Management Of Networked IoT Wearables – Very Large Scale Demonstration of Cultural Societal Applications
(Grant Agreement No 732350)

D12.4 Project Advertising Material 2

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1 Executive summary

This deliverable presents an overview of the advertising material produced by MONICA from June 2017 until the end of the project in March 2020. The document should thereby be seen as a continual of *D12.3 Project Advertising Material 1* submitted at the beginning of the project i.e. end of May 2017.

The deliverable contains advertising material published by MONICA at project and partner level, including material produced for technical demonstrations and hackathons. Finally, it provides a list of material published by the Large-Scale Pilots Programme (LSP) in which MONICA features and/or has contributed with content and input.

In total, including material from *D12.3*, the project and its partners have produced seven flyers, five posters and ten videos as well as a wide range of other promotion material such as postcard, illustration, t-shirts, banners etc. Additionally, MONICA has provided input and content to 10 publications (ebooks, brochures and leaflet) within the Internet of Things European Research Cluster (IERC), the Alliance for the Internet of Things Innovation (AIOTI) and LSP collaboration framework, with two of them being prepared for release at the time of writing.

The project material has the purpose of creating awareness of MONICA and promoting its visions and results, being of usage to project partners at all kinds of events, from meetings, workshops, exhibitions to technical demonstrations and hackathons. The aim of the Programme material is to maximise the impact of the IoT pilots and the Programme.

2 Introduction

2.1 Purpose, context and scope

This deliverable is classified as a DEC (Dissemination, exploitation, communication) delivery, providing an overview of the second advertising material created and planned from June 2017. It supplements the first advertising material covered in *D12.3 Project Advertising Material 1*.

The advertising material has the purpose of presenting and promoting MONICA visions and results, covering all the main aspects of the project and being of usage to all partners. Additionally, the project has collaborated with the other large-scale pilots and support actions in creating material to promote the IoT innovation of the Large-Scale Pilots (LSP) Programme.

The deliverable is part of task *T12.1 Communication Plan* and is also related to *D12.1 Communication and Dissemination Strategy* and *D12.2 Project Website and Social Media Platforms*.

It covers material produced by MONICA at project and partner level and content published by the Large-Scale Pilots Programme (LSP) in which MONICA features and/or has contributed with content and input. Articles about MONICA for other external magazines are not covered by this deliverable but feature as part of the communication impact.

3 Project advertising material

MONICA has developed and updated its project advertising material continuously to support activities at project and partner level. Additionally, the project has collaborated with the other LSP projects and support actions on material promoting the Programme. The following entries list all material created from June 2017.

3.1 Presentation material

The project templates have the purpose of supporting partners in dissemination and communication activities, ensuring a uniform MONICA impression.

3.1.1 Additional presentation template

As a supplement to the existing presentation template, an additional one has been made for external presentations and events seeking a more outreach and modern look and also including the ways to engage with the project (social media links).

To accompany the presentation of MONICA use cases at exhibitions, a set of slides was developed which can be seen in Appendix A.

Figure 1: MONICA presentation template version 2

3.1.2 Smart City illustration

For communication purposes, an image was created in July 2019 to illustrate the Smart City area of MONICA which project partners can use in presentations or in marketing material.

Two versions of the image were made, one with text overlay (Figure 2) in the context of the project and one without for general use (Figure 3).

Figure 2: Smart City area of MONICA with text overlay

Figure 3: Smart City area of MONICA without text overlay

3.2 Brochures and flyers

The project brochure has been updated twice to reflect the evolvement of the project. The latest version from June 2019 can be seen in Appendix B. The most visible change is an update of the pilot page, presenting pilots and their chosen applications.

Project partners have also produced brochures and handouts to promote visibility locally. See the list in Appendix B.

3.3 Posters and stand wall

For visual attraction at exhibitions and events, a project poster and roller banner were developed and design files were made available for project partners who wished other language versions.

At the IoT Week 2019, a stand wall was produced for maximum visual exposure and in alignment with the other large-scale projects and support actions.

Figure 4: The MONICA stand at IoT Week 2019

Project partners have also produced additional posters to illustrate specific use cases and applications at events. See Appendix C for all posters.

3.4 Demonstration material

For the technical demonstrations, the poster/roller banner and brochure have been used together with additional material and merchandise appropriate for the particular demonstration.

Banners were produced at Rhein in Flammen 2019 and Woodstower demonstrations to highlight the MONICA activities and attract interest. For Woodstower, t-shirts were produced for the volunteers distributing wristbands. The festival magazine also had a page on MONICA.

Figure 5: Banner for Rhein in Flammen 2019

Figure 6: Banner, poster and t-shirts at Woodstower festival 2019

Figure 7: MONICA page in the Woodstower Festival magazine

3.4.1 Postcard

To support the wristband demonstration at IoT Week 2019, a postcard was made to provide information about the features, return of the wristband and competition. The postcard can be seen in Appendix D.

Figure 8: Front page of the postcard

3.5 Hackathon material

MONICA planned and completed three hackathons in 2018 which took place in Roskilde, Leeds and Torino respectively. Project partners responsible for the organisation used existing MONICA material but also produced a range of advertising material and merchandise to promote participation and engagement.

Videos from two of the hackathons were produced after the event to spread the entrepreneurial atmosphere and spark interest in the successful outcomes. See 3.6.

3.5.1 Roskilde August 2018 – flyer and t-shirt

3.5.2 Leeds October 2018 – flyer, banner, roller banner, t-shirts


LEEDS BECKETT UNIVERSITY
MONICA
This is
#HACKINGLEY
IOT


MONICA
#HACKINGLEY


This is
MONICA
DO YOU WANT
TO HACK A
STADIUM?

3.5.3 Torino November 2018 – roller banner, t-shirts

3.6 Project and partner videos

The project has produced 10 videos in total, of which 9 have been made in the reported period.

Figure 9: Partnerships in MONICA, November 2017, created by Kingston University

The MONICA airship for monitoring crowds at large events

Figure 10: The MONICA airship for monitoring crowds at large events (Digisky, IN-JET)

Sound monitoring nuits sonores 2017

Figure 11: Sound monitoring Nuits Sonores 2017 (Acoucité, IN-JET)

Figure 12: Open-air Hackathon Roskilde, October 2018 organised by Vaeksthus Zealand

Figure 13: Urban Spaces Hackathon Torino, December 2018, organised by City of Torino

Figure 14: Presentation of the MONICA project organised by Atos IT Solutions and Services

Figure 15: Presentation of MONICA applications, created by Atos IT Solutions and Services

Figure 16: Presentation for Decibel D'Or 2019, created by Acoucité

Figure 17: Farewell video prepared by Atos IT Solutions and Services

3.7 Newsletters

Six newsletters have been produced and can be found on the project website:

- April 2018: Getting ready for IoT demonstrations
- July 2018: Kappa FuturFestival and MONICA Hackathon
- November 2018: Hackathon winners and nightlife demonstration
- December 2018: Fête des Lumières and last hackathon winners
- June 2019: IoT Week activities, video analytics and smart glasses review
- October 2019: Results from technical demonstrations and invitation to showcase event

A final newsletter is planned for release at the end of the project (March/April 2020) focusing on the results and replication opportunities.

3.8 Collaboration material

The project has collaborated with IERC, AIOTI, support action CREATE-IoT and the other LSPs in the creation of public material as well as videos to raise the impact of the Programme and advertise its results.

3.8.1 Publications

The research eBook *Cognitive Hyperconnected Digital Transformation, Internet of Things Intelligence Evolution* is organised by the IERC and serves to outline the 2017 IoT landscape. MONICA provided input to chapter 8: *IoT European Large-Scale Pilots – Integration, Experimentation and Testing*.

Figure 18: Research book 2017 prepared by IERC

Three publications have been collaborated on in 2018 to present the LSP Programme and projects, providing an overview and goals of the initiative, and information about each of the projects that comprise the Programme.

Figure 19: LSP eBrochures 2018 prepared by CREATE-IoT (two from the left) and Schuttelaar & Partners

For the IoT Week 2018, MONICA provided input to a Smart Event Market leaflet prepared by CREATE-IoT

Figure 20: Smart Events Market leaflet by CREATE-IoT

In 2019, an IoT eBook was developed to highlight the innovation aspect of the Programme and the LSP projects. MONICA delivered input to Chapter 5 and the focus area: IoT for the Event Management Market.

Figure 21: IoT eBook 2019 prepared by CREATE-IoT

MONICA also contributed to the AIOTI publication study released in January 2020: 'High Priority IoT Standardisation Gaps and Relevant SDOs' with a section on MONICA titled: 'Identification of an IoT/SRD RF standard for the stable and highly dependable transmission of sensor data'.

