ITEA 2 Office

High Tech Campus 69 - 3
5656 AG Eindhoven
The Netherlands

Tel : + 31 88 003 6136
Fax : + 31 88 003 6130
E-mail : info@itea2.org
Web : www.itea2.org

ITEA 2 is a EUREKA strategic ICT cluster programme

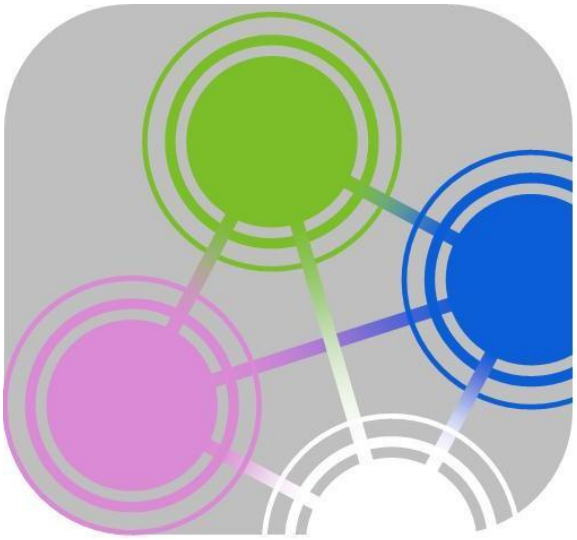
ITEA 2

INFORMATION TECHNOLOGY FOR EUROPEAN ADVANCEMENT

FPP Annex

INSIST

Integrated service delivery for citizens' safety and comfort



Edited by: Gianluca Monaci, Harry Broers, Ad de Beer

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1. Project key data

1.1. ACRONYM and full-length title

Acronym	INSIST
Project Number	13021
Program Call	Call 8 ITEA 2
Full-length Title	Integrated service delivery for citizens' safety and comfort

1.2. Description

The goal of the INSIST project is to increase comfort and safety of public spaces by linking video surveillance and light management technology into a smart connected platform and ecosystem.

1.3. Project duration & size

Start Date	2014-05-01
End Date	2017-04-30
Duration	36 months
Total Effort	244.17 Person Years

1.4. Positioning on the ITEA Roadmap

Roadmap Challenge	Security and safety

1.5. Relationship with other Projects or ICT Clusters

ICT Cluster	Country
Point One Association	Netherlands
TIVIT Oy	Finland

1.6. Key person information

Organisation	Philips Electronics Netherlands BV
Type	ITEA 2 Founding Company
Country	Netherlands
Contact Person	Mr. Ad de Beer
Email Address	ad.de.beer@philips.com
Telephone	+31 402 740 392
Mobile	+31 613 722 049
Fax	+31 402 746 321
Address	High Tech Campus Building 36 - P116
Town	EINDHOVEN

Postal Code	5656 AE
Country	Netherlands

2. Project one-page description

The urban spaces are full of stand-alone sensor based installations of different services designed according to their own purpose and requirements. For example the municipalities provide several services to the citizens: public lighting, safety and security services of citizens in the streets, traffic management, etc. These services rely mostly on street-implemented infrastructure, such as lighting poles, cameras, sensors, induction loops. In addition local businesses have their own illumination systems, advertising infrastructure including neon signs, public displays etc. They also monitor customer behaviour using various sensor systems. The INSIST project proposes an integration of these sensor based systems into a wider perspective. **The INSIST project aims to develop a smart connected ecosystem for public spaces**, where the sensor data provided by the different INSIST sensor systems can be efficiently used for not only the proprietary infrastructure services, but also to offer value added services based on data fusion from multiple sensor systems in the business areas of:

- smart lighting
- surveillance
- traffic management
- advertising and atmosphere
- business intelligence and building management

INSIST builds upon previous projects in the Security and safety domain such as Cantata and Vicomo. The building blocks from previous projects have reached a degree of maturity that allows us to add this next step in INSIST by integrating quantifiable data from multiple sources into models, workflow support and evaluation of effectiveness and efficiency. Therefore, it perfectly fits in the ITEA living roadmap Security and Safety.

The cross-over between light management, monitoring and surveillance is expected to increase public comfort, safety and security while improving energy efficiency through intelligent light control strategies and lowering emissions from city traffic. In the INSIST ecosystem the expensive sensor installations essential for e.g. lighting and surveillance services are used to create new business potential for digital service providers focusing on data fusion, analysis and knowledge management. Aiming at new intelligent services e.g. for business intelligence or intelligent advertising and atmosphere creation.
Public lighting is fundamental for the safety and comfort of citizens. However numerous case studies show that simply increasing light levels or maintaining high lighting levels does not necessarily promote or maintain enhanced safety or security. Besides, lighting already accounts for 19% of global energy consumption, of which 8% goes for outdoor lighting. Solid-state light sources offer potential energy savings approaching 50%. Another 20% can be saved when solid-state lighting technology is combined with intelligent light management systems that regulate light output according to ambient lighting conditions or people's presence and activities. The ledification of outdoor illumination is already taking place on a large scale, while smart light management systems responsive to environmental conditions or presence and activities of persons are deployed only on a very small scale. Larger-scale deployments are difficult due to high system complexity and installation costs. Moreover, the current sensing information provides limited insight of the environmental conditions and activity in the observed scene, while the robustness of the sensory systems is in fact restricting their applicability.
Video surveillance solutions are widely deployed in city agglomerations to secure public safety and targeted to ease the work of public security officers. The contextual information provided by advanced video analytics could be used to detect the first signs of undesired behaviour. Proper illumination is crucial for the proper functioning of surveillance systems. Besides, the manipulation of outdoor illumination could prevent violent or criminal activities from occurring or further escalation without physical presence of security officers. Despite the interaction between surveillance and lighting system being so critical, currently there is no solution available that enables intimate interaction between light management and surveillance infrastructures.

Management of transportation flow using intelligent systems has major impact on the life of people. It helps to enhance public safety, to reduce traffic congestion and it allows improving access to transit information. On the other hand the quantity and quality of transport infrastructure as well as the traffic

management affect significantly the spatial and economic development of cities and regions (e.g. saving costs due to optimization of transport of goods, transport of people to work, to shopping sites, to touristic sites etc.). By combining traffic management with the previously mentioned services, e.g. lighting can be adjusted depending on traffic conditions such as traffic density or car accidents or the intelligent advertisement can adapt to people behaviour based on traffic information.

Advertising systems in urban spaces are currently often stand-alone digital signage installations or part of limited networked systems. The latest digital signage advertisements often include interactive elements, which have limited capability to react to the people behaviour or changes in the surrounding local environment. The atmosphere adaptation can currently be done for example with large projections or illumination. However also these cannot adapt to changes in the space in real-time and the stand-alone installations are expensive. By combining the intelligent advertising with smart lighting systems and sensor-based business intelligence services we can offer new opportunities to automatically adapt the advertising content and interaction to match the current status in each position. The INSIST ecosystem will also make possible new type of ambient and atmosphere creation by smart lighting control.

Other challenges to consider when designing public space lighting, surveillance, traffic management, building infrastructures, intelligent advertising and atmosphere creation are the psychological aspects of comfort and security from user perspective. Especially in combination with intelligent outdoor lighting, there is limited research activity on human perception in this area. The illumination levels should be such that people will feel secure while minimize the risks of accidents and criminal activities. Also, there is limited knowledge of the effects of dynamic light control strategies on street users and residents.

The goal of the INSIST project is to increase comfort and safety of public spaces by integrating sensor based INSIST services and technology into a smart connected ecosystem to overcome current limitations of these systems and services. In order to increase knowledge and create proof points in the unexplored area of comfort and security perception of public systems and services, the project will investigate how smart light controls are perceived by users through pilot studies. Finally, the collection of data from INSIST systems into a connected ecosystem with intelligent data analysis and knowledge management features will allow to investigate new digital services beyond lighting delivery, surveillance and traffic management.

The INSIST project will address:

- **An architecture** supporting real-time video-based presence sensing, an open database accessible by INSIST services to exchange information and events, and supporting big data analysis (e.g. city planning). The analysis of large amount of historic data will also allow identifying trends and automating several aspects of system configuration, thus allowing lower installation costs. INSIST will apply a distributed, extensible, flexible architecture with network interfaces for the exchange of information. Such a loosely coupled architecture will safeguard the integrity of the system components such as the light management and surveillance system.

- **Advanced video analytics** mapped to embedded sensing solutions to enable reliable real-time responses of the smart lighting infrastructure. INSIST is expected to significantly extend sensing functionalities from simple presence detection to more intelligent interpretation (through single or multi-camera video or depth data processing techniques) and thus enabling more intelligent service control strategies. Also, the project will deliver sensing functionalities requiring limited computational resources to enable the application of cost-efficient embedded vision solutions. Third, the project will be addressing challenges related to distributed sensing and light control. Furthermore, it will enable a significant decrease of deployment costs through self-configuration and self-management of multi camera systems and by requiring the installation of a reduced number of sensors that can provide more advanced features (e.g. object classification, speed detection, trajectory analysis).

- A more intimate **integration of data analytics** and statistical data mining into the embedded hardware platform to collect and summarize the most salient sensor data information, so that it can be transmitted and stored efficiently across the INSIST ecosystem.

- The **integration of smart lighting infrastructure**, surveillance and traffic systems, business intelligence, building information management, intelligent advertising and atmosphere creation to

allow the different systems to leverage each other's sensing and actuation capabilities in order to improve functionalities and reduce installation cost to promote a wider applicability of various systems. The integration with other systems and sources of information (e.g. online information such as weather data, special events information, traffic etc.) is also foreseen to explore new public service offerings and opportunities to improve the different systems while reducing deployment costs. The wide integration of sensor based services will also create new business opportunities for digital service providers specialized in knowledge intensive services benefiting of data acquired from different sensor systems.

- **Security and comfort perception studies** for users of public spaces with dynamic outdoor illumination. There is some controversy over whether lighting improves security, although there is little doubt that individuals feel more secure when walking, cycling or driving in a well-lighted area. However, empirical studies on the effect of dynamic light control and its perception in terms of comfort and security are few and far between. In the INSIST project we will investigate the lighting preferences and needs of different road users in different situations, as well as their perception of dynamic, smart public lighting with one or if possible several pilot studies in public spaces. The outcome of the study will be very valuable to improve current control strategies.

INSIST brings together top, experienced embedded software device, sensors and intelligent lighting specialists, market leaders in video surveillance, management of transportation, smart advertising systems and world-class research institutions to address the burden of the citizen's safety and security in Europe. It will allow Europe to take the lead in the design and manufacture of a new class of smart connected ecosystem for public spaces with unprecedented advanced functionality. This will permit the first steps towards market leadership within Europe and eventually worldwide in the large and rapidly growing market of intelligent sensor based security systems.

3. Project added value

3.1. Rationale of the project: Business vision and value chain

3.1.1 Business vision

Global population growth and urbanization are increasing the demand for intelligent systems to improve the quality of life in our cities, from illumination to traffic management, surveillance, intelligent advertising and atmosphere adaptation. In the current challenging economic situation, municipalities will have to make their existing infrastructure smarter, reducing expenses while enhancing the comfort and security of citizens. For these reasons, and driven also by the decreasing cost of sensors, connectivity and storage, as well as by the maturity of analytics and data mining technologies, the markets of a number of smart connected applications are rapidly growing.

Smart Lighting - Solid-state light sources offer potential energy savings approaching 50% which can get to 70% when they are combined with intelligent light management systems that regulate light output according to ambient lighting conditions or people's presence and activities **[1][2]**. Studies forecast that by 2020, LED lamps for street lights will generate more than EUR 2 billion in annual revenue **[3]**. The demand for intelligent lighting systems, combined with the greater controllability of LED-generated light, will also result in an expected EUR 7 billion in revenues in lighting systems control components in 2020 **[4]**. Combined LED and smart street lighting markets are expected to reach a cumulative EUR 3.6 billion in the US alone by 2025 **[5]**.

Surveillance - Smart video analysis is a key part of integrated city surveillance offers. Global Intelligent Video Surveillance (IVS) & Video Analytics (VA) industry revenues totalled $13.5 billion in 2012, and are estimated to reach $39 billion in 2020 **[6].**
The rapid market growth is driven by the following dynamics:

- Increased use of video surveillance.
- Migration from analogue to digital cameras and to IP based cameras.
- Technology maturity. Video analytics algorithms, processors, applications and products underwent a decade of technological evolution to intelligent video processing, based on advancements in image processing, enabling automatic detection of signatures detection and identification.
- Cost reduction of video analytic systems driven by the falling prices of image processing DSPs and communication systems.
- Cost-performance of new edge-based video analytics DSP technologies (e.g., Intel, Texas Instruments DSPs).

Human operators entail high cost & high rate of overlooked events. Real time analysis of video images and recorded footage is a need that can hardly be answered effectively by human operators, and manpower cost. Furthermore, human operators fatigue and boredom cause a high rate of overlooked events.

Traffic management – During construction of a modern mass public transit system, instrumented, interconnected and intelligent technologies shall form the basis of a smarter transportation system. Smart and networked traffic lights help to ease the flow of traffic through the city. Cameras and social media technologies could help monitor the road network and provide intelligence to decision makers. The advances in data management technologies to address the challenges related to the processing and analysis of Big Data coming from various heterogeneous sources can facilitate city officials to gain a clearer view of how people move around within the city and how the existing transportation systems and public services could be enhanced accordingly. There are many aspects to improve transport safety, security and network efficiency whilst taking into account measures to reduce environmental impact. The traffic management system shall work towards zero accidents, zero delays and fully informed people, where services are affordable and seamless, the environment is protected, privacy is respected and security is provided.

Advertising and atmosphere – Advertising spending is growing steadily even if the global economy is in crisis. In 2012 the global ad spending grew 3.2%, where the growth focused to digital advertising channels (TV, radio, internet, cinema and outdoor advertising **[7]**). The industry is in transition as the traditional

printed media is losing its share of ad spending and for example the digital signage market is becoming a mainstream advertising medium **[8].** Worldwide business intelligence (BI) software revenue will reach $13.8 billion in 2013, a 7 per cent increase from 2012, according to Gartner, Inc. The market is forecast to reach $17.1 billion by 2016. The combination of real-time business intelligence and customer behaviour monitoring with adaptive intelligent advertising and atmosphere creation services will offer a major competitive edge, when competing of the advertising spending.

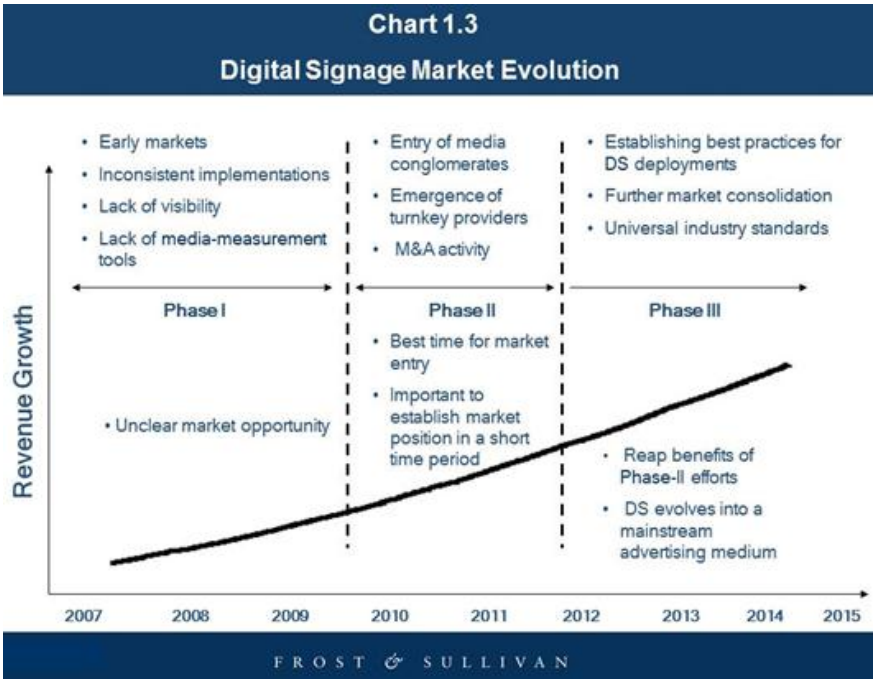


Figure 1: Digital Signage Market Evolution [8]

The INSIST project aims to develop a smart connected ecosystem for public urban spaces focusing on enhancing the functionality, energy-efficiency and interoperability of existing outdoor light management, traffic management surveillance, building infrastructure and digital signage systems. In addition the INSIST smart connected ecosystem will enable the creation of new services benefiting from the sensor information acquired from the urban sensor-based services.

3.1.2 The technological value chain

The urban spaces are full of stand-alone sensor based installations of different services designed according to their own purpose and requirements: public lighting, safety and security of citizens in the streets, traffic management, etc. These services are designed according to their own purpose and aspect. The aim of the INSIST project is to improve services for citizens' safety and comfort by developing new solutions for the different components of each system and by integrating relevant information from adjacent systems to provide breakthrough innovations while leveraging on existing infrastructure.

Figure 2 shows us the **value chain** of integrated smart services for citizens' safety and comfort consists of lighting management system, surveillance system, traffic management system, business intelligence and building information management system, advertising and atmosphere system, system integration and information exchange; finally, the last and possibly most important link of the chain is the user of the service.

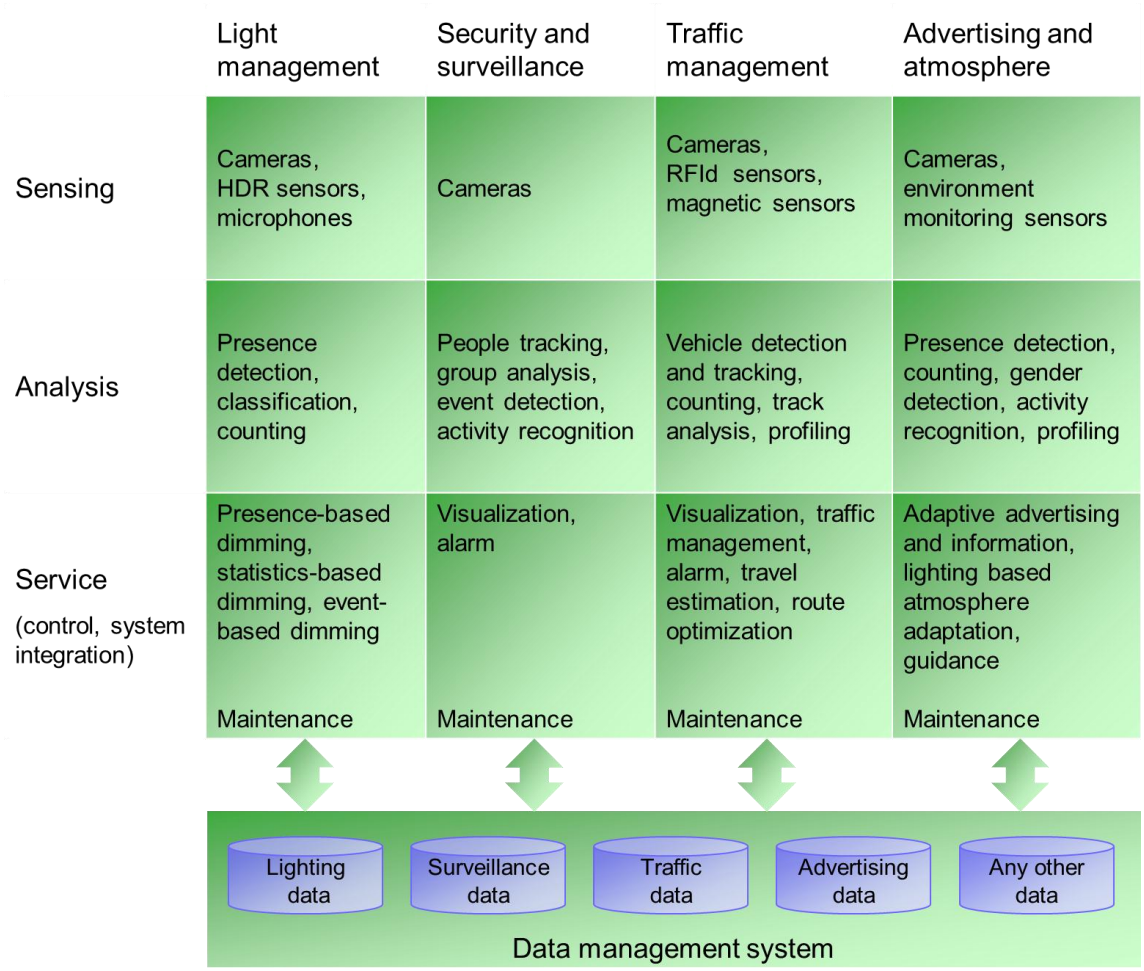


Figure 2: Technology value chain of connected platform for public service delivery.

Lighting management system includes dimmable luminaires that are connected to a network and controllable remotely or through dedicated sensors. INSIST will consider smart, energy-efficient lighting systems (**Philips Research** in the Netherlands, **Helvar, Valopaa** and **C2SmartLight** in Finland). The project will investigate new sensing solution for lighting activation, will develop algorithms for presence detection and activity recognition based on such solutions, and will investigate innovative network sensing and control strategies (**Philips Research** and **TU Delft** in the Netherlands, **KONE, Helvar**, **Valopaa** and **VTT** in Finland).

- Surveillance system comprises camera networks and analysis systems for event detection, activity analysis and recognition. INSIST will consider modern (both standard and high resolution) camera network infrastructures (**Prodrive** in the Netherlands and **Thales** in France, **Scati** in Spain), and will develop new solutions for advanced people and crowd detection and tracking, activity recognition and event detection (**TU Eindhoven VCA** and **ViNotion** in the Netherlands, **CEA LIST**, **Lille 1 University** and **Thales** in France, **Scati** in Spain).
- Traffic management system involves sensor systems to monitor traffic, algorithms to detect traffic flows and analysis algorithms for traffic management applications such as flow prediction, route optimization etc. INSIST will consider camera networks, cellular networks data and magnetic sensors solutions for traffic monitoring and analysis (**Prodrive** in the Netherlands, **Citilog** in France, **Verisun**, **Ericsson** and **Kocsistem, Argevas** in Turkey, **Telvent** in Spain). The project will also develop new integrated applications for traffic management and optimization, as well as information visualization for drivers and traffic managers (**TU Eindhoven VCA** and **ViNotion** in the Netherlands, **Citilog** and **Thales** in France, **Ericsson**, **Argedor** and **Provus** in Turkey, **Telvent** in Spain).

- Advertising and atmosphere system includes actuators such as interactive displays and luminaires, sensor networks for monitoring the environment, and algorithms for sensor interpretation and data analytics for business intelligence. INSIST will investigate interactive advertising systems (**VTT**, **Pro Piknik Festivals** and **MyPose** in Finland) and atmosphere creation (**VTT** and **Valopaa** in Finland), as well as business intelligence and data visualization services (**Innorange** and **Offcode** in Finland).
- System integration represents a crucial aspect in the INSIST project. The project aims at investigating how different systems can use information made available through a common platform by other systems. INSIST will rely on the connected platform provided by **Philips Corporate IT** as well as on domain specific knowledge management components developed by partners to exchange information between the different systems and provide services integrating lighting, surveillance, traffic management, signage and advertising. **All partners** will contribute to the system integration to develop new integrated applications for the security and comfort of citizens.
- Users: the INSIST project will look beyond the technological solutions alone, and will investigate user experience with new smart services together with service fusion potential. For the smart lighting domain, lighting preferences and needs will be investigated for different types of road users and situations. At the same time, the project will scrutinize the efficacy of smart lighting solutions in eliciting the desired effects on human functioning and security at night. This work will be conducted by **Philips Research** and **TU Eindhoven HTI** in the Netherlands, by **SIVECO** and **ECRO** in Romania and by **KONE** in Finland as well as **Digital Living Finland Oy**.

3.1.3 The concept

Global population growth and urbanization poses several challenges for maintaining the liveability and efficiency of a city. This concerns aspects such as safety and the efficiency of road infrastructure while contributing to energy saving. Below we elaborate on a few examples.

- With the increase of demand for smart lighting and the current budgetary pressure, municipalities will have to reduce their expenses for lighting, while preserving or enhancing the comfort and security of citizens.
- Increasing population, large crowds during events and high-density traffic increases safety issues, crime and the risk for terroristic activities. Therefore, efficient monitoring of the flows is highly desirable. In case of incidents, panic or other safety issues, the public lighting system and traffic control systems such as digital signage and traffic light can help to mitigate the safety issue and send help services.
- As the population is growing and the capacity of city infrastructure is limited, optimization of transportation of people and vehicle traffic is essential. As the flow of vehicles is improved, the emission of pollution is reduced.

The INSIST project aims to develop a smart connected ecosystem for public urban spaces focusing on enhancing the functionality, energy-efficiency and interoperability of existing outdoor light management, traffic management and surveillance systems. In addition the INSIST smart connected ecosystem will enable the creation of new services benefiting from the sensor information acquired from the urban sensor-based services (in INSIST domains. By refining and fusing the data provided by the sensors, we will be able to offer information on people's behaviour, and make inferences about their mental states, thus allowing tailored services for various application domains. The smart lighting system can automatically adapt to people's personal or situational needs; providing optimal lighting needed for general functioning at night, providing personal route information, or guiding groups of people in crowded situation. The real-estate managers can get real-time and long-term information on how the buildings are being populated and the spaces in them used. Crowd and audience data can be utilized to create interactive spaces, atmosphere or target marketing.

Smart lighting systems will increase energy savings while preserving the safety and comfort of the people in public spaces. The roadblocks that prevent high market penetration of smart lighting like the installation cost and complexity of the additional sensory systems will be taken away by providing cost-effective and easy to install sensory systems. Richer and more robust information enable intelligent light control strategies and (semi-)automatic configuration, operation and maintenance of lighting systems. Besides light control, it is

also expected that large-scale sensor information can be exploited for services beyond lighting management (e.g. monitoring of environmental and weather conditions, traffic density).

Video surveillance solutions are widely deployed in city agglomerations to secure public safety and targeted to ease the work of public security officers. The contextual information provided by advanced video analytics could be used to detect the first signs of undesired behaviour of people, groups, crowds and vehicle traffic. Proper illumination is crucial for the proper functioning of surveillance systems. Moreover, the manipulation of outdoor illumination could prevent violent or criminal activities from occurring or further escalation without physical presence of security officers. Even though the interaction between surveillance and lighting system is proven to be effective, currently there is no solution available that enables intimate interaction between light management and surveillance infrastructures.

We expect that the research and development in real-time computer vision technologies will enable automatic analysis of human behaviour and traffic intelligence, so that the tedious work of a security officer is considerably reduced and directed at the preselected important events. We aim at automatic surveillance of large events, where crowds of people are moving on the streets, at all times, including the periods of poor lighting conditions such as night hours. Intelligent video analysis algorithms will be created and deployed for detecting abnormal or suspicious behaviour of groups of people, for tracking a person or a group in crowded environment. Not only content but also the context of the scene plays a role in analysing it.

It will also provide and record the information on traffic participants so that the stored information can serve for data mining later. This information includes vehicle classification, speed estimation, trajectory analysis. For example, if an ambulance car is detected, the traffic can be managed in the way that favours the fastest movement of this car. Or in case of an accident, the behaviour of a car or of a group of cars can be tracked and analysed. Combined with smart lighting, these technologies bring a significant improvement in the safety and security of the urban citizens.

> Safety and security of people in an urban environment can only be achieved when the traffic and human behaviour is controlled. Intelligent traffic analysis will lead to detecting the accidents in real time.

Traffic management is already accepted as a multi-national issue by Europe and ERTICO (Intelligent Transport Systems and Services for Europe) has been established to create an efficient traffic system in Europe. To decrease the resources used for transport, eco-driving is also supported by cooperative systems include vehicle to vehicle infrastructure communications providing real-time interactive information from the road environment such as traffic lights. As an example; the interactive information systems will guide the driver in a perfect flow of green lights. The sensors on the road and the traffic lights shall check the traffic load on the road and inform the drivers with the estimated arrival time and based on the profile and or the preferences of the driver.

Other challenges in public space lighting and surveillance are the psychological aspects of security from user perspective. Especially in combination with intelligent outdoor lighting, there is limited research activity on human perception in this area. This is unfortunate as the tailoring of light to the needs of a specific individual or situation by means of information from integrated urban sensors poses several challenges. The main challenge is to formulate the lighting requirements for different road users and situations. In meeting this challenge, one has to face novel lighting parameters. Parameters that were irrelevant for conventional static street lighting, but that are crucial to maximizing the trade-off between energy savings and human functioning and security in intelligent systems. The question, for example, is no longer just how much lighting a type of road user needs, but also where on the street this lighting should be offered.

For urban services, including public lighting and surveillance, to benefit optimally from integrating information obtained from various connected sensors, user perception studies are much needed. Conversely, the proposed intelligent sensing system may aid such user perception research by offering new opportunities for evaluation and user testing. By integrating information from different sensors detailed analysis of human behaviour and emotions becomes possible, offering an unobtrusive means to measure whether a specific urban service (e.g., a lighting design) indeed has the desired effects. Moreover it enables experimentation with services in the public domain as it becomes possible to correlate, e.g., lighting manipulations with changes in sensor data.

Our vision is to provide a truly intelligent sensing system connected to the urban infrastructure with traffic control and lighting that can provide for example light only when and where needed through smart interpretation of events and environment, to achieve sizable energy savings while providing a secure, comfortable, pleasant environment.

The INSIST systems are interconnected through a common data management platform to leverage on each other's hardware and software infrastructures in order to improve functionalities and reduce installation cost to promote wider applicability. In order to increase knowledge and create proof points in the unexplored area of comfort and security perception of public smart lighting systems, the project will investigate how smart light controls are perceived by users through pilot studies. Finally, the collection of data from interconnected INSIST systems into a connected ecosystem will allow to investigate new services beyond lighting delivery, surveillance and traffic. This wide integration of sensor based services will create new business opportunities for digital service providers specialized in knowledge intensive services benefiting of data acquired from different sensor systems. Figure 3 illustrates the INSIST ecosystem for public service delivery, with several smart systems connected through the data management system.

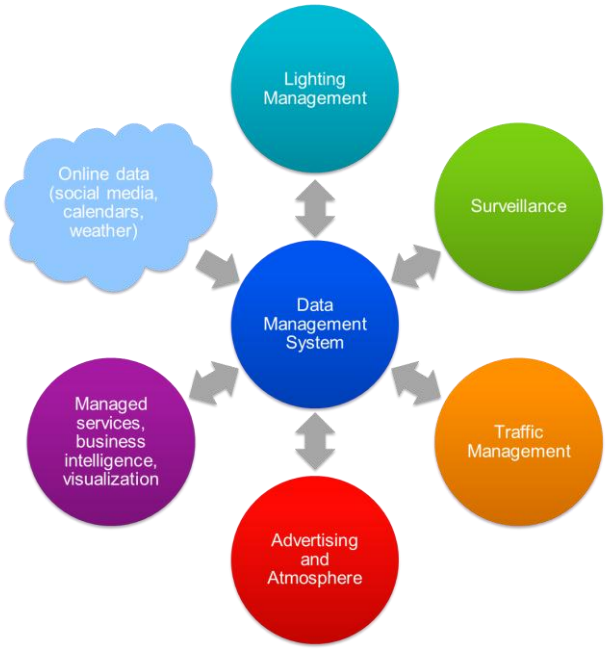


Figure 3: Connected platform for public service delivery.

3.1.4 The challenges addressed by INSIST

Societal challenges

- Global population growth and urbanization are increasing the demand for citizens' services in the urban environment, such as lighting, surveillance, building infrastructure, traffic management and advertising and leisure services.
- Resource scarcity and climate change are of increasing concern, and governments are responding to these concerns with stricter regulation towards energy efficiency.
- The demand for improved services to citizens while reducing energy consumption and costs for the municipalities leads to a growing need for intelligent integrated systems that deliver services when and where needed, providing safety and comfort to citizens while reducing pollution and energy consumption.
- The INSIST ecosystem will enable the interaction between smart systems in urban environments to provide services for the comfort and safety of citizens, while reducing costs and energy consumption.

Economic challenges

- Increasing energy costs and high financial pressure on municipalities.
- Integrated platform will enable improved services while leveraging on common infrastructure, thus reducing hardware and installation costs.
- Improved, smarter systems will provide better decision making, thus allowing greater energy savings and pollution reduction, e.g. for lighting control, traffic management, surveillance.
- Integration of information from multiple smart systems will enable both municipalities and companies to plan more efficient service infrastructure and to develop new business models based on data intelligence, such as intelligent advertising and interactive adaptive spaces.

Technical challenges

- Embedded detection, classification and counting algorithms for improved light control to provide safer, more comfortable, more energy-efficient lighting systems.
- Integration across multiple systems (lighting, surveillance, traffic management, building infrastructure and advertising) for increased intelligence at a reduced cost thanks to systems integration.
- Distributed heterogeneous data integration for different systems and applications to allow for interoperability, smarter behaviour and reduced cost exploiting systems' integration.
- Data analytics for system maintenance and automatic configuration to allow wider applicability, ease of installation, reduction of installation and maintenance costs.

3.1.5 The project proposed solutions & objectives

The **aim** of the INSIST project is to provide a truly integrated lighting, traffic surveillance, advertisement and atmosphere management system connected to the urban infrastructure. The integration across systems will allow leveraging the different systems' hardware and software infrastructures, making the resulting solutions more affordable and more intelligent.

Objectives and solutions

- An **architecture** supporting real-time video-based presence sensing, an open database accessible by light management, traffic management, advertising and surveillance systems to collect and share information and events. The analysis of large amount of historic data will also allow identifying trends and automating several aspects of system configuration, thus allowing lower installation and maintenance costs. INSIST will apply a distributed, extensible, flexible architecture with network interfaces for the exchange of information. Such a loosely coupled architecture will safeguard the integrity of the system components.
- **Advanced, cost-effective sensing solutions** to enable reliable real-time responses at a cost that allows its wide applicability. INSIST is expected to significantly extend sensing functionalities from simple presence detection to more intelligent interpretation (through single or multi-camera video processing techniques, sensor network processing etc.) and thus enabling more intelligent light control strategies, advanced monitoring functionalities and cross-domain service solutions. The project will deliver sensing functionalities requiring limited computational resources to enable the application of cost-efficient embedded vision solutions. Third, sensing solutions alternative to conventional cameras that promise to be interesting for lighting control (e.g. HDR sensors with special faceted lenses, microphones for audio event classification) will be explored and evaluated.
- The project will be addressing challenges related to **distributed sensor networks**; investigating methods to cope with the installation of a reduced number of sensors that can still provide advanced features through sensor network analysis (e.g. object classification, speed detection, trajectory analysis).
- A more intimate integration of **data analytics and statistical data mining** into the embedded hardware platform to collect and summarize the most salient sensor data information, so that it can be transmitted and stored efficiently across the connected platform.
- An advances in distributed data management methods towards the seamless information exchange across various services from different application domains to enable more effective and economically sounded service infrastructures

- The integration of smart lighting infrastructure, traffic management, advertising and surveillance systems to explore **new cross-domain public service offerings**. Integration across systems will allow the different components to leverage each other's sensing and signalling capabilities in order to improve functionalities and reduce installation cost to promote a wider applicability of smart systems. The integration with other sources of information (e.g. online information such as weather data, special events information etc.) is also foreseen to investigate opportunities to improve the various systems while reducing deployment costs.
- **Perception studies for users** of smart services developed in the project. Experiments and user studies will be conducted to elucidate the differential lighting preferences and needs of different types of road users and situations, thereby explicating the user requirements of smart lighting solutions. Furthermore, the INSIST project will put these integrated smart public lighting solutions to empirically scrutiny; evaluating their efficacy in eliciting the desired effect on human functioning and security at night by means of laboratory experiments, and several pilot studies in (semi-) public spaces. The outcome of these evaluations will be valuable in improving control strategies and energy saving policies.

