system. Citizens start tweeting or sending information on the solution's dedicated application reporting a rising water level along with photos. Then more people send data and video starts to come in. Initially, the beAWARE platform collects this multimodal data including text, images, audio, and video from the different sources, whether citizens, drones, weather sensors, or cameras. The platform then fuses the data to draw conclusions about what's going on in the field and relay the mapped alerts to the onscreen dashboard of the decision-makers. The information can include the exact location, level of the crisis, estimated time to flooding, and more. beAWARE continues to analyze the situation based on the information coming in and users can gain access to a dashboard to see more data – both the raw data and the conclusions being reached. Next, the authorities will be able turn to the platform for support in deciding which responders are available, what teams to send where, and what needs to be done in specific geographical locations. The solution can be equally valuable for governments, municipalities, firefighters, police, and citizens who need updates on closed areas, shelters, or new hazards.

Grab your go-bag and connect to the IoT

In November 2018, the beAWARE system will be called upon to help coordinate emergency response to a simulated heat wave in Salonika, Greece.

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In that situation, beAWARE will manage relief sites where people can get treatment and be exposed to cooler air conditioning, and verify that those centers are not getting overcrowded. The beAWARE solution also plans a test run in March 2019 to see how it can help authorities handle a flood in Vicenza, Italy. This production will involve hundreds of volunteers acting out the scenario, props, and of course, a chance to draw conclusions as to the readiness for handling such events. Towards the end of 2019, consortium partners will hold a live exercise to rehearse a fire in Valencia, Spain. The 'forest fire'will happen in a semi-urban area with buildings that will require evacuation, citizens that need direction, healthcare facilities, and other serious maneuvers.

Drones add a new dimension to emergency response system. Together with new capabilities that can collect, treat, merge, and analyze a myriad of data inputs, we foresee a uniquely agile and efficient system that can classify crises, respond in kind, learn from previous situations, and offer the ultimate in decision support.

Author: Benny Mandler, IBM Research
published on www.linkedin.com/in/benny-mandler-112550/
Photo credits: GETTY Images

Participation in Conferences/Workshops

beAWARE in SICUR 2018

During the International Security, Safety, and Fire Exhibition (SICUR) in Madrid on 19th February 2018, our partner Policia Local Valencia had the opportunity to present the beAWARE project and explain its aim on developing a technological platform in order to improve the response in case of weather emergencies principally caused by climate change, like forest fires, heat waves, and floods.

SICUR gave us the possibility to disseminate information about our project. Particularly, PLV's participation was focused on the importance of the project for LEAs and policymakers.

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SICUR is an International professional event about Innovation and technological development, which is held every two years in Madrid. It concerns about diﬀerent categories: Fire and Emergency Safety; Occupational Safety; Security, which encompasses Private and Public Security, in constant interaction, and Defence.As regarding the figures, SICUR welcomed in 2016 1,332 participating companies, of which 678 Spanish ones and 624 foreign ones; 576 direct exhibitors, of which 477 Spanish and 99 foreign. Moreover, the exhibition hosted 42,294 trade visitors, and the foreign ones came from 76 different countries.

SICUR had a great impact on the media, since 4,965 social media were attending the exhibition or did a report on it. Among the main ones there are: 142 magazines in the sector, 9 radio, 53 daily newspapers, and 243 accredited media.

beAWARE in Days of Hydrology

On the 20th of June, in Rome, it took place the conference 'Days of Hydrology', organized by the Italian Society of Hydrology. This conference is considered as one of the most important in Italy regarding the Hydrology and it involves the main experts in this branch, from researchers to public authorities and private professionals.

During the conference, one of the section was about new techniques to manage and reduce the risk from natural extreme events (in particular floods). Our distinctive partner AAWA had submitted an abstract for this session about beAWARE and the innovations carried by our project. The authors of this abstract were Michele Ferri, Daniele Norbiato, Giovanni Tomei, Francesca Lombardo, Francesco Zaffanella under the title 'beAWARE:

approccio innovativo per il supporto decisionale e la gestione integrata di eventi climatici estremi', i.e. beAWARE innovative approach for decision support and integrate management of extreme weather events.