Concerning protection of personal data, MONICA produced input for the LSP publication: 'Personal data protection for Internet of Things Deployments: Lessons Learned from the European Large-scale Pilots of Internet of Things', which was released in February 2020.

Figure 22: Publication on Personal Data Protection in the LSPs

Finally, MONICA delivered a chapter on IoT Solutions for Large Open-Air Events for an IERC cluster book production as well as content for a Springer Handbook of IoT. Both publications are being prepared for release at the time of writing.

3.8.2 Programme videos

Two videos have been made as part of the LSP Programme with MONICA interviews featuring in them. To target a general audience, a third video was made as part of Activity Group 8, explaining IoT and using the LSP projects as IoT examples.

Figure 23: Video presenting the LSPs, 2018, prepared by CREATE-IoT

Figure 24: Video story from IoT Week 2018, prepared by CREATE-IoT

Figure 25: Video targeting a general audience. Prepared by Schuttelaar & Partners, 2018

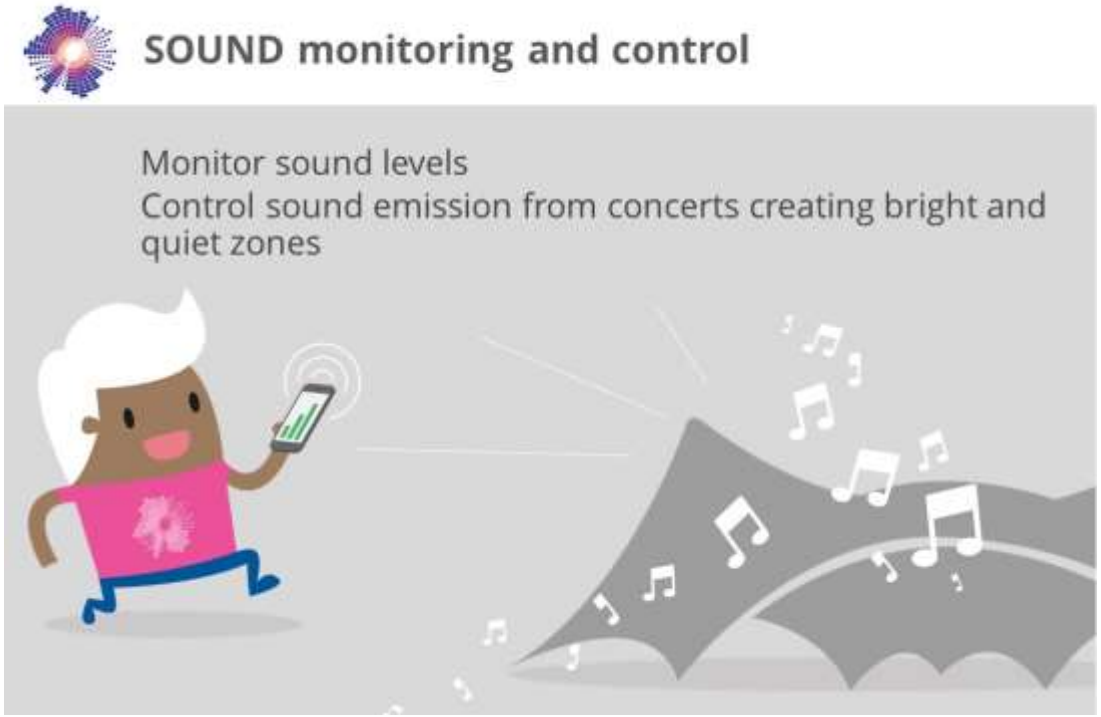
3.8.3 Programme newsletters

MONICA has also contributed with content and input to the six Programme newsletters issued and distributed by the activity groups which can be found here: https://european-iot-pilots.eu/

4 List of figures

4.1 Figures

5 Appendix A: Example of automatic slideshow presentation for exhibitions



CROWD and CAPACITY monitoring

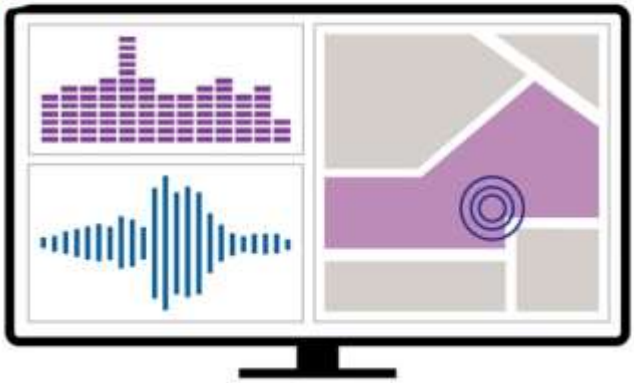
Count your crowd and density

Be notified when capacity limits are reached

Guide visitors to alternative routes, closest exits, shortest queues or fastest way

SECURITY, SAFETY and HEALTH incidents

Detect, report and handle incidents during the event




STAFF location
Monitor the location and availability of staff
Locate staff close to crowded area
Forward alerts

6 Appendix B: Brochures and magazines

Project brochure. 3rd version produced in June 2019

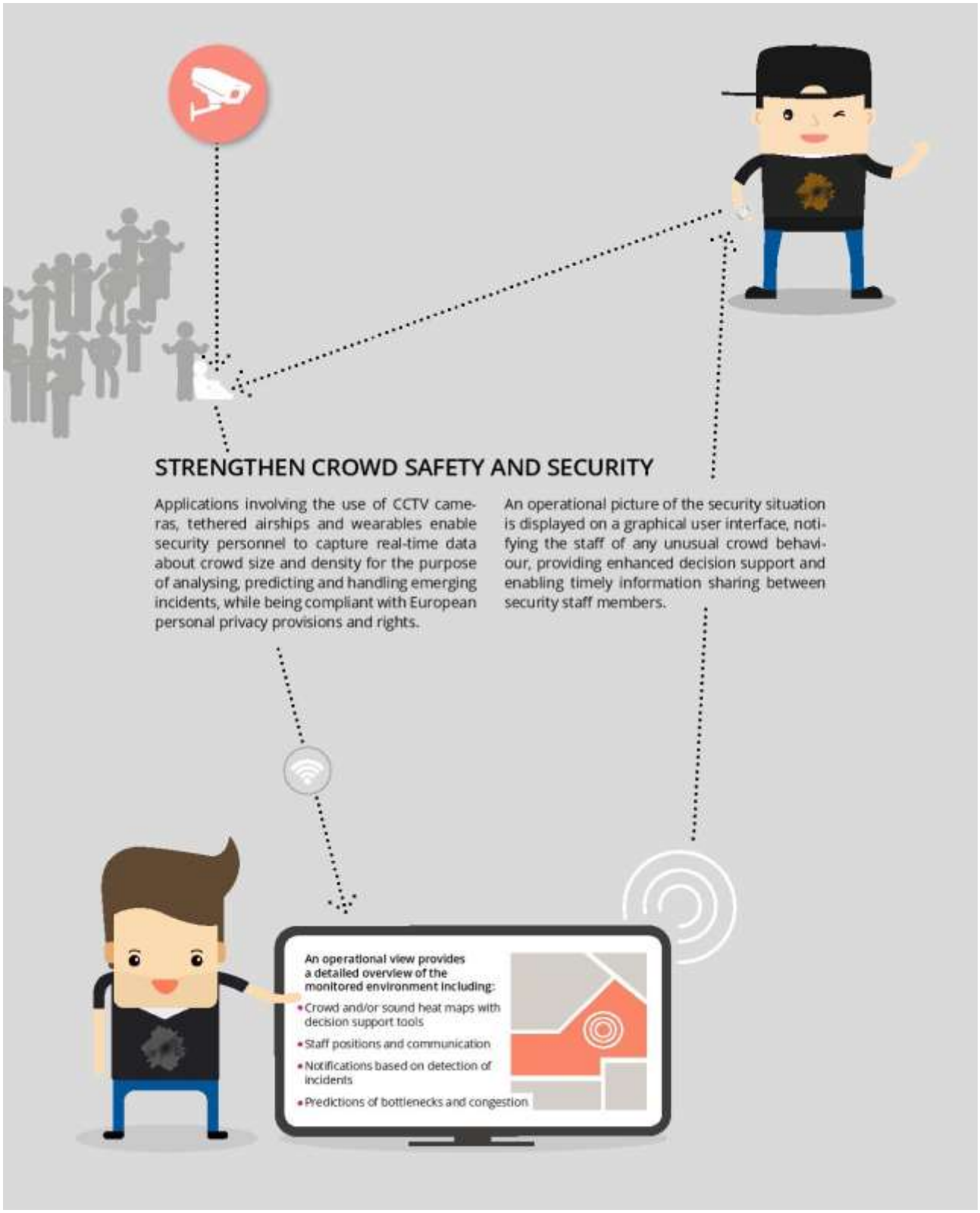
The MONICA project is conducting large-scale demonstrations of IoT technologies that help cities meet sound and security challenges at big, open-air events. The events include amplified concerts, cultural festivals and sports matches which attract and affect a large number of people. Several applications are developed and deployed at events in six European cities during 2018 and 2019, involving thousands of users who test the novel MONICA applications.