3.1.6 Final demonstrators

Each country participating in this project will have its own demonstrators for the local applications. Major cities in the participating countries play a significant role, because they will act as a test case of our local applications.
Besides that, we will define challenging scenarios to build sub-demonstrators. The scenarios and sub-demonstrators will be defined in the technical WP's. See below for the country demonstrators and related applications.

Finland
The intelligent advertising results will be demonstrated in the **city of Oulu**. The demonstration will include adaptive digital signage information and adjustable atmosphere lighting elements based on sensor data from people presence and behaviour sensors. The goal is to increase the comfort and effectiveness of advertising by controlling the atmosphere of the environment. The demonstration consists of:

- Multi-sensor environment monitoring network
- illumination control logic
- people behaviour monitoring, flow maps
- intelligent advertising systems
- data fusion and decision making from multiple data sources

In addition several small demonstrators will be developed in the premises of companies (e.g. Kone)

France
Achieved results for surveillance and traffic management shall be demonstrated in the **city of Strasbourg** including multiple cameras tracking of individuals and vehicles for security, traffic management and soft transportation solutions optimization (e.g. tramway, busses and bicycles traffic). For this the academics (Univ. Lille & CEA LIST) will work in close co-operation with the industrials (Thales Services & Citilog) to introduce advanced analytics into industrial solutions for traffic monitoring, video-protection supervision and soft transportation solutions. Thales Services will coordinate the French demonstration with the City Council of Strasbourg.

Romania
Achieved results of the city lighting quality system will be tested in the suburbs of the **city of Sibiu** in term of light excess consumption and optimal level of street lighting, based on real-time citizen interaction. Later feedbacks from the population and municipality will bring answers regarding the fact that the measures were or not in the right direction in terms of technical/economic efficiency as well as in terms of citizen comfort and flexibility by using dynamic lighting parameters.

Spain
The results of the project will be demonstrated in the **city of Seville** integrating traffic and surveillance management and including advanced features. Links with smart lighting will also be explored through this deployment for targeting optimized cross domain service solutions.

The Netherlands
Achieved results will be demonstrated in an installation at **High Tech Campus Eindhoven** including controllable, connected LED luminaires, a connected network of dedicated sensors for light control and connected surveillance cameras for local traffic management with algorithms. Second opportunity is the demonstration of a controlled area in the **city of Eindhoven** called **Stratumseind**. These intelligent outdoor lighting systems will be used to demonstrate:

- Improved sensing functionalities of the dedicated lighting sensor network and associated lighting control strategies.
- New distributed detection, tracking, classification algorithms for hybrid sensor networks including both dedicated lighting sensors and surveillance cameras.
- The use of the lighting system for signalling in surveillance/security applications.
- Data analytics methods for automatic configuration and maintenance of the lighting control system.
- Measurement of pedestrian and vehicle flows to optimize traffic and the use of the road infrastructure, while exploiting the light optimization.

Turkey
The Turkish consortia will develop an integrated and an interactive traffic management system to create a perfect flow of green lights in the suburbs of the **city of Istanbul**. This will be handled with sensors and cameras to detect the traffic flow and also to manage vehicle-vehicle communication and vehicle-traffic environment communication. The mobile application to be developed shall define arrival estimation and define alternative routes based on the driver's profile and preferences.

Efficient traffic management is a subject handled by governmental level in Turkey recently. KocSistem has been working on intelligent transport system projects which are Car2Car4Safety and CoMoSeF (Celtic+) since 2010. Also Koc holding company one of which member is KocSistem has several automovie provider participations such as Otokar, Tofaş and Ford Otosan. Ericsson works on M2M data traffic management globally, so the results of the project may be carried even out of Europe. Meanwhile, Verisun is the company that has implemented the official mobile application for the traffic in Istanbul. As the back office provider of HGS (Toll Collection System in Turkish motorways and Istanbul bridges), Provus will provide its Business Intelligence and Data Processing expertise in the demonstrator scenario. Argedor has experience and expertise in big data analytics, data mining and recommender systems. The company will contribute to big data storage and development of platform services and personalized services to drivers and traffic managers. The company is planning to detect social media profile and traffic behavioural analysis and recommend related services to the users. Argedor will also work on efficient routes to the drivers.

The Turkish consortia will develop an integrated and an interactive traffic management system to create a perfect flow of green lights. This will be handled with sensors and cameras to detect the traffic flow and also to manage vehicle-vehicle communication and vehicle-traffic environment communication. The mobile application to be developed shall define arrival estimation and define alternative routes based on the driver's profile and preferences.

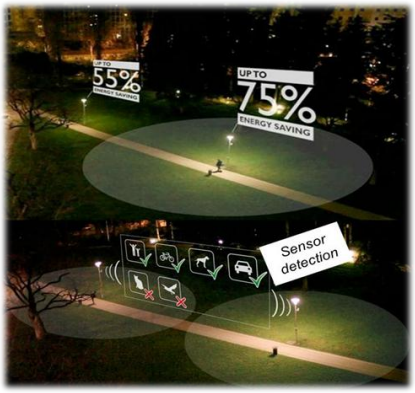
3.2. Technology

3.2.1 State-of-the-Art (SotA) and "roadblocks"

3.2.1.1 Application areas

Outdoor light management
In conventional outdoor lighting systems luminaires are switched by a controller that provides mains power to a segment containing multiple luminaires. Additionally, luminaires could be equipped with an ambient light-level sensor. In case the measured ambient illumination is lower than a certain threshold the luminaire will turn on. More advanced luminaires support timer-based dimming schedules that allow light levels to be configured for specific periods. For example, in the evening and morning when much traffic is expected, the light level will be set at 100%, while during low activity at night the light level can be dimmed down to 20% to save energy. There is a trend to connect luminaires to a light-management system by wireless or power-line communication. The light-management system is designed for configuration, operation and maintenance of

the lighting network. The system is able to configure luminaire behaviour on an individual level by setting parameters like time schedules and light levels, but also to directly control individual or segments of luminaires, for example, in case of emergencies. The Global Positioning System (GPS) provides the location of luminaires, which is used by the light-management system. Also, it provides time information necessary for timer-based control. Luminaires containing sensors for presence-based light control are entering the market. The conventional motion detectors are based on passive infra-red (PIR), radar, ultrasonic sensing or camera-technology, and only provide very basic presence information (binary signal). Richer sensor information like position, speed, type and density of traffic or weather conditions will enable more intelligent light control strategies. More robust sensing solutions will extend the applicability and could open up city services beyond lighting management.



City surveillance

The area of city surveillance has grown continuously over the years, of which visual surveillance is clearly the dominant application. A growth area that strongly emerges is shop and retail surveillance both for people safety and or shopping behaviour.
The application areas are split into people and crowd monitoring, people counting and flow measurement for safety management, parking lot surveillance, and monitoring of critical infrastructure.

1. **People and crowd monitoring** is certainly one of the most important applications in urban areas. This is particularly important for happenings and events in cities like big sports events, trade fairs, and city festivals. The surveillance is deployed with an existing – usually fixed mounted – infrastructure of surveillance cameras, which are connected to a network (CCTV or fibre, or similar). The information is typically compressed video and gathered in a local control room, operated by city government and/or police or security companies. The analysis is strongly based on the detection of individual persons and the tracking thereof. The control room contains many video displays arranged in a matrix and requires personnel to actively observe the live video images and then signal situations to local police and other services. Experiments in the R&D area also report, besides the detection of persons, the behaviour of (groups of) persons by analysing their profile and motion actions over time.
2. **People counting and flow measurement** is closely connected to the previous area of monitoring. For large festivals and city events, the counting of people in certain areas is crucial for safety reasons and organizational guidance.

Conventional surveillance cameras are not always good enough for accurate measurements, so that regularly a temporal and/or removable system is deployed with a specialized camera. The advantage of such a system is that the image sensor is optimized for the purpose, such as a having a high sensitivity for low or fluctuating light conditions. The corresponding video analysis is a highly tuned person detector and classifier matching the specific mounting position of the camera. The use of stereo cameras and range finding sensors has been reported in literature for such experiments. Also, tracking algorithms for persons are available, based on various principles, such as mean shift, motion analysis, and various filtering techniques like particle filtering. New sensors can be optimized even for measuring heart beat and so on, but this is not yet broadly used, and infrared sensors may be used for night-time surveillance.
3. **Monitoring of critical infrastructure** (incl. parking lots). This is a field where typically more sensing principles are jointly used, because of the value of the infrastructure. For example, in a harbour, radar is often used for ship guidance, and this may be extended with visual sensors. For vehicles,

magnetic coils or inductive loops are used for detection and supplemented with visual sensing. For entrance control, face detection/ recognition applications are deployed and can be enhanced with eye detection, iris scanning, or biometric features like fingerprint processing and recognition. With respect to analysis, the world is diverse in that area. Human face recognition exists, but the size of the database may become critical at larger scale and for fast identification. The detection of vehicles and other objects with different sensors may be enhanced with different information such as identity tags, and is typically shown in large control rooms or on a table or screen. In urban areas, object detectors and classifiers exist for cars and persons and initial algorithms are available for following an object through the infrastructure from one camera view to the other. Tunnels in a city have typically a similar infrastructure for surveillance.

4. **Shop and retail surveillance.** This is an emerging area that was initially starting from safety but now increasingly is used for tracking shopping behaviour as well, so that the investment for the retailers becomes more interesting. The typical mode is visual surveillance and this is regularly extended with RFID tags and magnetic / inductive loops for good detection and flow monitoring. The analysis involves high-quality person detectors, and pose and posture descriptors and trackers for recording the walking paths of customers in a shop. It is obvious that the people's presence and the type of goods may be well combined with specific light types and colours to stimulate customer behaviour.

Traffic management

We distinguish two types of systems for intelligent traffic management as state-of-the-art: Intrusive sensors and non-intrusive sensors. The first one includes devices such as pneumatic road tubes and inductive loop detectors. These systems are installed directly at the pavement surface of a road via saw-cuts, holes, or by anchoring them directly to the pavement surface as is the case with pneumatic roads. In general the advantage of using intrusive sensors is related to the mature, well understood and cheap to implement technology. On the other side, the drawback is the costs related to disruption of traffic installations and roads every time such systems are deployed.

In locations where road pavement work and interruption of traffic should be minimized non-intrusive sensors can be used. These sensors can be mounted aboveground; above the lane of traffic they are monitoring or on the side of the roadway where they can view multiple lanes of traffic at angles perpendicular to or at an oblique angle to the flow direction. The non-intrusive technologies include Global positioning systems (GPS), PIR sensors and video content analysis based camera footage. Like intrusive sensors, the non-intrusive sensors measure vehicle count, presence, and passage. However, sensors like video content analysis based cameras deliver more broad information such as multiple-lane, multiple-detection zone coverage, vehicle speed and vehicle classification,

In the following subsection we describe the principle of functioning, the use and the advantages of each intrusive and non-intrusive sensor:

1. **Pneumatic road tubes** consist of a rubber tube with air that signals a vehicle when pressured. This method is cheap and easy to install. However measurement accuracy is not very high due to high temperature sensitivity of the air switch and the unknown relation between the number of wheels and the vehicle. Moreover, it cannot classify the traffic, does not work for pedestrian and bicycles, and is sensitive to vandalism and wear produced by truck tires.
2. **Inductive loop** detectors are devices composed by a coil of wire embedded in the road and a detector. Such systems are used to assess vehicle passage, presence, count, and occupancy. The main advantage of this technology is the low costs involved purchasing the sensors, however the

drawbacks include disruption of traffic for installation and repair, and failures associated with installations in poor road surfaces. Also inductive loops are not suitable for pedestrians and bicycles.

3. **Passive Infrared (PIR) sensors** are made of thermoelectric materials and usually contain lenses or mirrors in order to focus the infrared light for maximum reception in its field of view. PIR sensors are often used in the construction of PIR-based motion detectors. Apparent motion is detected when an infrared source with one temperature, such as a human, passes in front of an infrared source with another temperature, such as a wall. Infrared sensors are used for estimation of object speed, as well as detecting pedestrians in crosswalks. A PIR sensor can provide accurate measurement of object position and speed although it cannot distinct different traffic participants and is not able to classify the type of participant. Consequently, if the traffic situation is at some points a bit dense, the sensors fail.
4. **Cameras and video content analysis.** A smart camera usually consists of several components like an image sensor device and an image processing unit. An example of usage of video content analysis techniques is to assess presence and absence of pedestrians and vehicles in an urban area to control the light intensity of lighting poles, which has been investigated in the Intelligent Street Lighting for Energy Saving & Safety (ISLES) project. In literature, extraction of moving objects from a static camera is typically carried out by calculating a background model of the scene. Usually foreground objects are detected by evaluating the difference between the current image and the background image. However, the maintenance of a background model is difficult, because of issues related to changes in lighting, moving backgrounds (e.g., waving leaves, flowing water and cast shadows).

In order to solve these problems, in this project we propose to use a technology based on object recognition carried out by employing knowledge of object shape and texture properties. Such an approach is independent of motion and illumination changes and does not require a background model. Such methodology has already been proven by ViNotion, who has developed a people counting system that is specifically suited for counting in a passageway (such as street), based on the localization of individual people. The employment of video content analysis systems covers multiple applications. Such systems provide detection and classification of vehicles, bikes, motorcycles, and pedestrians in multiple lanes, vehicle/pedestrian counting, and assessment of speed, assessment of density and forecast of travel time. Additional advantages with respect to the other methods are that video content analysis techniques are general and can serve other purposes such as intelligent video surveillance. For instance a camera network on a street and the video content methods could be used by public authorities such as the police to monitor a certain area. Because a video camera solution is non-intrusive for the road infrastructure and can serve multiple city services such surveillance and lighting control, the solution is more cost efficient.
Regarding video detection for road traffic application the challenges of a deep integration with traffic lighting will be:

a) the capacity to work under changing lighting conditions (as of today road traffic detection relies on the fact that illumination changes over a scene are slow)
b) Installation constraints allowing easy deployment compatible with public lighting deployment constraints. Especially the constraints for road traffic video detection will be: the capacity to work with cameras with wide-angle focal length (panoramic focal), automatic calibration, and video sensors positioning
c) the possibility to integrate a video sensor within a lamp pole:
d) with enough processing capacities to be able to detect the situations of interest without the need to send back the images to another location for analysis
e) with low power consumption
f) at low cost to allow large-scale deployment

Data Management Systems

The Connected Products Platform (CPP) is a highly available, secure and reliable platform that provides global connection services to devices and mobile apps, enabling them to access online services. The platform is composed of generic components using industry standards. Devices and/or applications require a client software component with a small footprint that supports the connectivity, authentication and authorization with the platform. Additional services that can be configured and managed centrally are:

- Notification

- Firmware download
- Data collection
- Remote diagnostics
- Device control
- Registration
- Key provisioning
- Device Pairing

By using the CPP as the connectivity platform will take away the connectivity burden and its related functionality. Applications can be designed and built with focus on the required functionality and leverage the CPP services as input. The CPP is providing device and connectivity information to underlying application(s) and/or systems. The platform is generic; it does not contain specific application logic but acts as the interface between devices and their respective application(s). Therefore any data analysis logic or business Intelligence must be handled by a separate component outside the CPP. The domain-specific data/knowledge management services as well as the business-intelligence components will be developed by partners according to application context requirements.

Business intelligence and building information

Business intelligence based on sensor data can provide new innovative service opportunities, lead to intelligent design of spaces by understanding people's movement and behaviour better. It will also lead to more profitable business and cost-efficient system designs by intelligently controlling the needs of the building and the space utilisation in various domains, both out and indoors.

One important factor in the sensing is to understand how people move around in space. Understanding people presence and occupancy is valuable information for many services. People presence can be detected for example via WLAN or Bluetooth, and nowadays there exist accurate positioning systems based on these technologies, but it always requires an active device. People segmentation and tracking can also be done with camera and depth-sensor based technologies. People segmentation and tracking is a widely researched subject, which has been started in the context of security and surveillance. As the camera-based algorithm research and development has been on-going for a long time, there are quite extensive surveys available in **[9]**. Recent advances in depth sensing technologies have enhanced the algorithm development in that field as well. With depth sensors people tracking **[10],[11],[12]** benefits from the understanding of 3D scenes, handing occlusions and the robustness to changing lighting conditions.

There are also several intelligent technologies and systems available for smart building automation containing a huge number of different standards, devices and subsystems. In current state-of-the-art buildings already have sensors for HVAC (heating, ventilation and air-conditioning) systems, Lighting systems, Fire protection Systems, but they are often individual systems and not used for cross domain or even new intelligence.

The possibility to utilise the existing sensoring across domains is huge. Smart environments rely on sensory data from the real world. **Table 1** lists the most important properties of the environment that need to be captured and how they can be measured. The basic sensor types utilized currently include pressure, temperature, flow, motion, light, and camera sensors.

Properties	**Measuring**
Physical properties	Pressure, temperature, humidity, flow
Motion properties	Position, velocity, angular velocity, acceleration
Contact properties	Strain, force, torque, slip, vibration
Presence	Tactile/contact, proximity, distance/range, motion
Biochemical	Biochemical agents
Identification	Personal features, personal ID

Table 1: Sensors for smart environments [**13]**

Advertising & Atmosphere

The adaptive advertising has traditionally referred to personalized advertising content based on profile information acquired, for example, automatically from the user or user group behaviour in a web shop or based on demographic user information (e.g. paper ads of toys mailed to parents of small children). Public screens and digital signage systems in retail and advertising as well as digital installations are getting very common these days. Currently most of these systems are passive, but some of them hold already different interaction methods. The user can either interact by gestures of their body with the content or the systems can be interactive with personal devices using, for example, smartphones with NFC (Near Field Communication) technologies. As future systems will contain more and more sensorial information from surroundings and interactions different methods to understand behaviour of the people are required. Depth sensing technologies can provide a valuable tool for natural interaction and people behaviour monitoring even for people intention and emotion analysis based on their actions. It will support a new type of advertising where the original people can be part of it via interactive digital solutions in city view as well as through social media.

The audience funnel models describe the audience behaviour in front of public displays. At the first stage the user is only passing the display, but in the second stage they start to react to it by glancing, smiling or approaching it **[14].** Detecting this implicit behaviour of the user will enable developing more emphatic interactive screens. In this stage the interactive system should encourage the user for further interaction to engage the user. This will require understanding the actions and movements of users in space as well as the user's emotional state.

The future systems will have larger and larger displays and by their illumination properties they can act as luminaires and have direct effect on the atmosphere of the space they are present in. This can be already seen in how 3D projections to facades, architectural lighting or interactive outdoor illuminations, which currently are created more or less as installations, can change the visual view of the whole space. The projection technologies are a powerful tool for changing how the environment looks and feels. Microsoft's IllumiRoom proof-of-concept of an augmented reality projection already shows a glimpse of what the technology including depth sensing; 3D modelling and projectors can create.

Distributed sensing networks for outdoor

New ambient-light sensing technologies will be investigated in the INSIST project, where we envision taking advantage of the combination of two emerging technologies: High Dynamic Range (HDR) imaging and 3D printed micro-lens arrays. HDR imaging is an image capturing technique that makes it possible to capture the whole range of radiances of a scene using either several exposures of that scene or special image sensors. HDR imaging is used for artistic purposes, but also for machine vision and surveillance applications. It also becomes a more and more popular tool for light measurements **[15],[16],[17].** Combined with systems capable of non-destructive pixel readout [**18]**, these techniques make it possible to embed light measurement at pixel level directly into a smart camera.

The other key technology to be used in INSIST for ambient light measurement is micro-lens arrays. Such optics replace a traditional lens and provide many entry points for light instead of one. These entry points (the lenses) can be oriented so that they capture light coming from a known direction in space. Progress in 3D printing technology enables the printing of objects with controlled optical properties **[19],[20].**

Installing, operating and maintaining a large network is currently time-consuming and costly, because standard solutions (protocols and the like) typically use an engineering approach where individual nodes are linked –possibly hard wired– to a central control authority. Within the INSIST project we will try to overcome this inherent bottleneck, by introducing direct communication between nodes. This will allow for exchanging more data between nodes, hence, more advanced algorithms can be used to control the coordinated lighting of street segments based on observed human activity. To minimize operational costs we will explore routing-free communication protocols, such that costly and error-prone configuration found in standard solutions is no longer necessary. In particular, we like to explore the use of gossip-based protocols as our initial experience with such scale-free solutions for controlling large networks of embedded devices is very positive **[22].**

User studies

Although informative to the design of smart lighting services, current norms and guidelines for static lighting do not fully cover the more complex design space of intelligent dynamic lighting. Moreover, user perception studies on smart lighting remain few and far between (for an exception, see **[23]**). At the same time, the effects of public lighting on crime and security remain a topic of debate, and although there is a general consensus that improved street lighting can reduce crime and increase a sense of security **[24]**, the field lacks a thorough understanding of the underlying mechanisms (i.e., through enhancing visibility and surveillance, through strengthening a sense of community, or through improving the atmosphere of the environment; e.g. **[25]**). For example, there is conflicting, mostly anecdotal, evidence regarding motion detection home security lights having a psychological benefit over static lighting in chasing away burglars by installing in them a feeling of being detected. Taken together it remains difficult to predict whether a specific dynamic lighting setting will have the desired effect, for example, on perceived safety, deterring crime, or preventing aggressive situations to escalate. The required empirical investigations are challenging especially because they require specialized test sites with fully controllable LED luminaires and sensor technology. In situ pilot studies with smart lighting are still rare, and past en present evaluations, by relying on single sensor presence detection, have not addressed the psychological issues that arise when lighting is tailored to a specific type of road user or situation.

3.2.1.2 Status of current R&D work

Table 2 below summarizes preceding and present projects and their relations to the INSIST proposal.

Project Name	Cooperative Programme	Time period (approx.)	Technical Focus	Relation to, and difference with, this project proposal
ViCoMo	ITEA	2010-2012	Modelling of visual context to improve video analysis	ViCoMo did not study crowds and high-density traffic. Video analysis in INSIST is typically optimized for dense people and traffic flow for safety and light control reasons.
ISLES 2014	Point One	2011-2013	Investigating intelligent dynamic residential lighting using PIR-based presence detection to reduce energy consumption and maximize feelings of safety	ISLES 2014 project focusses on lighting services only. It does not focus on integrating sensors from multiple urban services, and thus does not focus on tailoring the light to different types of road users and situations.
3D-TestBench	(ITEA2-06043)	2007-2010	Has contributed in developing modelling and simulation techniques to meet the challenges of the growing complexity of software systems by improving the design and validation phases for a wide variety of new engineering products.	Will extend the control and execution of modelling and simulation to support decision making capabilities to achieve smart lighting management and surveillance systems.
LASCOT	(ITEA-02027)	2003-2005	Web services technologies - XML as extensible mark-up language for data, using the Simple Object Access Protocol (SOAP), and Universal Description, Discovery and Integration (UDDI) as a directory of Web services.	Brings in focus new generation of Semantic Web technologies for both surveillance and lighting systems to achieve the adequate situational-awareness through visualization.

Project Name	Cooperative Programme	Time period (approx.)	Technical Focus	Relation to, and difference with, this project proposal
SERKET	(ITEA-04005)	2006-2007	An open software platform for preventive security in public crowded places and for large events.	Will support open-source initiatives, and contribute to the standardization through PSIA, OGC and OASIS as well accepted standards.
ESNA	(ITEA-05023)	2006-2009	Open-source architecture supports off-the shelf sensor network nodes, including applications, software development kits and middleware services, based on documented interoperability specifications.	The lighting monitoring and surveillance system will have a wired or wireless communication interface that sends and receives messages to and from other external systems, where the ESNA results might be reused.
Empathic Products	ITEA2	2012-2015	Enabling intention and emotion aware products	Developing technologies that support detecting people intentions and emotions for multiple application fields e.g. video communication, health, advertising
Smarcos	Artemis	2010-2013	Smart composite human-user interface techniques	Smarcos focused on user interface techniques, intelligent backed server analysis, and fusion of context, activity, UI modalities and target/source device properties to enable inter-usability across user interfaces used in smart environment.
SmartProducts	FP7	2009-2012	Contextual knowledge management & interactive data visualization with focus on processes/ workflow, cases automotive, industrial and smart kitchen	Public domain is not addresses in SmartProducts. Moreover INSIST will focus more on event-action/service activation rather than workflow management.
SOFIA	Artemis	2009-2012	Semantic cross-domain interoperability on data level	SOFIA's knowledge management technology can be considered by INSIST, more domain specific knowledge models need to be developed
EnLight	ENIAC JU	2011-2014	Energy efficient and intelligent lighting systems	Intelligent lighting system development, energy evaluation, advanced censoring and control capability with mobile devices.
SparkSpace	Tekes	2011-2013	Adaptive lighting control with multi-channel ambient sensing	Intelligent lighting system development, wireless control, advanced censoring.
AthLEDics	Tekes	2010-2013	Advanced technologies for energy efficient LED lighting applications to satisfy user	Intelligent LED luminaire and lighting system development. The results validated with

Project Name	Cooperative Programme	Time period (approx.)	Technical Focus	Relation to, and difference with, this project proposal
			needs	technical performance as well as with user acceptance studies.
D-SenS	FP7 (Research for benefit of SMEs)	2012-2014	The D-SenS depth sensing framework will enable the development of new innovative applications in different application areas to yield state-of-the art performance and beyond.	In D-SenS the main focus is in indoor application domain for people safety. INSIST has a wider technology scope and new challenges for computer vision technology deriving from outdoor environment.

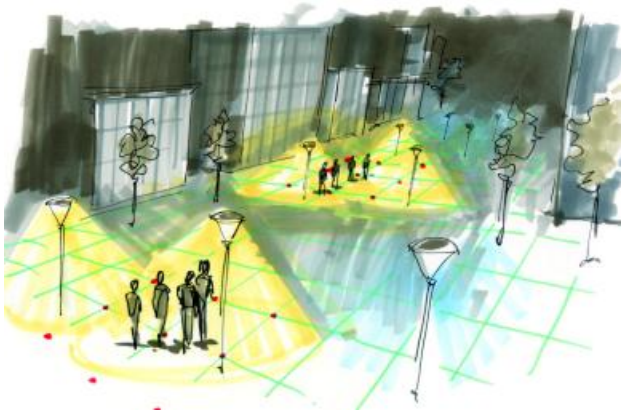
Table 2: List of related projects

3.2.2 Innovation

3.2.2.1 Technology

Technology for light management

The next generation of light management systems will go beyond state-of-the-art sensors used nowadays in outdoor lighting applications. The INSIST project is expected to significantly extend sensing functionalities from simple presence detection to more intelligent interpretation through single or distributed sensors such as vision and sound. Advanced distributed sensing activities such as detection, classification and tracking of objects and behaviour monitoring will enable more intelligent light control strategies. Also, the project will deliver sensing functionalities requiring limited computational resources to enable the application of cost-efficient embedded solutions. Third, the project will be addressing challenges related to distributed sensing and light control with constrained communication bandwidth. Furthermore, it will enable a significant decrease of deployment costs through self-configuration and self-management of multi-sensor systems. In addition to goals related to cost-efficiency and energy savings the INSIST ecosystem will be used to evaluate the possibilities to create new experiences to the citizens by adjusting the atmosphere in urban spaces by combining smart lighting control systems with the people behaviour data.



The distributed dynamic comfort level, with many possible factors influencing locally the lighting behaviour, is expected to give answers to both decision regarding general lighting level/policy in cities but also to cover most of the “special” cases to cover an improved technical/economic lighting efficiency.
The proposed lighting system is not only more efficient and controllable, but it has an adaptive behaviour due to the following factors:

- The “comfort” factor is a dynamically measured criterion, based on real-time actions from street-passing citizens. Well adapted “avatars” running on smartphones will allow dynamic factoring of traditional lighting level, based on on-the-fly inputs at any time-moment either:
  - at will (walking people give a recommendation for satisfaction of lighting at that place and moment, will of increase or decrease lighting level) or
  - automatic - smartphone may automatically exchange information with distributed intelligence of the lighting system, giving a default preference (children, women may want always a higher momentary lighting for increasing their security feeling, while some man may accept a lower illumination as they are not so much afraid of dark);

  - the lighting level may be changed suddenly, superposing the other rules, due to special situations (temporary feeling of un-security, temporary need for more light for reading the map, the street name or other info displayed on the building).
- The dynamic “comfort” factor will be amended also by energy availability, energy price in that time frame, and energy availability with renewables.
- The Romanian consortium will develop new algorithms to maintain real-time, up-to-date dynamic comfort factors, as inputs for multi-criteria dynamic lighting, including in relation with energy sources, energy prices and energy availability in each time frame.

Technology for city surveillance

The next generation of surveillance algorithms for city surveillance will have to focus much more in the direction of increased level of intelligence to enable autonomous decision making of simple cases and alerting for complex cases and scenarios. Secondly, a higher robustness is needed for large-crowd scenarios as in festivals and sports events. The typical individual person object detector is then of limited use and the focus has to be on group detection and behaviour. In groups, the individual persons cannot be detected anymore in a reliable way, so that other models have to be deployed. An example is the deep analysis of motion behaviour on the basis of particles instead of persons that share a common behaviour and/or trajectory. An example of this is shown in Figure 4 for density estimation.

The higher robustness of city surveillance should come from new sensor technology where sensors make use of different spectral properties and from improved and intelligent lighting conditions, since so many visual sensors are used in a city. In video surveillance, the new generation of cameras will largely benefit from the use of larger sensor surfaces for high light sensitivity, higher resolution and more integration efficiency. The vast majority now involves CMOS sensors which have rapidly decayed in cost. This is paving the way for infrared sensors to gradually go down in cost as well. The resulting improved picture quality due to higher resolution and sensitivity allows reliable detection of person groups and group behaviour for city management and light control, to a level that was previously not possible. This type of video analysis is innovative for the surveillance industry and it also innovates the current surveillance systems and overall systems control offered by the industry, which is currently still based on person-based interpretation and decision making.

Technology for crowd and traffic management

The technology developed in the INSIST project is general and is beneficial for different applications. For example, the intelligent multi-camera systems installed in the city could be used to automatically observe and to recognize abnormal events (e.g. people fighting, crime scenes etc.), as well as vehicle and people to measure flow and to count them. That is possible, since the basics of the algorithms involved in such different applications follow a common principle. A machine learning algorithm is trained using a dataset of objects of interest (e.g. people, bikes, cars etc.), described with certain features invariant with respect to intensity and contrast, and robust with respect to scale and view point. One the objects of interest are learned, they can be detected and classified. Hence, objects of interest present in the video images are recognized and then tracked (see Figure 4) [26],[27].

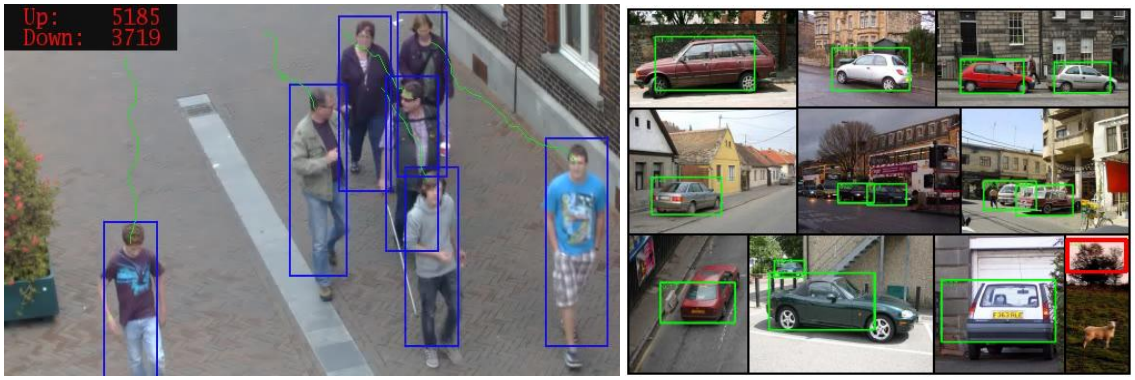


Figure 4: Detected people (left image), detected cars (right image).

The detected objects allow creating quantitative measures about the presence and the movements of pedestrians/bikes/vehicles (single or group) in a considered area of interest (e.g. number of pedestrians/bikes/vehicles entering and exiting the area under observation; origin to destination matrixes). In Figure 5, the people counting system developed by ViNotion is used to measure the density of pedestrians walking on a large area.

According to the quantitative measures, the system will be able to propose actions to be carried out on the field by operators such as: limiting access to an area, to prevent excessive congestions or densities, facilitate or stimulate the egress from an area, for similar reasons, proposing information to operators on the field but also to simple pedestrians in an area (for instance by means of informative signage).

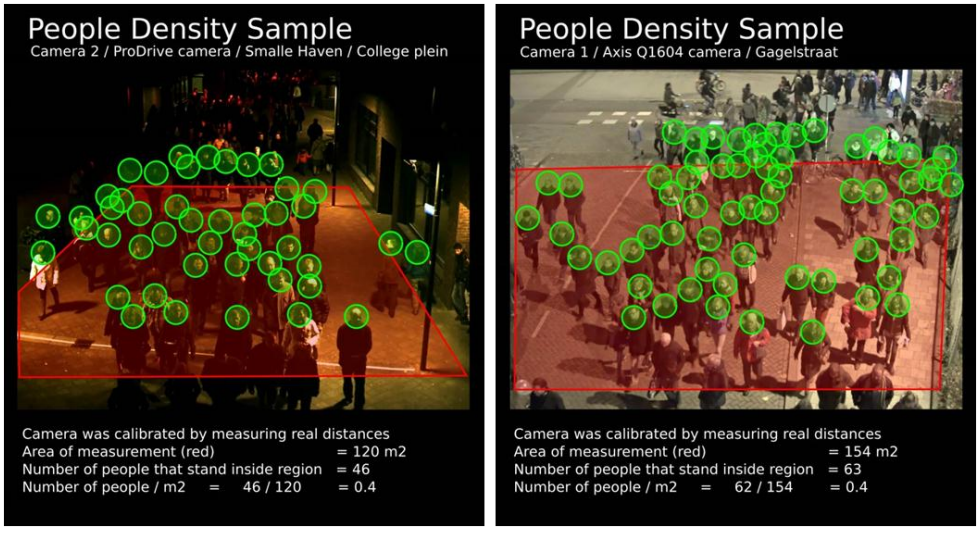


Figure 5: People density estimation.

Innovation regarding traffic management will rely on the deep integration of video detection sensor to the public lights lamp. As of today the public lighting is only based on a time of the day switch. The availability of new lighting technology with capacity to dynamically adjust the luminosity level and deeper integration of road traffic sensors will open the possibility to have intelligent lighting depending on the current traffic situations. Public lighting will have the possibility to adapt them based on information provided by traffic sensors. As an example, the lighting level may be adjusted based on the current volume of traffic in order to save power when the volume of traffic is low.

The project will also investigate the possibility to use the lamp on poles to inform road user of certain hazardous situations and thus reinforce road safety. Thanks to a deep integration the light can be used as a variable message sign to notify for the presence of a pedestrian on cross-walk, an incident ahead on the

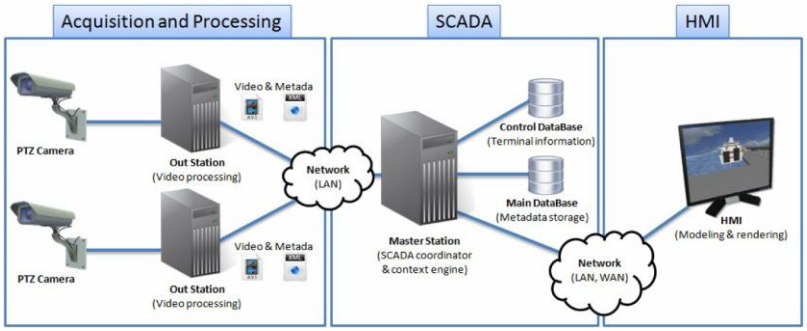
road, or a stopped vehicle on the road or on the emergency lanes. The video traffic sensors will provides the accurate detection.
This can also be used to improve the mobility of Person with Reduced Mobility (PRM). As an example specific path may be illuminated when a vehicle is detected on a PRM parking.
Last but not least, deep integration of traffic sensors with public lighting is a way to accelerate for the diffusion of ITS (Intelligent Transportation Solutions) over the world in order to the global road mobility and safety challenges.