Additionally, our colleagues had the opportunity to make a short presentation and explain a poster about beAWARE giving a great occasion to increase the visibility of our project.
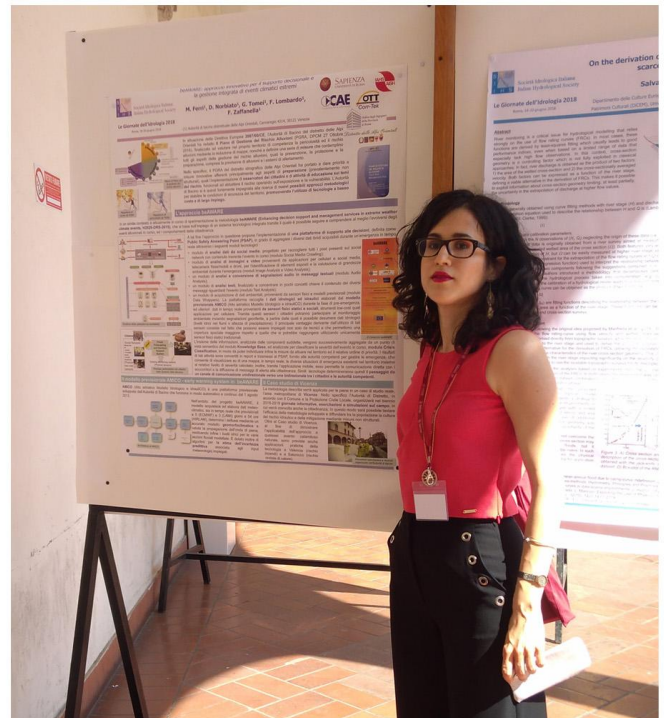
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ISCRAM Workshop

The Information Systems for Crisis Response and Management (ISCRAM) Community is an international community of researchers, practitioners and policy makers involved in or concerned about the design, development, deployment, use and evaluation of information systems for crisis response and management.

For the purpose of the ISCRAM 2018 workshop, relative presentations were created by members of the beAWARE Consortium. During the presentation, the room was full and very promising can be considered the fact that the feedback that was received during these presentations was in general terms very positive.

This favorable reception is showing the acceptance of the beAWARE project, both as a holistic platform with different components and from the point of view of participating partners, to the scientific community and in terms of explain the importance of the work that is being done.

Having the welcome from such high level audience as the one found in ISCRAM, is a promising proof that the solutions that the platform will offer to tackle with the challenges coming from extreme weather phenomena are those that both the scientific community and the first responders will require from a crisis management platform.
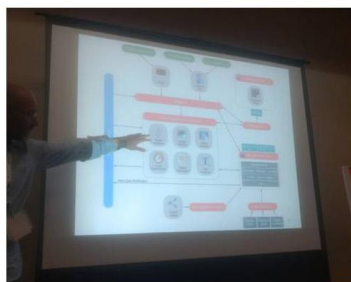
CERTH presentation, ISCRAM 2018 - IOSB presentation, ISCRAM 2018

Workshop on sensor data management in September

The SensorThings API standard of the Open Geospatial Consortium (OGC) stands for efficient management of sensor data in the Internet of Things. What's new about this open standard, what and how is it used and how is it developing? Users, developers, experts and newbies will exchange ideas and share experience at the "OGC Summit on SensorThings API" on September 11, 2018 at the HochschulefürTechnik in Stuttgart. The Fraunhofer Institute of Optronics, Systems Engineering and Image Exploitation IOSB in Karlsruhe will present its implementation of the API, "FROST– Fraunhofer Open Source SensorThings Server and Client".

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With a smartphone, for example, you can switch on the air conditioning in your home and a printer orders a new toner cartridge on its own –that's how the Internet of Things works. The most important basis for the Internet of Things is sensor data. With the help of sensors, information about "things" of any kind is collected and processed. These are used in many areas, for example in industrial environments, energy management, the environment or crisis management.