MONITOR SOUND, ENHANCE SOUND PERCEPTION AND REDUCE UNWANTED SOUND LEVELS

The MONICA sound applications provide real-time information about sound levels to help organisers of music events control the impact. A sound heat map of the venue is displayed, detailing sources of sound as well as level of unwanted acoustic emissions.

To enhance the sound experience for concert-goers and reduce the level for neighbours, MONICA establishes sound zones which optimise sound in front of the stage and attenuate it beyond the concert area. Additionally, people can go to quieter zones if needed.

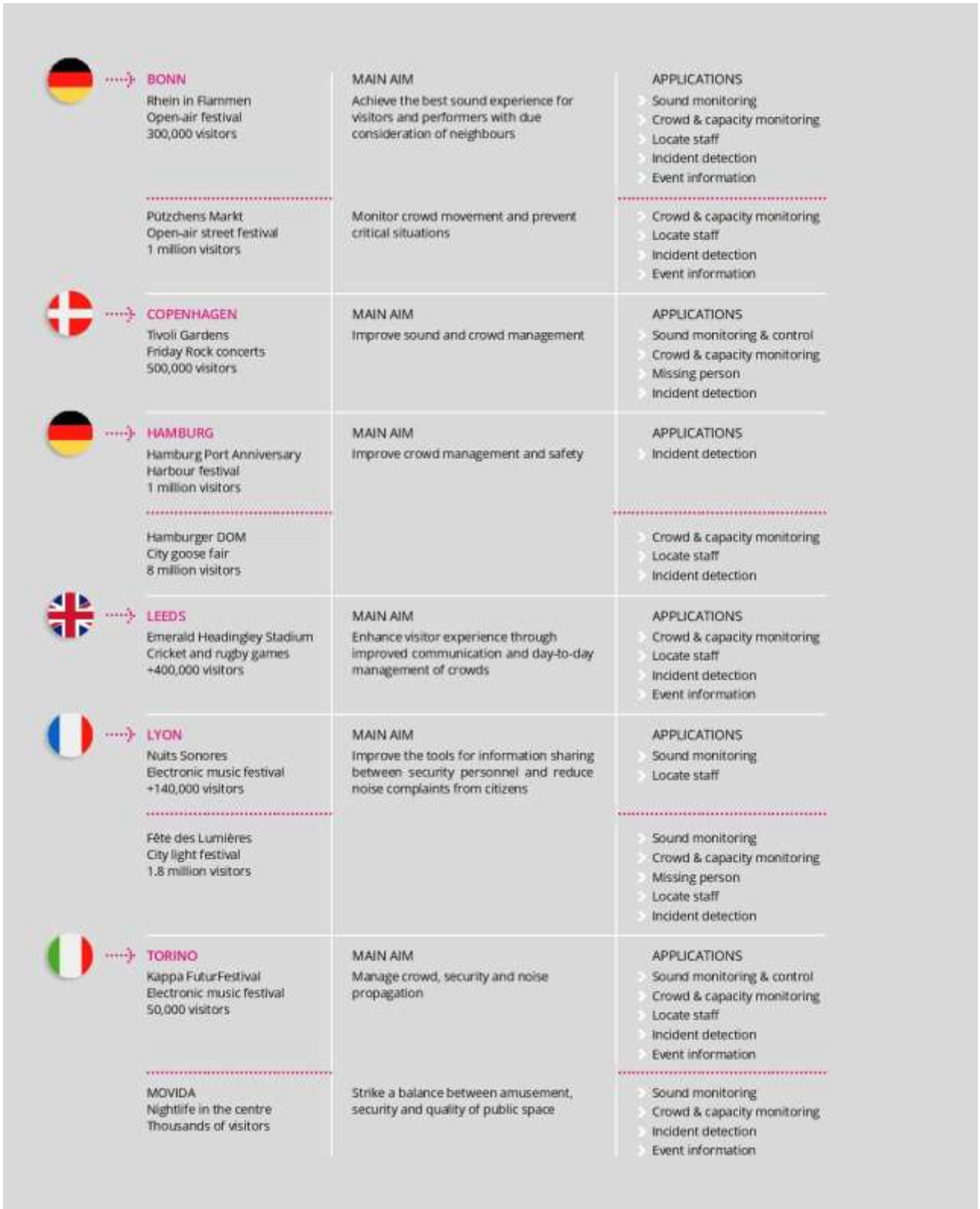
IoT= Internet of Things: Advanced wireless technologies connecting physical devices to the internet and making it possible to collect and exchange data and perform actions. Devices used in MONICA include smart wristbands & trackers, video cameras, smart glasses, airships, loudspeakers, sound level meters, environmental sensors and smartphones.


STRENGTHEN CROWD SAFETY AND SECURITY
Applications involving the use of CCTV cameras, tethered airships and wearables enable security personnel to capture real-time data about crowd size and density for the purpose of analysing, predicting and handling emerging incidents, while being compliant with European personal privacy provisions and rights.
An operational picture of the security situation is displayed on a graphical user interface, notifying the staff of any unusual crowd behaviour, providing enhanced decision support and enabling timely information sharing between security staff members.
An operational view provides a detailed overview of the monitored environment including:
Crowd and/or sound heat maps with decision support tools
Staff positions and communication
Notifications based on detection of incidents
Predictions of bottlenecks and congestion

IMPROVE USER EXPERIENCE

Communication with visitors is improved by the use of visitor apps and IoT wristbands with value-adding features, enabling people to connect with and locate each other, interact with performers or organisers and receive event-related information.

Open data coming from sensors are accessible to the public and developers for awareness creation and innovation.


BONN
Rhein in Flammen
Open-air festival
300,000 visitors
MAIN AIM
Achieve the best sound experience for visitors and performers with due consideration of neighbours
APPLICATIONS
Sound monitoring
Crowd & capacity monitoring
Locate staff
Incident detection
Event information
Pützchens Markt
Open-air street festival
1 million visitors
Monitor crowd movement and prevent critical situations
Crowd & capacity monitoring
Locate staff
Incident detection
Event information
COPENHAGEN
Tivoli Gardens
Friday Rock concerts
500,000 visitors
MAIN AIM
Improve sound and crowd management
APPLICATIONS
Sound monitoring & control
Crowd & capacity monitoring
Missing person
Incident detection
HAMBURG
Hamburg Port Anniversary
Harbour festival
1 million visitors
MAIN AIM
Improve crowd management and safety
APPLICATIONS
Incident detection
Hamburger DOM
City goose fair
8 million visitors
Crowd & capacity monitoring
Locate staff
Incident detection
LEEDS
Emerald Headingley Stadium
Cricket and rugby games
+400,000 visitors
MAIN AIM
Enhance visitor experience through improved communication and day-to-day management of crowds
APPLICATIONS
Crowd & capacity monitoring
Locate staff
Incident detection
Event information
LYON
Nuits Sonores
Electronic music festival
+140,000 visitors
MAIN AIM
Improve the tools for information sharing between security personnel and reduce noise complaints from citizens
APPLICATIONS
Sound monitoring
Locate staff
Fête des Lumières
City light festival
1.8 million visitors
Sound monitoring
Crowd & capacity monitoring
Missing person
Locate staff
Incident detection
TORINO
Kappa FuturFestival
Electronic music festival
50,000 visitors
MAIN AIM
Manage crowd, security and noise propagation
APPLICATIONS
Sound monitoring & control
Crowd & capacity monitoring
Locate staff
Incident detection
Event information
MOVIDA
Nightlife in the centre
Thousands of visitors
Strike a balance between amusement, security and quality of public space
Sound monitoring
Crowd & capacity monitoring
Incident detection
Event information

THE TECHNICAL CONCEPT

To support the applications, MONICA deploys a cloud-based platform, wirelessly connecting and handling several IoT-enabled devices whether fixed, worn or moved around. Control systems monitor the data collected and can perform automated actions based on the information gathered.