Technology for business intelligence, intelligent advertising and atmosphere

The business intelligence services will combine information acquired from different sensor systems providing real-time information in a cost-effective way. The combination of different types of sensors from visual sensors to more simple presence sensors will enable coverage of large areas and at the same time detailed information from specific hotspots. This will mean advanced sensing possibilities via multi-modal detection using different sensor types for elaborated person presence and activity detection, and context analysis.
The INSIST solution will extend the system re-configurability, and optimise the system performance via the sensor fusion. The solution breaks the barriers between the different sub-systems of urban automation – e.g. Lighting, Heating/Cooling, Surveillance, Intelligent Advertising and Safety -, thus facilitating the synergies in the sensing and control. Efficient co-design of lighting and information systems (e.g. people behaviour information and statistical business intelligence data) will lead to added comfort and more effective advertising. In the long-run the ecosystem can be improved by adding intelligent visual sensors capable of interpreting semantic events.

Technology for data management systems

The platform security is based on a smart combination of existing standards like SHA, AES, and TLS allowing for authentication and communication security for (embedded) devices with different levels of processing capabilities. Communication content is based on HTTP and JSON standards. The platform itself is meant to be open to accept different kinds of data upload formats, Inter-server components make use of well-defined industry standards such as WSDL and SOAP (WS-I basic profile) as well as RESTful gained its popularity addressing the challenges of service development for the resource constrained devices.



The proposed solution is to use the CPP as the interface between the different devices and the application(s). All devices will use the CPP client software to connect to the CPP infrastructure. Depending on the device type additional domain specific services and components will be developed such as to address data collection needs, firmware download, notification services, etc.

Technology for distributed sensing networks

The INSIST partners are specifically interested in cameras with low pixel counts. Together with specially designed optics, it is possible to achieve an efficient ambient light estimation by exploiting the properties of multiple lenses optics. Such optics, similar to the faceted eyes of insects, allows each pixel (or group of) to receive light from a predefined direction in space only. Moreover, changes in light intensity over the facets provide an essential clue for changes in the scene. Practically, faceted optics, together with HDR cameras appear to be the perfect tool for ambient light monitoring: they make it possible to measure the amount of

light from a wide range of known directions in space with a single or few (very) low resolution sensor(s). Enhanced with communication capabilities, a network of such cameras will be able to share information and computing resources to build a global illumination map of, for instance, a street where light poles are equipped with such systems.

Concerning video surveillance, one of the most innovative aspects of the envisaged technologies is the tight coupling between video analytics and light management in an integrated system. Depending of the current situation from the security point of view, light may be adapted, for instance increased, if an abnormal behaviour is detected, or reduce to save energy if nothing happens. Vision based algorithms should be robust to lighting changes, especially in outdoor environments. On the other hand, co-locating cameras and sources of light is an optimal configuration for a good scene illumination. In addition, the knowledge of light status may be taken into account in video analytics to better model illumination. The relevance of surveillance related functionalities, as well as the accuracy of situational awareness assessment will benefit from controlled adaptation of light sources.

In the INSIST project, surveillance and traffic management applications will be addressed in a common framework and share common generic video analysis algorithms such as people/groups of people, vehicle detection and tracking, and event recognition.
Gossip-based communication, in which nodes in a large-scale network interact with random (neighbouring) nodes, has the advantage of being very robust to the network topology. In contrast to standard (ad-hoc) routing protocols there is no need to build up and maintain state (routing tables) about the (local) network topology. Spreading of information in a gossip-based network, however, still requires some care as the default behaviour of flooding entails high overheads in large-scale networks. Either the information range can be limited by introducing a time-to-live counter, or the information can be processed (fused, aggregated) at each node allowing for the creation of information landscapes **[21**] that capture network-wide knowledge about the monitored process. For example, by periodically exchanging/fusing information with direct neighbours only, gradients to a human walking on the street segment of interest can be formed to track and estimate its path for lighting purposes.

3.2.2.2 Domain specific technology

Advances in smart lighting
While connected lighting systems that adapt their light output to the presence of pedestrian and vehicles start to appear, more advanced sensing functionalities are required to provide smarter interpretations of the environment that lead to increased user comfort and efficiency, At the same time, to promote the diffusion of smart lighting systems, system, installation and maintenance costs need to be reduced from the current levels. To address these open issues, new, low-cost sensors suitable for sensing in very low light conditions will be developed in the INSIST project. Intelligent event interpretations will be developed for single and distributed sensor networks.

The INSIST platform will enable the integration of the lighting system with other systems in the urban environment, such as surveillance and traffic management. By leveraging the shared infrastructure and information, smart lighting systems will become even more affordable and intelligent. While concepts to integrate different urban systems exist, in practice these are rarely realized. INSIST will provide a simple, lean infrastructure, as well as a pool of partners with relevant, complementary expertise, that will allow exploring and implementing new, integrated, cross-system concepts for citizen's safety and comfort in the urban space.

Advances in city surveillance, crowd and traffic management
Although object recognition of different type of objects is discussed in scientific literature, it is not applied for real-time traffic management and in particular to classification all different traffic participants. In combination

with object tracking this is essential to apply the technology for different type of city services. Hence, in the project we will adopt models for different type of traffic participant and use them for recognition with machine learning techniques.

The recognition and tracking technology enables analysis of traffic density, flow and behaviour in the city including pedestrians. The higher quality of sensing now enables to exploit group detection and tracking and automated analysis of group behaviour. Both these improve robustness and the level of intelligence of video analysis to a city management function to which light control can be coupled. Nowadays, information on vehicle traffic is available, but only national roads while the information is only used to warn the drivers about traffic jams. However, typically the transportation speed within city centres is worse. The INSIST project will reveal this information within the city centre and can be used for control of traffic lights, digital signage, navigation information and public lighting.

If city centres become more crowded due to traffic or pedestrians that visit large events, the safety and security becomes an issue. If these situations are not notified, the capacity of police officers is too low while ambulances, fire engines and police vehicles get stuck. By measuring all traffic within and at the borders of the city, preventive actions can be taken and incidents can be circumvented.
The platform architecture of INSIST will allow us to collect information for many different sensors and sources. Not only the traffic participants, but also real-time people behaviour information, weather forecasts, event agenda's, shopping hours, public holidays, road constructions, etc. are available in a single system. This type of information is already being used for city services, but the decision making from large amounts of different information is cumbersome to interpret by human operators that need to make instant decisions for security and traffic management. By doing the automatically, the efficiency is increased considerably.

Advances in Data Management Systems
By using the CPP as interface between devices and underlying application(s) the advantage is that all connected devices and applications will make use of a generic platform with industry standard protocols. Scaling, reliability and security are fully embedded in the platform and proven technology. The other additional services will be of immediate added value and help to speed up implementation and integration of the different components of the project.

Advances in business intelligence, intelligent advertising and atmosphere
With the intelligent advertising and atmosphere creation INSIST will aim at offering new experience to the users/customers as well as novel advertising possibilities by providing both new interaction methods in adaptive urban spaces and real-time information on people behaviour. When we understand better the people behaviour and movement in space we can tailor the content and presentation in digital services providing intelligent, more alluring ads. The service design can be based on the knowledge how people move in the space or the advertising can be intelligently distributed and displayed.

In INSIST there is a need for more flexible and light information integration and data fusion means e.g. to put together the measurements obtained from different sensor systems in-situ with information coming from human actors and social web as well as efficient scaling techniques for knowledge representation assets. Considering in particular applications where human actor is involved in data exploitation process (e.g. maintenance domain), challenges exist with respect to information filtering, and information presentation. An important aspect to address will be to investigate the means to personalise and contextualise data in order to create data representation and data analysis views tailored to particular actors involved in the data exploitation process and the situation at hand.

Advances in distributed sensing networks
For this project we will develop a new modality for ambient light sensing based on low resolution HDR sensors and multi-lens optics. This technology will enable smart lightning systems to gather the information they need in order to adapt their behaviour to the circumstances (LT). The necessary steps to achieve this result will lead to advances in HDR image processing and (auto) calibration procedures for effective measurement. This will enable a whole range of application where HDR will be suitable for light measurement (ST). Finally progress in 3D printing will be achieved in order to increase the optical properties to the printed material and the spatial resolution of the printing (MT).

Intelligent video surveillance and light management have not been addressed jointly so far. Over the last years, a lot of effort was spent to improve the robustness of video analytics to lighting conditions, especially in outdoor environments. Existing video analytics technologies can exhibit good performances in controlled environments (indoor or outdoor with stable or smoothly varying light conditions) but lack robustness when illumination changes rapidly. Moreover, information about artificial sources of light is not exploited, but could be used could increase video analytics performances, by adapting parameters or type of processing. Gossip-based algorithms hold the promise for achieving scale-free networking. The INSIST project will provide the unique opportunity to explore the theoretical results obtained so far in a concrete use-case scenario and a real-world practical setting. In addition, the INSIST project will challenge us to develop new aggregation/fusion algorithms; one of the issues that need to be addressed is how to track pedestrians when only limited information is available (i.e. due to cost considerations the cameras do not cover the entire street leaving “black holes”) inducing the need for prediction.

Advances in user studies
The promise of integrating multiple sensors is urban services that are better tailored to the different type of users of a public space or to the situation they are in. For a selected set of use cases from the lighting and security domain, the INSIST project will thoroughly investigate the lighting preferences and needs of specific user groups, and situations of use, in order to set requirements for the desired smart lighting solutions. Where needed, gaps in our understanding of the effects of lighting on, for example, human functioning and the sense of security at night will be resolved. To do so, we aim to overcome one difficulty inherent to user perception research on smart lighting solutions: the need for specialized, fully interactive outdoor lighting test sites. We will explore and develop means of employing immersive virtual environments (IVEs) as a methodological tool for research on lighting and security.

The benefits of IVEs are plentiful: They offer more control over experimental (e.g., lighting settings) and contextual variables (e.g., weather, height of lampposts, street characteristics) than is possible with most outdoor lab facilities, while at the same time allowing for more natural and ecological valid experimental circumstances than classical laboratory research (pre-testing, for example, a lighting solution in a virtual environment that mimics closely the real environment in which the smart lighting system is intended to be used. IVEs also offers the possibility to radically break with current experimental paradigms in which the effects of lighting on the sense of security are investigated under circumstances of relative low anxiety. Due to its immersive qualities, a participants’ sense of anxiety may be more easily manipulated in an IVE than in a classical laboratory situation. Possible triggers may be visible (e.g., by adding signs of incivilities) or occurring even outside a participant’s awareness (e.g., by subliminal levels of a burning smell).

Of course actual field trials are inevitably, not in the least because of the yet to be proven validity of using night time virtual environments for lighting and safety research. A lot is to be learned from in situ pilot studies, but we believe that these evaluations may become even more informative when we exploit the possibilities offered by the integrated sensor system in providing real-time measurements of human behaviour and mental states. By integrating information from different sensors detailed analysis of human behaviour and emotions becomes possible, offering an unobtrusive means to measure whether a specific urban service (e.g., a lighting design) indeed has the desired effects. Moreover it enables experimentation with services in the public domain as it becomes possible to correlate changes in, for example, lighting settings with changes in sensor data.

3.3 Market & business

3.3.1 Current market trends and competition

As the Smart Lighting technology evolves from first generations of “smartness” – e.g. systems capable of reacting to occupancy and daylight – to more sophisticated intelligent systems aiming at energy savings and positive effect on people health and mood the smart lighting market revenues are expected to grow rapidly to over 11 billion $ by 2020 (Figure 6).

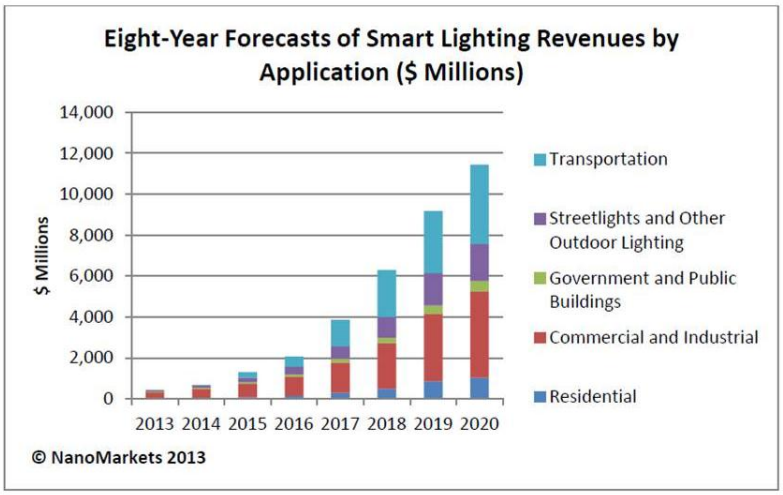


Figure 6: Smart Lighting Revenues by Application - forecast 2013-2020 [28]

The main application fields of smart lighting are Commercial and Industrial, Outdoor Lighting and Transportation, which all will be in the focus of INSIST project.

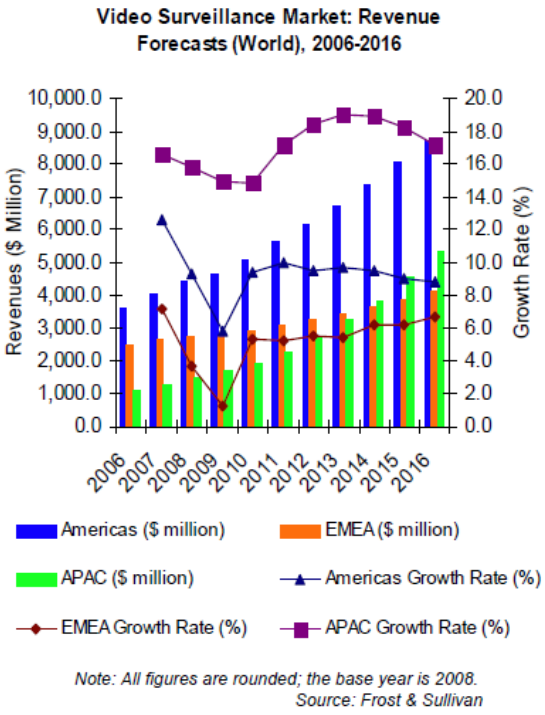


Figure 7: Market estimation of video surveillance [29]

Frost and Sullivan have estimated a strong worldwide growth rate for video surveillance market revenues at the upcoming years as seen in Figure **7**. They also estimate video content analysis (in security) market to reach $623.6 million in 2014 with a CAGR (Compound Annual Growth Rate) of 27.7% from 2007 to 2014. Similarly independent market research agencies as IMS Research forecast the video surveillance market to grow from a value of 2.1 billion dollars (1.5 billion euro) in 2009 to 3.3 billion dollars (2.4 billion euro) in 2015 with a CAGR (compound annual growth rate) of 10%.

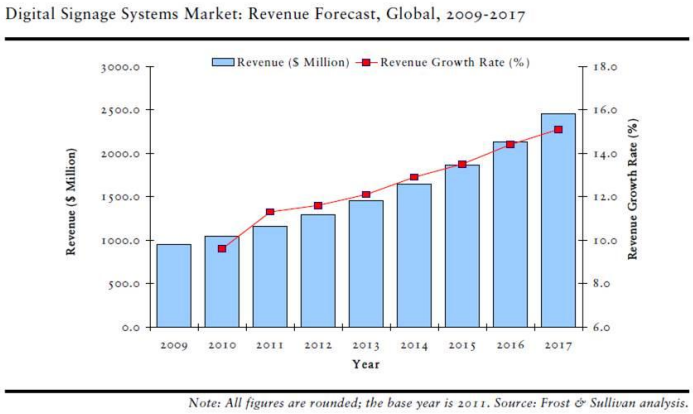


Figure 8: Digital Signage Systems Market: Global Revenue Forecast 2009-2017 [30]

Advertising spending is growing steadily even if the global economy is in crisis. In 2012 the global ad spending grew 3.2%, where the growth focused to digital advertising channels (TV, radio, internet, cinema and outdoor advertising). The revenue for the global digital signage displays market is expected to increase from $384.8 million in 2011 to $821.8 million in 2017, at a CAGR of 13.5 per cent, while the overall digital signage systems market is expected to increase to $2.5 billion by 2017 **[30]. (Figure 8)**

Internationally 54 % of the capital is on real estates. Only, in Finland the market potential in total results from the number of 3 million real estate property in total. Giving an example of the estimations of the impact of ICT is used the energy usage in smart housing and intelligent transport. Currently, final energy consumption in the EU is dominated by households 37 % (including also services) and transport 28 %. The digitalization of services will turn into energy saving and cost-effective housing and transportation. The potential of energy efficiency of the digital ecosystem of housing and mobility is proven to be very high by several studies. As an expert guess, we can speak of the multitude of 10 to 20 per cent enabled by ICT.
ICT has considered the key enable in many paths of life and new legal frameworks have launched as for example for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport (Directive 2010/40/EU) across Europe. Several policy and action papers urge to use ICT when applicable, not to mention the Innovation Union and Digital Agenda.

Regarding the citizen involvement, INSIST project has also an important impact. A “Green World” vision is not possible to achieve without empowering people with systems that enhance their capabilities, also from a ICT systems’ design perspective. The market impact is remarkable since each and every of the contributions we will provide the project with, are innovative and are being heavily requested by an ever-growing critical mass of practitioners who need them.

3.3.2 Market opportunities: expected business

The increasing capacity and capability of technology resulting from INSIST ecosystem allows rapid emergence of new and improved digital services. This will clearly be the major growth area for different organisations across the INSIST value network over the next decade as consumers, public bodies and businesses recognize the benefits of networked and highly intelligent services. The challenge of crafting new connected sensor systems occurs in both consumer oriented and B2B markets. The impact of this project will therefore be not limited to a specific market segment but rather the results will be applicable to a large number of ICT solution providers across different sectors and application domains benefiting from an interconnected sensor-based information ecosystem.

The project will create a “paradigm” for crafting intelligent and flexible sensor-based systems and services for urban spaces. The consortium expects that the potential economic benefits of the results of this project will greatly outweigh its research and development cost. Indeed, European smart sensor-based system builders will benefit from the results of INSIST, as these will enable firms to strengthen their competitive

position in an ever more demanding market and ever changing business environment, by differentiating from their competitors on the basis of solutions built by INSIST-project.

The INSIST project increases the market opportunities of the partners on the following main business domains (See details from the Market opportunity Table in the section 3.3.3):

- Indoor and outdoor lighting business and intelligent lighting management
- Flexible surveillance systems and their management services
- Traffic management of people, goods and machines
- Intelligent advertising and atmosphere service business

The participating partners in the different business areas:

- The partners operating on lighting business are seeking to increase their markets by developing more energy efficient high quality products, control systems and novel intelligent, efficient and scalable lighting management services as well as create new markets by integrating physical products with intelligent cloud services. The partners include: Philips, Citilog, Valopaa, Offcode, KONE, Helvar, C2SmartLight, Digital Living, SIVECO, ECRO.
- The partners operating on surveillance business aim at extending the market of video surveillance for outdoor public areas for surveillance, focusing on automatic real-time behaviour interpretation and analysis of pedestrians and vehicles, traffic and crowd management and megapixel camera technologies for that field. The partners include: ViNotion, Prodrive, Thales, CEA-LIST, KONE, Digital Living, Scati, Catec.
- The partners operating on traffic management believe that their business will increase on by developing a framework supporting mobile applications and cloud based services for example to define routes and personalized services in smart traffic utilising big data storage, solutions for advanced Intelligent traffic control, integrated city mobility management as well as implementing SW for utilising M2M data. The partners include: ViNotion, Prodrive, Thales, Argevas, KocSistem, Ericsson, Argedor, Provus, Verisun, Telvent, Catec.
- The partners operating on intelligent advertising and atmosphere are expecting to increase their market share in the field of business intelligent platforms, interactive marketing/advertising solutions and crowd and audience management for retail. The partners include: MyPose, Offcode, Innorange, Pro Piknik Festivals and Digital Living.

3.3.3 Exploitation plans

The results of INSIST project will be exploitable both in short- and long-term timeframe. The technology innovations focused on development of specific sensor systems (e.g. smart lighting or surveillance) will create new business opportunities and competitive advantage in relatively short time after the end of the project. On the other hand the commercialization of the new innovative services resulting from data fusion from different sensor systems or the cross-usage of the sensor data between various systems will aim at beyond the immediate end of INSIST project.

Exploitation activities have two forms:
(1) **The academic partner**s will enrich their teaching activity with the knowledge generated within the project. This will be achieved, on the one hand, by integrating the generated knowledge in regular or in new courses. In particular, the use cases, scenarios and user studies can serve as motivating examples for future, large scale, heterogeneous information and communication systems, the requirement analysis can be used to highlight security, privacy, reliability, and interoperability aspects of these systems, and the architecture and the mechanisms developed in the project can give useful insights into the general design principles as well as into the details of some particular technology. On the other hand, the project can provide the context for student semester and diploma projects. In addition, it is also expected that the project will attract prospective PhD students.
(2) **The industrial partners** will try to introduce the know-how developed in the project into pre-existing research and development projects, in order to launch new products. In particular, providers of security, surveillance and traffic management systems together with providers of intelligent lighting and recommender systems to initiate further efforts for larger scale deployment.

In the following table we list the specific exploitation plans for each partner.

Industrial partner	Country	Software/ system to be developed	Market opportunity / Exploitation
Philips	NL	Intelligent light control algorithms and architecture	By 2020, LED lamps for street lights will generate more than EUR 2 billion in annual revenue **[3]**. The demand for intelligent lighting systems will also result in an expected EUR 7 billion in revenues in lighting systems control components in 2020 **[4]**. Philips is the global market leader in lighting and claims a top three position across all end markets (LEDs, lamps, professional luminaires, lighting electronics) in all geographies. Besides, Philips has the ambition to expand its applications and services portfolio, as demonstrated by the numerous recent acquisitions in the field. The technologies and applications developed in the INSIST project will allow Philips to provide innovative solutions to remain ahead of the competition in all the relevant markets.
ViNotion	NL	Camera-based intelligent sensing applications: - Smart video surveillance - Traffic management - Crowd management The intelligent sensing will be based on video content analysis methodologies.	With the INSIST technology, ViNotion will be able to address an extended market of video surveillance for outdoor public areas, deploying systems for real-time behaviour interpretation of pedestrians and vehicles. In addition the technology will be exploited for new ViNotion markets such as traffic and crowd management. Some competitors offer technology for traffic classification using radar-based approaches. Such technologies are able to detect speed and count the number of vehicles in a small area but are mainly applied for traffic enforcement. We foresee that the cost-efficient camera-based sensing technology is especially suitable for city services as they can easily be deployed at the corner of all main roads in the city. Subsequently, they can be used for traffic control but also for video surveillance, lighting control and context-adaptive advertising. In this latter case for example, the system could be trained to recognize the brand and brand series of cars to address a specific population target. This will create a new business model, since the retrieved information could be used to trigger the advertising panel on the streets to promote e.g. events interesting for the drivers (e.g. motor sport events on TV). Since this is a new market, the potential is huge. To quantify the business potential, we hereby consider an example deployment in the city of Eindhoven. For coarse-grain management and control of the traffic in the centre, 50 to 100 camera's at the most important intersections on the inner road circle are sufficient. A market-conform price of around 3.000 Euro per intelligent camera including VCA hardware and analytics software would result in a gross turnover of 250 KEuro from the intelligent camera's only. If we deploy this INSIST technologies in the first 5 biggest cities of the Netherlands, the turnover would more than

Industrial partner	Country	Software/ system to be developed	Market opportunity / Exploitation
			2 MEuro. Notice that exploitation on a global scale offers a considerable market opportunity.
TU-Delft	NL	Image processing software and gossip networks for very low resolution HDR image sensors and intelligent lampposts networks.	IP development for industrial partners
TU/e-VCA	NL	New Image/Video Analysis algorithms and technology is developed with intensive cooperation in the local high-tech industry. Object perceptual evaluation of light usage provides independent know-how to the industry.	IP is regularly offered or used by the industrial partners in exchange of research budget for further innovation of systems and products. Besides this, TU/e group research lead to new SME spin-off companies, e.g. the TU/e VCA group research resulted in 3 spin-offs companies in the last 6 years. The research in image analysis is also exploited in new education courses on 3D and analysis.
TUE-HTI	NL	Optimizing interactions between users, lighting systems, and public spaces in order to optimize both energy saving and security	TU/e HTI benefits through scientific publications, and the involvement of educational programs: Psychology & Technology BSc, Human-Technology Interaction MSc, and the Engineering Intelligent Lighting certificate program. Insights will find their way into readers and lectures, and student projects will be formulated around the INSIST research.
Prodrive	NL	Advanced camera technology in combination with a variety of processing technology capable to process advanced algorithms of partners. Advanced camera technology means 10x the most popular full HD resolution (10xHD) of today, low light performance, advanced optics and high image frame rates.	Last year Prodrive started the introduction of a first 10xHD full frame, 30fps with the best low light performance available today camera in the market. We gained a lot of market interest and projects worldwide since the start. Due to the conclusions of our partners ViNotion and TU/e-VCA that their algorithms perform much better on: a. recognize more details (10x more resolution) and b. much more reliable due to the remarkable low light performance (very low noise) and the global shutter (no moving artefacts), Within INSIST Prodrive will combine advanced camera technology with an advanced processing platform capable to support advanced algorithms of our partners. This new advanced intelligent camera platform fits perfectly in our strategy to make security / surveillance and traffic management more productive. The need for more productivity pops up due to increasing amount of cameras and the lack of evidence in case of an event. With an advanced intelligent camera platform we expect to gain a new yearly business of 20M.
Argevas	TR	An algorithm to define efficient route for energy consumption	There is no traffic application that has an efficiency parameter yet.
Argedor	TR	Collecting the data which comes from vehicle-vehicle and vehicle-traffic sensors then modelling current situation and creating the real time reports. Modelling possible traffic forecasts when the traffic lights are located in different coordinates. Forecasting the traffic in specific time by using machine learning and data mining methods.	ArgeDOR will utilise the outcomes of INSIST to enhance its existing business solutions and to develop new solutions in data mining and recommender systems. Improving a real time support system with using a big and real time sensors and location data. ArgeDOR wants to integrate the location and sensor data's' processing capacity with its own recommender systems products.

Industrial partner	Country	Software/ system to be developed	Market opportunity / Exploitation
Ericsson	TR	We want to produce software that can analyse data created by M2M devices. Ericsson estimates that by 2020, there will be 50 billion devices connected on planet earth. So understanding and giving meaning to it will be a very important issue and a problem to be solved. So we plan to develop this software to understand M2M environment in a better view.	The market is ready for this kind of solutions. The only missing part is that the solutions provided are not stable and reliable. Ericsson with a high knowledge of productisation we believe we can enter the market easily with the power of brand all around the world. When we complete this product we will have chance to market it all around the world via our Ericsson global network.
KocSistem	TR	KocSistem is interested in adding value to framework development, smart video processing and cloud based services.	By the end of the project, KocSistem would like to make exploitation of the common workspace KocSistem will develop, traffic application services.
Provus	TR	Traffic management system: -A profiling database based on the traffic database to determine the behaviour of drivers. Traffic data to be analysed includes most frequented routes, time of travel, etc. -Personalized profiling service based on the profiling database, which will make suggestions to the end users that will enhance their quality of life, reduce the amount of time spent in traffic and/or minimize gas consumption.	Provus, which is the back-end server of the fast track payment system in Turkey, namely HGS, will use the existing knowledge database for user profiling purposes. Since traffic data is a new data source for profiling, Provus benefits through scientific publications and through the development of a new profiling service, which could be used to provide personalized services to end users.
Verisun	TR	A mobile application to design a new approach to define routes including public transportation	Public transportation is a new option on mobile applications for route definition.
Fada-Catec	ES	Infrastructure software for surveillance and traffic management solutions	Fada-Catec is a technology centre and as such it will exploit project results through the collaboration with the industry
Scati	ES	Security and surveillance	Scati develops powerful set of video analysis and applications such as recording, utilization, local and/or remote management, control and monitoring combined with megapixel cameras. The project will allow extending current market domains.
Telvent	ES	Traffic management	Telvent develops advanced Intelligent traffic control solutions as well as integrated city mobility management. The project will provide the opportunity to evolve in interoperability and to explore optimised multiservice solutions.
SIVECO Romania SA	RO	Web platform development for end-users	SIVECO will develop specific web platform for citizens in their relation with authorities and energy providers
ECRO SRL	RO	End-user involvement	ECRO will develop new algorithms to maintain real-time, up-to-date dynamic comfort factors, as inputs for multi-criteria dynamic lighting, including in relation with energy sources, energy prices and energy availability in each time frame
CEA	FR	People and groups of people detection and tracking algorithms with increased robustness to	IP developments for industrial partners

Industrial partner	Country	Software/ system to be developed	Market opportunity / Exploitation
		illumination	
Citilog	FR	Video detection sensor OEM for smart public lighting and Traffic Management	New distribution mode (OEM / ODM) relying on public lighting distribution New market opportunity: road traffic data for smart public lighting
Thales Services	FR	Architecture for large scale security and traffic management based on video content analysis Integration of video-analytics for persons and vehicles tracking using model-based and temporal video descriptors considering sparse to huge density of persons and very different points of view (outputs from Univ Lille, CEA LIST and Thales internal developments)	Thales will improve and refine large cities security and traffic management systems providing advanced data collection systems based on video analytics for statistics, density assessment, counting and tracking.
Strasbourg	FR	End-User requirements, demonstration definition and validation,	The urban community of Strasbourg intends to test the exploitation capabilities of the INSIST results and validate their potential to improve light, surveillance and traffic management systems in the city. For instance video analysis will be used for lighting maintenance
Univ. Lille	FR	New forms of temporal video descriptors to take into account 3D shape of objects for individual/group analysis and activity recognition	IP developemnts for industrial partners
C2-SmartLight	FI	To enhance the existing Intelligent outdoor lighting control system. Make Intelligent outdoor lighting control system more adaptive • Advanced wireless sensor technology , like camera based presence monitoring Interfaces and interoperability with smart urban environment	Results to be achieved in project are expected to strengthen company's competitiveness in export sales. Also offers new business possibilities in domestic sales.
Digital Living Finland Oy	FI	Web 3.0 core technology and Internet of Things (IoT) app platform in cloud and based on linked data for business use.	The INSIST project advances the knowledge of the company in data management and in the IoT ecosystem building for smart urban environments. The INSIST broadens the applicability of the company's sophisticated software. The INSIST will have a great effect on the market potential of the company in the system or service fusion apps for businesses in new fields. The possibilities of piloting and of international cooperation with the key players in the field offer a great chance for a new operator in the field to become a partner of business clusters or an eservice provider for new clients.
Innorange	FI	Innorange is a leading retail business intelligence provider for brinck-and-mortar retail what comes to customer behaviour. Innorange Business Intelligence platform currently fuses information from radio, camera, WiFi authentication and 3rd party databases such as cashier data.	With INSIST project Innorange aims to add 3rd party sensor to its business intelligence and offer its business intelligence and sensor data to other INSIST project members.

Industrial partner	Country	Software/ system to be developed	Market opportunity / Exploitation
Helvar	FI	Helvar aims to develop control gear SW to support a set of network commands for a simple lighting control system	Major energy saving potential through dimming and pre-defined lighting schemes. Fast commissioning due to no extra control wires. This simple solution is especially suitable for retro-fit solutions were the lights needed to be remotely controlled through a simple PC or the system can be added to a existing lighting system through a DALI lighting router . This system can also access the INSIST database to get full or complimentary lighting control information
KONE	FI	End-user interface solutions for KONE People Flow intelligence. KONE develops new signalization platform which enables complete people flow solutions inside the building.	There are great possibilities for deploying signalization devices more than they currently are by adapting their function based on the sensor data received from the surroundings. With the means of integration KONE is able to provide complete solutions instead of just elevator user interface. Integration will improve users safety and comfort by proving new novel user interfaces and reducing life-cycle costs by enabling flexibility through building life-cycle.
Offcode	FI	Development of the distributed device network. HW and SW development integration to various industrial sensors, actuators and wired and wireless communication links. The aim is provide seamless connectivity between dummy and intelligent devices and the cloud services.	The results of INSIST project can be utilized in multiple business sectors providing essential added value to Offcode tool chain. Offcode has an ADN42 measurement &control node for environmental, industrial and automotive solutions. By having extra flexibility the device can be utilized in new business areas. Increasing device volume, bring the costs down and yet more business sectors became accessible.
MyPose	FI	MyPose will develop interactive marketing solutions concentrating on personal marketing and advertising solutions where the users can provide content for social media and include information of sensor data to it as well as control lighting at the moment of content creation for creating suitable atmosphere.	MyPose creates interactive marketing solutions for retail – connecting offline and online. Our area of expertise is software. We create applications for interactive displays, especially touch-screen, but also for other methods of interaction. We develop software to the client and server side, creating full solutions for retail marketing. The INSIST ecosystem will provide added value to our services in form of sensor data applicable both to interactive marketing content adaptation and interaction.
Pro Piknik Festivals	FI	Crowd and audience management solutions Marketing/advertising solutions	The ideas tested in project will be taken to production provided they add the value of the whole process and business model, an evolutionary choosing method of relevant ideas. Without exploring new things the business cannot evolve.
Valopaa	FI	Wireless lighting control system development. Sensor HW and SW development. System integration	Valopaa develops LED luminaires and lighting control systems. Due to increasing energy saving requirements, demand for LED luminaires and controls system is expected to increase. INSIST project enhances Valopaa lighting control system functionality and utilization by providing new type control methods and interfaces to other systems. This means new market opportunities and competitor differentiation.

Table 4: List of exploitation / market opportunities for the partners individually

3.4 Standardisation & Dissemination

3.4.1 Standardisation strategy

The project has a strong ambition to distribute, transfer and exploit the knowledge, experience and relevant project results to the European community and world-wide.
The project members intend to contribute to the evolution of relevant standards, through direct membership and following the standardization in the relevant bodies. The standards that the project will follow and contribute if possible are for example:

Technology standards such as:

- DALI Digital Addressable Lighting Interface
- KNX KNX is a standardized (EN 50090, ISO/IEC 14543), OSI-based network communications protocol for intelligent buildings.

Energy saving/lighting quality standards such as

- EN 15193 Energy performance of buildings, energy requirements for lighting
- EN 12464-1 Light and lighting, lighting of work places, part 1: indoor work places

The main actors of this project are already involved in the standardization groups. Also the project will receive the feedback of the work being developed in these standardization bodies from the partners involved in them. The relevant standardisation bodies will wary according to the application domains defined in INSIST project.

Also some partners of INSIST will investigate the possibility to contribute to open source software (OSS), while making sure that the participants' commercial endeavours are not endangered.
The best practices should also be codified in open source libraries that the project will either seek, or if needed, build. This includes activities like:

- Contributing new libraries into the open source space
- Ensuring continuity and good governance of the tools contributed by the project
- Activating relevant developers and open source communities to adopt these libraries and standards
- Promoting the standards and libraries in technical conferences
- Organizing workshops for interested developer communities aiming for standards and tool adoption
- Working with relevant standards bodies to document the best practices
- Contributing to related open source efforts

3.4.2 Dissemination

Dissemination in INSIST constitutes a key aspect and is focused on creating outside world awareness, maintaining relationships with media and coordination of a liaison with associated projects related to the ITEA programme, providing input to standardization bodies, as well as creation of a project identity. Specific domain-dependent issues (e.g. based on different use cases) are also taken in the due consideration. Dissemination will be described in a dissemination plan and will follow clear approval, release and publication processes.
The main activities for the dissemination are grouped into the following categories:

- Demonstration events and workshops
- Journal publications and conference contributions;
- Information material;
- A web platform;
- Input to Standardization bodies.