The SensorThings API (Application Programming Interface) is a standard that allows this data to be collected and processed in a uniform way despite the enormous variety of devices and fields of application. It builds on long OGC experience in the field of sensor data management and takes into account modern requirements for performant and easy to master interfaces. In the Summit the standard will be presented with its implementations and applications and further developments will be discussed.

Open source implementation for ease of use

Against the background of requirements from numerous applications in the megatrend topic of the Internet of Things, Fraunhofer IOSB has developed a server that implements the standard: "FROST –The Fraunhofer Open Source SensorThings API Server". Great importance was attached to a functionally complete implementation with high performance. The aim was to enable easy use both in the research environment and in commercial applications in order to pave the way for innovations. Therefore, the implementation is provided as open source software.

The FROST Server has been certified by the Open Geospatial Consortium since August 2016 and is freely available under the GNU Lesser General Public License 3.0. This license allows commercial applications and ensures that further developments are made available to all users of the FROST Server.

Practical application in various projects

Numerous projects are using FROST. For example, Fraunhofer IOSB's own building is equipped with a sensor network to collect building data such as temperature, energy consumption or water consumption values. Currently, the system stores about 6.8 million observations per month. These are combined with other operational data, for example to evaluate different approaches to room cooling in the summer months.

The European H2020 research project beAWARE, which is working on improving decision support in the event of extreme weather and climate events, also uses FROST. Heterogeneous data from different sources are integrated and stored. Environmental datais easily combined with data from social media, reports from first responders and from people in danger.

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Scalability is an important feature of the FROST server for all projects. It runs on microcomputers, such as a Raspberry Pi, or in a cloud environment.
Further information: www.iosb.fraunhofer.de/?FROST-Server.

Details about the event "OGC Summit on SensorThings API":

• **Time:** Tuesday, 11th September 2018, 10.15 – 17.30 (during the session of the OGC Technical Committee and the OGC Planning Committee)
• **Place:** University of Applied Sciences, Schellingstraße 24, 70174 Stuttgart, Germany
• **Conference chairs:** Dr.-Ing. Thomas Usländer from Fraunhofer IOSB and Dr. Steven Liang from the University of Calgary in Canada
• **Agenda:** see https://www.iosb.fraunhofer.de/servlet/is/85589/

Participation in the workshop is free of charge and does not require membership in the Open Geospatial Consortium. Registration at https://store.opengeospatial.orgis however required.

Examples of sensor data stored in FROST and its visualization (above: weather data, below: real-time detection of a crack in a building in relation to the temperature:

beAWARE at the INTERGEO fair in Frankfurt in October

Fraunhofer IOSB is presenting beAWARE results at the INTERGEO trade fair happening in Frankfurt/Germany from 16th to 17th of October. INTERGEO is the leading international trade fair for geodesy and geo-information. The FROST server to manage sensor data compliant to OGC SensorThings API standard and the inter-domain knowledge base for crisis management are on display.

Place of presentation: Hall 12, Booth A15

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Fourth Plenary Meeting in Helsinki, 15-17 May 2018

In an unusually warm and sunny Helsinki, the fourth plenary meeting that took place on 15-17 of May gave the possibility to all the consortium partners to present the work done since the last meeting in November in Haifa, take some decision for the upcoming period and, most importantly, prepare for the review meeting that will take place in July in Brussels.

Review preparation meeting in Brussels, 16-17 July 2018

During the preparatory meeting in Brussels for the upcoming review, all work packages were shown to the entire consortium, with valuable feedback and improvements before the review meeting of the next day. After receiving some very fruitful and precious comments, we are moving forward more committed than ever!

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Partners of the Consortium

The partners that formulate the consortium of the project are:

Centre for Research and Technology Hellas (CERTH) - Coordinator

Motorola Solutions Israel Ltd (MSIL)

Universitat Pompeu Fabra (UPF)

Fraunhofer Institute of Optronics, System Technologies and Image Exploitation (IOSB)

Valencia Local Police (PLV)

Hellenic Rescue Team (HRT)

Finnish Meteorological Institute (FMI)

Alto Adriatico Water Authority (AAWA)

IBM Israel - Science And Technology Ltd (IBM)

Frederiksborg Fire & Rescue Service (FBBR)