The platform also consists of components which analyse data and detect critical incidents, supporting operators in assessing the situation and making decisions.

The platform can be incorporated with existing Smart City systems, be replicated to fit other settings or used to develop new Smart City applications.

Features include:

- Integration of many different interoperable sensors and actuators
- Use of open standards and architectures as well as open source software
- Large-scale operation design to enable large IoT deployments
- Seamless integration with external Smart City platforms using oneM2M
- Data Security, Privacy and Trust Framework, ensuring full data protection and privacy

MONICA DEMONSTRATES THREE ECOSYSTEMS WHICH INVOLVE THE ENTIRE CHAIN OF STAKEHOLDERS AND THEIR NEEDS:

SECURITY ECOSYSTEM
Applications that can be used to monitor crowds and manage security before, during and after an event

ACOUSTICS ECOSYSTEM
Applications that help monitor and manage the sound before, during and after a performance

INNOVATION ECOSYSTEM
Applications for public engagement and innovation based on open data and development tools

MONICA

Management of Networked IoT Wearables
- Very Large Scale Demonstration of Cultural and Societal Applications

29 PROJECT PARTNERS, NINE COUNTRIES

Fraunhofer Institute for Applied Information Technology, Germany
Acoucité, City of Lyon, France
Atos IT Solutions and Services, Slovakia
Brüel & Kjær Sound & Vibration Measurement A/S, Denmark
CERTH Information Technologies Institute, Greece
City of Bonn, Germany
City of Copenhagen, Denmark
City of Hamburg, Germany
City of Torino, Italy
CNet Svenska AB, Sweden
Dexels BV, Netherlands
DigiSky SRL UAV & Robotic Systems, Italy
Hamburg University of Applied Science, Germany
In-JeT ApS, Denmark
Kingston University, UK
Leeds Beckett University, UK
Leeds Rugby, UK
Links Foundation (formerly ISMB), Italy
Movement Entertainment Srl, Italy
Optinvent S.A., France
Praesidio Group ApS, Denmark
Ring Advocacy ApS, Denmark
Rinicom Ltd, UK
Technical University of Denmark
Telecom Italia S.p.A., Italy
Tivoli A/S, Denmark
VCA Technology Ltd, UK
Vaeksthus Zealand, Denmark
Yorkshire County Cricket Club Ltd, UK

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MonicaProject
Monicamatters
MonicaIoTforCities
MONICA Project

Co-funded by the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No 732350. Project Coordinator and legal representative: Markus Eisenhauer, Fraunhofer FIT, markus.eisenhauer@fit.fraunhofer.de

Fraunhofer FIT project flyer – June 2017

Fraunhofer
FIT

FRAUNHOFER-INSTITUT FÜR ANGEWANDTE INFORMATIONSTECHNIK FIT

MONICA

Management Of Networked IoT Wearables – Very Large Scale Demonstration of Cultural & Security Applications

Fraunhofer-Institut für Angewandte Informationstechnik FIT

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SICHERHEIT, SOUND UND SERVICE FÜR GROSSE OPEN AIR EVENTS

Das EU-Projekt MONICA widmet sich den Themen Sicherheit, Lärmschutz und Management von Besucherströmen bei Großveranstaltungen. Durch den Einsatz von Sensortechnik und Wearables sollen »partizipierende Systeme« ge-schaffen werden, die direkt mit den Teilnehmenden in Verbindung gebracht werden, etwa in Form von intelligenten Armbändern. So wäre beispielsweise eine Echtzeit-Analyse von Besucherströmen möglich, die zur Regelung und Leitung der Besucher dient und in Notfällen Organisatoren und Einsatzleitern einen Überblick bietet.

Die Wearables sollen zudem neue Interaktionsformen für die Besucher und somit neue Mehrwertdienste bieten. Beispielsweise sind Interaktionen auf Konzerten mittels Lichtelementen am Armband denkbar. Auch interaktive Anwendungen für Smartphones, angepasst an den jeweiligen Event, sollen die Besucher besser einbinden und beteiligen.

Darüber hinaus arbeitet das MONICA-Konsortium an einer Optimierung der Geräuschkulisse bei Konzerten. Ziel ist, die Lautsprecher so zu platzieren und auszurichten, dass ihr Klang in der richtigen Lautstärke zielgenau das Konzertareal abdeckt und möglichst wenig in Anwohnerbereiche streut. Hierzu werden weitere Sensoren, etwa Präzisionsschallpegelmesser oder Windsensoren, in die MONICA IoT-Plattform integriert und im großen Maßstab getestet.

Untersuchungsgegenstand sind diverse Großveranstaltungen in den fünf beteiligten Europäischen Städten Bonn (Pützchens Markt, Rhein in Flammen), Kopenhagen, Hamburg, Leeds, Turin und Lyon.

Fraunhofer FIT koordiniert das Großprojekt und wird von Technik-Experten aus Industrie und Wissenschaft aus Italien, Dänemark, Großbritannien, Frankreich und den Niederlanden unterstützt. Insgesamt umfasst das Konsortium 29 Partner.

www.monica-project.eu

Fraunhofer
FIT

FRAUNHOFER-INSTITUTE FOR APPLIED INFORMATION TECHNOLOGY FIT

MONICA

Management Of Networked IoT Wearables – Very Large Scale Demonstration of Cultural & Security Applications

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SECURITY, SOUND AND SERVICE FOR BIG OPEN AIR EVENTS

The European MONICA project focuses on security, noise prevention and managing streams of visitors to big events. By using sensor technologies and wearable devices the project aims to create "participating systems" that are immediately linked to the visitors, e.g. in the form of smart bracelets. They would, for instance, permit a real-time monitoring of streams of visitors in order to control and channel them and to give security and organizers a clear picture of the situation in case of an emergency.

The visitors should also profit from new interaction and direct participation in MONICA. For instance, using LEDs incorporated in the bracelets in concerts would allow new interactions with the visitors. Likewise a smartphone app tailored to the specific event will allow a better participation and add additional value for the visitors.

Moreover the consortium behind the MONICA project intends to optimize the sound design of open-air concerts. The aim is to optimize the sound experience for vistors through an exact directional alignment and adjustment of the loud-speakers while at the same time minimizing the noise for adjacent residential areas. Precision sound level meters, wind gauges and other sensors will be integrated in the MONICA IoT platform and tested in real-life environments in oder to achieve that goal.

MONICA will impement its systems to a range of big events in five European cities: Bonn (Pützchens Markt celebrating its 650th anniversary in 2017, Rhine in Flames), Copenhagen, Hamburg, Leeds, Turin and Lyon.

Fraunhofer FIT is coordinating the large-scale project whose consortium includes a total of 29 partners, among them technology providers and research institutes from Italy, Denmark, Great Britain, France and The Netherlands.

www.monica-project.eu

Article on MONICA by Kingston University in June 2017 published in research brochure

Solving a security challenge

The Robot Vision team has been tasked with finding smart solutions to security challenges at major events using Internet of Things technologies

MONICA

- MONICA stands for "Management Of Networked IoT wireless – very large scale demonstration of Cultural societal Applications"
- A €17m project, it is funded by the Horizon 2020 EU Research and Innovation programme
- The project seeks to address both venue impact and security challenges at outdoor music events
- The Robot Vision team – along with other European partners – will be working on the security aspect of the project
- During the three-year project, pilot events will be held across several European cities to demonstrate how these technologies might be used in the real world

Watching live music is a favourite pastime for millions of people worldwide. According to UK Music, 27.7 million fans were reported to have attended festivals and concerts in the UK in 2016 alone – and 38 per cent of this live music audience came from abroad specifically to attend these events.

While large gatherings of people bring joy and a sense of common spirit to the occasion, they can also pose huge security challenges. With so many factors to take into account, these challenges can range from anything to overcrowding, fire, individuals being ill, petty crime, lost children and outbreaks of violence.

Detecting and resolving flashpoints in real time would go a long way to reducing the overall impact of an incident. But, given the potential for vast numbers of people to be involved – and the emotional response arising from it – reacting to incidents quickly and effectively is a challenge in itself.

Robot Vision

"The bigger the event, the more potential issues you have in terms of ensuring the safety of those attending," says Professor Paolo Remagnino, based in the School of Computer Science and Mathematics at Kingston University.

London. "We want to develop a way of bringing technologies together to help establish a secure environment during public events where many thousands of people are attending."

Professor Remagnino leads Kingston University's Robot Vision team, which has secured more than €900,000 to investigate how Internet of Things (IoT) technologies might be used to provide security at major outdoor events. Their research is part of a wider EC-funded project known as MONICA, whose initial aim was to find ways of reducing the impact of noise levels on residents living near Tivoli Gardens, an amusement park and large-scale venue for outdoor music concerts in Copenhagen.