3.4.2.1 Dissemination strategy

The demonstration events and workshops are planned according to a clear strategy, aiming at maximizing the potential impact while keeping a clear scheduling for them, also respecting the flow of the project and being in line with the progress of the other work packages.

3.4.2.2 Dissemination of project results

The scientific and technological results can be disseminated to the technical community through the following conferences and journals:

	Name/Title	Partners involved	Target group
Conference	International Conference on Advance Computer Science and Information System	Provus	Computer vision
	IEEE Pervasive Computing	VTT	Computer vision
	IEEE Intelligent UI	VTT	Computer science
	IEEE International Workshop on Multimedia Signal Processing	VTT	Video and signal processing
	IEEE International Conference on Advanced Video and Signal-Based Surveillance (AVSS)	VTT	Video and signal processing
	ACM Conference on Embedded Networked Sensor Systems	VTT	Embedded systems
	International Conference on Human System Interaction	VTT	Human Computer Interaction
	International Conference on Intelligent Sensors, Sensor Networks and Information Processing	VTT	Sensor networks
	For marketing purposes we plan the disseminate on some of the following commercial conferences and trade fares: • Safety & Security Amsterdam, The Netherlands, April • Security Essen, Exhibition for Security and Fire Prevention, Germany, September • IFSEC International, Exhibition and Conference event for security industry, London, UK, June • Festivak, Exhibition for the events branch	Vinotion, Philips	
	IEEE Pervasive Computing	VTT	Computer vision
	IEEE International Conference on Image Processing	TU/e	Embedded systems
	SPIE Electronic Imaging	TU/e	Embedded systems
	IEEE International Conference on Multimedia & Expo	TU/e	Embedded systems
	National Conference and Energetic Exhibition – CNEE	SIVECO ECRO	Smart cities and communities
	International Conference on Energy and Sustainability	SIVECO ECRO	Smart cities and communities
	International Conference on Energy and Environment	SIVECO ECRO	Smart cities and communities
Publications	Energetica Revue	SIVECO ECRO	Energy comunity

	IEEE International Conference on Advanced Video and Signal-Based Surveillance (AVSS), submission deadline Feb-Mar, Conference Aug-Sep 2014	Vinotion, Philips	Security
	IEEE Conference on Computer Vision and Pattern Recognition (CVPR), submission deadline Oct-Nov, Conference Jun	Vinotion, Philips	Computer vision
	AMC Conference on Embedded Networked Sensor Systems, submission deadline Feb-Mar, Conference Oct-Nov	Vinotion, Philips	Embedded systems
	International journal on smart sensing intelligent systems	ARGEDOR	Sensor networks
	Journal of Information and data management	ARGEDOR	Data management systems
	International Journal on Semantic Web and Information Systems	ARGEDOR	Information systems
	International Journal on Human Computer Interaction	VTT	Human Computer Interaction
	IEEE Transactions on Circuits and Systems for Video Technology	TU/e	Video and signal processing
	SPIE Journal of Electronic Imaging	TU/e	Computer vision
	Journal of machine vision and applications	VTT	Computer vision
	Multimedia tools and applications	VTT	Video and signal processing
	Signal processing: image communication	VTT	Computer vision
	Signal, image and video processing	VTT	Video and signal processing
	Journal of Visual Communication and Image Representation	TU/e	Computer vision
	International journal on smart sensing intelligent systems	ARGEDOR	Sensor networks
	Journal of Information and data management	ARGEDOR	Data management systems
	International Journal on Semantic Web and Information Systems	ARGEDOR	Information systems
	International Journal on Human Computer Interaction	VTT	Human Computer Interaction
Commercial Trade Exhibitions	Safety & Security Amsterdam, The Netherlands	ViNotion	
	Security Essen, Exhibition for Security and Fire Prevention, Germany	ViNotion	
	IFSEC International, Exhibition and Conference event for security industry, London, UK	ViNotion	

Table 5: Overview of dissemination possibilities

4. Consortium

4.1 Consortium overview: key players

Partner	Country	Type of Partner	Positioning in the value chain
C2 SmartLight Oy	FIN	sme	Outdoor Lighting
Digital Living Finland Oy	FIN	sme	SME, personalised life management eservice provider in Web 3
Helvar Oy Ab	FIN	ind	Lighting control and systems
Innorange Ltd	FIN	sme	SME Business Intelligence
Kone	FIN	ind	global system supplier for construction industry
Mypose Oy	FIN	sme	Digital retail marketing solutions
Offcode Oy	FIN	sme	SME HW/SW engineering R&D
Pro Piknik Festivals	FIN	sme	SME - deployment & utilization
Valopaa Ltd.	FIN	sme	Lighting solutions provider
VTT Technical Research Centre of Finland	FIN	res	RES - smart environment technologies
CEA	FRA	res	Research on video analytics
CITILOG	FRA	sme	SME - video detection for traffic management & light managem
Lille 1 University	FRA	uni	Scene understanding, activity recognition, event detection
Thales	FRA	ifc	Information fusion & Decision managment
Thales Services SAS	FRA	ifc	Video analytics and architecture
Urban Community of Strasbourg	FRA	gov	end user
Delft University of Technology	NLD	uni	University, bio robotics, embedded software
Eindhoven University of Technology	NLD	uni	University, R&D video analysis & light perception
Philips Lighting	NLD	ifc	Large Industry - Intelligent Lighting
Philips Electronics Netherlands BV	NLD	ifc	Large Industry - Intelligent Lighting
Prodrive	NLD	sme	Electronic System development & Manufacturing
ViNotion BV	NLD	sme	Research on video analytics technology
ECRO SRL	ROU	sme	SME Smart Grid
Siveco Romania S.A.	ROU	ind	ICT Large Industry
FADA-CATEC	ESP	res	Research Centre

SCATI	ESP	sme	SME Video analytics & video surveillance integration
Telvent	ESP	ifc	Large Industry, Service developer
ARGEDOR Information Technologies Ltd.	TUR	sme	SME, Big data Analytics.
Argevas	TUR	oth	Data analysis, Algorithm development on energy efficiency
Ericsson Arastrma Gelistirme ve Bilisim Hizmetle	TUR	ind	M2M Data Analysis
KoçSistem Information Communications Services	TUR	ind	System Integrator, Data analysis,
Provus Bilisim Hizmetleri A.S	TUR	sme	SME Business Intelligence, Service Development
Verisun Informatics Ltd	TUR	sme	Sensing, data representation, mobile applications

4.2 Partners' positioning along the described value chain

The **INSIST consortium** consists of 33 partners in the Netherlands, France, Finland, Romania, Turkey and Spain:

Each of the partners of the project has been selected in a way that ensures that the full spectrum of skills and expertise required for carrying out the proposed project are present in the INSIST consortium.
It must be emphasized once again that the partners were selected to be complementary in terms of their skills and knowledge, as well as for the role they will play within INSIST. Each partner has an impressive track record in knowledge creation and innovation in their respective domains of expertise. As a result, the partners that have been included in the consortium were selected, based on their ability to **add value to the project**, through their **commitment to joint innovation** at a Pan-European level, their **specific knowledge**, and their capacity for dissemination and exploitation. This plan also incorporates the extensive experience and knowledge of the other members of the consortium in participating in previous ITEA and the other EU framework programmes.

These points become more evident from the short description of roles, expertise and experience which are presented in Table 6. Moreover, Table 6 clearly highlights the roles and the functions (responsibilities and involvement) of each participant in the INSIST consortium. The more extensive profiles of the partners of the INSIST project, as well as the short CVs of key personnel from all project participants were presented in the appendices, section 10.1

As previously mentioned, we have taken special care in selecting our partners. The most important criteria for their selection were:

- Possession of relevant data and the willingness to share this data (conditionally or unconditionally);
- Innovation in research methodologies and methods for knowledge discovery;
- Adherence to and compliance with legal and ethical issues. Their adherence to these "quality attributes", i.e. openness and collaborative innovation, represents an additional complementarity dimension of project partners.

Finally, it is our experience that an additional attribute that in many cases influences the success of a project is the ability of the various partners to function together as a coordinated and coherent group and perform high-level collaborative research.

The partners in the Insist consortium have a proven ability to working together. Most of them have successfully collaborated in a number of flag-ship research projects in their domains of expertise.
The strong leadership of the project will also assist in further developing the "collaborative innovation culture" of the consortium. The project manager, with the support of the very experienced Philips personnel, will focus on efficient, effective accomplishment of planned tasks, including proper handling of the consortium agreement, intellectual property rights, etc.
Concluding we may reemphasize our belief that the current consortium:

- Is of the highest possible quality, as individual partners;
- Possesses all required skills and expertise relevant to the project;
- Has a very impressive track record in innovative work while working together;
- Is highly motivated.

It is our belief, therefore, that the current consortium will be successful in responding to the various challenges described in our work plan and in delivering a truly innovative suite of solutions, and in setting up appropriate structures for exploiting – either individually or collectively – project results.

Country	Partner	Lighting management			Surveillance			Traffic management			Advertising and atmosphere			System integration	User experience
		Sensing	Analysis	Service	Sensing	Analysis	Service	Sensing	Analysis	Service	Sensing	Analysis	Service		
NL	Philips	x	x	x										x	x
NL	TUe-HTI			x											x
NL	TUe-VCA					x	x		x	x				x	
NL	TUD-BR	x	x											x	
NL	TUD-ES		x	x										x	
NL	ViNotion					x	x		x	x				x	
NL	Prodrive				x		x	x		x				x	
FR	Thales				x	x	x			x				x	
FR	CEA-LIST					x			x					x	
FR	Lille 1 University					x			x					x	
FR	Strasbourg			x			x			x			x		x
FR	Citilog	x	x					x	x	x				x	
FI	VTT	x	x								x	x	x	x	
FI	Valopaa		x	x										x	
FI	MyPose										x	x	x	x	x
FI	Offcode		x									x	x	x	
FI	Innorange										x	x	x	x	
FI	Pro Piknik Festivals												x	x	x
FI	KONE			x			x				x	x	x	x	x
FI	Helvar	x	x	x										x	
FI	C2SmartLight	x	x	x										x	
FI	Digital Living			x			x			x		x	x	x	x
RO	SIVECO			x										x	x
RO	ECRO	x	x	x										x	x
TR	Argevas									x				x	
TR	KocSistem					x	x			x				x	
TR	Ericsson							x	x	x				x	

Country	Partner	Lighting management			Surveillance			Traffic management			Advertising and atmosphere			System integration	User experience
		Sensing	Analysis	Service	Sensing	Analysis	Service	Sensing	Analysis	Service	Sensing	Analysis	Service		
TR	Argedor								x	x				x	x
TR	Provus								x	x				x	x
TR	Verisun							x	x					x	
SP	Telvent							x	x	x				x	
SP	Scati				x	x	x							x	
SP	Catec				x	x		x	x					x	

Table 6: Overview of the partners involved completing the value chain

4.3 Cooperation added value

4.3.1 Technology level

Horizontal and vertical technology innovation/cooperation contained in the consortium
The INSIST project proposal wants to establish innovations by bridging several technological fields: the lighting field and surveillance field (with traffic management), and advertisement where the combination of these fields will nurture not only ideas and exchange of technology within the fields, but the combination/bridge between the two areas will enable unprecedented innovation at the high system layer in information-controlled lighting and strongly improved safety and security vice versa from the lighting in the surroundings. Especially at this bridge/combined level, scenario's and solutions can be developed that would never occur by a project in one individual field. The consortium has been positioned and constructed in this way. The current practice is that within each individual field, such intelligent scenario-based applications would never be implemented at large scale, since projects are typically not positioned for this. INSIST will enable such scenarios and their evaluation.

Looking to the individual fields of lighting and surveillance/traffic management, the consortium is well balanced in the sense that a few large industrial partners per area will lead the areas and offer the reception platform for high-tech innovations coming from the SMEs in the respective areas. In the lighting area, the Philips Company is a world leader in lighting systems, Prodrive offers embedded platforms for integrated computing and their own production technology, whereas Ericsson can aid with networking between lighting devices (M2M) and connected systems technology. For the surveillance area, a similar situation occurs, where the company Thales, KocSistem and Telvent are in large surveillance and traffic management systems development.

For the several fields a number of high-tech SMEs are enclosed in the consortium, offering multiple specific and niche solutions in terms of algorithms and techniques, which are interesting for integration of innovative solutions into the larger systems of the large industrial partners. Examples of this are ViNotion and Scati with crowd and object detection and recognition (video analysis), a group of SMEs like MyPose, Innorange, Propiknik Festivals in the advertisement area, Argevas, Argedor, Provis, etc. for traffic management. Besides these SMEs, innovations will come and defined by a number of Universities and research institutes, such as TU-Delft for embedded solutions for lighting, Lille 1 University, CEA-LIST and TU/e with video analysis for traffic and surveillance, VTT for advertisement and people behaviour. The number of SMEs and Universities/institutes is just broad enough to create substantial innovation power in conjunction with the larger partners.

While the individual clusters in lighting, traffic, surveillance and advertisement are powerful for their application area, the bridging between the areas will enable very interesting innovative scenarios for research and development of new applications. In this sense, the project consortium brings both width in applications and depth in systems and technology and innovation providers.

With respect to what the project can bring in terms of the goals of individual partners, we sketch snapshots of the interests of a selection of partners, since the consortium is too large to describe each individual partner's benefits and goals.

4.3.2 Business level

Examples of partner goals and benefits within the project
Philips aims at growing the lighting market with intelligent professional systems that reduce energy consumption. Intelligent embedded systems with integrated algorithms will offer a lower total cost of ownership for cities, infrastructure customers and the like. For the company as a system maker, it essential to learn the breaking point when that cost of ownership is lower than that of conventional situations

ViNotion expects serious market potential due to its SW component integration into professional surveillance cameras. They foresee markets for cities throughout Europe. The project offers large system integrators working on an international scale that may adopt their algorithms, whereas they can benefit from the existing and expanding university relations for new algorithm ideas such as from TU/e, Lille 1 University and CEA for video analysis technology.

Prodrive expects new business opportunities on 10xHD intelligent camera platforms. Our goal is to create a platform that is capable to accommodate many kind of Video Content Analysis algorithms from many vendors (partners) worldwide on this platform. Prodrive will support these partners to map their algorithms most efficiently on this platform and will provide an environment based on ONVIF to make integration with Video Management Systems easy, quick and reliable.

TU Delft-ES has been active in the area of Wireless Sensor Networks for more than 10 years and has a solid understanding of networking and data processing on embedded devices with limited capabilities. Participation within the INSIST project will allow them to expand their knowledge base and validate gossip-based algorithms in a real-world setting.

TU/e is active in video analysis for coding and intelligent video communication systems for 15 years now and has an excellent track record in industrial cooperation. The INSIST project offers a multitude of partners in new countries like Turkey, while the Dutch, French and Finish countries offer supplementary market areas for learning new applications, and thus expand on the depth and width of its know-how in image analysis and real-time applications.

Thales is a large industrial system maker for the defence and surveillance markets. The INSIST project will offer improved urban supervision solutions relying on a broader use of video analysis to capture and understand data from the city.

SIVECO will utilize its expertise of building software systems (information retrieval, content management, decision making, and application integration), empowered by the knowledge of INSIST related technologies gained during the project, in order to setup a valid strategy for the exploitation of project results. SIVECO's participation in the project is to share relevant information in order to develop competences for the beneficiaries of the project in the project's targeted domain and to raise awareness of the research work carried out within the project.

ECRO will utilize its expertise in energy management for lighting systems and in smart grid technologies in order to develop new functionalities towards dynamic lighting in municipalities, integrated in a Smart City concept and considering also the power system aspects in a national deregulated energy market.

VTT can further expand its R&D in the domain of advertisement and signage technology. The cooperation with and amount of SMEs is significant, so that they expand in the discipline of signage applications and underlying technology components including people behaviour monitoring means, data management and decision making services, intelligent user interfaces and adaptation techniques

Citilog is SME focussing on video analytics dedicated to road traffic management (Automatic Incident Detection, Traffic Data Collection and Intersection Control). The INSIST project offer the possibility to explore new market segments or new distribution models (ex: light management) and to develop or to reinforce relationships with large scale integrators and research laboratories.

5. Work Description

The INSIST project is divided into 6 technical work packages, and one management work package. The main activities are described below.

5.1 Work Breakdown Structure and technical overview

A detailed overview of the work breakdown of WP's activities and deliverables is shown in table 7 below.

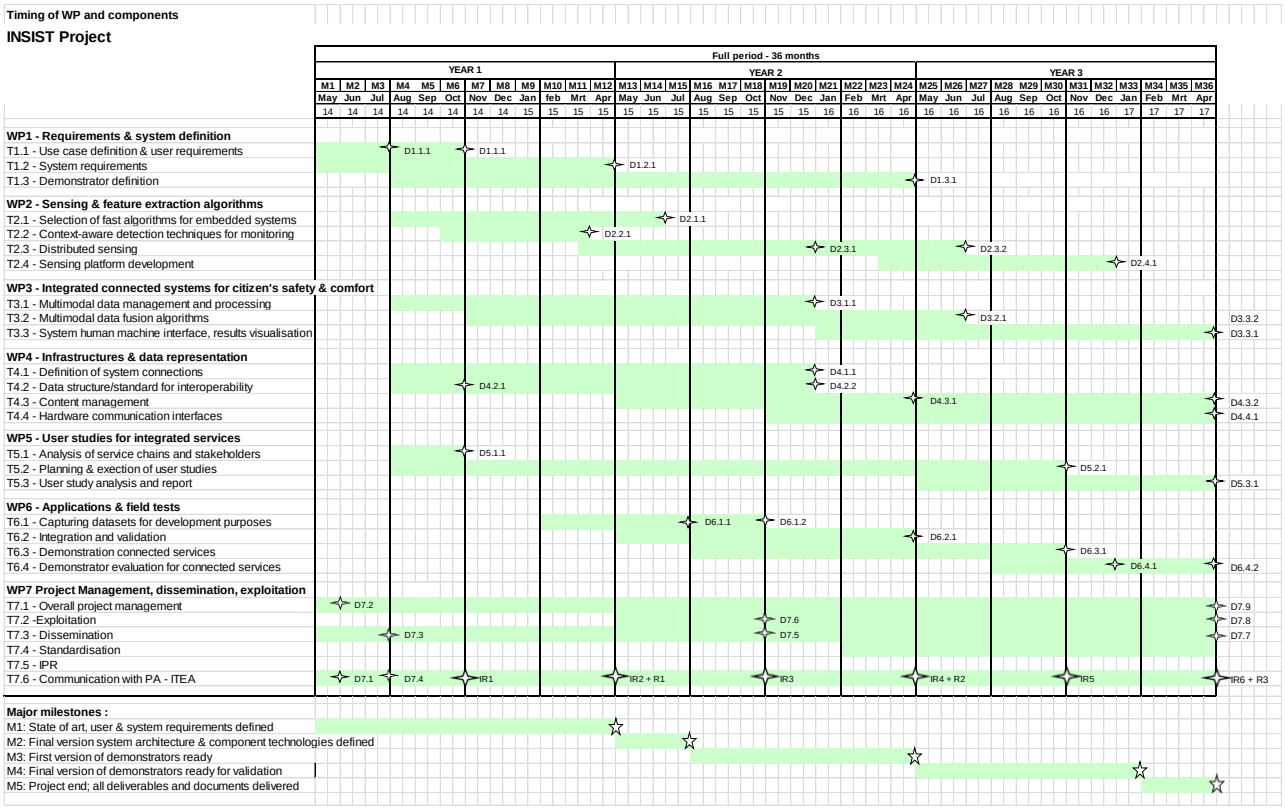


Table 7: Work breakdown WP's, tasks, deliverables and milestones

WP1 Requirements and system definition

- Develop requirements (operational and functional) for smart lighting, security, traffic monitoring, advertising systems (ALL)
- Develop requirements (operational and functional) for systems of systems integrating lighting, security, traffic monitoring, advertising (ALL)
- Develop propositions for cross-system integrated services for citizens' safety and comfort (ALL)
- Define scenarios and integration options (ALL)

WP2 Sensing and feature extraction algorithms

- Sensors and algorithms for detection and classification for lighting system control (Philips Research, TUDelft-BR, TUDelft-ES, ECRO, VTT, C2SmartLight, Citilog)
- Sensors and algorithms for video people detection and tracking, data analytics, event recognition (Prodrive, TUe-VCA, ViNotion, Thales, CEA LIST, Kone, Lille 1 University, Scati, Catec)
- Sensors and algorithms for detection and tracking, data analytics, event recognition for traffic monitoring (Prodrive, TUe-VCA, ViNotion, CEA LIST, Citilog, Ericsson, Verisun, Telvent, Catec)
- Sensors and algorithms for intelligent advertising and atmosphere creation (VTT, MyPose)

WP3 Integrated connected systems for citizens' safety and comfort

- Information format requirements for integration with other systems (Philips Research, ViNotion, Prodrive, Thales, Citilog, VTT, Offcode, Helvar, Kone, Digital Living, , SIVECO, ECRO, KocSistem, Ericsson, Argedor, Provus, Telvent, TU/e-VCA, Scati, Catec)
- Feature extraction and analysis algorithms for integration with other systems (ALL ABOVE)
- Algorithms for people, vehicle, activity, event detection in distributed, hybrid sensor networks (ALL ABOVE)
- Data analytics for system maintenance, fault detection, automatic configuration, business intelligence, visualization (ALL ABOVE)

WP4 Infrastructure and data representation

- Infrastructure requirements (Philips Corporate IT, Philips Research, ViNotion, Prodrive, Thales, Citilog, VTT, Valopaa, Offcode, Helvar, Kone, ProPiknik, ECRO, KocSistem, Ericsson, Argedor, Provus, Telvent, Scati, Catec)
- Data management infrastructure (communication, storage…) and data formats (ALL ABOVE)
- Definition of connected systems

WP5 User studies for integrated services for citizens' safety and comfort

- Study definition, identification of relevant parameters (Philips Research, TUe-HTI, ECRO, SIVECO, Digital Living, City of Strasbourg)
- Proposition and evaluation light control strategies for security and energy savings (Philips Research, TUe-HTI, ECRO, SIVECO, Kone, Digital Living, City of Strasbourg)
- User studies of connected services

WP6 Applications and field tests

- Infrastructure set-up (ALL)
- Collection of representative datasets for development purposes (ALL)
- Smart lighting, surveillance, traffic monitoring, signage integrated services demonstrators (ALL)
- Demonstration of connected services

WP7 Project management, dissemination, exploitation, standardisation

- Project planning, execution, control and closure
- Project tracking (finance and planning)
- Progress reporting (internal & external)
- Deliverable specification, verification and validation
- Risk management (risk identification and mitigation at the start and mid-term milestone)
- Quality management
- Configuration management
- Communication (internal and external)
- Technical problem solving (possibly supported by external advisers)

5.1.1 Project and Work Package Leaders information

	Leader's Name	Organisation
13021 INSIST	Ad de Beer	Philips Electronics Netherlands BV
WP 1 Requirements & system definition	Gianluca Monaci	Philips Research
WP 2 Sensing & feature extraction algorithms	Pieter P. Jonker	Delft University of Technology
WP 3 Integrated	Jean-Francois Goudou	Thales Services SAS

connected systems for public comfort & safety		
WP 4 Infrastructure & data representation	Özgün Algin	Argevas
WP 5 User studies for integrated systems	Jesús Bermejo Muñoz	Telvent
WP 6 Applications & field tests	Johannes Peltola	VTT Technical Research Centre of Finland
WP 7 Project management, exploitation & dissemination	Gianluca Monaci	Philips Research

5.1.2 Effort breakdown

Partner	Country	WP1	WP2	WP3	WP4	WP5	WP6	WP7	Total
C2 SmartLight Oy	FIN	0.20	0.50	0.60	0.00	0.00	2.00	0.00	3.30
Digital Living Finland Oy	FIN	0.16	0.00	0.07	0.00	0.06	0.45	0.43	1.17
Helvar Oy Ab	FIN	0.40	0.00	0.40	1.60	0.00	1.20	0.00	3.60
Innorange Ltd	FIN	0.50	0.00	0.00	0.00	0.00	1.00	0.00	1.50
Kone	FIN	0.90	0.00	0.00	2.40	5.55	0.20	0.00	9.05
Mypose Oy	FIN	0.25	0.25	0.00	0.00	0.00	1.00	0.00	1.50
Offcode Oy	FIN	0.33	0.00	1.76	1.74	0.00	0.33	0.00	4.16
Pro Piknik Festivals	FIN	0.40	0.00	0.00	1.00	0.00	1.00	0.00	2.40
Valopaa Ltd.	FIN	0.50	0.00	0.00	4.00	0.00	1.50	0.00	6.00
VTT Technical Research Centre of Finland	FIN	1.30	3.30	2.50	3.30	0.00	3.30	1.30	15.00
CEA	FRA	0.50	2.10	1.60	0.50	0.00	1.50	0.40	6.60
CITILOG	FRA	0.90	0.99	0.60	0.30	0.00	0.51	0.30	3.60
Lille 1 University	FRA	0.40	1.50	1.90	0.50	0.00	0.60	0.60	5.50
Thales	FRA	0.50	5.00	0.00	1.00	0.00	1.00	1.00	8.50
Thales Services SAS	FRA	1.80	0.00	7.90	0.00	0.00	2.30	0.40	12.40
Urban Community of Strasbourg	FRA	1.00	0.00	0.00	0.00	0.60	0.40	0.00	2.00
Delft University of Technology	NLD	0.47	10.32	0.00	0.00	0.00	2.16	0.40	13.35
Eindhoven University of Technology	NLD	0.70	2.84	1.92	0.00	3.24	1.73	0.84	11.27
Philips Lighting	NLD	0.60	0.00	0.00	0.00	1.00	3.90	0.50	6.00

Philips Electronics Netherlands BV	NLD	4.30	2.10	2.30	1.90	0.60	1.90	1.90	15.00
Prodrive	NLD	0.67	5.00	0.00	0.67	0.00	2.33	0.33	9.00
ViNotion BV	NLD	1.00	2.74	0.50	1.00	0.00	2.00	0.26	7.50
ECRO SRL	ROU	1.10	0.40	0.60	0.00	1.00	2.20	0.40	5.70
Siveco Romania S.A.	ROU	1.12	0.00	1.00	0.00	2.85	3.70	2.00	10.67
FADA-CATEC	ESP	0.50	1.00	0.30	0.20	0.30	0.20	0.00	2.50
SCATI	ESP	0.75	3.00	1.50	0.75	0.00	1.50	0.00	7.50
Telvent	ESP	2.91	0.88	2.91	1.74	0.00	2.96	0.60	12.00
ARGEDOR Information Technologies Ltd.	TUR	1.25	0.00	1.80	3.00	0.00	2.75	0.70	9.50
Argevas	TUR	1.10	0.00	1.60	2.50	0.00	1.10	0.80	7.10
Ericsson Arastrma Gelistirme ve Bilisim Hizmetle	TUR	3.20	3.60	2.40	2.80	0.00	0.00	0.00	12.00
KoçSistem Information Communications Services	TUR	0.50	2.30	1.10	3.80	0.80	1.20	0.50	10.20
Provus Bilisim Hizmetleri A.S	TUR	1.50	0.00	1.40	1.40	1.40	1.90	0.60	8.20
Verisun Informatics Ltd	TUR	1.60	5.00	0.00	2.00	0.00	1.80	0.00	10.40
Totals		33.31	52.82	36.66	38.10	17.40	51.62	14.26	244.17

5.2 Work Packages description

5.2.1 Work Package 1

Work Package 1: Requirements and system definition	
WP1 start date	M1
WP1 end date	M24

Objectives:
The role of WP1 is to investigate the state-of-the-art and gather the requirements on the smart systems targeted by the INSIST project, and their development flow. WP1 will capture and organize the functional requirements of the smart lighting, surveillance, traffic monitoring and advertising systems. The operational and functional requirements for the integration and compatibility of the lighting, surveillance, traffic monitoring and advertising systems will be developed and organized. Based on these requirements, propositions for cross-system integrated services for citizens' safety and comfort will be elaborated and documented, and demonstration scenarios and integration options formulated.

Expected results:

State-of-the-art investigation, requirements, propositions, demonstration scenarios and integration options for cross-system integrated services for citizens' safety and comfort.

Detailed activities:

The WP is divided into the following (main) activities:

Activity 1.1: Use case description and user requirements – ViNotion
The INSIST uses information in people's behaviour and preferences acquired from sensors that are distributed in public urban spaces. One of the key elements of the project is interconnection and sharing of information from different subsystems to expand the usage and create an ecosystem for new applications. As a start, the activity will investigate the state-of-the-art on cross-system integrated services for citizens' safety and comfort. The result of this investigation will be documented in deliverable D1.1.1 "State-of-the-art on cross-system integrated services for citizens' safety and comfort".

Next, the project will investigate typical use cases and user requirements relevant for cross-system integrated services. In the project proposal we distinguish use cases focusing on different applications:

- Light management
- Security and surveillance
- Traffic management
- Advertisement and atmosphere creation

In **light management** applications the sensor information can be used for presence-based light control, thereby saving energy. Lighting can also be used for de-escalation of aggression in a night-life area when such situations are automatically detected.
Security and surveillance applications uses sensor information to trace suspicious people and can make use of the lighting system to notify or prevent criminal activities and prevent dangerous situations in case large crowds appear for an event or festival.
For **traffic management**, the sensor information can be used to optimize the flow through the city, to warn and navigate vehicles via road signs and bill boards or automatically recognize accident situations.
In **advertising and atmosphere creation,** the comfort and effectiveness of advertising is increased by adaptive digital signage information and adjustable atmosphere lighting elements based on sensor data from people presence and behaviour sensors.

This activity will involve the collection of potential scenarios in cross-system integrated services. Based on selection criteria (technological and business aspects) the potential scenarios are evaluated and ranked. For the most promising scenarios we will focus on possible use cases that are realistic for future deployment and exploitation and these use cases will be further detailed. The demonstrators that are developed within the project will prove the feasibility of the use cases and provide innovative solutions for the technological challenges. The demonstrators represent a subset of the use cases and are separately addressed in WP6. The defined use cases and collected user requirements will be documented in the deliverable D1.1.2 "Use case definitions and user requirements specification".

Activity 1.2: System requirements – Provus
The main objective of this activity is the definition and the consistency evaluation of the generic INSIST system requirements, taking into account the use cases and user requirements of the targeted applications. These will include sensing functionality and its requirements (detection, recognition, tracking, etc.) and system responsiveness. The operational requirements will be also defined and prioritized: system cost, electrical consumption, networking, installation complexity, integration aspects, etc.
To achieve this goal, a system requirement specification methodology will be used. This will facilitate the generation of a detailed definition of the different parts of system features and constraints and how the parts relate to each other. Once the system requirements have been defined, this activity will also deal with the detection of requirements inconsistency, as a key to success in the development of a heterogeneous system as INSIST, and the management of the inconsistencies. The functional and operational requirements will be documented in the deliverable D1.2.1 "System requirements specification".

Activity 1.3: Demonstrator definition – VTT

This activity will define the demonstrators, which will be used to evaluate the feasibility of both business aspects of the use case and technological solutions. The demonstrators will implement selected functionalities of the use cases defined in previous activities. We aim at providing demonstrators on two levels:

- Basic demonstrator components aiming to solve a specific technological challenge
- Integrated demonstrator systems providing an extensive solution for an application domain

The basic demonstrator components will focus on the following technological challenges:

- Sensing solutions (algorithms and platforms)
- Distributed sensing networks
- Data analytics
- Perception

The integrated demonstrator systems will target the four INSIST application domains:

- Light management
- Security and surveillance
- Traffic management
- Advertising and atmosphere creation

The descriptions of the basic demonstrator components and integrated demonstrator systems will be documented in deliverable D1.3.1 “Specification of basic demonstrator components and integrated system demonstrators”. The demonstrators depicted here will be subject to evaluation in the final phase of the project. Our focus is to demonstrate the innovative nature of the technology solutions developed in INSIST.

WP1 Leader: Philips Research

Partners breakdown

Partner	**Contribution**
Philips Research	Philips Research will be the overall WP leader and will contribute to the definition and specification of use cases, will gather and structure system requirements, mainly for the Lighting system, and will contribute to the definition of the demonstrators involving Lighting infrastructure.
Philips Lighting	Philips Lighting will also contribute towards the definition of the demonstrators involving Lighting infrastructure
ViNotion	ViNotion will coordinate activity 1.1 ViNotion is commercially active in crowd control and people flow analysis for marketing research. ViNotion is also active in intelligent video surveillance. Hence, ViNotion will contribute input from its customers for traffic management and surveillance.
Prodrive	Prodrive will contribute in activity 1.1 and 1.3 in the area of Security / Surveillance and Traffic management. Prodrive will retrieve the requirements from their current partners in the security market and will define the 10xHD intelligent camera platform in cooperation with the Video Content Analysis partners.
TU/e VCA	TU/e VCA will investigate the state-of-the-art and the functional requirements for surveillance and traffic monitoring with respect to traffic object descriptions for detection and categorization. Also, a contribution will be made in defining the use case scenarios.
TU/e HTI	TU/e HTI will investigate possible use cases, and contribute to formulating user requirements especially in relation to light management and lighting services.
Citilog	Citilog will contribute to the 3 tasks bringing its experience in video analytics and traffic sensing and management.
Thales Services	Thales Services will participate on requirements definitions and coordinate the French demonstration for lighting, traffic and video-protection data exchanges and management
Lille 1 University	Lille 1 University will participate in the definition of user ans system requirements, bringing expertise in video analysis. Lille 1 will be involved in activities 1.1 and 1.2.

Strasbourg	The urban community of Strasbourg, as End-User of the INSIST system, will participate to all activities of the Work Package and especially work on: • The use case and user requirements definitions (Activity 1.1). • the demonstrator definition (Activity 1.3)
SIVECO	SIVECO will participate in defining the generic INSIST system requirements and the integrated demonstrator systems, Thus it will be involved in task 1.2 and task 1.3
ECRO	ECRO will participate to all tasks in WP1: use case definitions and user requirements specifications, system requirements specification, specification of demonstrators.
ArgeDOR	ArgeDOR will contribute WP 1.1 and WP 1.2 for defining use cases and gather the state-of-the-art and the requirements on the smart systems. ArgeDOR especially concentrate on the gathering, management and processing of generated data from different services, i.e. light management, security and surveillance, traffic management, advertisement and atmosphere creation
Provus	Provus will coordinate activity 1.2 and will contribute to the definition and specification of the functional and operational requirements, as well as to the detection and evaluation of the inconsistencies within the requirements.
Kocsistem	KocSistem will contribute on requirements specification of the global management of big data sets; developing use cases to check the feasibility and accuracy of data formats
VTT	VTT will coordinate activity 1.3 and will contribute actively to the specification of the Finnish consortium demonstrator on intelligent Advertising and atmosphere creation participating to all tasks in WP1.
MyPose	MyPose will participate to all the activities in WP1 focusing on advertising and digital signage solutions.
Innorange	Innorange will participate in Activity 1 with 25% of total WP effort and to Activity 3 with 75%. In Activity 3 Innorange works closely with VTT's technology solution based on 3D depth sensor.
Valopaa	Valopaa expertise is in light management. We will participate and contribute to all WP1 sub activities. We contribute to use case/user requirements, system requirements and demonstrator definition on light management area.
KONE	KONE will participate to all tasks in WP1: use case definitions and user requirements specifications, system requirements specification, specification of demonstrators.
Offcode	Offcode participates to all tasks in WP1: use case definitions, systems requirement specification and demonstrator specification.
Digital Living Finland Oy	Digital Living Finland Oy will work on: • the cross system requirements based on the use case descriptions and user requirements within the activity 2, • the integrated demonstrator systems within the activity 3.
C2SmartLight	C2Smartlight will participate to all activities in WP1 contributing on requirements and specifications related to smart lighting systems.
Pro Piknik Festivals	Pro Piknik Festivals / PPF will contribute to defining the scenarios of functional requirements for a specific advertising system and its integration to other data systems.
Helvar	Helvar will contribute to all the activities in the work package focusing on requirement setting and specification of smart lighting systems.
Milestones and deliverables	
M 3	D1.1.1 - State-of-the-art on cross-system integrated services for citizens' safety and comfort
M 6	D1.1.2 - Use case definition and user requirements specification
M 12	D1.2.1 - System requirements specification
M 24	D1.3.1 - Specification of basic demonstrator components and integrated system demonstrators

5.2.2 Work Package 2

Work Package 2: Sensing and feature extraction algorithms	
WP2 start date	M3
WP2 end date	M32

Objectives:
The goal of WP2 is to develop a set of tools and algorithms to capture and analyse data from a sensor or a set of homogeneous sensors (dominantly visual sensors in WP2) which are monitoring the environment, where smart lighting, surveillance, traffic monitoring and advertising systems are installed in the surroundings. The aim is to extract and describe the salient information of the observed scenes, so that objects and related information can be effectively detected. This object data is then used by the considered application (e.g. traffic analysis to control street lighting) and/or it can be shared with other systems (city and safety control) for further processing and aggregation to develop integrated hybrid applications. WP2 will develop new sensor network infrastructures. Therefore, this WP also involves algorithms for detection and classification for lighting system control, algorithms for people detection and tracking, data analytics, event recognition in surveillance camera networks, algorithms for vehicle and pedestrian detection and tracking, traffic density and lane density estimation for traffic monitoring, and algorithms for smart signage interaction. The previously mentioned object detection algorithms result dominantly from the data of one or more visual sensors. However, other sensors may also be applied as long as the same sensor type is used. This work package receives input from WP1 in the form of requirements and uses case definitions, and will provide input for WP3 and WP4, where integration activities between different systems will be carried out and various sensor modalities are combined.

Expected results:
- A set of fast object/feature detection algorithms, suited for embedded application and tailored to traffic participants, traffic flow, etc.
- Feature extraction algorithms dedicated to traffic measurement and traffic density, participants and suited for lighting control, and context feature extraction algorithms.
- Distributed sensing algorithms for multiple sensors for high robustness, eliminating inconsistencies from individual sensors and exploiting redundancy from the multiple sensors.
- Embedded optical light measurement system suited for use in lighting infrastructure and exploring multifaceted optics and light change detection algorithms for object presence detection.

Detailed activities:
The WP is divided into the following (main) activities

Activity 2.1: Selection of fast algorithms for embedded systems – TU/e VCA
Numerous algorithms for feature and object detection (cars, pedestrians, etc.) already exist from video content analysis projects (e.g. CANTATA, ViCoMo). However, the vast majority of deployed surveillance cameras do not include object detection, since algorithms are not suitable for integration into embedded systems. For the desired efficient, low-cost integration of video analysis, this activity concentrates on choosing the best and efficient algorithms for the sensor data analysis approaches which will be developed and further explored in this work package. For comfort and security of citizens, the algorithms should provide high accuracy of the results and at the same time, these algorithms must be suited for an embedded real-time implementation. We will investigate and identify the algorithms that balance the accuracy and computational costs such that they are suitable for (near) real-time performance and embedded implementation. The output of this activity will yield a list of suitable algorithms that have been evaluated with respect to performance and computational cost.

Activity 2.2: Context-aware detection techniques for monitoring – Lille 1 University
The objective of this activity is to elaborate tailored sensor-dependent data processing techniques for smart

lighting, surveillance, traffic monitoring and advertising systems. More specifically, this activity focuses on the design of software components that handle the pre-processing and extraction of relevant features from raw sensor data. The goal of this activity is make the sensor data more precise, compact and accurate.
The required features for city and lighting control split up into several areas: features for traffic participants and features for context information. Traffic participants are moving objects, such as cars and moving vehicles in the broadest sense, pedestrians, and the like, and also their trajectories on the road(s). Context information in traffic is found in the spatial organization of scene (road infrastructure), but also static objects influencing the traffic (signs, lane indication) and the weather conditions. This work package intends to extract the features involved with finding the traffic participants and the required context features. Since this type of feature extraction forms the beginning and fundament of the analysis framework at higher level (events, etc.), they have to be carefully designed to realize a high performance and reliability/robustness at the higher levels of analysis. Besides this, the detection techniques have to take into account a number of circumstances (location, time and date, weather conditions, etc.) that form the context of the monitored scene and will help its interpretation and understanding.

Activity 2.3: Distributed sensing (homogeneous) – CEA List
This activity focuses on developing the sensing functionalities from sensors of the same type, which will be dominantly visual sensors. The individual detected object and features from Activity 2.2 (e.g. people, vehicles) can be used and combined in this Activity 2.3 to analyse the traffic flow in a broader network view. In this activity this will lead to estimating the flow of traffic along a trajectory with several sensors, the detection of special events and detecting the behaviour of traffic or a set of participants.
The detection of events and higher levels of analysis like flow is typically not possible with a single sensor so that we analyse a set of identical sensors as in a homogeneous sensor network, which will enable monitoring of large areas with more precise and robust outputs. The robustness comes from multiple detections and confirmations of what already was found by a single sensor. As a result, the distributed sensing within a given area can yield a smarter light control, by avoiding errors from inconsistent sensor results. Distributed data analytics can also deliver consolidated statistics like traffic flow at a crossroad, human presence and activity in a given neighbourhood for video surveillance or intelligent advertising. Besides intelligent use of distributed sensor data, video analytics should be robust to illumination change because the algorithms will have to run day and night in various outdoor conditions. Moreover, in the smart light control application, they will be part of the light control loop, triggering a light modification which will impact their results. As input, the sensing functionalities will use the results of the context-aware detection techniques developed in Activity 2.2 of WP2. The output of this activity will be used as input in WP3 for multimodal data fusion from heterogeneous sensors.

Activity 2.4: Sensing platform development – TU Delft
This activity aims at developing a low-cost sensor platform for embedding in lighting system or other devices that can serve to do light measurement and or global forms of object presence detection by finding the light changes when objects pass by. This will involve HDR (high dynamic range) sensing, special optics construction and light measurement. First, a physically related radiance measurement of the scene is evaluated for a wide range of HDR sensors. Second, the optics construction has to be considered in detail. Multifaceted optics manufacturing is a challenging activity as many tiny individual structures have to be packed together in a small volume according to a complex geometry. We will focus on optimizing the manufacturing process and the materials on one side and the geometry of the optical waveguide arrays typically used in multifaceted optics. Third, with the new optics, light calibration has to be re-tuned and calibrated. Specific algorithms to extract the light field from the captured “image”, correct it for performance phenomena and extract the actual illumination of a specific area in space.

Event detection with such an embedded optic system with HDR sensor(s) is an interesting activity. The specific geometry of faceted optics makes it possible to sample a very large portion of the space with a small number of photo sensitive elements. Because of their low spatial resolution, static image analysis is not an option with faceted lenses, but this low resolution also makes it possible to use advanced machine learning algorithms to learn the patterns of changes of intensity over the lenses corresponding to specific events (e.g. pedestrians or cars passing by). In INSIST, we will design such algorithms based on reinforcement learning and propose solutions to allow for online learning of events when the camera is on site.

Finally, to take advantage of multiple cameras surveying a particular scene, we will be developing a communication substrate for sending/receiving data while being easy to operate (auto configuration) and resilient to changes in network topology. To this end we will base our efforts on the gossip paradigm in combination with advanced compression techniques to cater to the particular need of image fusion.

WP2 Leader: TUD

Partners breakdown

Partner	**Contribution**
Philips Research	Philips Research will contribute to Activity 2.1, providing recommendations and contributing to literature survey for embedded sensing options for lighting systems. Furthermore, Philips Research will also collaborate with TU Delft in Activity 2.4 to provide specifications for the low-cost sensor platform for the lighting system.
TU/e	TU/e will develop tests and evaluations of traffic object detection and traffic feature extraction algorithms using video/images captured with low-cost visual sensors and a comparison of performance and computational costs of those algorithms. TU/e will also contribute to robust multi-sensor traffic analysis algorithms for measuring global traffic participation and throughput. For homogeneous multi-camera systems, TU/e will create signatures of traffic vehicles and human participants to measure participation trajectories and build with this more accurate throughput and traffic flow parameters.
ViNotion	ViNotion has background on pedestrian detection for people counting and will extend the functionality to also recognize other traffic participants like vehicles, bicycles. Moreover, the detection system should be invariant for the viewpoint toward the objects. This requires more advanced features. Finally, we will improve the tracking of object; enable more accurate counting and behaviour analysis for WP3.
Prodrive	Prodrive will contribute in activity 2.1 in the area of Security / Surveillance and Traffic management. Prodrive will investigate several kind of Video Content Analysis algorithms mapped on embedded hardware platform (FPGA's, DSP's, GPU's, generic processors and the mix of these processing blocks) in cooperation with their partners.
TUD	University of Delft will develop prototype optics for HDR sensing, with low-resolution and high-resolution configurations of lenses with optimizations of geometry and manufacturing aspects. Prototype sensors will be developed for material and application evaluations. Besides this, event detection for multifaceted optics will be developed, as well as a gossip-based communication substrate for image fusion.
Thales SA	Thales SA will participate to this work package with innovative algorithm design for Complex Event Processing and information fusion.
Lille 1 University	Lille 1 University will coordinate activity 2.2. Besides, Lille 1 will contribute to activities 2.1 and 2.3 with feature extraction algorithms that are fast and robust to various situations, such as illumination changes and weather conditions. Intended features for extraction are objects like cars and pedestrian, but also traffic flow and traffic density.
Citilog	Citilog has a filed proven experience in video detections applied to traffic management. Citilog will work on using its sensors for smart lighting application and thus will works on video analytics algorithms in order to provide pertinent data enabling adjusting lighting depending on traffic volume or depending on traffic incidents. Citilog will also work on advanced algorithms for traffic management and road safety applications, focusing on new modes mobility such as 2-weelhers and pedestrians.
CEA-LIST	CEA LIST will coordinate task 2.3. CEA LIST will develop people, groups of people, and vehicles detection and tracking algorithms for both surveillance and traffic management applications, from single visual sensors and networks of homogeneous visual sensors. Robust multi-class classification methods for discriminating people and vehicles will be investigated. Special attention will be paid to video analytics robustness despite variations of illumination from natural and artificial light sources.

	In addition, the developed algorithms will benefit from the coupling between light management and video analytics to achieve better performance.
ECRO	ECRO will contribute at activity 2.2, Context-aware detection techniques for monitoring and activity 2.4: Sensing platform development, by establishing simple cost effective detection techniques and low cost embedded platforms which will allow dynamic lighting services for pedestrians.
VTT	VTT will participate to tasks 2.1, 2.2 and 2.3 focusing on development of algorithms for people behavior analysis as well as people movement, action and intention modeling. Main focus in sensing and feature extraction algorithm development is in provision of meaningful data for intelligent lighting and advertising systems in various urban contexts supporting the goals of Finnish participants.
MyPose	MyPose will contribute to activity 2.1 on development of accurate and reliable video analysis algorithms for digital signage displays.
C2 SmartLight	C2 SmartLight will participate in activities 2.3 and 2.4 selecting/developing sensors and sensor gateways to be integrated into intelligent lighting systems.
KocSistem	KocSistem will contribute to WP2 for developing image processing algorithms which can detect and classify vehicle types and traffic flow.
Milestones and deliverables	
M11	D2.2.1 - Context-aware detection algorithms
M14	D2.1.1 - Report of selected feature/object algorithms for embedded systems
M20	D2.3.1 - Prototype sensing optics for HDR sensing and multifaceted optics
M26	D2.3.2 - Distributed sensing software
M32	D2.4.1 - Event detection algorithms for multifaceted optics and light-field measurements

5.2.3 Work Package 3

Work Package 3: Integrated connected systems for citizens' safety and comfort	
WP3 start date	M3
WP3 end date	M36

Objectives:
WP3 is related to the integration of the different algorithms and sensors developed for each specific task (e.g. lighting, security, traffic management, etc.) in order to build a system based on several subsystems to deliver user-oriented function, such as people trajectories, density, etc.
The goal of WP3 is to define data requirements for information exchange between systems by identifying which information can be provided by each system that can be useful for other connected systems.
WP3 will also develop high level algorithms for people, vehicle, activity, event detection in distributed, hybrid sensor networks, as well as data mining algorithms working on the share big data set for systems configuration, fault detection, business intelligence and visualization. This work package is central to the project: it receives input from WP1 and WP2 and it is executed in tight cooperation with WP4 where the data infrastructure is defined. WP3 develops the tools to enable the applications that are tested and demonstrated in WP5 and WP6.

Expected results:
WP3 shall provide the following results:

- A data model for high-end applications based on sensors data processing for smart lighting, surveillance, traffic monitoring and advertising.
- A data model for merging several heterogeneous data

- An HMI for data management and results visualization

Detailed activities:
The WP is divided into the following (main) activities

Activity 3.1: Multimodal data management and processing – Lille 1 University
The objective of this activity is to design and implement high-level data algorithms for smart lighting, surveillance, traffic monitoring and advertising systems. This activity will build on the output from activity 2.2, where algorithms for the context-aware detection of individual pedestrians and vehicles are designed. The context will be used to facilitate the interpretation of the data and the understanding of the scene.

The algorithms developed in this activity will enable several system functionalities by providing task-specific, high-level, interpretable data, e.g. tracking of objects (pedestrians and vehicles), trajectory analysis, flow estimation and counting, recognition of object type (pedestrian, stroller, bicycle, car, truck, etc.), crowd monitoring, activity and event detection. New descriptors and new algorithms will be explored using data mining techniques to identify and recognize patterns of data from individual sensors, working at different levels of granularity.
At this level, sensors will be considered independent from each other. For each of them, high-level features (e.g. traffic density) or local outputs (e.g. occurrence of a specific event) will be computed. This step precedes data fusion: the output from individual sensors is to be correlated one to another in activity 3.2 for a global scene understanding. As such, it is expected to provide reliable information, or estimates of the information reliability, to ensure the effectiveness of the decisions to be taken after data fusion.

Activity 3.2: Multimodal data fusion algorithms – TU/e VCA
This activity will focus on design and implementation of data fusion between heterogeneous sensors, be it for different modalities, different applications, and different semantic level.
The algorithms developed in this activity will exploit the various ranges of each sensor and/or low level algorithm in order to enhance robustness or to exploit on a broader range the data provided by each sensor. The ultimate goal of this activity is to federate data to create a global scene understanding based on the fusion of activity 3.1 data. This fusion will be done using the most appropriate technologies, from semantics (ontology mapping) to evidence theory and relational analysis.

Activity 3.3: System Human Machine Interface, results visualization – Thales Services
Poor HMI designs have been identified as factors contributing to abnormal situations, billions of dollars of lost production, accidents. For example; the Three Mile Island accident should have been avoided if the control panel of the central had been better designed[1]. In short, Human Machine Interface is very important when it comes to security and safety product.
The goal of human-machine interaction design is to produce a user interface which makes it self-exploratory and efficient to operate a system in the way which produces the desired result. This generally means that the operator needs to provide minimal input to achieve the desired output, and also that the machine minimizes undesired outputs to the human.
During this activity, a basic HMI compatible with every use cases – light management, security and surveillance, and traffic management – will be developed. The goal of this HMI is not to be used as it will be in production systems; it only aims to test the rest of the system and to provide a good foundation to begin the production phase. It has to be adapted according to the user (training, initial profession…), the size of the area to manage…
The future HMI of the INSIST system will comprise a storyboard representing interactions between the user and the system and an interface for trials and demonstration.

WP3 Leader: Thales Services

[1] Norman, Donald (1988). The Design of Everyday Things. New York: Basic Books. pp. 43–44. ISBN 978-0-465-06710-7.

Partners breakdown	
Partner	**Contribution**
Philips Research	Philips will design and prototype the part of the interface concerning light management.
ViNotion	The object detections, object classification and their movement from tracking will be further analysed to infer higher lever semantics such as flow, density and behaviour.
Prodrive	The role of Prodrive in this work package is similar as the role in work package 2. Prodrive will investigate will investigate several kind of Video Content Analysis algorithms mapped on embedded hardware platform in cooperation with their partners.
TU/e VCA	Based on detection and tracking algorithms developed in WP2, TU/e will research multi-modal and multi-sensor based algorithms for detection of dangerous, abnormal, and suspicious behaviour for various traffic participants (pedestrians, cars, bikes). This involves exploration of learning algorithms for traffic analysis. This may also be applied for history analysis using the signature descriptions and re-identification techniques.
Thales Services	Thales Services will coordinate the development of the different pieces of the HMI. It will design and prototype the interface module dealing with security and surveillance. Thales Services will also take part to the data management and propose fusion algorithms for video-based sensing algorithms
Thales SA	Thales SA will participate to integration activities of previously defined algorithms
Lille 1 University	Lille 1 University will coordinate activity 3.1. It will provide expertise in developing new descriptors and new algorithms for extracting high-level features from sensors. Moreover, Lille 1 will participate to activity 3.2 and contribute to design data fusion methods in a heterogeneous sensor network.
Citilog	Citilog will contribute to the definition of system architecture
CEA LIST	CEA LIST will develop multimodal data fusion methods using hybrid sensor networks for high level analysis and data mining.
SIVECO	SIVECO will participate at the definition of the system architecture and also will contribute to the design of the user interfaces
ECRO	ECRO will contribute to the activity 1: Definition of system architecture and activity 3: System Human Machine Interface, results visualization, related to the dynamic lighting application for pedestrians in cities.
ArgeDOR	ArgeDOR will contribute to the definition of system architecture. ArgeDOR will also work in big data analytics, data mining and recommender systems for detecting normal and abnormal behaviors on traffic data with the requirements of use cases defined in WP1. ArgeDOR will also contribute to big data storage and development of platform services and personalized services to drivers and traffic managers.
Provus	Provus will contribute mainly in activities 3.1 Multimodal data management and processing and 3.3 System Human Machine Interface, results visualization by using its experience in traffic management and data acquisition experiences.
VTT	VTT will contribute to task 3.1 with the definition of architecture of integrated connected system from data management perspectives as well as data sharing patterns. The required domain specific knowledge management services will be designed and developed to address the needs of advertising and atmosphere use cases as well as history data processing methods. VTT will participate to tasks 3.2 and 3.3 focusing on development of methods for interaction with urban spaces. VTT in collaboration with other Finnish participants will design and prototype a solution for controlling the atmosphere of urban space.
Offcode	Offcode contributes to WP3 by developing solutions to implement communication and application independent distributed device network. Aim is to develop integrated connectivity layer with supports distributed applications.
Digital Living Finland Oy	Digital Living Finland Oy will perform a case study on the potential of the IoT related web technology in the context of urban space ecosystem by the methods developed for service

	interaction by VTT and with the System Human Machine Interface (HMI) elements developed by Thales for addressing the needs of use case applications.
C2 SmartLight	C2 SmartLight will participate integrating existing and new systems and/or sensors to achieve advanced intelligent lighting systems.
Helvar	Helvar will develop the smart lighting control system and evaluate the usage of multimodal sensor input.
Milestones and deliverables	
M20	D3.1.1 – High-level data processing algorithms
M26	D3.2.1 – Multimodal data fusion algorithms
M36	D3.3.1 – Prototype of the HMI in the form of an application
M36	D3.3.2 – Interaction with smart urban spaces

5.2.4 Work Package 4

Work Package 4: Infrastructure and Data Representation	
WP4 start date	M3
WP4 end date	M36

Objectives:
The goal of WP4 is to define and implement an infrastructure to enable communication between different systems such as surveillance, lighting, traffic management and advertising systems which are diverse, complex and broad in structure.
Work package aims at defining and developing connectivity among several systems with secure, standardized interfaces, data processing modules for managing content, defined rules and structures to exchange information between different systems in a reliable way. Work package will also define and develop hardware interfaces for accessing data among external devices and storing processed data.

Research activities in this work package will follow design and implementation phases. During the design phase, main topics of research will be connectivity with different systems (Security, Confidentiality, Synchronization, etc.), data structures and standards for interoperability (Database structures, data protocols, data types, etc.), content management (Policy management, privacy) and hardware communication interfaces (External device communication, data storing). Following the design phase, implementation will begin for the defined components.

WP4 will receive input from WP1 as the reference architecture, and then will work closely with WP3 to define the infrastructure elements and develop the infrastructure.

Expected results:
- Definition of connectivity requirements and architecture for system interoperability.
- Definition of data types, structures, and standard data exchange protocols.
- Definition of content management rules
- Implementation of content management system
- Definition of hardware types
- Implementation of hardware communication interfaces

Detailed activities:
The WP is divided into the following (main) activities

Activity 4.1: Definition of system connections – Philips Research
Systems such as smart lighting, surveillance, and traffic management as well as people behaviour monitoring systems for advertising, collect different type of data, analyse different aspects, and calculate broad set of results. INSIST project aims at providing a common platform for the interoperability of those

diverse systems. Communication and interoperability of those systems will be provided by the infrastructure that will be developed in this work package.

This activity of the work package focuses on developing the communication layer of the infrastructure. Communication layer will define tools and methodologies for connectivity with different systems. Each system proposes different security criteria's, and process confidential information. Communication layer will include mechanisms to handle security and confidentiality aspects. Another topic that will be studied in this activity will be the synchronization of data with connected systems.

The system connections will be done using standard communication protocols on device side (Wifi, Bluetooth (light), Zigbee, Zwave, etc) and on the Device to Cloud communication: HTTP(s). All traffic between devices and Cloud services will be encrypted and done using the most secure channel available (not all devices are able to for example use HTTPS). Communication infrastructure will be based on Philips Connected Products Platform (P-CPP).

Activity 4.2: Data structure/standard for interoperability - **Provus**
The objective of this activity is to determine requirements of the data structure, format and standards for the interoperability between the intelligent lighting, surveillance, advertising and traffic monitoring systems of INSIST.

For interoperability purposes, the data structures and formats of the surveillance, traffic monitoring, lighting management and advertising data shall be compliant with one another. The data structure and format to be used in INSIST shall conform to the following requirements:

- Data elements shall be grouped in different categories, such as functions, subjects or other groupings that are most relevant to their use.
- Data can be classified as input, output, static, dynamic, internal and external.
- Input data is used to generate output data.
- Internally generated data is created as a result of program calculations or other program manipulations, such as algorithms.
- Static data shall be used for control or reference purposes during operation.
- Dynamic data includes all data that shall be updated during execution.
- Data elements are arranged in logical groups which may include, but are not limited to the following:
    - Data element name
    - Synonymous name
    - Type (e.g., alpha, alphanumeric, or numeric)
    - Definition
    - Format
    - Range of values or discrete values
    - Unit of measurement
    - Precision (e.g., number of decimal places)
    - Data item names, abbreviations, and codes
    - Characteristics, such as accuracy, validity, timing, and capacity
- Data constraints shall be indicated as the limits of the data requirements with regard to further expansion or use, such as the maximum size and number of files, records, and data elements. Limitations may be placed on the data due to such factors as:
    - source of data input
    - devices used for input and output of data
    - recipients of the data
    - conversion processes, the converted form the input and output data will take
    - how often the data will be updated
- Information regarding version control shall be included in the data format as a static data element.
- Data elements of records or selected fields that are extracted, appended, joined, merged or related shall be the same.
- The number and order of the data elements that are extracted, appended or merged shall have the same type.
- The data type of data that are extracted, appended, joined, merged or related shall be identical.

- The field length of data that are extracted, appended, merged or joined shall be identical.
- The date format of data that are extracted, appended, or merged shall be identical and entered as static data.
- The format of the field value of data that are joined or related shall be identical.
- Data logs of the surveillance system shall be reusable, storable and viewable with software.

Activity 4.3: Content management - Ericsson
Infrastructure that will be developed within this work package will enable connectivity between systems such as smart lighting, surveillance and traffic management. Those systems are subject to different privacy rules depending on the governmental policies and agreements with data providers. To enable interoperability among different systems there is a need for policy management components within the infrastructure. This activity of the work package focuses on defining and developing a content management system for handling varying privacy policies.

Activity 4.4: Hardware communication interfaces – KocSistem
INSIST system will interact with external hardware systems as well as software systems for data collection. Hardware systems such as embedded systems, traffic systems and advertising screens will interact with the infrastructure to synchronize data. Another type of hardware system that will be studied will be the storage systems. Data will be stored locally and also on the cloud systems. This activity aims at defining and developing the communication interfaces for different hardware components.

WP4 Leader: Argevas

Partners breakdown

Partner	**Contribution**
Philips Research	The lighting system will be a pivotal element of the city control system. Philips Research will contribute to define data structures and interfaces from and to the smart lighting system.
Prodrive	Prodrive will contribute in this work package regarding the communication with existing surveillance systems (Prodrive already cooperate with the world leaders of Video Management Systems (VMS)) based on the ONVIF standardization.
ViNotion	The results from traffic analysis need to be used for the city control systems via management system. Hence, ViNotion will contribute in defining the data structures and designed the interfaces.
CEA LIST	CEA LIST will contribute to data structures and interfaces definition.
Lille 1 University	Lille 1 University will participate to activity 4.2 by contributing to the definition of data/metadata format and structure to guarantee interoperability.
Citilog	Citilog will contribute both as data provider and small system integrator for traffic management.
Provus	Provus contributes to Activity 2 by coordinating the activity and investigating the requirements of the INSIST data structure/standard for interoperability.
ArgeDOR	ArgeDOR will contribute the data structure standardization and interoperability between diverse systems with respect to the data storage and management services over big data architecture.
VTT	VTT contributes to tasks 4.1, 4.2 and 4.3 providing content management and interoperability solutions for intelligent advertising and atmosphere creation services.
Valopaa	Valopaa will participate to WP4 definition work, and contributes to specifications. Depending on the selected demonstrators we develop and implement respective parts for light management.
KONE	HW and SW design of the signalization modules.
Offcode	Offcode works by specifying and developing embedded devices that can interact with the environment that they are attached in. Aim in this task is to find general purpose solutions that can be utilized in multiple cases.

Pro Piknik Festivals	PPF will contribute both as data provider and small system integrator for advertising systems.
Helvar	Helvar will participate to the activities defining data structures and interfaces from and to the smart lighting control system.
Milestones and deliverables	
M6	D4.2.1 - Data Structure/Standard Requirements Specification
M20	D4.1.1 – Definition of System Connection Models
M20	D4.2.2 - Investigating the requirements of the data structure/standard for interoperability.
M24	D4.3.1 – Privacy & Policy Management Specifications
M36	D4.3.2 – Content Management System Implementation
M36	D4.4.1 – Hardware Communication Interfaces Implementation

5.2.5 Work Package 5

Work Package 5: User studies for integrated services for citizens' safety and comfort	
WP5 start date	M3
WP5 end date	M36

Objectives:
The goal of WP5 is to conduct experimental studies to evaluate how the integrated services for safety and security, as implemented in WP6, are perceived by end users or to assess the potential of the INSIST approach for increasing the efficiency in City management. Possibilities for using sensor data from the connected platform (e.g., on user behaviour and emotions) to evaluate the efficacy of a service will be explored. In the preparation phase, WP5 will analyse the cities service chains to identify stakeholders and end users, as well as, the activities for the smooth going interactions and data flows. Based on these analyses, WP5 will define the boundaries and conditions of the evaluation studies and identify the relevant issues that need to be addressed in order to strengthen safety and security in cities by smart and lean technology.
Where needed, WP5 will conduct user studies to determine how the user requirements, as set in WP1, can best be met; by defining and testing, for example, new lighting and mobility control strategies that connected applications offer to improve users' comfort and energy savings, or by applying user centred design methods to create intuitive user interface solutions .
This work package will receive input from WP1, WP2 and WP3 and will provide useful insights for future applications of smart integrated systems. This work package will be executed in tight collaboration with WP6, where field tests and final applications will be executed.

Expected results:
- Service chains model in a Smart City Service context
- New light and mobility control propositions and new interaction approaches for related integrated sensor systems
- Demonstrator evaluations studies definition and planning
- Analysis of results of demonstrator evaluations and conclusions

Detailed activities:
The WP is divided into the following (main) activities:

Activity 5.1: Analysis of Service chains and stakeholders – Digital Living Finland Oy
In general, city services refer to those that the citizens are expected from the city government to provide with the taxes. City governments often operate or contract the services. The approach may depend on

location and frequently the tradition plays an important role. The services provided and how they are managed in a city may change from a country to another or even among cities. City services can be operated directly by a department of the municipality or sub-contracted to a third party. It is intuitively obvious that the interoperability among services may help for increasing the efficiency, and reducing costs enabling also for new services to appear. The efficacy created from the end-user feedback and related service ecosystem will serve municipalities not only with more appealing environments but also with economic advances, both most important and in need for the creation of a competitive city. However, for this to become possible it is essential to understand how service chains operate in a particular city and planning the transitions for exploiting the advantages of the INSIST approach, after understanding the obstacles to be overcome for gaining an ever functional digital ecosystem.
This activity will analyse how INSIST services are provided in a city identifying stakeholders and positioning final user in the service chains. Outputs will be used for the definition, design and planning of the studies.

Systems engineering methodology will be applied insofar as those techniques can be used to analyse an effective plan for service processes development, showing where estimates are to be used, how design iterations and reviews are handled, and how information flows during the design work and operational phases. The descriptions of information flows can be used to determine the consequences of a change in any variable on the rest of the variables in the system, and thus which engineers or end-users must be informed and which parameters, files or documents must be changed. The case studies for the activity will be defined in cooperation with WP1 and WP6. The WP5 will take advantage of the Digital living lab or other relevant method together with the pilots in WP6, in order to conduct the user studies in a true research environment. The examination will be conducted not only in the end of the project, but data of preliminary concepts will be gathered in as early phase of the project as possible. The continuation of the pilots after the project is targeted as well established applications after the piloting.

Activity 5.2: Planning and execution of User studies – TU/e HTI
To maximize the benefits of integrating multiple sensors in a single platform for user safety and comfort, user studies are needed to investigate how the proposed services can best be implemented. User and efficiency studies with prospective end users are thus needed to develop and test propositions for meeting the user requirements defined in WP1. This activity involves the planning and execution of these user studies. The use of simulation tools such as immersive virtual reality environments and 'wizard of Oz' approaches are foreseen in this phase to evaluate end-user feedback for the proposed connected service applications; defining and testing, for example, new light and traffic control strategies and user interaction approaches that connected applications offer to improve services efficiency, users' comfort and energy savings in smart lighting and mobility systems, or taking a user centred / user experience approach to develop and test new and intuitive interaction approaches and user interface solutions.

Activity 5.3: User Study Analysis and Report – TU/e HTI
This activity involves the qualitative evaluation of the experimental studies. The results from the studies will be analysed and conclusions reported identifying potential factors that may impact on the outcomes as well as the scope of validity. This activity will be executed in tight collaboration with WP6, where the various services based on the INSIST platform will be implemented in the demonstrators.

WP5 Leader: Telvent

Partners breakdown

Partner	**Contribution**
Philips Lighting	Philips Lighting will assist in the analysis of the user studies in order to derive the right conclusions for the lighting system architecture and possible adaptations to the system to improve performance
Philips Research	Philips Research will contribute to the realization of the user studies and will assist on the analysis of the results related to the lighting system.

TU/e	Tue HTI contributes to Activities 5.2 and 5.3, especially with respect to preparing and executing studies to investigate user expectations for connected smart lighting services, and to evaluate the final implementation with end-users. They explore how (virtual reality) simulations and the sensor data from the connected platform can be used in aid of this research.
Telvent	Telvent will lead the WP focussing on the perception from city service operators and traffic/surveillance interactions in the interoperability approach proposed by INSIST.
Strasbourg	The urban community of Strasbourg will contribute to this work package by describing the existing service chains and stakeholders and also by analysing the chain transition to handle in the frame of the INSIST innovation.
SIVECO	SIVECO will participate in all WP5 tasks, being involved in the definition of the target groups, analysis and report on the impact of the INSIST use cases
ECRO	ECRO will contribute in all activities:: Analysis of Service chains and stakeholders, User Studies definition, design and planning and in User Study Analysis and Report
KONE	KONE will contribute to WP5 on user centred design, industrial design of the signalization devices; user- user studies definitions, execution and analysis.
Digital Living Finland Oy	Digital Living Finland Oy will contribute to the activity 1 (on the Analysis of Service chains and stakeholders) with systems engineering. The digital living lab can be used for verification of the methodology developed in the activity 2 (User Studies definition, design and planning) and the analyses in the activity 3 (cf. http://www.openlivinglabs.eu/livinglab/digital-living-lab).
Provus	Provus will contribute to all tasks of this WP focusing mainly on user definitions and analysis of inputs required for related INSIST use cases
Milestones and deliverables	
M6	D5.1.1 – Service chains and experimental study planning
M30	D5.2.1 – Design and execution of experimental studies
M36	D5.3.1 – Evaluation result analysis and report of connected services studies

5.2.6 Work Package 6

Work Package 6: Applications and field tests	
WP6 start date	M9
WP6 end date	M36

Objectives:
The role of WP6 is to realize applications and field tests to validate the INSIST platform. Field tests (defined in WP 1) are envisioned within four main different application domains: outdoor lighting management, surveillance, traffic management and intelligent advertising and atmosphere creation. Integrated value-added services combining several of the above mentioned systems will also be considered. Applications will be implemented using the platform developed in WP2, WP3 and WP4, and will demonstrate how well the INSIST solution answers the stakeholder's requirements on different domains. The use cases and field tests will be performed based on the specifications developed in WP1 and refined in this work package. Additionally, the infrastructures developed in this work package will be used during the project execution phase to capture representative datasets for development purposes.

Expected results:
- Datasets for outdoor lighting management, surveillance, traffic management and advertising and atmosphere
- Demonstrator components
- Integrated demonstrators

- Demonstrator validation and evaluation

Detailed activities:
The WP is divided into the following (main) activities

Activity 6.1: Capturing datasets for development purposes – Scati
The objective of this Activity is to collect representative datasets from the INSIST application fields. The datasets will be a reference for development purposes for the INSIST project and for future projects in this field. Additionally this information will complement the proposals for the partners who are involved in standardisation bodies so that the main results could be integrated into new or updated standards
In order to meet the target, datasets should be composed of the following sections:

- The purpose of the dataset
- Context information
- Applications and field tests specific data
- Conclusions

The datasets have to be easily understood. They are intended to enforce close collaboration among the partners. They will be disseminated to partners through the Internet by an online tool that will allow comments to collect feedback about their use and implementation, in order to improve them.

Activity 6.2: Demonstrator component evaluation – Valopaa
In order to realize the field tests in the different countries, different components will be modelled and tested as subsystems. Technology components created in work packages 2, 3 and 4 will be evaluated using the data collected in task 6.1. The sub-systems related to outdoor lighting management, surveillance, traffic management and intelligent advertising and atmosphere creation will be triggered by the corresponding data sets and the response will be verified according to the system requirements. The results of the evaluation will be used as a feedback to the development process in WP's 2, 3 and 4. The design of the interfaces between the modules will be updated for enabling the integration of the components in task 6.3.

Activity 6.3: Integration and validation – Philips Lighting
After the demonstrator component evaluations performed in activity 6.2 the demonstrator components must subsequently be integrated to show that the system as a whole works as intended. For this it is mandatory that some system integration activities are done for each of the demonstrators that are planned. The field tests themselves will be defined in Activity 1.3, and the system architecture to be used is defined in Activity 3.1. In activity 6.3 these systems will be realized in different practical situations. In addition for each field test a test plan will be made in which the criteria are described which are used to validate the correct functioning of the system as a whole, and which also contains the series of tests that will be executed to decide that the system meets these criteria. These tests will address both technical aspects as well as feedback from users (in collaboration with WP5).

Activity 6.4: Demonstrator evaluation for connected services – Telvent
Once integrated and validated the demonstrators will be evaluated to assess how well the solutions are answering to the stakeholder's requirements for the different domains. Original objectives, predictions, what was accomplished and how it was addressed for different aspects to evaluate (such as technological, usability, economic, efficiency or potential for broad commercial deployments) will be identified. Summary lessons and conclusions from the project and the approaches proposed by INSIST will constitute the primary outcome from this activity.