This international study, which is coordinated by the Fraunhofer Society and involves sound and technology experts from 19 partner institutions across Europe, has now widened its remit to include the issue of security.

An internet-connected security system

IoT technologies are devices, or objects, that are able to connect to the internet to collect and share data. Working with several project partners, Professor Remagnino's team will be looking at how wearable devices – such as smart wristbands – could be worn by spectators and remotely connected to a system that provides GPS information. These wearable devices would then facilitate the use of other technologies such as drones and body-mounted video cameras to create a fully-fledged, internet-connected security system.

Professor Remagnino explains, "We will be researching how other inter-connected IoT technologies, such as body-mounted video cameras or drones, could be sent to affected areas to obtain footage that can be fed back into the control system."

A smart security system

The potential security applications of these technologies would be significant. Various devices could record live video and audio footage, and other data, which might then be used to respond to incidents quickly. Moreover, if the data were stored in a cloud-based system it could be examined and processed both in real time and after the event.

Associate professor Vasileios Argyriou, who is working alongside Professor Remagnino on the project, concludes, "If we can show that this kind of smart security system works on this scale, it would go a long way to demonstrating the potential of these smart technology solutions to the challenges faced in crowded outdoor environments in big cities."

Praesidio Group handout September 2017 for Cyber Security Event in Copenhagen, Denmark

Praesidio

ABOUT US

Praesidio delivers security, intelligence and cyber solutions to individuals, corporations, international institutions, governments, and authorities positioned throughout the globe.

Our staff and consultants provide reliabe, threat-integrated security and safety services 24 hours a day, seven days a week, and all year long.

Our knowledge and distinctive expertise is founded and developed through decades of professional experience and personal relationships within the military, law enforcement and intelligence communities. In addition, we embrace our relationship with International Governmental Organisations, special forces and chief security officers in blue-chip international corporations.

INTERNATIONAL FOOTPRINT

We have an international panel of reputable intelligence and security experts; and our global reach is facilitated through our highly qualified network of staff, associates, and partners. Our international footprint ensures that Praesidio provides global, regional and domestic security services.

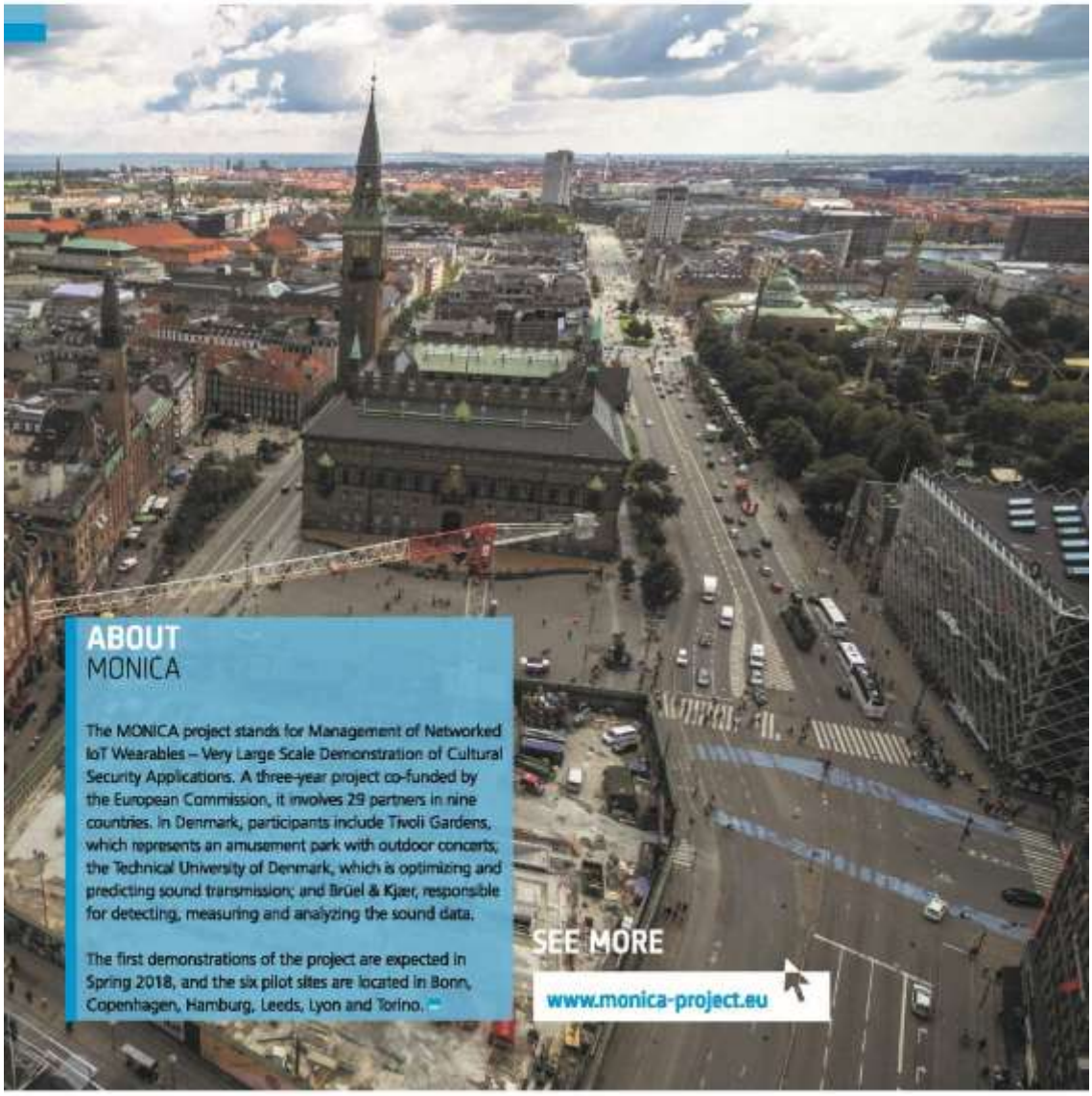
SPECIALISATIONS

- Security Risk Consulting
  - Crisis Management
  - Business & Enterprise Resilience
  - Executive Advisory
  - Brand Protection
  - Travel Security
  - Kidnap for Ransom
- Security Intelligence
  - Political & Security Risk Analysis
  - Protective Security Intelligence
  - Counter Intelligence & Surveillance
  - Background Checks & Employment Vetting
  - Corporate Investigations & Interviews
- Information & Cyber Security
  - Cyber Protection & Assurance
  - Vulnerability Assessments & Testing
  - Cyber Threat Intelligence
  - Digital Forensics
- Physical Security
  - Executive Protection
  - Event & Sport Security
  - Kidnap for Ransom
  - Residential Security

MONICA

B&K Customer magazine, April 2018 and November 2018 (30,000 subscribers)

THE SOUND OF A SMART CITY



"IN TIVOLI, WE CONTINUOUSLY EXPLORE WAYS TO MINIMIZE THE IMPACT ON THE ENVIRONMENT AT THE SAME TIME AS PROVIDING THE BEST POSSIBLE QUALITY OF EVENTS."

MICHAEL FREJDAL,
HEAD OF PRODUCTION, TIVOLI GARDENS

Every big city knows the challenge: pleasing concert organizers and attendees, while appeasing the neighbours of the concert venues. The MONICA project is demonstrating how IoT technologies can manage both sound and security at large, open-air cultural and sporting events – and keep everybody happy.

When Keith Richards sends the first notes of "(I Can't Get No) Satisfaction" out over the screaming crowd of Rolling Stones fans, you want those ticket holders to feel like they've indeed gotten every bit of their money's worth. But you certainly don't want it to be at the expense of dissatisfying the neighbours.

How can you tell what portion of the sound wafting through city streets and sidewalks is actually coming from the concert, and how much is just the 'normal' noise of a pulsing metropolis?

That's where the MONICA project comes in. A large-scale demonstration of how cities can use the Internet of things (IoT) to meet such challenges, MONICA deploys a cloud-based platform to wirelessly connect various IoT-enabled devices. Control systems monitor the data collected and can automatically induce required actions based on the information gathered.

One hoped-for outcome of the project is an acoustic system that can reduce low frequencies outside a concert area, while not interfering with the music in the audience area of venues that use it. It should be able to support designated quiet zones within the concert venue as well. The acoustic system will be automatically adjusted for changes in weather, audiences, music types and other variables.