WP6 Leader: VTT

Partners breakdown	
Partner	**Contribution**
Philips	Philips Research will contribute to activities 6.1, 6.2 and 6.3 to capture test data,

Research	integrate, validate and demonstrate a smart connected lighting system and its integration with other smart systems in the urban infrastructure.
Philips Lighting	Philips Lighting will coordinate Activity 6.2. Philips Lighting is commercially active in lighting systems and connected lighting solutions, and has experience in practical end-user validation studies in collaboration with academic partners.
TU/e VCA	TU/e VCA will contribute in Activities 6.2 and 6.3 by integrating its results into the demonstrator. The data acquired in Activity 6.1 will serve for validation and evaluation of the behavior analysis and abnormal and suspicious event detection algorithms.
Prodrive	Prodrive will contribute in activity 6.2 and 6.3 to integrate, test and validate Video Content Analysis on the 10xHD intelligent camera platform in cooperation with the partners and validate the integration with Video Management Systems.
ViNotion	ViNotion focuses on traffic sensing for all targeted applications but will mainly contribute on surveillance and traffic management with respect to application development. These applications cover all activities and ViNotion will contribute in data capturing (activity 6.1), integration (activity 6.2) and demonstrations (activity 6.3).
Thales Services	Thales Services will contribute to activities 6.2 for system integration and 6.3 for demonstration
Thales SA	Thales SA will contribute to integration and demonstration activities.
Strasbourg	The urban community of Strasbourg will contribute to this work package by providing a test field in Strasbourg. The tests will include multiple cameras tracking of individuals and vehicles for security, traffic management and soft transportation solutions optimization (e.g. tramway, busses and bicycles traffic). The city will participate to the validation of the performances and synthesize End-User feedbacks to the INSIST applications performances.
CEA LIST	CEA LIST will contribute to system integration and validation (6.2) and demonstration activities (6.3).
Citilog	Within this WP Citilog will focus on outdoor lighting management, traffic management and will contribute to tasks 6.1, 6.2 and 6.3 to capture test data, integrate, validate and demonstrate.
Lille 1 University	Lille 1 University will participate to the demonstrator integration, validation, and evaluation. Therefore, it will participate to activities 6.3 and 6.4. Il will also take part in the component evaluation in 6.2.
SIVECO	SIVECO will participate in WP6 by taking part at task 6.2 and 6.3, focusing on the integration aspects and evaluation of the efficiency of the INSIST services
ECRO	ECRO will contribute to all activities of the workpackage, namely Capturing datasets for development purposes, Integration and validation, Demonstration connected services and User studies
VTT	VTT will lead this workpackage and participate to all activities focusing mainly on advertising and atmosphere creation for the Finnish demonstrator. VTT's role is to offer advanced sensor technologies and data management functionalities ensuring interoperability of various systems provided by the Finnish participants.
Innorange	In WP6 Innorange participates to activities 6.1, 6.2 and 6.3 focusing in the realization of the Finnish demonstrator
Valopaa	Valopaa participates to Finnish consortium demonstrator integration and validation.
Offcode	Offcode participates to tasks 6.1, 6.2 and 6.3 offering, integrating and validating components for the Finnish consortium demonstrator.
KONE	KONE will participate to building the demonstrator.
Digital Living Finland Oy	Digital Living Finland Oy will work on the activity 1 (Capturing datasets for development purposes) for being able to contribute into the activity 3 or 4 by true care implementation and for strengthening its RTDI. A true case test bed will be provided to support the work within the activity 3 (Demonstration connected services) or within the activity 4 8User studies).
C2 SmartLight	C2 SmartLight will participate to the Finnish demonstrator providing components and integration of the intelligent lighting control system. C2 SmartLight also participates to annual housing fair events demonstrating lighting systems.
Pro Piknik	PPF will focus on advertising systems and will participate to applications and field tests.

Festivals	
Helvar	Helvar will demonstrate the smart lighting control system and participate to the Finnish demonstrator development.
MyPose	MyPose will participate to all the activities in WP6 contributing to the Finnish demonstrator for intelligent advertising application domain.
Provus	Provus will contribute to all tasks of this WP focusing on the outputs related to Traffic Management use case. Provus will contribute to use case activities mainly on data analysis and new services created in the defined use cases.
KocSistem	KocSistem will contribute to this work package by testing the functionality of the tools developed in other work packages.
Milestones and deliverables	
M15	D6.1.1 Data collection plan
M18	D6.1.2 Data collection
M24	D6.2.1 Demonstrator component evaluation report
M30	D6.3.1 Integrated demonstrators
M32	D6.4.1 Integrated demonstrator evaluation plan
M36	D6.4.2 Integrated demonstrator evaluation report

5.2.7 Work Package 7

Work Package 7: Project management, dissemination, exploitation and standardisation	
WP7 start date	M1
WP7 end date	M36

Objectives:
The management and internal communication of the project will be carried out in WP7. The main objective is to support the technical, financial and contribution aspects of the other work packages. Project reporting and monitoring will follow strictly all ITEA2 guidelines and requirements. The dissemination, exploitation and demo activities will also take place within this work package.

The main activities in this WP are to:

- Develop a project plan with deliverable specifications and detailed planning
- Conduct project tracking (activities, milestones, deliverables) and, if necessary, synchronize the project activities as to achieve the expected results
- Organize project progress meetings at regular time intervals with all consortium members
- Organize technical project meetings at regular time intervals with selected consortium members / work package team members
- Organize milestone review meetings with the PCC and external reviewers
- Report project progress and project budget to ITEA2 organization
- Conduct project risk assessment at regular time intervals and take mitigation actions
- Define a structure for configuration management
- Define a quality management plan (if relevant)
- Communicate project progress via a dedicated restricted web site and / or newsletter
- Organise external events to disseminate and demonstrate project results.

The WP is divided into the following (main) activities

Activity 7.1: Overall management – Philips Research

The day-by-day project management will be under the responsibility of the **Project Management Team (PMT**). The PMT consist of the Project Manager (acting as the chair) and the Work Package Leaders (WPL). The Project Manager holds the supervision of the project, i.e. monitors the overall project progress: deliverables and milestones, interrelations between work packages, etc. The PMT will also be responsible for the external contacts, organization of project review and project progress meetings, and dealing with the administrative issues.
The **Work Package Leaders** will be responsible for the co-ordination and progress of the work within their work packages, and for the working contacts between the various partners within their work packages. The Work Package Leaders will be assisted by the Task Leaders.
The highest level in this project is the **Project Co-ordination Committee (PCC)**. It has the responsibility for all strategic, cooperation, effort and financial decisions. All partners will delegate a member to the PCC. SMEs and Universities may request an industrial partner they have a working relation with to represent them. The PCC monitors the strategic issues of the project, including quality, changes in the project, and (when necessary) conflict resolution. It is the intention that the PCC will in principle meet with a frequency of once each year. Whenever necessary, the PCC chair (this role is filled in by the non-voting Project Manager) can call for an extra PCC meeting.

Reporting and meetings

Since the project is complex, all the technical work packages are split up into several tasks, each led by a task leader, who will execute and coordinate the daily work of the task. The work package leader and the task leaders together perform work package management, reporting and organise work package, task and subtask meetings. The PMT will report twice a year, according ITEA rules, to ITEA Office. The project manager is both the chairman of the PCC and of the PMT meetings. Once a year ITEA office will organise a review meeting were we can present our progress and demonstrators.
In order to ensure the smooth running of the project, the PMT will have regular telephone conferences, at least once a month and will have technical meetings (face to face) every three months.

Detailed activities:

This WP also monitors and controls the overall project progress and ensures that deliverables and milestones are achieved on time. Risks will be carefully identified at the beginning and midterm milestone of the project while mitigation plans are defined. It is also the responsibility of this WP to organize regular meetings, to report progress and to ensure good communication between the partners. Therefore, a project start up workshop will be organized at the beginning of the project with all participants involved in this project. Project goals, planning, rules and way of working will be explained and set during this meeting. This WP will also manage the communication between the project partners and with the ITEA2 organization. Finally, an IT infrastructure (e-mailing lists and document system) will be made available to all partners.

Activity 7.2: Exploitation – Thales Services

The INSIST partners will describe their Exploitation intentions through an Exploitation Plan. It should reflect the interest of the Consortium by analysing in detail all the aspects concerning the potential exploitation and commercialization of the project results:

- Product and Services Analysis (competitors, enablers…)
- Market Analysis (tendencies, pricing, promotion…)
- Strategy and Implementation (short and mid-term market approach)
- Management Issues
- Financial Plan

The preparation of the INSIST Exploitation plan will help all interested parties and enabled them to approach the exploitation phase in a more realistic and practical way.
An Exploitation plan is based always on a Technology Implementation Plan (TIP), which is a study that shall deal with the Background and Foreground Rights, the Patents, TM and IPR issues, which will be in the base of the future INSIST products and applications, taking account of EU policies, including those to foster the transfer of technology to SME's, and promoting the use of generic "non-proprietary technologies" as well as the overall European security framework.
The Exploitation Plan must take into consideration, and within the INSIST project, different scenarios depending upon the maturity of the technologies under research and development. While the concept of the INSIST solution as a whole is an attractive one, we cannot disregard the possibility to have different technologies advancing at different paces; thus, requiring the analysis of two exploitation scenarios.

The first one focuses on specific sensor systems (e.g. smart lighting or surveillance) which will create new business opportunities and competitive advantage in relatively short time after the end of the project.
The second one centres on the commercialization at long-term of the new innovative services resulting from data fusion from different sensor systems or the cross-usage of the sensor data between various systems.

Activity 7.3: Dissemination (including set-up data portal and public website) – TU Delft
The activity will be initiated by setting up a project website that provides up-to-date information about the project and its results to the public. Goals will be established and followed regarding visitor statistics and a database of registered users will be established and used for dissemination. INSIST partners will also prepare a realistic dissemination plan that sets out an agreed approach to dissemination throughout the project. The dissemination plan is intended to optimize dissemination of project knowledge and results to scientific community, companies, device/chip manufacturers, and other relevant organizations. The Consortium will approve the detailed dissemination plan before any dissemination takes place.

INSIST partners will work towards dissemination by publications in high-quality refereed international journals and at targeted conferences, and will also be active in individual promotion. They will engage in normal dissemination activities within their areas of expertise. Moreover, partners will work together for achieving dissemination goals by various other means, including but not limited to: workshops, summer schools, courses of various types, invited talks, exhibitions, policy conferences, printed documents, websites, and CDs. The results of the technological research work conducted in the development work packages of the project will be submitted for publication according to the established dissemination plan.

Activity 7.4: Standardization – Philips Research
Most partners using best practices as codified in open source libraries that the project will either seek, or if needed, build. This includes activities like:

- Contributing new libraries into the open source space
- Ensuring continuity and good governance of the tools contributed by the project
- Activating relevant developers and open source communities to adopt these libraries and standards
- Promoting the standards and libraries in technical conferences
- Organizing workshops for interested developer communities aiming for standards and tool adoption
- Working with relevant standards bodies to document the best practices
- Contributing to related open source efforts

Activity 7.5: Intellectual property – Philips Research
According to the innovative nature of this work, all partners in the consortium will examine the requirement for IPR protection for new inventions conceived on various aspects of the research work. Intellectual property will be protected by patent filing or publication. In addition, patent searches will be done regularly to keep the project up to date with the state of the art and to be alert to strategic opportunities. The project will also carry out benchmark and competitive analysis. The appropriate departments of the industrial partners (in particular the Philips Research Library, the Intellectual Property Rights and Standardization department (IP&S) and the Knowledge Database of Philips Research) will play an active role in assisting the project with filing patents and with patent searches.

Activity 7.6: Communication with the ITEA and Pa's – Philips Research
The project manager will be the primary contact point to the ITEA organisation and the reviewers for all matters, technical and administrative, concerning the execution, progress and management of all project activities. The country coordinators maintain contacts with their local Public Authorities on financial and administrative matters, in the context of this activity a specific section of the communication platform will be dedicated to the interaction with the ITEA office and the Public Authorities. This activity comprises the organisation and execution of an annual review meeting with the ITEA review board and any required national reviews.

WP7 Leader: Philips Research

Partners breakdown	
Partner	**Contribution**
Philips Research	Philips Research will coordinate this work package and the activities 7.1, 7.5 and 7.6. Philips will be responsible for the overall project management, will be the main contact for ITEA and will coordinate the connection with the national Public Authorities. Besides, Philips will coordinate the Intellectual Property protection and search activities.
Philips Lighting	Philips Lighting will contribute to the realisation and coordinate integration of some of the demonstrators, and assist Philips Research in IPR and standardization aspects
Prodrive	Prodrive will participate in all WP7 tasks and will participate in dissemination activities and exploitation activities.
TUD	TUD will set-up and maintain the data portal and public website for the project. In addition, the research results of TUD will be published in top conferences and journals.
ViNotion	ViNotion will take responsibility for coordination of some the activities and will fully support the overall management with progress reporting. In addition, ViNotion plans to disseminate project results on scientific conferences (D7.5). From the start of the project ViNotion will work on a business plan and exploitation plan (D7.8) to receive feedback of potential customers in the future.
TU/e VCA	TU/e VCA will re-use integrated results in its course 5DD50 which teaches students techniques for object analysis and event detection. The research results of TU/e VCA will be published on peer reviewed class-A conferences like IEEE ICIP, SPIE Electronic Imaging, IEEE, ICME etc. Due of program director's involvement of TU/e VCA in SPIE Transportation and Imaging, TU/e VCA can organize special sessions using the results of INSIST and also organize European International Workshops.
Thales Services	Thales Services will coordinate the exploitation plan activity and contribute to it.
Thales SA	Thales SA will participate to management activities as a partner and will participate to dissemination and exploitation activities as research centre of Thales.
Lille 1 University	Lille 1 University will disseminate project results by promoting new areas of research on sensing, feature extraction, and data fusion. Lille 1 will also capitalize the results in the form of publications, forums, events, and conferences.
Citilog	Citilog will contribute as partner in WP7 and will be mainly involved in dissemination, exploitation and intellectual property activities.
SIVECO	SIVECO will participate in all WP7 tasks, being involved in all the aspects of the management: partner management, dissemination, exploitation, intellectual property, etc.
VTT	VTT will participate to activities 7.1, 7.3, 7.5 and 7.6 supporting Philips in the overall management of the project and leading the Finnish sub-consortium. VTT will actively disseminate the project results in scientific conferences and journals.
Strasbourg	The urban community of Strasbourg will participate to dissemination activities and contribute to determine the exploitation opportunities of the INSIST applications.
Provus	Provus will contribute to management activities as a project partner. Provus will contribute also dissemination and exploitation of project results.
Milestones and deliverables	
M1	D7.1 - Public summary of project
M1	D7.2 - Project start-up meeting
M3	D7.3 - Communication portal Twiki
M3	D7.4 - Public project web site
M18	D7.5 - Initial dissemination and standardisation plan
M18	D7.6 - Initial exploitation plan
M36	D7.7 - Final dissemination and standardisation plan

M36	D7.8 - Final exploitation plan and state of the art report
M36	D7.9 - Public report of projects' results
	Furthermore: All other ITEA Contractual reports

6. Main milestones and deliverables

6.1. List of milestones

WP	Milestone title rationale	Planned delivery date
1	State of art, user and system requirements defined.	M12
1-2-3	Final version system architecture and component technologies accepted	M15
2-3-4-5-6	First version of all demonstrators ready	M24
2-3-4-5-6	Final version of demonstrators ready for validation	M33
All	Project end: all deliverables and documents ready and accepted	M36

6.2. List of deliverables

Del. No.	Deliverable title rationale	WP	Nature	Dissemination level	Planned delivery date
D7.1	Public summary of project	7	R	PU	M1
D7.2	Project start-up meeting	7	O	CO	M1
D1.1.1	State-of-the-art on cross-system integrated services for citizens' safety and comfort	1	R	PU	M3
D7.3	Communication portal Twiki	7	O	CO	M3
D7.4	Public project web site	7	O	PU	M3
D1.1.2	Use case definition and user requirements specification	1	R	CO	M6
D4.2.1	Data Structure/Standard Requirements Specification	4	R	CO	M6
D5.1.1	Service chains and experimental study planning	5	R	PU	M6
D2.2.1	Context-aware detection algorithms	2	R	CO	M11
D1.2.1	System requirements specification	1	R	CO	M12
D2.1.1	Report of selected feature/object algorithms for embedded systems	2	R	CO	M14
D6.1.1	Data collection plan	6	R	CO	M15
D6.1.2	Data collection	6	R	CO	M18
D7.5	Initial dissemination and standardisation plan	7	R	PU	M18
D7.6	Initial exploitation plan	7	R	PU	M18
D2.3.1	Prototype sensing optics for HDR sensing and multifaceted optics	2	P	CO	M20
D3.1.1	High-level data processing algorithms	3	S	CO	M20
D4.1.1	Definition of System Connection Models	4	R	CO	M20

Del. No.	Deliverable title rationale	WP	Nature	Dissemination level	Planned delivery date
D4.2.2	Investigating the requirements of the data structure / standard for interoperability.	4	R	CO	M20
D4.3.1	Privacy & Policy Management Specifications	4	R	PU	M20
D1.3.1	Specification of basic demonstrator components and integrated system demonstrators	1	R	CO	M24
D6.2.2	Demonstrator component evaluation report	6	R	PU	M24
D2.3.2	Distributed sensing software	2	S	CO	M26
D3.2.1	Multimodal data fusion algorithms	3	S	CO	M26
D5.2.1	Design and execution of experimental studies	5	R	CO	M30
D6.3.1	Integrated demonstrators	6	D	PU	M30
D2.4.1	Event detection algorithms for multifaceted optics and light-field measurements	2	R	CO	M32
D6.4.1	Integrated demonstrator evaluation plan	6	D	PU	M32
D3.3.1	Prototype of the HMI in the form of an application	3	P	CO	M36
D3.3.2	Interaction with smart urban spaces	3	R	CO	M36
D4.3.2	Content Management System Implementation	4	R	CO	M36
D4.4.1	Hardware Communication Interfaces Implementation	4	P	CO	M36
D5.3.1	Evaluation result analysis and report of connected services studies	5	R	CO	M36
D6.4.2	Integrated demonstrator evaluation report	6	R	PU	M36
D7.7	Final dissemination and standardisation plan	7	R	PU	M36
D7.8	Final exploitation plan including state of the art report	7	R	PU	M36
D7.9	Public report of projects' results	7	R	PU	M36
	Furthermore: all reports requested by ITEA office will be delivered in due date				

7. Rationale for public funding

The aim of INSIST project consortium is to take a leading role on European level in the development of innovative sensor-based systems for smart lighting, surveillance, traffic management, intelligent advertising and atmosphere creation, business intelligence and building information management. These systems can be exploited separately for various application fields or providing a single solution for public bodies providing services to citizens in urban spaces. The coordinated effort in INSIST can bring major benefits in the global competition to the European companies. The success of such a development relies heavily on easy adoption of state-of-the-art computer vision and sensor technology offering major benefits compared to the solutions available on the market currently and totally new business opportunities.

Breakthrough
For each participating country a major city will act as a test case for our to develop new technologies

- *Finland – Oulu*
- *France – Strasbourg*
- *Romania – Sibiu*
- *Spain – Seville*
- *Netherlands – Eindhoven*
- *Turkey – Metropole of Istanbul*

INSIST importance – The advent of cost-effective sensor installations serving multiple application fields is a major breakthrough. As a result the previously expensive technology can be adopted on novel application fields to provide services and solutions, which could not be realized before due to technology or cost limitations. However efficient adoption of new technology on many application domains necessities development of an interconnected ecosystem with advanced data fusion and analysis services as well as well-defined interfaces between various systems keeping in mind the most important security aspect of services for citizens in urban spaces.
Developing interconnected sensor systems with well-defined interfaces is a challenging activity, thus synergies created in this project need to be exploited efficiently. INSIST consortium consists of efficient mix of different partners that support each other for performing the project goals. The consortium includes experienced research and company participants focused on specific INSIST application domains as well as technology developers and providers specialized in specific technology topics. The software developer companies will support the realization of the ecosystem that will allow easy integration of new sensor systems and value-added services by use of specific APIs for building the next generation services for urban spaces. The project allows more generic design of the technology provided by participants, thus new value chains can be formed and participants may increase their market potential in new application domains.
In INSIST we will demonstrate the ecosystem functionality by developing national application demonstrators. The combination of these INSIST application domains will ensure the functionality of the ecosystem on a wide range of services from smart lighting and traffic management to business intelligence.

Rationale for funding – The effort to reach the INSIST project goals is notable, because we need to address the sensor technology and system development from many aspects and build the interconnected INSIST ecosystem to support the creation of services. INSIST is built on a well-balanced group of actors from all needed domains including large industry, researchers and SMEs. This will seriously increase the chances of success of the consortium in the ambition to obtain a true European adoption of the resulting sensor and service technology. The integration of smart traffic, surveillance and lighting could lead to major benefit in the development of transversal optimized solutions that will help in sustainability, as well as in security and in quality of life. This type of innovation for bringing different service sectors together, deploying results to support the validation, can only be achieved through public funding support.

European co-operation added value – The INSIST partners present a wide selection of European companies and research institutes providing expertise on related technology, application fields and user expectations. Many of the INSIST partners have also already experience from European co-operation projects and collaborate with both INSIST partners and other European projects and companies. The newcomers on the other hand will provide new insights and specialized knowledge for INSIST. By joining the different expertise and background in INSIST consortium into a common coordinated effort, Europe is clearly preparing a significant leap into the future of sensor-based systems and services with new means for the industry and SME partners to create cost-effective and highly innovative products for their customers.

8. Contacts with Public Authorities

The Netherlands	
Consortium national contact person	**Public Authority contacted person**
Ad de Beer Philips Research Eindhoven ad.de.beer@philips.com +31 40 27 40392	Wilbert Schaap Agentschap NL Wilbert.schaap@agentschapnl.nl +31 886 025 424

Finland	
Consortium national contact person	**Public Authority contacted person**
Johannes Peltola VTT johannes.peltola@vtt.fi +358 40 7694056	Olavi Keränen TEKES olavi.keranen@tekes.fi +358 50 557 7932

France	
Consortium national contact person	**Public Authority contacted person**
Jean-François Goudou Thales Services jean-francois.goudou@thalesgroup.com +33 1 69 41 59 96	Florent Della Valle Ministry of Finances florent.della-valle@finances.gouv.fr + 33 1 79 843 029

Romania	
Consortium national contact person	**Public Authority contacted person**
Monica Florea SIVECO Romania SA monica.florea@siveco.ro +40 21 3023300	Vasile Lungu UEFISCDI vasile.lungu@uefiscdi.ro +40 21 3023850

Spain	
Consortium national contact person	**Public Authority contacted person**
Jesus Bermejo Telvent jesus.bermejo@telvent.com +34 666499208	Joaquín Abati Ministry of Industry, Tourism and Trade jabati@minetur.es +34 913 462 511

Turkey	
Consortium national contact person	**Public Authority contacted person**
Özgün Algın Argevas ozgun.algin@argevas.com +90 532 366 12 23	Ezgi Bener TÜBİTAK ezgi.bener@tubitak.gov.tr +90 312 468 53 00

The Country coordinators in the above mentioned table are responsible for the negotiation with the local funding authorities; they have discussed the current consortium mentioned in this PO. Final consortium, his effort and total costs will be defined in FPP phase.

9. How the FPP takes into account the recommendations of the PO evaluations

STG Recommendations	Actions taken	Chapter
Complete the value chain actors and business dimension	Included in WP5, task 1. For each participating country a major city will act as a test case for our to develop new technologies • Finland – Oulu • France – Strasbourg • Romania – Sibiu • Spain – Seville • Netherlands – Eindhoven • Turkey – Metropole of Istanbul	WP5 description
Attainable market for the partners and the project is less clear	We have included a list of market opportunities and exploitation areas defined for each partner independently	3.3.3
Market opportunities are clearly described but not quantified.	Market opportunities and exploitation are made quantified in table 4	3.3.3
Standardization plan will most likely need to be focus more to reach optimal standardization potential.	Standardisation strategy and related deliverable is described in chapter 3.4.1 and deliverable D7.5 and D7.7.	3.4.1
The value chain is well defined, and partners are well positioned across the value chain, although focus is more on technological aspects and less including business aspects. For example decision-makers (city governance, police, etc.) are not mentioned although they represent important stakeholders in the value chain.	Definition of the value chain is part of WP5, and will be executed in activity 5.1. The corresponding deliverable is D5.1.1	WP5 description
As a recommendation, please make sure to at the end of the project to deliver a state-of-the-art document describing the separate components (and innovation on these), the integration and the newly created interconnected ecosystem	We have added to the deliverable about exploitation (7.8), the state of the art as it is at the end of the project. Furthermore, we have added a final deliverable in WP7, were we describe the results of the project D7.9 Public report of projects' results	WP7 description

ITAC Comments	Actions taken
Finland It is necessary for the project to focus on something. It is good that the consortium has size wise some margin for adjustment in case it would be necessary. In further evaluation the effects of research activities to participating companies' business progression and/or regeneration targets will be emphasized. The companies' commercial goals for the project need to be clearly documented.	Finland will focus on the development of smart lighting and information (advertising) systems. The focus is to measure context and use the information in adaptive lighting and information solutions. The target is to create interoperable services that strengthen the offering provided by the Finnish companies. Research institute (VTT) work has been targeted for support R&D activities and commercial exploitation of participating Finnish companies. Commercial potential has been identified by each company.
France Clarify their technical targets (for instance in	French consortium has specified the envisioned advances in terms of application domain and solutions in the

the fields of video surveillance and traffic management) • specify their state-of-the-art in terms of products and solutions on targeted application domains (industrial only) • List and describe envisaged collaborations within French consortium • Reduce the share of academic partners in the project • A letter confirming the label obtention should be attached to the FPP or transmitted to the PA.	partner's description. Collaboration within the consortium is explicit and the share of academics is reduced according to the PA guidelines.
Netherlands • The amount of work that has to be done in this project is somewhat unclear; where are they now?	A clearly state of the art is described in 3.2.1 for each technology. A detailed description of the work to be done by the (NL) partners is added in the WP and activity descriptions. The project has a clear vision and clear targets
Romania • The project is too spread in objectives. • SmartCities concept is present but the full integration is too ambitious. • Romanian participants are involved in several project proposals, too many for the funding possibilities both in self-funding and public funding	Romanian partners focused their project objectives and clarified their involvement in INSIST proposal by taking into account a dedicated module from the Smart City concept based on consumers involvement. The public funding will be available for several project proposals based on competition's evaluation rating. Romanian partners are private large or medium size enterprises, running national and international large scale projects, and having good self-funding capabilities.
Spain • Should highlight values, differences with other very similar projects, SOTA and innovation. • Project should be more centred in some of the problems detected, coming back to earth. • CDTI (grey): No status set. • Research Centre must be subcontracted. Spanish low budget contribution.	An increased level of detail in the FPP will help to differentiate the project from others in the same domain. The table in 3.2.1.2 compares INSIST at a high level with others helping for its positioning. One of the areas in which the Spanish sub-consortium will concentrate will be in the development of new 3D surveillance systems and analysing the potential of surveillance and mobility management interoperability. This will allow for lower cost and higher efficiency solutions in areas such as parking and blue area management as well as in optimizing street lights control through real-time processing of more accurate information of vehicle and pedestrians flows. The selected technology research centre for the project is not public allowing it being partner, some other partners could also join before national application.
Turkey • Project aims to integrate various public services with different technologies into a single connected information ecosystem. • Project should emphasize the different added value and Turkish consortium is quite satisfactory.	During the FPP preparation phase Turkish consortium scenario has been detailed in technical and business aspects according to PA guidelines. Turkish consortium will provide an integrated platform on traffic management with different Turkish partners having complementary technology expertise. Turkish consortium would like to apply results of the project in large cities in Turkey. Therefore the consortium is in contact with two metropolitan municipalities. Pre-discussion results are positive and conversation is on-going.

10. Appendices

10.1.Partner Overview

5.2.8 C2 SmartLight Oy

Organisation	C2 SmartLight Oy
Type	Small and Medium sized Enterprise
Country	Finland
Technical Contact	
Contact Person	Mr. Mauri Matias Haapasaari
Email Address	mauri.haapasaari@c2smartlight.com
Telephone	
Mobile	+358 405 488 902
Fax	
Address	Ohjelmakaari 10
Town	Jyväskylä
Postal Code	40500
Country	Finland
Financial Contact	
Contact Person	Mr. Mauri Matias Haapasaari
Email Address	mauri.haapasaari@c2smartlight.com
Telephone	
Mobile	+358 405 488 902
Fax	
Address	Ohjelmakaari 10
Town	Jyväskylä
Postal Code	40500
Country	Finland

C2 SmartLight Oy is an expert in outdoor lighting. With our products, population centres and industrial areas can be lit at the desired times, in the desired places, and with suitable output.

5.2.9 Digital Living Finland Oy

Organisation	Digital Living Finland Oy
Type	Small and Medium sized Enterprise
Country	Finland
Technical Contact	
Contact Person	Dr. Mervi Himanen
Email Address	mervi.himanen@digitalliving.fi
Telephone	

Mobile	+358 408 460 306
Fax	
Address	Hiilikatu 3
Town	Helsinki
Postal Code	00180
Country	Finland
Financial Contact	
Contact Person	Dr. Mervi Himanen
Email Address	mervi.himanen@digitalliving.fi
Telephone	
Mobile	+358 408 460 306
Fax	
Address	Hiilikatu 3
Town	Helsinki
Postal Code	00180
Country	Finland

Digital Living Finland Oy provides Web 3.0 based platform in cloud (on Amazon). The ultimate aim of the company is to provide an open access platform for various applications. Its own interests lie in a full service concept of daily living covering housing, wellbeing, energy and sustainability, and mobility in cooperation of relevant partners. It will be a tool for managing life to enable increased easiness, autonomy, ever accessible means for social inclusion and easy access to daily activities, and compatibility with the apparatus providing prolongation of functional capacity.

On the knowledge layer, the Digital Living covers the linked data from real world to the solutions after the user needs. The Digital Living service infrastructure makes it easily possible for the end users to be in close contact with their relatives and friends as often as they wish. The cycles of design phase of experts and the RTDI carried out in the Digital Living Lab environment take turns from the very beginning of the development of the Housebook eservice infrastructure (cf. the ENoLL network membership). The first spear head application for content and data analytic services for living is the Housebook. The basis of the Housebook application is in personalised data of the place and thus, in knowledge of real estate and facilities management. The win-win-win type ecosystem of Housebook builds starting from the financers, investors and owners interests forming the basis for the benefit of the primary end users. The service providers, their responsibilities and profits are planned in synergy. It is valid for all types of housing and related personalised knowledge management in real estate. Making the facilities management for the building owners more rational compared to the traditional tools and use of housing flexible even in cases of the changing living conditions. Not only the social connectivity via new media but also the effective space management makes the dwelling easily rich with personal contacts.

5.2.10 Helvar Oy Ab

Organisation	Helvar Oy Ab
Type	Large Industry
Country	Finland

Technical Contact	
Contact Person	Max Erik Bjorkgren
Email Address	max.bjorkgren@helvar.com
Telephone	+358 400 448 092
Mobile	+358 400 448 092
Fax	
Address	Yrittajantie 23
Town	Karkkila
Postal Code	03600
Country	Finland
Financial Contact	
Contact Person	Christina Paatero
Email Address	christina.paatero@helvar.com
Telephone	
Mobile	
Fax	
Address	Ostolaskut PL 70227
Town	Karkkila
Postal Code	01051 Laskut
Country	Finland

Helvar is an international lighting technology company specialising in energy-efficient components and solutions for lighting and lighting control systems.

5.2.11 Innorange Ltd

Organisation	Innorange Ltd
Type	Small and Medium sized Enterprise
Country	Finland
Technical Contact	
Contact Person	Mr. Samuli Juhani Silanto
Email Address	samuli@innorange.fi
Telephone	+358 504 837 411
Mobile	+358 504 837 411
Fax	
Address	Apollonkatu 4A4
Town	Helsinki
Postal Code	00100
Country	Finland
Financial Contact	

Contact Person	Mr. Samuli Juhani Silanto
Email Address	samuli@innorange.fi
Telephone	+358 504 837 411
Mobile	+358 504 837 411
Fax	
Address	Apollonkatu 4A4
Town	Helsinki
Postal Code	00100
Country	Finland

Innorange a leading retail business intelligence provider for brinck-and-mortar retail what comes to customer behaviour. Innorange Business Intelligence platform fuses information from radio, camera, WiFi authentication and 3rd party databases such as cashier data.

5.2.12 Kone

Organisation	Kone
Type	Large Industry
Country	Finland
Technical Contact	
Contact Person	Mr. Jussi Hiltunen
Email Address	jussi.hiltunen@kone.com
Telephone	
Mobile	
Fax	
Address	PL 1000
Town	Hyvinkää
Postal Code	05801
Country	Finland
Financial Contact	
Contact Person	Mr. Jussi Hiltunen
Email Address	jussi.hiltunen@kone.com
Telephone	
Mobile	
Fax	
Address	PL 1000
Town	Hyvinkää
Postal Code	05801
Country	Finland

KONE is a global company that delivers elevators, escalators and automatic doors to construction industry and provides maintenance and other services. KONE is among three biggest companies in all of its main market areas.

5.2.13 Mypose Oy

Organisation	Mypose Oy
Type	Small and Medium sized Enterprise
Country	Finland
Technical Contact	
Contact Person	Mr. Lassi Asseri Anttonen
Email Address	lassi.anttonen@mypose.fi
Telephone	
Mobile	+358 405 166 252
Fax	
Address	Hakakatu 16 A 1
Town	Oulu
Postal Code	90140
Country	Finland
Financial Contact	
Contact Person	Mr. Lassi Asseri Anttonen
Email Address	lassi.anttonen@mypose.fi
Telephone	
Mobile	+358 405 166 252
Fax	
Address	Hakakatu 16 A 1
Town	Oulu
Postal Code	90140
Country	Finland

Mypose Oy, creates interactive marketing solutions for retail _ connecting offline and online. Company is a start-up with 4 persons. Our area of expertise is software. We create applications for interactive displays, specially touch-screen, but also for other methods of interaction. We develop software to the client and server side, creating full solutions for retail marketing.

5.2.14 Offcode Oy

Organisation	Offcode Oy
Type	Small and Medium sized Enterprise
Country	Finland
Technical Contact	
Contact Person	Mr. Takaluoma Antti
Email Address	antti.takaluoma@offcode.fi

Telephone	+358 400 599 588
Mobile	+358 400 599 588
Fax	
Address	Valtatie 67
Town	oulu
Postal Code	90500
Country	Finland
Financial Contact	
Contact Person	Mr. Takaluoma Antti
Email Address	antti.takaluoma@offcode.fi
Telephone	+358 400 599 588
Mobile	+358 400 599 588
Fax	
Address	Valtatie 67
Town	oulu
Postal Code	90500
Country	Finland

Offcode Ltd. (www.offcode.fi) is an engineering office specializing in embedded systems, mobile Linux and various user Interface Technologies. We have producing solutions in sectors of Medical, Wellness, Telecom, Automotive and Industrial sectors.

Offcode is founded in 2004 and we are located at Oulu, Finland.

Offcode provides a wide range of services from subcontracting to full product development. We also have couple industrial measurement products. Offcode' s customers are device manufacturers, software vendors and system integrators located in the USA, Far East, Europe and Finland.

Offcode has strong background in complex multi-technology projects. Low power mobile devices, wireless communications, user interface technologies and embedded Linux are some of our key technology areas. In software development, Offcode typically utilize open source software, tools andmethods. Offcode has done Linux base ports to various embedded devices and implemented necessary Linux device drivers. Offcode has worked with most of the Embedded Operating Systems.

5.2.15 Pro Piknik Festivals

Organisation	Pro Piknik Festivals
Type	Small and Medium sized Enterprise
Country	Finland
Technical Contact	
Contact Person	Jaakko Jokipii
Email Address	jjokipii@gmail.com
Telephone	

Mobile	+358 407 779 319
Fax	
Address	Kirkkokatu 19 a 13
Town	Oulu
Postal Code	90100
Country	Finland
Financial Contact	
Contact Person	Jaakko Jokipii
Email Address	jjokipii@gmail.com
Telephone	
Mobile	+358 407 779 319
Fax	
Address	Kirkkokatu 19 a 13
Town	Oulu
Postal Code	90100
Country	Finland

Pro Piknik Festivals Oy (PPF) is a company that works in the fields of event organizing, marketing and digital media solutions. The most prominent aspect of business in PPF's repertoire is Loistonäyttö, a public screen located in the pedestrian area of the city of Oulu, Finland. In addition to commercials, Loistonäyttö offers cultural and artistic content to the people. The location of the screen provides excellent possibilities to test new technical and operational applications.

5.2.16 Valopaa Ltd.

Organisation	Valopaa Ltd.
Type	Small and Medium sized Enterprise
Country	Finland
Technical Contact	
Contact Person	Mr. Ari Kalervo Mattila
Email Address	ari.mattila@valopaa.com
Telephone	
Mobile	+358 405 459 874
Fax	
Address	Konekuja 2
Town	Oulu
Postal Code	90630
Country	Finland
Financial Contact	
Contact Person	Mr. Ari Kalervo Mattila
Email Address	ari.mattila@valopaa.com

Telephone	
Mobile	+358 405 459 874
Fax	
Address	Konekuja 2
Town	Oulu
Postal Code	90630
Country	Finland

http://www.valopaa.com/company

5.2.17 VTT Technical Research Centre of Finland

Organisation	VTT Technical Research Centre of Finland
Type	Research Institute
Country	Finland
Technical Contact	
Contact Person	Mr. Johannes Peltola
Email Address	johannes.peltola@vtt.fi
Telephone	+358 40 769 4056
Mobile	+358 40 769 4056
Fax	+358 8 551 2320
Address	P.O. Box 1100
Town	OULU
Postal Code	90571
Country	Finland
Financial Contact	
Contact Person	Ms. Jaana Aarnikare
Email Address	jaana.aarnikare@vtt.fi
Telephone	+358 207 222 143
Mobile	
Fax	+358 207 222 320
Address	P.O. Box 1100
Town	OULU
Postal Code	90571
Country	Finland

VTT Technical Research Centre of Finland is a globally networked multitechnological applied research organization. VTT provides high-end technology solutions and innovation services. We enhance our customers' competitiveness, thereby creating prerequisites for society' s sustainable development, employment, and wellbeing.
Our expertize in INSIST include sensor data analysis, lighting systems, data management and fusion and interaction technologies.

5.2.18 CEA

Organisation	CEA
Type	Research Institute
Country	France
Technical Contact	
Contact Person	Mr. Quoc Cuong Pham
Email Address	quoc-cuong.pham@cea.fr
Telephone	+33 169 415 718
Mobile	+33 169 082 716
Fax	
Address	CEA Saclay - NanoInnov - Institut LIST/DIASI/LVIC Bât 861 - PC 173
Town	Gif sur Yvette
Postal Code	91191
Country	France
Financial Contact	
Contact Person	Ms. Dominique Schoen
Email Address	dominique.schoen@cea.fr
Telephone	+33 169 085 028
Mobile	
Fax	+33 1 69 088 395
Address	Point Courrier 178
Town	Gif sur Yvette - Cedex
Postal Code	91191
Country	France

CEA LIST Institute focuses its research activities on developing innovative technologies for smart and complex systems. Its R&D programmes, with potentially major economic and social implications, centre on interactive systems, embedded systems, sensors and signal processing. The main mission of CEA LIST is to encourage innovation and technology transfer through long-term industrial partnerships. Inside the LIST Institute, the Vision & Content Engineering Laboratory (LVIC) will be in involved in the INSIST project. The core activities of the lab are structured around: technological watch, information retrieval, video surveillance and new applications associated to mobility (augmented reality, multimedia content management, embedded mobile applications).

5.2.19 CITILOG

Organisation	CITILOG
Type	Small and Medium sized Enterprise
Country	France

Technical Contact	
Contact Person	Dr. Jerome Douret
Email Address	jdouret@citilog.com
Telephone	+33 141 243 460
Mobile	
Fax	
Address	19-21 rue du 8 mai 1945
Town	ARCUEIL
Postal Code	94110
Country	France
Financial Contact	
Contact Person	Marc Braun
Email Address	cfo@citilog.com
Telephone	
Mobile	
Fax	
Address	19-21 rue du 8 mai 1945
Town	ARCUEIL
Postal Code	94110
Country	France

CITILOG (France) : Citilogis a French company created by IFFSTAR[1] researchers (with the participation of IFFSTAR and financial partners) in order to develop and to market the products stem from the research work done at IFFSTAR in the domain of traffic surveillance and management based on video sensors.

Citilog has developed a smart sensor embedding image processing algorithms, that is installed at each intersection input and allow to measure in real time the real traffic demand. On of the main asset of the XCam sensor is its ability to provide a lot of different measurements in a very robust way (among others presence detection,stop detection, speed, flow), and also to provide measurements that can not be provided by other technologies, such as the direct queue length measurements at intersection inputs, used as a very reliable indicator of the traffic demand.

[1] Formerly INRETS

5.2.20 Lille 1 University

Organisation	Lille 1 University
Type	University
Country	France
Technical Contact	
Contact Person	Dr. Jean Martinet
Email Address	jean.martinet@lifl.fr

Telephone	+33 659 691 191
Mobile	+33 659 691 191
Fax	
Financial Contact	
Contact Person	Muriel Vernay
Email Address	muriel.vernay@univ-lille1.fr
Telephone	
Mobile	
Fax	
Address	Service des Activités Industrielles et Commerciales (SAIC), Bat. A3, Universit
Town	Villeneuve d' Ascq
Postal Code	59655
Country	France

Lille 1 University is a State University, founded in 1562 by the Spanish. It became French in 1667. Louis PASTEUR was the first Dean of the Science Faculty in 1854. Lille 1 University was, at that time, situated in the town centre. In 1971, the Science Faculty and the different faculties in Lille moved to the new town of Villeneuve d' Ascq. Lille 1 is a centre of excellence in large wide domains, and is one of the leading science universities in France. The Computer Science Laboratory of Lille (in French: Laboratoire d'Informatique Fondamentale de Lille, LIFL) is a joint research unit of Lille 1 University and the French National Centre for Scientific Research (CNRS). It also has strong links with the French National Institute for Research in Computer Science and Control (INRIA). LIFL was founded in 1983 and currently comprises more than 250 members - 120 lecturers and professors, 30 technicians and administratives, and more than 100 PhD students.

Our research group at Lille 1 University focuses on multimedia content representation and optimization for indexing and retrieval, object and event detection from video. Our expertise also involves mining multi-dimensional data, multimedia content management with metadata (e.g. ITEA2 CAM4Home project), user-centred design, user gaze tracking, and multi-modal interface. Lille 1 has been involved

in many research projects in the domain of video analysis and real time information extraction, event detection, high-level feature detection, object tracking, user monitoring (e.g. ITEA2 MIDAS project).

Interests in the INSIST project:
Lille 1 University will develop scene understanding, individual/group analysis, and activity recognition algorithms. We will namely focus on event detection, trajectory analysis, and density estimation methods for people and possibly vehicles, to be applied to the surveillance and traffic contexts. These approaches will be investigated and developed analysing the requirements, constraints, and close interactions with the integrated light management and control platform.

A great attention will be given to light-weighted solutions and embedded implementations will be explored in order to enable a real-time feedback from sensor to the connected platform to improve smart lighting strategies. Besides, Lille 1 university will also contribute in the advertising application by developing presence detection methods for interactive advertising systems and luminaires.

Benefits of the projects:
Lille 1 will exploit results by promoting new areas of research, in the domain of advanced algorithms for scene understanding from video analysis and activity recognition. Lille 1 will also capitalize the results in the form of publications, participation to forums, conferences, and scientific events. The research activities related to INSIST project will contribute in students' education and training.

5.2.21 Thales

Organisation	Thales
Type	ITEA 2 Founding Company
Country	France
Technical Contact	
Contact Person	Dr. David Faure
Email Address	david.faure@thalesgroup.com
Telephone	+33 169 415 688
Mobile	
Fax	+33 169 416 001
Address	Campus de Polytechnique1, avenue Augustin Fresnel
Town	PALAISEAU Cedex
Postal Code	91767
Country	France
Financial Contact	
Contact Person	Dr. David Faure
Email Address	david.faure@thalesgroup.com
Telephone	+33 169 415 688
Mobile	
Fax	+33 169 416 001
Address	Campus de Polytechnique1, avenue Augustin Fresnel
Town	PALAISEAU Cedex
Postal Code	91767
Country	France

Thales is a world leader for mission critical information systems, with activities in three core businesses: aerospace (with all major aircraft manufacturers as customers), defence, and security (including ground transportation solutions). It employs 68000 people worldwide (50 countries). It provides its customers with all the key functions in the critical information loop, from detection and processing to transmission and distribution. Thales develops its strategic capabilities in component,

software and system engineering and architectures through its R&T organisation. Designing and developing the mission/safety-critical information systems that underpin the company's leadership in aerospace, defence and security markets calls for comprehensive expertise in increasingly sophisticated technologies and the ability to integrate these technologies with large-scale software driven systems.

Thales Research & Technology (TRT), a network of corporate research laboratories of the Thales group, coordinates these activities at the global level. TRT' s primary mission is to forge links between the company and leading scientific bodies in each area of expertise in order to monitor the latest advances, develop disruptive technologies and expertise in new areas, attract talented science graduates (140 doctoral students work at Thales labs) and provide a platform for innovation and knowledgesharing to support company-wide projects. Most of these corporate laboratories are located on university campuses in immediate proximity to the company' s research partners. The corporate research laboratory in France, for example, is located on the campus of the École Polytechnique _ one of the country' s most prestigious engineering schools _ and forms part of a complex of world-class research establishments located just south of Paris. Thales research centres in the Netherlands and Singapore are located at Delft University and Nanyang Technological University (NTU). In the UK, the Reading laboratories have close ties with major British universities including Cambridge, Surrey and London Imperial College. The joint Thales Alcatel-Lucent research laboratory dedicated to III-V semiconductor technologies is also part of this worldwide network.

5.2.22 Thales Services SAS

Organisation	Thales Services SAS
Type	ITEA 2 Founding Company
Country	France
Technical Contact	
Contact Person	Dr. Jean-Francois Goudou
Email Address	jean-francois.goudou@thalesgroup.com
Telephone	+33 169 415 996
Mobile	+33 689 681 630
Fax	
Address	Campus Polytechnique1, avenue Augustin Fresnel
Town	Palaiseau Cedex
Postal Code	91767
Country	France
Financial Contact	
Contact Person	Dr. Jean-Francois Goudou
Email Address	jean-francois.goudou@thalesgroup.com
Telephone	+33 169 415 996
Mobile	+33 689 681 630
Fax	
Address	Campus Polytechnique1, avenue Augustin Fresnel
Town	Palaiseau Cedex

Postal Code	91767
Country	France

Thales Services innovation lab develops both ICT and physical security skills. ICT cluster focus on Web services based architectures, information system security and resilience and open-source software and standards for system interoperability. The physical security domain develops technologies dealing with video analytics, synthetic environments and business processes topics and is specialized in crisis management and critical infrastructures protection

5.2.23 Urban Community of Strasbourg

Organisation	Urban Community of Strasbourg
Type	Government
Country	France
Technical Contact	
Contact Person	Dr. Céline Oppenhauser
Email Address	celine.oppenhauser@strasbourg.eu
Telephone	+33 388 609 271
Mobile	
Fax	
Address	1 parc de l'étoile
Town	strasbourg
Postal Code	67076
Country	France
Financial Contact	
Contact Person	Dr. Céline Oppenhauser
Email Address	celine.oppenhauser@strasbourg.eu
Telephone	+33 388 609 271
Mobile	
Fax	
Address	1 parc de l'étoile
Town	strasbourg
Postal Code	67076
Country	France

Strasbourgurban community (CUS) is a form of intercommunal cooperation which introduces the notion of financial solidarity and the defence of joint interests between 28 member communes.

The Urban Community has a certain number of both mandatory and voluntary responsibilities over and above those of the member communes. It is also an important partner of the State in other areas which do not come under its direct legal responsibility. There are two main areas of responsibility: management and public services:

Drawing up master plans, and land-use plans and establishing real estate reserves : Creating and providing facilities for concerted development areas (ZAC): housing areas, industrial zones and small business areas, Contributing to school running expenses and facilities, Emergency and firefighting services, Urban transport systems, Water supply, sanitation and hygiene, The creation and extension of cemeteries, The "market of national interest" (MIN), Car parks and parking, Roads and signposting, Economic, university and scientific development, New technologies.

The city ofStrasbourglocated on the Rhine, is the first the inland port inFrance. ThePortofStrasbourgis an important multi-modal hub and influence the upperRhineeconomic are. It is responsible for operating and managing the economic zones entrusted. It hosts 350 companies for 13,000 direct jobs.

CUS is regularly involved in the geographic data management project. Projects operated in the field of traffic management and network transit.

Strasbourgurban community is currently involved in the program CATS (City Alternative Transport System 7/PCRD).

The CATS project objective is final development and experimentation of a new urban transport service based on a new generation vehicle. This transport system service aimed at filling the gap between public mass transport and private individual vehicles. CATS project investigate through an mobility needs analysis, on site demonstration, showcases, impact on environment and especially on CO2 emissions.

5.2.24 Delft University of Technology

Organisation	Delft University of Technology
Type	University
Country	Netherlands
Technical Contact	
Contact Person	Prof. Dr. Koen Langendoen
Email Address	k.g.langendoen@tudelft.nl
Telephone	+31 152 787 666
Mobile	
Fax	
Address	Mekelweg 4
Town	Delft
Postal Code	2628 CD
Country	Netherlands
Financial Contact	
Contact Person	Mr. J.D. van den Bos
Email Address	j.d.vandenbos@tudelft.nl
Telephone	+31 15 278 1548
Mobile	
Fax	+31 15 278 6632
Address	Mekelweg 4 (LB 02.020)

Town	DELFT
Postal Code	2628 CD
Country	Netherlands

Delft University of Technology (Dutch Technische Universiteit Delft) is the oldest and the largest university of technology of the Netherlands. It is a university constantly attracting talent from all over the world and is being ranked as the most prestigious institution of higher education in the Netherlands (Times Higher Education Ranking 2013). Furthermore, Delft University of Technology is one of the top engineering schools in the world, ranked independently by all major university ranking agencies, and a

member of prestigious IDEA League of technical-oriented universities in Europe. Delft University of Technology, established in 1842, by King William II of the Netherlands, expanded to a university with almost 20,000 students and more than 3,000 academic staff. Through many discoveries (including recent experimental discovery of Majorama fermion), and many internationally acclaimed graduates, among them two Nobel Prize winners, continues to be on the forefront of research. The involved research groups are the Vision-Based Robotics group (chaired by prof. P. Jonker) of the faculty of Mechanical, Maritime and Materials Engineering, and the Embedded Software group (chaired by prof. K. Langendoen) of the faculty of Electrical Engineering, Mathematics and Computer Science. Prof Jonker is known for his work in image processing for use in robotics, while prof. Langendoen is a leading researcher in the domain of Wireless Sensor Networks.

5.2.25 Eindhoven University of Technology

Organisation	Eindhoven University of Technology
Type	University
Country	Netherlands
Technical Contact	
Contact Person	Prof. Dr. Ir. Peter H.N. de With
Email Address	p.h.n.de.with@tue.nl
Telephone	+31 402 472 540
Mobile	+31 639 707 535
Fax	+31 40 247 4567
Address	Den Dolech 2
Town	Eindhoven
Postal Code	5612 AZ
Country	Netherlands
Financial Contact	
Contact Person	Mrs Annelies Keijzers
Email Address	J.F.M.Keijzers@tue.nl
Telephone	

Mobile	
Fax	
Address	Dept. of Electrical Engineering PT 1.21, PO Box 513
Town	Eindhoven
Postal Code	5600 MB
Country	Netherlands

Eindhoven University of Technology (TU/e) is a research university specializing in engineering science and technology. Our education, research and knowledge valorisation contribute to: science for society (solving the major societal issues and boosting prosperity and welfare by focusing on the Strategic Areas of Energy, Health and Smart Mobility), science for industry (the development of technological innovation in cooperation with industry), and science for science (progress in engineering sciences through excellence in key research cores and innovation in education). It contributes to the development of technological innovations and as a result to growth, prosperity and welfare in the immediate region (technology and innovation hotspot Eindhoven) and beyond. TU/e is also partner of two EIT KICs (European Institute of Innovation and Technology, Knowledge and Innovation Community), EIT KIC ICT (ICTLabs) and EIT KIC InnoEnergy, both having a prominent node in Eindhoven. The involved department of the TU/e is the VCA research group of the Faculty of Electrical Engineering. The EE faculty is leading in multiple cooperations with the high-tech industry. The VCA group is part of the SPS department inside EE in which multiple projects are executed in cooperation with many industrial companies of the Eindhoven region, like Philips Research and Healthcare, Lighting, Prodrive, ViNotion, CycloMedia and so on. The head of the VCA group, Prof. Dr. Peter de With, is also director in the Strategic Area Health of the TU/e for the research program of Smart Diagnosis and a reknowned international expert in Video Coding, Content analysis, and Architectures with real-time processing. The VCA group has participated in many earlier surveillance projects of (ITEA), like Candela, CANTATA and ViCoMo. The group has also been involved in national projects like Watervisie for surveillance of the harbour in Rotterdam. Prof. de With is IEEE Fellow, board member of the Dutch Institute for Technology on Safety & Security and advisor to companies like Cyclomedia and ViNotion.

Another contribution is coming from the faculty of IE&IS in particular the HTI group of that faculty, which is guided by Prof. Antal Haans. The TUe-HTI group will contribute by developing and evaluating the perception of the used light for in the specific use case developed in the INISIST project. Prof. Haans is an expert in perception of light and is part of the TUe ILI Lighting Institute, which is a cooperation between Philips Electronics and the TU/e for light research and innovation.

5.2.26 Philips Lighting

Organisation	Philips Lighting
Type	ITEA 2 Founding Company
Country	Netherlands
Technical Contact	
Contact Person	Dr. Marco Haverlag
Email Address	marco.haverlag@philips.com
Telephone	+31 620 399 355

Mobile	+31 620 399 355
Fax	
Address	P.O. Box 80020
Town	Eindhoven
Postal Code	5600 JM
Country	Netherlands
Financial Contact	
Contact Person	Dr. Marco Haverlag
Email Address	marco.haverlag@philips.com
Telephone	+31 620 399 355
Mobile	+31 620 399 355
Fax	
Address	P.O. Box 80020
Town	Eindhoven
Postal Code	5600 JM
Country	Netherlands

Philips Lighting is a global market leader with recognized expertise in the development, manufacturing and application of innovative lighting solutions. We have pioneered many of the key breakthroughs in lighting over the past 121 years, laying the basis for our current strength and ensuring we are well-placed to be a leader in the digital transformation. We aim to further strengthen our position in the digital market through added investment in LED leadership while at the same time capitalizing on our broad portfolio, distribution and brand in conventional lighting.

We address people' s lighting needs across a full range of market segments. Indoors, we offer lighting solutions for homes, shops, offices, schools, hotels, factories and hospitals. Outdoors, we offer solutions for roads (street lighting and car lights) and for public spaces, residential areas and sports arenas. In addition, we address the desire for light-inspired experiences through architectural projects. Finally, we offer specific applications of lighting in specialized areas, such as horticulture and water purification.

Philips Lighting spans the entire lighting value chain _ from light sources, luminaires, electronics and controls to full applications and solutions _ through the following businesses: Light Sources & Electronics, Consumer Luminaires, Professional Lighting Solutions, Automotive Lighting, and Lumileds.

5.2.27 Philips Electronics Netherlands BV

Organisation	Philips Electronics Netherlands BV
Type	ITEA 2 Founding Company
Country	Netherlands
Technical Contact	
Contact Person	Mr. Ad de Beer
Email Address	ad.de.beer@philips.com
Telephone	+31 402 740 392

Mobile	+31 613 722 049
Fax	+31 402 746 321
Address	High Tech Campus Building 36 - P116
Town	EINDHOVEN
Postal Code	5656 AE
Country	Netherlands
Financial Contact	
Contact Person	Mr. Patrick Keur
Email Address	patrick.keur@philips.com
Telephone	+31 402 744 718
Mobile	
Fax	+31 40 274 3993
Address	High Tech Campus 34
Town	Eindhoven
Postal Code	5656AE
Country	Netherlands

Royal Philips Electronics of the Netherlands is a diversified health and well-being company, focused on improving people' s lives through meaningful innovation in the areas of Healthcare, Consumer Lifestyle and Lighting. Headquartered in the Netherlands, Philips posted 2012 sales of EUR 24.8 billion and employs approximately 118,000 employees with sales and services in more than 100 countries. The company is a leader in cardiac care, acute care and home healthcare, energy efficient lighting solutions and new lighting applications, as well as male shaving and grooming, home and portable entertainment and oral healthcare.

Philips Research was founded in 1914 in Eindhoven, The Netherlands, as part of Royal Philips Electronics. Philips Research is one of the world' s major private research organizations, staffed by around 2,100 people. Its activities have led to the award of some 100,000 patent and design rights, and the publishing of many thousands of technical and scientific papers. In close cooperation with the Philips Product Divisions, the Philips Research organization generates options for new and improved products and processes and produces important patents in many fields. In order to fulfil our ambition, it is crucial that we work together with companies that are complementary to Philips and share our vision. Philips Research, as one of the pioneers of open innovation, is actively leveraging its deep competences, know-how and IP to work with selected companies and organizations with the purpose of creating win-win propositions. For almost a century, our approach has enabled us to surprise people with breakthrough innovations _ everything from lamps, radios and televisions to medical equipment, electric shavers and semiconductors.

5.2.28 Prodrive

Organisation	Prodrive
Type	Small and Medium sized Enterprise
Country	Netherlands
Technical Contact	

Contact Person	Mr. Leonardus Johannes van de Laar
Email Address	leon.van.de.laar@prodrive.nl
Telephone	+31 402 676 212
Mobile	
Fax	+31 (0)40 2676201
Address	Science Park Eindhoven 5501
Town	Son
Postal Code	5692 EB
Country	Netherlands
Financial Contact	
Contact Person	Ms. Rianne Sleegers
Email Address	rianne.sleegers@prodrive.nl
Telephone	040 2676196
Mobile	
Fax	040 2676201
Address	PO box 28030
Town	Eindhoven
Postal Code	5602 JA
Country	Netherlands

Prodrive delivers most competitive solutions in electronics design, manufacturing and added value services for OEM's and ODM's operating in industrial, professional and consumer markets. Our customers benefit from lower costs, higher flexibility, shorter time-to-market and sustained quality and this has powered Prodrive's continuous growth since the companies start in 1993. We offer a complete range of solutions and services, take full responsibility and work closely together with our clients.

For the INSIST project, Prodrive brings in specific knowledge about their high-quality camera for surveillance and traffic management cases in this project. First, the Prodrive camera is highly suited for the measurement of objects, tracking of people and vehicles and advanced event detection. Together with analysis and system partners in the project, such as Thales, ViNotion and TU/e, Prodrive is interested in the development of advanced surveillance and traffic management cases as proposed in INSIST, to innovate the computing platform of the camera and later integrate/map such advanced cases onto the computing platform. Second, the camera of Prodrive is highly sensitive and may offer possibilities of surveillance under low light conditions. The INSIST project offers the cooperation with Prodrive to develop robust algorithms and camera platform updates for algorithms and analysis under low light conditions.

5.2.29 ViNotion BV

Organisation	ViNotion BV
Type	Small and Medium sized Enterprise
Country	Netherlands
Technical Contact	

Contact Person	Mr. Egbert G.T. Jaspers
Email Address	egbert.jaspers@vinotion.nl
Telephone	+31 402 366 761
Mobile	+31 615 410 981
Fax	
Address	Postbus 2346
Town	EINDHOVEN
Postal Code	5600 CH
Country	Netherlands
Financial Contact	
Contact Person	Mr. Egbert G.T. Jaspers
Email Address	egbert.jaspers@vinotion.nl
Telephone	+31 402 366 761
Mobile	+31 615 410 981
Fax	
Address	Postbus 2346
Town	EINDHOVEN
Postal Code	5600 CH
Country	Netherlands

ViNotion offers solutions for the professional environment, using autonomous systems, based on Video Content Analysis technology. ViNotion is a technology-driven company performing its R&D program in close collaboration with European knowledge institutes. ViNotion offers software development services for customized solutions or system components for several market segments. These services range from delivery of software libraries and integration in the products of the customer to complete systems including embedded hardware platforms. The off-the-shelf proven technology components are particularly developed to quickly address your needs in specific market segments such as: surveillance in the maritime sector, industrial areas and utilities; defense and public safety; geo-based image inspection.

5.2.30 ECRO SRL

Organisation	ECRO SRL
Type	Small and Medium sized Enterprise
Country	Romania
Technical Contact	
Contact Person	Dr. Mihai Vasile Sanduleac
Email Address	mihai.sanduleac@ecro.ro
Telephone	+40 212 108 888
Mobile	+40 722 315 123
Fax	
Address	6, Precupetii Vechi Str.

Town	Bucharest
Postal Code	020685
Country	Romania
Financial Contact	
Contact Person	Dr. Mihai Vasile Sanduleac
Email Address	mihai.sanduleac@ecro.ro
Telephone	+40 212 108 888
Mobile	+40 722 315 123
Fax	
Address	6, Precupetii Vechi Str.
Town	Bucharest
Postal Code	020685
Country	Romania

ECRO is a private SME Romanian company, established in 1999. The company is specialized in research and development, design and consultancy for the energy sector, with focus on new technologies, metering and ancillary services systems, deregulated market and renewables. During its twelve/thirteen years of existence, ECRO has become one of the most important providers of solutions, integrators and software developers for niche segments in the energy area. Their successful references include complex projects in energy and ancillary services metering and studies for the transmission and distribution companies related to power system development.

ECRO is focused in the later years on Smart Grid and Smart Meters solutions, from different perspectives: design, consultancy, specific solutions for Smart Grid functionalities. In this respect, ECRO developed specialized IT platforms for the energy sector: EDEN (Energy Data Engine) _ a software platform which provides Automatic Meter Reading (AMR) with enhanced functionalities; ANSER (Ancillary Services Metering) which was mainly used to provide measurement of ancillary services for the ten biggest hydro-plants in Romania; SIRIUS-SGS (Smart Grid Solutions), which is an evolving package of applications for Smart Grids, especially focused on Virtual Power Plant functionalities. The company aims to continue the development of modern solutions for the energy sector, by using state of the art and beyond technologies, based on latest trends in real-time acquisition and processing, artificial intelligence, semantics, agent-based distributed architectures etc.

In 2012 ECRO also started a collaboration with Polytechnic University of Bucharest _ Faculty of Energetics (UPB), for co-participating with UPB in the development of a Smart Grid laboratory for didactic use and for common research in the area. ECRO SRL participated in the FP5 European Project named FENIX (Flexible electricity networks to integrate the expected ‘ energy evolution’), which dealt with Virtual Power Plants for the energy sector.

5.2.31 Siveco Romania S.A.

Organisation	Siveco Romania S.A.
Type	Large Industry
Country	Romania
Technical Contact	

Contact Person	Dr. Monica Florea
Email Address	monica.florea@siveco.ro
Telephone	+40 213 181 200
Mobile	+40 730 055 784
Fax	+40 21 3181202
Address	Victoria Park, 73-81, Bucuresti-Ploiesti Drive, Building C4, District 1
Town	Bucharest
Postal Code	013685
Country	Romania
Financial Contact	
Contact Person	Dr. Monica Florea
Email Address	monica.florea@siveco.ro
Telephone	+40 213 181 200
Mobile	+40 730 055 784
Fax	+40 21 3181202
Address	Victoria Park, 73-81, Bucuresti-Ploiesti Drive, Building C4, District 1
Town	Bucharest
Postal Code	013685
Country	Romania

SIVECO Romania SA (www.siveco.ro, http://rd.siveco.ro) is a private shareholder company, established in 1992. During its twenty years of existence, SIVECO Romania SA has become one of the most important Romanian providers and software integrators of ERM L&M (Enterprise Resource Management License and Maintenance), eLearning, eGovernment, eHealth, eBusiness, eAgriculture, eCustoms solutions and turnkey projects acting both on the internal and international markets. Moreover, SIVECO has gained a solid reputation on international markets by developing successful projects together with several international companies, collaboration that has blossomed into genuine partnership over the years.

SIVECO has a great experience in the designing and implementing large scale information systems for multiple domains of the public sector such as healthcare, agriculture, customs, government, education we can offer our expertise for the implementation of the software architecture that will support the collection, aggregation, archiving, allocation and analysis of the relevant information from the multitude of sensors and also the presentation of the relevant information on geospatial systems or geographical information systems in order to offer a graphical representation a more comprehensive understanding of the different risk and hazard indicators that have to be monitored.

5.2.32 FADA-CATEC

Organisation	FADA-CATEC
Type	Research Institute
Country	Spain
Technical Contact	
Contact Person	Jorge Cordero Machado
Email Address	jcordero@catec.aero
Telephone	+34 954 179 002
Mobile	
Fax	
Financial Contact	
Contact Person	Silvia de los Santos
Email Address	ssantos@catec.aero
Telephone	
Mobile	
Fax	
Address	Wilbur y Orville Wright 17 La Rinconada
Town	Seville
Postal Code	41309
Country	Spain

The Andalusian Foundation for Aerospace Development (FADA) is a non-profit organisation that takes care of the management and development of CATEC research centre. The main goal of FADA-CATEC is the research and development in aerospace related technologies supporting industries in coordination with universities and other research centres.

FADA-CATEC has currently 50 researchers and engineers and has been awarded with a 21 million euros grant for laboratories and equipment.

CATEC develops technology for the aerospace sector and related ones in its four main research areas: Avionics and Unmanned Systems, Robotics and Automation, and Simulation and Software. It is currently involved in more than 30 R&D projects, including the coordination of two IPs in FP7-ICT programme and the participation in other six FP7 projects.

5.2.33 SCATI

Organisation	SCATI
Type	Small and Medium sized Enterprise
Country	Spain
Technical Contact	
Contact Person	Mr. Oscar Puyal
Email Address	oscar.puyal@scati.com

Telephone	+34 902 116 095
Mobile	+34 609 952 510
Fax	
Address	Scati Labs. Bari, 23. Plataforma Logística PLAZA
Town	Zaragoza
Postal Code	50197
Country	Spain
Financial Contact	
Contact Person	Mr. Oscar Puyal
Email Address	oscar.puyal@scati.com
Telephone	+34 902 116 095
Mobile	+34 609 952 510
Fax	
Address	Scati Labs. Bari, 23. Plataforma Logística PLAZA
Town	Zaragoza
Postal Code	50197
Country	Spain

With more than 15 years life, Scati has had a continuous growth until being consolidated as a leading company in digital video recording systems for security. Integral solutions are provided for the efficient control and supervision of large number of recorders and special facilities in sectors such as: banks, industry, logistics, retailing, public sector, etc. As a technology partner in video-surveillance projects, we collaborate with integrators, engineerings and customers from the design to the start-up through consulting, training and customized 24/7 technical support.

Currently, the company has headquarters in Colombia and Mexico, from where they provide technical support to all their clients in Latin America. Scati has headquarters in France too, from where they develop the markets of France, Belgium and North Africa, to meet more efficiently the needs of their clients. Thanks to several distribution agreements with partners, Scati is introducing their products and solutions in other markets such as Brazil, USA, and other African countries. Due to its great international expansion, Scati has been awarded with the Prize for Exports given by the Chamber of Commerce of Zaragoza (2011).

Scati is provided with AENOR certificates for its Quality Management System (ISO 9001 standard), R&D Management Systems (UNE 166002 standard) and CMMI (Capability Maturiy Model Integration) level 2.

SCATI has a strong research background in Video Content Analysis and Video-Management Systems. Relevant for SVASI are the Spanish grants:

ThunderARM - Desarrollo de la segunda generación de tecnologías para sistemas de seguridad (Development of second generation technologies for security systems). Funded by CDTI (IDI-20111556).From 2011 to 2013. Coordination: Scati. Partners: Zaragoza University.

TelMAX - Sistema de comunicaciones móviles profesionales de banda ancha (Professional broad band mobile communication system). Funded by CENIT (CEN-20071036). From 2007 to 2010. Partners: Teltronic, Ikusi, Indra, AT4 wireless, Acorde, Satec.

FidesLocus - Protección de instalaciones vulnerables a través del análisis de video y la fusión de la información (Vulnerable facilities protection by video analysis and information fusion). Funded by plan nacional de I+D+i (Dex-520100-2008-40). From 2008 to 2009. Coordination: Scati. Partners: LsLUZ, Pompeu Fabra University, Zaragoza University.

E-Medusa - Estrategias avanzadas de adquisición, análisis, visualización y fusión de información y su integración en un sistema avanzado de seguridad para entornos complejos (Advanced strategies for information acquisition, analysis, visualization and fusion, and its integration in an advances security system for complex environments). Funded by PROFIT (FIT-360000-2006-55, FIT-360005-2007-9). From 2005 to 2008. Coordination: Scati. Partners: LsLUZ, InterWAVE, Pompeu Fabra University, Zaragoza University.

iEye - Desarrollo de un sistema de tercera generación para seguridad en entornos inteligentes mediante técnicas de visión por ordenador (Third generation system development for security of intelligent environments using computer vision techniques). Funded by PROFIT (FIT-070000-2002-93, FIT-070200-2003-112, FIT-390000-2004-30). From 2002 to 2004. Coordination: Scati. Partners: Universidad de Zaragoza y Universidad Pompeu-Fabra.

Control del correcto posicionamiento de un camión y el posterior proceso de carga de materiales utilizando procesado avanzado de la imagen (Truck position control and cargo load process system using advanced image processing). Funded by Principado de Asturias Goverment (IE09-133). From 2011 to 2012. Partners: TSK.

5.2.34 Telvent

Organisation	Telvent
Type	ITEA 2 Founding Company
Country	Spain
Technical Contact	
Contact Person	Mr. Jesús Bermejo Muñoz
Email Address	jesus.bermejo@telvent.com
Telephone	+34 954 937 245
Mobile	+34 666 499 208
Fax	+34 954923921
Address	Campus Palmas Altas. Edificio A Calle Energía Solar no 1 Palmas Altas
Town	SEVILLE
Postal Code	41014
Country	Spain
Financial Contact	
Contact Person	Mr. Jesús Bermejo Muñoz

Email Address	jesus.bermejo@telvent.com
Telephone	+34 954 937 245
Mobile	+34 666 499 208
Fax	+34 954923921
Address	Campus Palmas Altas. Edificio A Calle Energía Solar no 1 Palmas Altas
Town	SEVILLE
Postal Code	41014
Country	Spain

Telvent, as part of Schneider Electric, is specialized in IT solutions and services with high technological added value for specific industrial sectors such as Energy, Environment, Traffic, Transport, Telecom, City Services and Public Administration. Telvent executes projects and provides technical services in the field of mission-critical, real time, control and information management. With the most comprehensive portfolio of outsourcing and consulting services, and employing a technology-neutral philosophy, Telvent manages IT and telecommunications infrastructure for many international clients. Telvent's systems facilitate organization-wide integration of vital operational, business process and commercial information.

5.2.35 ARGEDOR Information Technologies Ltd.

Organisation	ARGEDOR Information Technologies Ltd.
Type	Small and Medium sized Enterprise
Country	Turkey
Technical Contact	
Contact Person	Ms. Özlem Gürel
Email Address	ozlem.gurel@argedor.com
Telephone	
Mobile	
Fax	
Financial Contact	
Contact Person	Selda Fidan
Email Address	selda.fidan@argedor.com
Telephone	
Mobile	
Fax	

ARGEDOR provides innovative information processing solutions about information retrieval, processing of information available worldwide, research and customization to companies and end users. ARGEDOR creates products that increase workforce efficiency, manage business processes, increase customer satisfaction and increase sales over Web. ARGEDOR works with the most talented, target oriented and continuously self-improving engineers and researchers. Our team' s extensive research

projects continue with vast research and professional experience and expertise. ARGEDOR strengthens its close relationships with universities with innovative projects.