TWENTY-NINE PARTNERS FROM AROUND THE EU

Brüel & Kjær is one of the many partners involved in the MONICA project. The company's role is threefold: 1) to create and deliver IoT-enabled sound level meter prototypes for use at the EU pilot sites; 2) to develop the complex algorithms that can accurately estimate the impact of the different sound contributions; and 3) to automatically detect sounds that could indicate a 'security situation'.

"It's going to enable not just Brüel & Kjær, but also all the other partners in the project, to collect the data they need – it will be possible to deploy our solution anywhere," says Brüel & Kjær Research Engineer Karim Haddad, PhD. All data is protected to ensure privacy, and MONICA will comply with the applicable national and EU regulations on data protection, privacy, informed consent and authorization.

Karim adds: "The sound level meters will contain GPS info, so you can recognize exactly where they are and collect the data you need in the cloud."

As part of the process of data collection, microphones are placed wherever sound optimization is required and according to the landscape's unique demands. Anything from the weather, to the location of surrounding buildings, to the sounds themselves affect how sound propagates. ▶

THE SOUND OF A SMART CITY

Fredagsrock (Friday's rock) at the Open Air Stage in Tivoli

CAN IT REALLY BE THAT DIFFICULT?

One of the many challenges in distinguishing between concert and city noises is distinguishing low-frequency noises from each other. Because low-frequency sounds like a bass drum, bass guitar, car, truck or thunder have a far narrower frequency (Hz) range than high-frequency sounds, they are harder to differentiate – both for the human ear and for a machine.

The Brüel & Kjær solution uses machine learning to detect, first of all, whether the sound being measured actually does come from the concert or not; then, the algorithm determines how MUCH of the total, synchronized sound picture is from the concert.

"If there's a long stretch without buildings near the concert area, then the sound waves can travel far distances. But behind a building, there's not much sound contribution, so you might not hear the concert at all. Temperature, wind and humidity can also affect how sound travels, and some noises carry farther distances than others. It's quite complex," says Wookeun Song, PhD, Brüel & Kjær Research Engineer.

IS IT CONCERT NOISE OR CITY NOISE?

Of course, measuring sound levels is only useful in the context of the MONICA project if it's possible to detect how much of the overall sound is from concert activities and how much is city noise.

That requires Brüel & Kjær to create algorithms, placed in the cloud and linked with IoT-enabled devices that can calculate the different sound contributions.

Some of the algorithms depend on time synchronization between the sound level meters – within virtually a millisecond. Otherwise, it's impossible for the algorithms to determine how sound actually propagates between different locations. And decisions about what actions need to be taken to ensure optimal sound depend on the availability of accurate data.

"Distinguishing between different sound sources is not an easy task. Furthermore, no one has created this type of algorithm distinguishing concert noise from city noise before," says Wookeun.

Brüel & Kjær uses machine learning, as well as other types of algorithms, to solve the basic problem of identifying concert noise vs city noise. During the 'training' phase of machine learning, a learning algorithm enables the system to determine how to distinguish concert noise from other types of noise.

A GUINEA PIG IN TIVOLI GARDENS

To create the vast amounts of data necessary for machine learning, Brüel & Kjær has already monitored hundreds of hours of sound at different times of year in Copenhagen, Denmark. This includes different weather conditions, as well as an entire season of Friday Rock concerts at Tivoli Gardens in downtown Copenhagen.

Tivoli, one of the world's most popular amusement parks, wants to be both a great place for concert patrons and a

Karim Haddad and Wookeun Song work in Brüel & Kjær's innovation Team – the team responsible for researching new methods and technologies that solve and simplify our customers' existing and future sound and vibration challenges

great neighbour, which makes their interest in contributing to the project a natural fit.

Brüel & Kjær is analysing the data now and is taking even more measurements during the new season of Tivoli Friday Rock concerts, which begins this month. This will enable validation of the algorithm.

Six pilot sites, including Tivoli, are included in the MONICA project. Where the sound level meters will make their formal debut is unknown as of the Waves publication date. ►

"ESTIMATING THE CONTRIBUTION IN AN AUDIO RECORDING OF A SPECIFIC SOUND, SUCH AS MUSIC, WHEN OTHER TYPES OF SOUNDS OVERLAP, IS NOT EASY."

KARIM HADDAD
RESEARCH ENGINEER, BRÜEL & KJÆR

THE SOUND OF A SMART CITY

SAFE AND SOUND

Security is another aspect of the MONICA project in which sound plays a role. Although video cameras are used at concert venues, they are only as useful as what they can see – which sometimes is a shoulder-to-shoulder 'wall' of people.

Sound, however, has no line-of-sight issue, so we can detect acoustic abnormalities instead. Say, for example, there's a fight going on among some concertgoers, but it's not visible from a video camera. If there are sound level meters deployed throughout the area, it is possible to determine that there's trouble near a specific microphone and dispatch security personnel to the location.

By combining video and audio, the picture of what's actually happening at or near the concert area becomes even more accurate.

SMARTER CITIES, SMARTER RESIDENTS

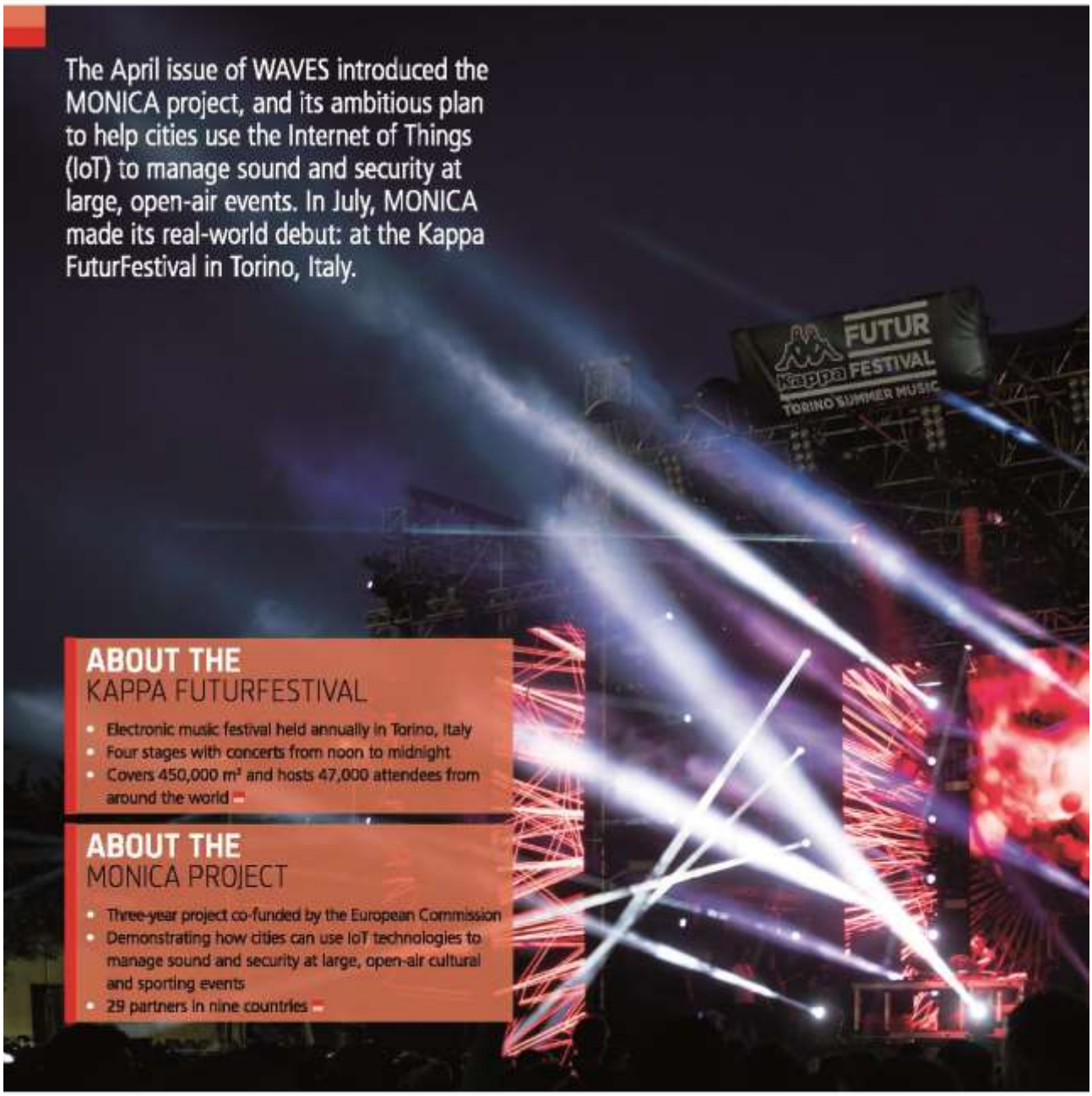
Devices such as smart wristbands, video cameras, loudspeakers, mobile phones and smart glasses will also be part of the portfolio of applications MONICA will be able to offer to enhance city services.

The project has the potential to be used in a wide variety of ways. Based on open standards and architectures, the platform can be reused across multiple applications, with only the application layer specific to the deployment setting.

Look for results of the project in a future issue of Waves. ■

MONICA TAKES ON TECHNO

The April issue of WAVES introduced the MONICA project, and its ambitious plan to help cities use the Internet of Things (IoT) to manage sound and security at large, open-air events. In July, MONICA made its real-world debut: at the Kappa FuturFestival in Torino, Italy.



ABOUT THE KAPPA FUTURFESTIVAL

- Electronic music festival held annually in Torino, Italy
- Four stages with concerts from noon to midnight
- Covers 450,000 m² and hosts 47,000 attendees from around the world

ABOUT THE MONICA PROJECT

- Three-year project co-funded by the European Commission
- Demonstrating how cities can use IoT technologies to manage sound and security at large, open-air cultural and sporting events
- 29 partners in nine countries

A view from the stage with apartment buildings in the background

Swirling spotlights cut a path across thousands of techno fans, their hands raised as they pay homage to deejay Joseph Capriati. One inexplicably waves a metre-long inflatable banana in front of the massive stage, and almost all are still sweaty, even as the clock nears midnight. For nearly 12 solid hours, a hefty bassline has throbbed across the festival grounds, bullying its way towards the nearby residences.

But this year the chest-pounding pulse has met its match: the MONICA project. Or, at least, the first demonstration of what MONICA will be capable of.

Like all city concert venues, the Kappa FuturFestival aims to create the right balance between an optimal outdoor concert sound and reduced noise in the surrounding environment. The MONICA project's sound solution is designed to enable more accurate monitoring and control, both for a quality concert experience inside the venue and to limit sound propagation outside the venue.

"You need high sound pressure levels for an optimal concert sound, which is, of course, what the audience and the performers want. But you might have to turn down the volume because of sound level regulations. And even when you comply with those regulations, the neighbours might still complain. It's tricky," says Brüel & Kjær Research Engineer Karim Haddad, PhD, who is actively involved in the MONICA project.

With the help of staff from the city of Torino, Karim installed Brüel & Kjær's specially designed sound level meters at the Kappa FuturFestival and actively monitored them throughout the event.

MEASURING SOUND LEVELS

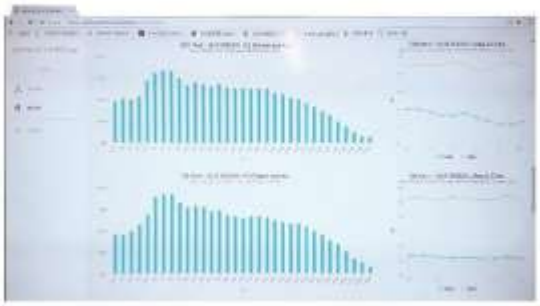
The sound level meters were used both within the concert area and outside the festival grounds. Each of the festival's four stages had a sound level meter situated roughly 20 m in front of the stage. Five additional sound level meters were placed in the most exposed private residences outside the festival grounds to monitor the music's impact on non-concertgoers nearby.

"We measured the noise levels and the spectra at each of the locations," explains Karim. "All the data was sent in real time to the cloud and used by technicians to make any necessary adjustments. If the level was above the acceptable guidelines for the city, then they reduced the level on the loudspeaker system inside the park area." ▶

MONICA TAKES ON TECHNO

Five sound level meters were placed in the most exposed private residences outside the festival grounds to monitor the music's impact on non-concertgoers nearby

Overview of the time-updated acoustic levels and spectra via the Web-based MONICA common operational picture (COP)



SOUND FIELD CONTROL SYSTEM ADAPTS AS NEEDED

The Technical University of Denmark (DTU), also a partner in the MONICA project, plays a key role in the sound solution. While Brüel & Kjær is responsible for detecting, measuring and analysing the sound data, the university's task is to optimize and predict sound transmission. In Torino, DTU set up 16 loudspeakers (subwoofers) behind the audience area at the "Futur" stage. The subwoofers are ideal for reproducing low-pitched audio frequencies. Five rows of 10 Brüel & Kjær microphones were placed approximately 50 to 150 m behind the subwoofers in the dark zone, which is an area where lower sound exposure from the stage is desired.

"The basic idea of the adaptive sound field control system (ASFCS) is using the secondary set of subwoofers to produce a sound field that is the same as the one produced by the original PA system subwoofers, but with opposite phase, and thus opposite sign. When adding the two, the result should be close to zero," explains Jonas Brunskog, PhD, Associate Professor of Acoustic Technology in the DTU Department of Electrical Engineering.

"The microphones are used to measure transfer functions between all loudspeakers and microphones, before the concert. These are then used to find filter functions for each of the 16 added loudspeakers, found so that they minimize the sound pressure level in the dark zone where the microphones are located."

"Background noise from traffic and the other festival stages made for problematic conditions, which affected both the quality of the measurements and the qualitative experience of the system," Jonas says. However, the test was considered successful, since they achieved a reduction of about 6 dB at low frequencies.

A SUCCESSFUL START

The city of Torino, one of six pilot sites for the MONICA project, believes the demonstration of the sound system bodes well for its sister sites and, eventually, widespread use.

"The city of Torino deeply relies on continuous noise monitoring for the control of outdoor events, and the MONICA project successfully strengthened this approach. For this reason, we supported project demonstration at our best with local police, green areas staff and topographers," says engineer Enrico Gallo, who works for the Municipality of Torino in its Environment, Green Areas and Civil Protection Division.

"ALL THE DATA WAS SENT IN REAL TIME TO THE CLOUD AND USED BY TECHNICIANS TO MAKE ANY NECESSARY ADJUSTMENTS."

KARIM HADDAD
RESEARCH ENGINEER, PHD, BRÜEL & KJÆR

In addition to collecting and using the measurements in real time, the city of Torino analysed all the sound data collected throughout the festival to determine how much each stage contributed to the overall sound levels at the locations measured.

"The chance of having detailed, real-time data from each stage and at dwellings together with ASFCS really opens new opportunities for noise and annoyance reduction," Enrico says.

NEXT UP

Karim, from Brüel & Kjær, shares Enrico's enthusiasm. "We got what we wanted! The results were what we expected, so now we can move on with our plan."

For Brüel & Kjær, next steps include adding time data to the cloud, so that it's possible to listen to the actual sounds recorded and to implement its algorithm for distinguishing concert noise from city noise and add it to the cloud.

"We're in the second year of the three-year project," Karim explains. "Next year we'll have to demonstrate the system fully working at lots of different festivals."

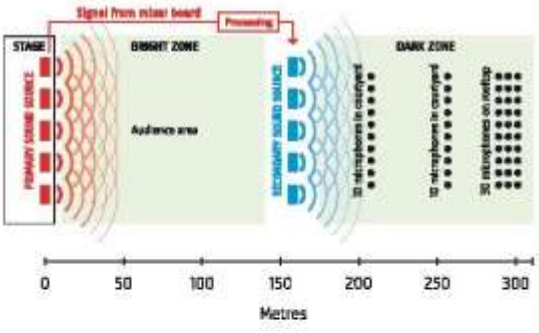
In his opinion, the MONICA project's dependency on the cloud is its biggest challenge.

"We're depending on the network, which can go down when there are so many people using it, and which can be vulnerable. It went well in Torino, but it depends on the local network. You have to be sure it's reliable," Karim cautions.

And having 29 different MONICA partners collaborating on different aspects of the same mammoth undertaking brings its own set of challenges.

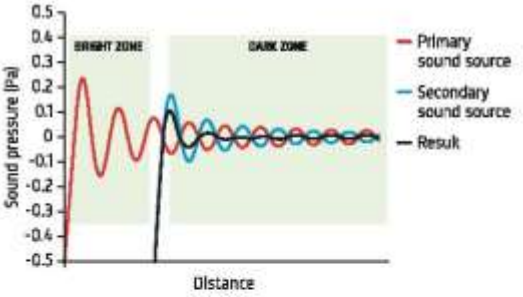
"What's interesting about a project like this is that you interact with people from different companies, universities and institutions who are not working in your field. You have to adapt your language, and they have to adapt their language, because of different expertise domains. And even working within Europe, you have different cultures. But if people have the good will, then it works well. And every partner on this project works seriously."

ADAPTIVE SOUND FIELD CONTROL SYSTEM



The 5 x 10 microphones in the dark zone are used before the concert to estimate the transfer function between the two sets of sound sources and each microphone in the dark zone. During the concert, the signal from the mixer board is processed using the measured transfer function

ACTIVE SOUND CANCELLATION



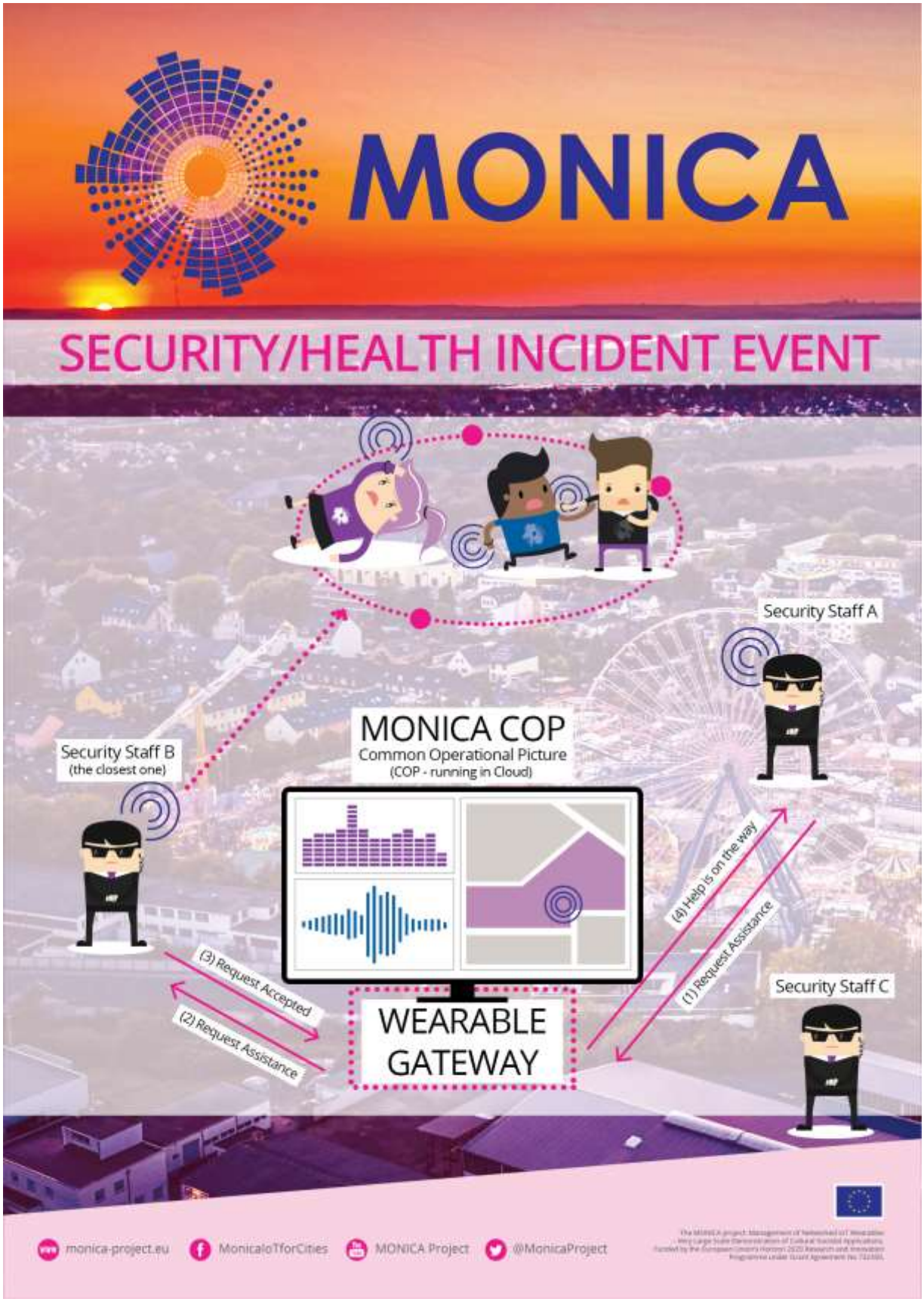
When the MONICA sound system mixes the sound from the concert with 'anti-noise' from the secondary speakers, the sound waves even out resulting in less noise in the dark zone

7 Appendix C: Posters

Project poster produced in August 2017 also as roller banner

French version of the project poster produced in August 2019

Use case poster produced by ATOS for IoT Week 2018



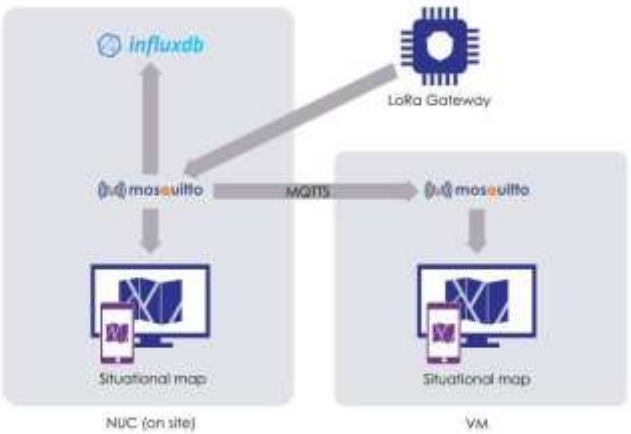
Use case poster produced by Fraunhofer FIT for EclipseCon conference, October 2019

MONICA

MANAGING LARGE, OPEN-AIR EVENTS IN THE CITY

Applications involving the use of cameras and wearables will enable security personnel to capture real-time data about crowd size and density for the purpose of analysing, predicting and handling emerging incidents, while being compliant with personal privacy provisions and rights.

An operational picture of the security situation is displayed on a graphical user interface, notifying the staff of any unusual behaviour, providing decision support and enabling timely information-sharing between setcurity staff members



THE PROJECT

The MONICA project is a large-scale demonstration of how cities can use IoT technologies to meet sound, noise and security challenges at big, open-air cultural and sport events, which attract and affect many people.

www.monica-project.eu

LORA TRACKERS

- GPS tracking devices for staff
- Update every 5 seconds
- Custom build for the project
- Alarm button
- No WiFi, no mobile network

SITUATIONAL MAP

- Positions of staff and security personnel
- Location info e.g. individual attractions, stalls and first aid facilities
- Weather information
- Positions of security cameras
- Mobile and desktop

Fraunhofer FIT

IoT European Large-Scale Pilots Programme

8 Appendix D: Postcard

Try out the MONICA Smart Wristband
The MONICA project offers you to try out one of their smart wristbands. In the project, the wristband is mainly used for crowd monitoring at big, open-air cultural and sporting events but here at the IoT Week, you can explore a few other features for a bit of fun.

Since we need to reuse the wristbands for our events, we kindly ask you to hand back the wristband after your conference stay and Thursday at 17:00 at the latest. You can do this at the registration desk.

As a thank you for returning, you will enter into a competition to win an iPhone X.

If you experience issues
Please keep in mind:

- The wristband only works in the Foyer, Store Sal and Lille Sal
- You might need to reactivate your wristband after leaving the covered area or the venue. Press the larger button to reactivate upon return.
- To use the profile exchange feature, you need to register your wristband at a MONICA Registration Station.

If you experience issues, please contact a MONICA representative at the reception.

Terms and Conditions
By registering the wristband to exchange your profile with others, you agree to the terms and conditions. The MONICA project does not collect or store any of your personal data.

For more information we welcome you to visit our stand. You can also go exploring at www.monica-project.eu

FEATURES

Connect with others
Register your wristband for profile exchange

- Download the IoT Week event app "Grenadine Event Guide" to your mobile device. App code if needed: iot2019
- Go to one of the MONICA Registration Stations at the reception and scan your wristband
- Scan the QR code displayed on the screen with the event app scan feature
- Follow the event app registration procedure
- You are now ready to connect with other registered users. Hold the two wristbands close to each other. Then press and hold the larger buttons simultaneously until the LEDs (smaller buttons) light green.

Vote at sessions
At some sessions in Store Sal and Lille Sal, the presenter might do polls where you can use your wristband for voting. Use the larger button on the wristband to vote.

Get alerts
The LED lights on your wristband will notify you of keynote sessions and breaks:

09:00 Opening Keynotes

10:45 Coffee break Thursday

11:00 Official Opening of the Public Expo Tuesday

12:30 Lunch

13:30 Session start after lunch

15:30 Coffee break Tuesday and Wednesday

17:00 Farewell Thursday

REMEMBER TO HAND BACK THE WRISTBAND