ARGEDOR takes part in University-Industry collaboration projects and R&D projects supported by TUBITAK and the European Union.

ARGEDOR creates innovative products in the following interest areas:

Data Mining

Data mining is a task of accessing potential information among large scaled indirect and unclear data. Technical approaches such as clustering, classification, data summarization, analysis of changes and detection of deviations are applied in data mining. In this way, patterns, relations, changes, irregularities, rules and statistically significant structures of data are explored in a semi automated manner. ARGEDOR presents its technical and academic knowledge (statistics, machine learning, databases and high performance processing) through different applications to institutions and end users.

Search Technologies

Search engines have become the primary means of accessing information on the Internet. The aim of search technologies is to obtain the information in the demanded structure from irregular and vast information sources such as Web, prepare the information for usage and present it to different domains. ARGEDOR demonstrates its technical and academic knowledge in search technologies through different applications to institutions and end users.

Recommender Systems

Recommender systems aim to present customized preferences to users by capturing the views or preferences of user communities about content items. In that way, users quickly reach the most suitable/accurate information for them. ARGEDOR has been working in the field of recommender systems for a long time and it developed recommender systems in many domains such as music, games, programs and movies.

Sentiment Analysis

Sentiment Analysis classifies Web-based social media contents in intuition based domains such as thoughts/emotions. Then, these multi social perceptions are used in target application domains and new services are generated. Sentiment Analysis is a technology that is intersection of high technologies such as Natural Language Processing, Machine Learning, and Text Mining. Sentiment Analysis' R&D and innovation features are highly important. ARGEDOR has been carrying out academic and technological research in this technology and it has been applying this technology to domains such as finance, shopping and news to create products.

Cloud Computing

With the developing Internet, the capacity of accessing computers that are far away and data processing through these computers have increased. Cloud Computing is a general name given to services that allow collaborative information sharing among information devices. These services can be

software, hardware and file storage. ARGEDOR has been carrying out R&D based research over Cloud Computing technologies especially by creating innovative products that process and store data.

Mobile and Smart TV Applications

ARGEDOR has been developing innovative mobile and smart TV applications and investing in R&D activities in these domains.

5.2.36 Argevas

Organisation	Argevas
Type	Others
Country	Turkey
Technical Contact	
Contact Person	Mr. Özgün Algin
Email Address	ozgun@ozgunalgin.com
Telephone	+90 532 366 1223
Mobile	+90 532 366 1223
Fax	
Address	Afiyet Sok. No:30 K:1
Town	stanbul
Postal Code	34450
Country	Turkey
Financial Contact	
Contact Person	Mr. Özgün Algin
Email Address	ozgun@ozgunalgin.com
Telephone	+90 532 366 1223
Mobile	+90 532 366 1223
Fax	
Address	Afiyet Sok. No:30 K:1
Town	stanbul
Postal Code	34450
Country	Turkey

Argevas is a consultancy and technology development company established in 2012 in Istanbul. Argevas is working with research and innovation based companies to create their research strategy, innovation management processes, research collaboration in multinational research programs.

Argevas also providing technology solutions in different B2B application domains. During the INSIST project, Argevas will be working on data analysis and algorithm development for energy efficient route planning.

5.2.37 Ericsson Arastrma Gelistirme ve Bilisim Hizmetle

Organisation	Ericsson Arastrma Gelistirme ve Bilisim Hizmetle

Type	Large Industry
Country	Turkey
Technical Contact	
Contact Person	Mr. Arda Güreller
Email Address	arda.gureller@ericsson.com
Telephone	
Mobile	
Fax	
Financial Contact	
Contact Person	Orhan Camlica
Email Address	orhan.camlica@ericsson.com
Telephone	
Mobile	
Fax	
Address	ITU Ayazaga Kampusu Teknokent ARI2 Binalari BBlok K3 Maslak
Town	Istanbul
Postal Code	34390
Country	Turkey

Ericsson is the world's largest maker of equipment for building mobile telecommunications networks, with a market share of 38% (2012). It is one of Sweden's largest companies and provides telecommunications equipment, data communication systems, and related services covering a range of technologies including mobile networks.
Directly and through subsidiaries, Ericsson also has a major role in M2M, CRM and cable TV and IPTV systems. Ericsson was also the inventor of Bluetooth.

5.2.38 KoçSistem Information Communications Services

Organisation	KoçSistem Information Communications Services
Type	Large Industry
Country	Turkey
Technical Contact	
Contact Person	Mr. Mehmet Onat
Email Address	mehmet.onat@kocsistem.com.tr
Telephone	+90 216 556 1341
Mobile	+90 532 367 3891
Fax	
Address	Unalan Mah. Ayazma Cad. Camlica Is Merkezi B3 Blok Uskudar
Town	Istanbul
Postal Code	34700
Country	Turkey

Financial Contact	
Contact Person	Oguz YUKSEL
Email Address	oguzy@kocsistem.com.tr
Telephone	
Mobile	
Fax	
Address	Unalan Mh. Ayazma Cd. Camlica Is Merk. Uskudar
Town	Istanbul
Postal Code	34700
Country	Turkey

KocSistem is a leading systems integrator company providing end-to-end solutions and outsourcing services to address business requirements and creating value-add for its customers considered to be locomotives of the national economy.

Established in 1945, KocSistem still delivers business value with an expert staff over 1,000 to a wide range of companies from sectors including public, financial, telecomm, industrial and commercial. In addition to the products and solutions developed in-house, KocSistem shares its wide-spread service network and immense knowledge on each domain and technologies.

As a systems integrator company with over 100+ full time R&D engineers, KocSistem has extensive expertise in project management of engineering and R&D projects. Researchers with the required expertise increase the effectiveness and efficiency of the execution of the project. These projects can be categorized as: Software and Application Development Digital Signage and Content Management Business Process Outsourcing solutions Mobile and Automation Solutions Enterprise Resource Planning (ERP) Consultancy and Solutions Partner Document and Workflow Management Solutions Business Intelligence and Decision Support Solutions Business Process management and SOA Based (BPM and SOA) Solutions

5.2.39 Provus Bilisim Hizmetleri A.S

Organisation	Provus Bilisim Hizmetleri A.S
Type	Small and Medium sized Enterprise
Country	Turkey
Technical Contact	
Contact Person	Mr. Volkan Erol
Email Address	volkan.erol@provus.com.tr
Telephone	+90 212 329 0616
Mobile	+90 533 362 1947
Fax	
Financial Contact	
Contact Person	Mr. Mehmet Kaynakci
Email Address	mahmet.kaynakci@provus.com.tr
Telephone	

Mobile	
Fax	
Address	Maslak Yolu No:5 Ayazaga Mah. Sisli
Town	Istanbul
Postal Code	34396
Country	Turkey

Provus was founded in 2001 and has been leader in providing payment services for debit and credit cards, Point-of-Sale, EPOS and ATM operations. We are also implementing value added services and solutions with our existing technology infrastructure in Turkey. Additionally printing/enveloping and card personalization is the other fields Provus is managing with success to date.

Provus is unique in serving as a Switch between banks and other industries in payment processing and working with top-tier financial institutions, telcos, municipalities, transportation companies and internet companies. With our internationally approved credentials (PCI, Vendor Certification), we operate well over 5.000.000 cards and 100.000 POS' s and 5.500 ATMs.

In addition to these Provus has been certified as R&D Center and is running 5 nationally funded projects out of 30 research projects. Having more than 60 engineers in our R&D center, Provus regularly chases for innovative research projects with breadth experience in industry and know how in payment processing systems. Provus is also contributing to the ITEA2 ADAX project.

Our Operation Fields and Infrastructure; Debit and Credit Card Payment Services Point-of-Sale, EPOS and Merchant Operations ATM Operation Customer Loyalty Applications Document Printing and Enveloping Card Personalization

Some of our references but not limited to are: PTT TEB Garanti INGBank HSBC Citibank Finansbank T-Bank Eurobank Tekfen Societe General Rib Abn-Amro BKT EstimaFinance Romanian International Bank Mondial Raiffeisen Bank Banca Romaneasca Vodafone Avea Tesco Benetton Turkish Airlines RomPetrol

5.2.40 Verisun Informatics Ltd

Organisation	Verisun Informatics Ltd
Type	Small and Medium sized Enterprise
Country	Turkey
Technical Contact	
Contact Person	Sadullah Uzun
Email Address	sadullah@verisun.com

Telephone	+90 216 688 1175
Mobile	+90 533 251 5091
Fax	
Address	Uphill Tower kat 5 daire 27
Town	istanbul
Postal Code	34768
Country	Turkey
Financial Contact	
Contact Person	Sadullah Uzun
Email Address	sadullah@verisun.com
Telephone	+90 216 688 1175
Mobile	+90 533 251 5091
Fax	
Address	Uphill Tower kat 5 daire 27
Town	istanbul
Postal Code	34768
Country	Turkey

Verisun is founded to empower integration of mobile devices to daily life.

Verisun' s approach to mobility is not limited with mobile applications but also M2M solutions and desktop apps makes life easier and smart.

We are operating in 3 business areas: Smart City Smart Business Smart Life

Smart City: Verisun is offering hardware and software solutions for smarter cities. Thanks to its experience on Intelligent Transportation Systems, Verisun proudly announce its innovative solutions to the industry: Maus Sensor _ Magnetic Sensor for Vehicle Detection and Otokontrol _ Automated driver performance meter.

Smart Business: We help our clients to monitor and control their business activities. You can find any financial, HR, and marketing activities of your company in easy-to-understand pie charts or graphs thanks to advanced reporting tool of IBM, Cognos. Executives will have access to important company figures in their iPads.

Smart Life: Mobile applications, web solutions, facebook applications and so on. If you need off-the-chart solutions, please visit us on www.verisun.com

Verisun is official business partner of Turkcell, IBM, and Blackberry.

Verisun is specialized in Intelligent Transportation Systems, Business Intelligence, Mobile Applications, Smart City

10.2.Efforts per Partner

Partner	Country	2014	2015	2016	2017	Perc.	Total
C2 SmartLight Oy	FIN	0.20	1.30	1.40	0.40	1%	3.30
Digital Living Finland Oy	FIN	0.03	0.32	0.38	0.44	0%	1.17
Helvar Oy Ab	FIN	0.50	1.10	1.20	0.80	1%	3.60
Innorange Ltd	FIN	0.25	0.50	0.50	0.25	1%	1.50
Kone	FIN	2.05	3.40	3.60	0.00	4%	9.05
Mypose Oy	FIN	0.25	0.50	0.50	0.25	1%	1.50
Offcode Oy	FIN	0.99	1.08	1.10	0.99	2%	4.16
Pro Piknik Festivals	FIN	0.40	0.80	0.80	0.40	1%	2.40
Valopaa Ltd.	FIN	1.00	2.00	2.00	1.00	2%	6.00
VTT Technical Research Centre of Finland	FIN	2.00	5.20	5.30	2.50	6%	15.00
CEA	FRA	0.50	2.10	2.40	1.60	3%	6.60
CITILOG	FRA	0.80	1.20	1.20	0.40	1%	3.60
Lille 1 University	FRA	1.40	3.00	0.70	0.40	2%	5.50
Thales	FRA	1.00	2.75	2.75	2.00	3%	8.50
Thales Services SAS	FRA	1.10	4.20	4.80	2.30	5%	12.40
Urban Community of Strasbourg	FRA	0.30	0.60	0.70	0.40	1%	2.00
Delft University of Technology	NLD	3.00	4.45	4.40	1.50	5%	13.35
Eindhoven University of Technology	NLD	2.02	3.83	3.62	1.80	5%	11.27
Philips Lighting	NLD	1.70	2.45	1.35	0.50	2%	6.00
Philips Electronics Netherlands BV	NLD	2.00	5.10	5.00	2.90	6%	15.00
Prodrive	NLD	1.59	2.40	3.99	1.02	4%	9.00
ViNotion BV	NLD	0.92	2.33	2.99	1.26	3%	7.50
ECRO SRL	ROU	0.60	2.00	2.00	1.10	2%	5.70
Siveco Romania S.A.	ROU	2.68	2.65	2.67	2.67	4%	10.67
FADA-CATEC	ESP	0.20	0.80	1.00	0.50	1%	2.50
SCATI	ESP	1.60	2.50	2.50	0.90	3%	7.50
Telvent	ESP	2.41	3.96	3.96	1.67	5%	12.00

ARGEDOR Information Technologies Ltd.	TUR	0.90	3.50	3.50	1.60	4%	9.50
Argevas	TUR	1.40	1.90	1.90	1.90	3%	7.10
Ericsson Arastrma Gelistirme ve Bilisim Hizmetle	TUR	3.00	3.00	3.00	3.00	5%	12.00
KoçSistem Information Communications Services	TUR	1.15	4.05	4.00	1.00	4%	10.20
Provus Bilisim Hizmetleri A.S	TUR	0.60	3.50	3.30	0.80	3%	8.20
Verisun Informatics Ltd	TUR	1.50	2.50	3.90	2.50	4%	10.40
Totals		40.04	80.97	82.41	40.75		244.17

10.3.Costs per Partner

Partner	Country	2014	2015	2016	2017	Perc.	Total
C2 SmartLight Oy	FIN	10.0	120.0	120.0	10.0	1%	260.0
Digital Living Finland Oy	FIN	10.0	50.0	50.0	16.0	0%	126.0
Helvar Oy Ab	FIN	50.0	100.0	100.0	50.0	1%	300.0
Innorange Ltd	FIN	25.0	50.0	50.0	25.0	1%	150.0
Kone	FIN	175.0	290.0	305.0	0.0	3%	770.0
Mypose Oy	FIN	9.0	18.0	18.0	9.0	0%	54.0
Offcode Oy	FIN	110.0	118.0	102.0	65.0	1%	395.0
Pro Piknik Festivals	FIN	25.0	50.0	50.0	25.0	1%	150.0
Valopaa Ltd.	FIN	93.0	190.0	190.0	102.0	2%	575.0
VTT Technical Research Centre of Finland	FIN	300.0	858.0	858.0	558.0	10%	2,574.0
CEA	FRA	79.0	332.0	380.0	253.0	4%	1,044.0
CITILOG	FRA	81.0	122.0	122.0	41.0	1%	366.0
Lille 1 University	FRA	94.0	195.0	54.0	27.0	1%	370.0
Thales	FRA	181.0	499.0	499.0	363.0	6%	1,542.0
Thales Services SAS	FRA	164.0	628.0	717.0	344.0	7%	1,853.0
Urban Community of Strasbourg	FRA	42.0	57.0	57.0	42.0	1%	198.0
Delft University of Technology	NLD	404.0	607.0	607.0	194.0	7%	1,812.0
Eindhoven	NLD	244.0	488.0	477.0	255.0	6%	1,464.0

University of Technology							
Philips Lighting	NLD	280.0	405.0	223.0	83.0	4%	991.0
Philips Electronics Netherlands BV	NLD	398.0	1,014.0	995.0	577.0	11%	2,984.0
Prodrive	NLD	200.0	300.0	500.0	125.0	4%	1,125.0
ViNotion BV	NLD	95.0	239.0	305.0	129.0	3%	768.0
ECRO SRL	ROU	38.0	108.0	125.0	70.0	1%	341.0
Siveco Romania S.A.	ROU	192.0	192.0	192.0	192.0	3%	768.0
FADA-CATEC	ESP	50.0	50.0	50.0	50.0	1%	200.0
SCATI	ESP	40.0	101.0	101.0	36.0	1%	278.0
Telvent	ESP	192.0	320.0	320.0	136.0	4%	968.0
ARGEDOR Information Technologies Ltd.	TUR	60.0	165.0	165.0	95.0	2%	485.0
Argevas	TUR	109.0	148.0	148.0	148.0	2%	553.0
Ericsson Arastrma Gelistirme ve Bilisim Hizmetle	TUR	144.0	144.0	144.0	144.0	2%	576.0
KoçSistem Information Communications Services	TUR	92.0	326.0	322.0	80.0	3%	820.0
Provus Bilisim Hizmetleri A.S	TUR	65.0	378.0	356.0	58.0	3%	857.0
Verisun Informatics Ltd	TUR	117.0	195.0	304.0	195.0	3%	811.0
Totals		4,168.0	8,857.0	9,006.0	4,497.0		26,528.0

10.4.Efforts per Country

Country	Code	2014	2015	2016	2017	Perc.	Total
Finland	FIN	7.67	16.20	16.78	7.03	20%	47.68
France	FRA	5.10	13.85	12.55	7.10	16%	38.60
Netherlands	NLD	11.23	20.56	21.35	8.98	25%	62.12
Romania	ROU	3.28	4.65	4.67	3.77	7%	16.37
Spain	ESP	4.21	7.26	7.46	3.07	9%	22.00
Turkey	TUR	8.55	18.45	19.60	10.80	24%	57.40
Totals		40.04	80.97	82.41	40.75		244.17

10.5.Costs per Country

Country	Code	2014	2015	2016	2017	Perc.	Total

Finland	FIN	807.0	1,844.0	1,843.0	860.0	20%	5,354.0
France	FRA	641.0	1,833.0	1,829.0	1,070.0	20%	5,373.0
Netherlands	NLD	1,621.0	3,053.0	3,107.0	1,363.0	34%	9,144.0
Romania	ROU	230.0	300.0	317.0	262.0	4%	1,109.0
Spain	ESP	282.0	471.0	471.0	222.0	5%	1,446.0
Turkey	TUR	587.0	1,356.0	1,439.0	720.0	15%	4,102.0
Totals		4,168.0	8,857.0	9,006.0	4,497.0		26,528.0

10.6.Efforts per Workpackage

Workpackage	2014	2015	2016	2017	Perc.	Total
WP 1 Requirements & system definition	10.97	13.13	6.72	2.49	14%	33.31
WP 2 Sensing & feature extraction algorithms	9.03	19.45	17.15	7.19	22%	52.82
WP 3 Integrated connected systems for public comfort & safety	4.39	13.40	13.31	5.56	15%	36.66
WP 4 Infrastructure & data representation	6.10	13.63	12.76	5.61	16%	38.10
WP 5 User studies for integrated systems	3.39	5.72	6.03	2.26	7%	17.40
WP 6 Applications & field tests	3.63	11.89	22.07	14.03	21%	51.62
WP 7 Project management, exploitation & dissemination	2.53	3.75	4.37	3.61	6%	14.26
Totals	40.04	80.97	82.41	40.75		244.17

5.2.41 WP 1 Requirements & system definition

Partner	Country	2014	2015	2016	2017	Perc.	Total
C2 SmartLight Oy	FIN	0.20	0.00	0.00	0.00	0%	0.20
Digital Living Finland Oy	FIN	0.02	0.10	0.04	0.00	0%	0.16
Helvar Oy Ab	FIN	0.20	0.20	0.00	0.00	1%	0.40
Innorange Ltd	FIN	0.25	0.25	0.00	0.00	1%	0.50
Kone	FIN	0.30	0.30	0.30	0.00	1%	0.90
Mypose Oy	FIN	0.25	0.00	0.00	0.00	0%	0.25
Offcode Oy	FIN	0.33	0.00	0.00	0.00	0%	0.33
Pro Piknik Festivals	FIN	0.20	0.20	0.00	0.00	1%	0.40
Valopaa Ltd.	FIN	0.30	0.20	0.00	0.00	1%	0.50
VTT Technical Research Centre of Finland	FIN	0.50	0.80	0.00	0.00	2%	1.30
CEA	FRA	0.30	0.20	0.00	0.00	1%	0.50

CITILOG	FRA	0.20	0.30	0.30	0.10	1%	0.90
Lille 1 University	FRA	0.20	0.20	0.00	0.00	1%	0.40
Thales	FRA	0.00	0.25	0.25	0.00	1%	0.50
Thales Services SAS	FRA	0.40	1.00	0.40	0.00	2%	1.80
Urban Community of Strasbourg	FRA	0.30	0.40	0.30	0.00	1%	1.00
Delft University of Technology	NLD	0.47	0.00	0.00	0.00	1%	0.47
Eindhoven University of Technology	NLD	0.21	0.33	0.12	0.04	1%	0.70
Philips Lighting	NLD	0.40	0.10	0.10	0.00	1%	0.60
Philips Electronics Netherlands BV	NLD	0.40	1.60	1.60	0.70	6%	4.30
Prodrive	NLD	0.50	0.17	0.00	0.00	1%	0.67
ViNotion BV	NLD	0.33	0.67	0.00	0.00	1%	1.00
ECRO SRL	ROU	0.30	0.30	0.30	0.20	2%	1.10
Siveco Romania S.A.	ROU	0.62	0.50	0.00	0.00	2%	1.12
FADA-CATEC	ESP	0.20	0.30	0.00	0.00	1%	0.50
SCATI	ESP	0.15	0.25	0.25	0.10	1%	0.75
Telvent	ESP	0.59	0.96	0.96	0.40	4%	2.91
ARGEDOR Information Technologies Ltd.	TUR	0.30	0.40	0.40	0.15	2%	1.25
Argevas	TUR	0.50	0.60	0.00	0.00	2%	1.10
Ericsson Arastrma Gelistirme ve Bilisim Hizmetle	TUR	0.80	0.80	0.80	0.80	4%	3.20
KoçSistem Information Communications Services	TUR	0.25	0.25	0.00	0.00	1%	0.50
Provus Bilisim Hizmetleri A.S	TUR	0.50	1.00	0.00	0.00	2%	1.50
Verisun Informatics Ltd	TUR	0.50	0.50	0.60	0.00	2%	1.60
Totals		10.97	13.13	6.72	2.49		33.31

5.2.42 WP 2 Sensing & feature extraction algorithms

Partner	Country	2014	2015	2016	2017	Perc.	Total
C2 SmartLight Oy	FIN	0.00	0.20	0.20	0.10	0%	0.50
Digital Living Finland Oy	FIN	0.00	0.00	0.00	0.00	0%	0.00

Helvar Oy Ab	FIN	0.00	0.00	0.00	0.00	0%	0.00
Innorange Ltd	FIN	0.00	0.00	0.00	0.00	0%	0.00
Kone	FIN	0.00	0.00	0.00	0.00	0%	0.00
Mypose Oy	FIN	0.00	0.25	0.00	0.00	0%	0.25
Offcode Oy	FIN	0.00	0.00	0.00	0.00	0%	0.00
Pro Piknik Festivals	FIN	0.00	0.00	0.00	0.00	0%	0.00
Valopaa Ltd.	FIN	0.00	0.00	0.00	0.00	0%	0.00
VTT Technical Research Centre of Finland	FIN	0.30	1.20	1.20	0.60	3%	3.30
CEA	FRA	0.20	0.90	0.80	0.20	2%	2.10
CITILOG	FRA	0.22	0.33	0.33	0.11	1%	0.99
Lille 1 University	FRA	0.50	0.90	0.10	0.00	1%	1.50
Thales	FRA	0.50	2.00	1.50	1.00	5%	5.00
Thales Services SAS	FRA	0.00	0.00	0.00	0.00	0%	0.00
Urban Community of Strasbourg	FRA	0.00	0.00	0.00	0.00	0%	0.00
Delft University of Technology	NLD	2.07	3.85	3.30	1.10	9%	10.32
Eindhoven University of Technology	NLD	0.50	0.92	0.92	0.50	3%	2.84
Philips Lighting	NLD	0.00	0.00	0.00	0.00	0%	0.00
Philips Electronics Netherlands BV	NLD	0.30	0.60	0.60	0.60	2%	2.10
Prodrive	NLD	1.00	1.80	1.80	0.40	5%	5.00
ViNotion BV	NLD	0.46	0.91	0.91	0.46	2%	2.74
ECRO SRL	ROU	0.00	0.40	0.00	0.00	0%	0.40
Siveco Romania S.A.	ROU	0.00	0.00	0.00	0.00	0%	0.00
FADA-CATEC	ESP	0.00	0.50	0.50	0.00	1%	1.00
SCATI	ESP	0.60	1.00	1.00	0.40	3%	3.00
Telvent	ESP	0.18	0.29	0.29	0.12	1%	0.88
ARGEDOR Information Technologies Ltd.	TUR	0.00	0.00	0.00	0.00	0%	0.00
Argevas	TUR	0.00	0.00	0.00	0.00	0%	0.00
Ericsson Arastrma Gelistirme ve Bilisim Hizmetle	TUR	0.90	0.90	0.90	0.90	3%	3.60
KoçSistem Information	TUR	0.30	1.00	0.80	0.20	2%	2.30

Communications Services							
Provus Bilisim Hizmetleri A.S	TUR	0.00	0.00	0.00	0.00	0%	0.00
Verisun Informatics Ltd	TUR	1.00	1.50	2.00	0.50	5%	5.00
Totals		9.03	19.45	17.15	7.19		52.82

5.2.43 WP 3 Integrated connected systems for public comfort & safety

Partner	Country	2014	2015	2016	2017	Perc.	Total
C2 SmartLight Oy	FIN	0.00	0.10	0.20	0.30	1%	0.60
Digital Living Finland Oy	FIN	0.01	0.02	0.02	0.02	0%	0.07
Helvar Oy Ab	FIN	0.00	0.20	0.20	0.00	1%	0.40
Innorange Ltd	FIN	0.00	0.00	0.00	0.00	0%	0.00
Kone	FIN	0.00	0.00	0.00	0.00	0%	0.00
Mypose Oy	FIN	0.00	0.00	0.00	0.00	0%	0.00
Offcode Oy	FIN	0.33	0.50	0.60	0.33	3%	1.76
Pro Piknik Festivals	FIN	0.00	0.00	0.00	0.00	0%	0.00
Valopaa Ltd.	FIN	0.00	0.00	0.00	0.00	0%	0.00
VTT Technical Research Centre of Finland	FIN	0.30	1.00	1.00	0.20	4%	2.50
CEA	FRA	0.00	0.70	0.70	0.20	2%	1.60
CITILOG	FRA	0.13	0.20	0.20	0.07	1%	0.60
Lille 1 University	FRA	0.50	1.20	0.20	0.00	3%	1.90
Thales	FRA	0.00	0.00	0.00	0.00	0%	0.00
Thales Services SAS	FRA	0.60	2.90	3.20	1.20	12%	7.90
Urban Community of Strasbourg	FRA	0.00	0.00	0.00	0.00	0%	0.00
Delft University of Technology	NLD	0.00	0.00	0.00	0.00	0%	0.00
Eindhoven University of Technology	NLD	0.40	0.67	0.67	0.18	3%	1.92
Philips Lighting	NLD	0.00	0.00	0.00	0.00	0%	0.00
Philips Electronics Netherlands BV	NLD	0.30	0.80	0.80	0.40	4%	2.30
Prodrive	NLD	0.00	0.00	0.00	0.00	0%	0.00
ViNotion BV	NLD	0.08	0.17	0.17	0.08	1%	0.50
ECRO SRL	ROU	0.00	0.20	0.20	0.20	1%	0.60
Siveco Romania	ROU	0.00	0.33	0.34	0.33	2%	1.00

S.A.							
FADA-CATEC	ESP	0.00	0.00	0.30	0.00	0%	0.30
SCATI	ESP	0.35	0.50	0.50	0.15	2%	1.50
Telvent	ESP	0.59	0.96	0.96	0.40	4%	2.91
ARGEDOR Information Technologies Ltd.	TUR	0.00	0.75	0.75	0.30	3%	1.80
Argevas	TUR	0.20	0.40	0.50	0.50	2%	1.60
Ericsson Arastrma Gelistirme ve Bilisim Hizmetle	TUR	0.60	0.60	0.60	0.60	4%	2.40
KoçSistem Information Communications Services	TUR	0.00	0.50	0.50	0.10	2%	1.10
Provus Bilisim Hizmetleri A.S	TUR	0.00	0.70	0.70	0.00	2%	1.40
Verisun Informatics Ltd	TUR	0.00	0.00	0.00	0.00	0%	0.00
Totals		4.39	13.40	13.31	5.56		36.66

5.2.44 WP 4 Infrastructure & data representation

Partner	Country	2014	2015	2016	2017	Perc.	Total
C2 SmartLight Oy	FIN	0.00	0.00	0.00	0.00	0%	0.00
Digital Living Finland Oy	FIN	0.00	0.00	0.00	0.00	0%	0.00
Helvar Oy Ab	FIN	0.30	0.50	0.50	0.30	2%	1.60
Innorange Ltd	FIN	0.00	0.00	0.00	0.00	0%	0.00
Kone	FIN	0.40	1.00	1.00	0.00	3%	2.40
Mypose Oy	FIN	0.00	0.00	0.00	0.00	0%	0.00
Offcode Oy	FIN	0.33	0.58	0.50	0.33	2%	1.74
Pro Piknik Festivals	FIN	0.20	0.40	0.40	0.00	1%	1.00
Valopaa Ltd.	FIN	0.70	1.30	1.30	0.70	5%	4.00
VTT Technical Research Centre of Finland	FIN	0.50	1.20	1.20	0.40	4%	3.30
CEA	FRA	0.00	0.30	0.20	0.00	1%	0.50
CITILOG	FRA	0.07	0.10	0.10	0.03	0%	0.30
Lille 1 University	FRA	0.10	0.40	0.00	0.00	1%	0.50
Thales	FRA	0.50	0.50	0.00	0.00	1%	1.00
Thales Services SAS	FRA	0.00	0.00	0.00	0.00	0%	0.00
Urban Community of Strasbourg	FRA	0.00	0.00	0.00	0.00	0%	0.00

Delft University of Technology	NLD	0.00	0.00	0.00	0.00	0%	0.00
Eindhoven University of Technology	NLD	0.00	0.00	0.00	0.00	0%	0.00
Philips Lighting	NLD	0.00	0.00	0.00	0.00	0%	0.00
Philips Electronics Netherlands BV	NLD	0.30	0.60	0.60	0.40	2%	1.90
Prodrive	NLD	0.00	0.33	0.34	0.00	1%	0.67
ViNotion BV	NLD	0.00	0.50	0.50	0.00	1%	1.00
ECRO SRL	ROU	0.00	0.00	0.00	0.00	0%	0.00
Siveco Romania S.A.	ROU	0.00	0.00	0.00	0.00	0%	0.00
FADA-CATEC	ESP	0.00	0.00	0.20	0.00	0%	0.20
SCATI	ESP	0.15	0.25	0.25	0.10	1%	0.75
Telvent	ESP	0.35	0.57	0.57	0.25	2%	1.74
ARGEDOR Information Technologies Ltd.	TUR	0.50	1.00	1.00	0.50	4%	3.00
Argevas	TUR	0.50	0.70	0.70	0.60	3%	2.50
Ericsson Arastrma Gelistirme ve Bilisim Hizmetle	TUR	0.70	0.70	0.70	0.70	4%	2.80
KoçSistem Information Communications Services	TUR	0.50	1.50	1.50	0.30	5%	3.80
Provus Bilisim Hizmetleri A.S	TUR	0.00	0.70	0.70	0.00	2%	1.40
Verisun Informatics Ltd	TUR	0.00	0.50	0.50	1.00	3%	2.00
Totals		6.10	13.63	12.76	5.61		38.10

5.2.45 WP 5 User studies for integrated systems

Partner	Country	2014	2015	2016	2017	Perc.	Total
C2 SmartLight Oy	FIN	0.00	0.00	0.00	0.00	0%	0.00
Digital Living Finland Oy	FIN	0.00	0.02	0.02	0.02	0%	0.06
Helvar Oy Ab	FIN	0.00	0.00	0.00	0.00	0%	0.00
Innorange Ltd	FIN	0.00	0.00	0.00	0.00	0%	0.00
Kone	FIN	1.35	2.10	2.10	0.00	19%	5.55
Mypose Oy	FIN	0.00	0.00	0.00	0.00	0%	0.00
Offcode Oy	FIN	0.00	0.00	0.00	0.00	0%	0.00
Pro Piknik Festivals	FIN	0.00	0.00	0.00	0.00	0%	0.00

Valopaa Ltd.	FIN	0.00	0.00	0.00	0.00	0%	0.00
VTT Technical Research Centre of Finland	FIN	0.00	0.00	0.00	0.00	0%	0.00
CEA	FRA	0.00	0.00	0.00	0.00	0%	0.00
CITILOG	FRA	0.00	0.00	0.00	0.00	0%	0.00
Lille 1 University	FRA	0.00	0.00	0.00	0.00	0%	0.00
Thales	FRA	0.00	0.00	0.00	0.00	0%	0.00
Thales Services SAS	FRA	0.00	0.00	0.00	0.00	0%	0.00
Urban Community of Strasbourg	FRA	0.00	0.20	0.20	0.20	2%	0.60
Delft University of Technology	NLD	0.00	0.00	0.00	0.00	0%	0.00
Eindhoven University of Technology	NLD	0.54	1.08	1.08	0.54	11%	3.24
Philips Lighting	NLD	0.20	0.40	0.30	0.10	3%	1.00
Philips Electronics Netherlands BV	NLD	0.10	0.20	0.20	0.10	2%	0.60
Prodrive	NLD	0.00	0.00	0.00	0.00	0%	0.00
ViNotion BV	NLD	0.00	0.00	0.00	0.00	0%	0.00
ECRO SRL	ROU	0.20	0.30	0.30	0.20	3%	1.00
Siveco Romania S.A.	ROU	1.00	0.32	0.73	0.80	10%	2.85
FADA-CATEC	ESP	0.00	0.00	0.00	0.30	1%	0.30
SCATI	ESP	0.00	0.00	0.00	0.00	0%	0.00
Telvent	ESP	0.00	0.00	0.00	0.00	0%	0.00
ARGEDOR Information Technologies Ltd.	TUR	0.00	0.00	0.00	0.00	0%	0.00
Argevas	TUR	0.00	0.00	0.00	0.00	0%	0.00
Ericsson Arastrma Gelistirme ve Bilisim Hizmetle	TUR	0.00	0.00	0.00	0.00	0%	0.00
KoçSistem Information Communications Services	TUR	0.00	0.40	0.40	0.00	3%	0.80
Provus Bilisim Hizmetleri A.S	TUR	0.00	0.70	0.70	0.00	5%	1.40
Verisun Informatics Ltd	TUR	0.00	0.00	0.00	0.00	0%	0.00
Totals		3.39	5.72	6.03	2.26		17.40

5.2.46 WP 6 Applications & field tests

Partner	Country	2014	2015	2016	2017	Perc.	Total
C2 SmartLight Oy	FIN	0.00	1.00	1.00	0.00	2%	2.00
Digital Living Finland Oy	FIN	0.00	0.15	0.15	0.15	0%	0.45
Helvar Oy Ab	FIN	0.00	0.20	0.50	0.50	1%	1.20
Innorange Ltd	FIN	0.00	0.25	0.50	0.25	1%	1.00
Kone	FIN	0.00	0.00	0.20	0.00	0%	0.20
Mypose Oy	FIN	0.00	0.25	0.50	0.25	1%	1.00
Offcode Oy	FIN	0.00	0.00	0.00	0.33	0%	0.33
Pro Piknik Festivals	FIN	0.00	0.20	0.40	0.40	1%	1.00
Valopaa Ltd.	FIN	0.00	0.50	0.70	0.30	1%	1.50
VTT Technical Research Centre of Finland	FIN	0.20	0.60	1.50	1.00	3%	3.30
CEA	FRA	0.00	0.00	0.60	0.90	1%	1.50
CITILOG	FRA	0.11	0.17	0.17	0.06	0%	0.51
Lille 1 University	FRA	0.00	0.20	0.20	0.20	1%	0.60
Thales	FRA	0.00	0.00	0.50	0.50	1%	1.00
Thales Services SAS	FRA	0.00	0.20	1.10	1.00	2%	2.30
Urban Community of Strasbourg	FRA	0.00	0.00	0.20	0.20	0%	0.40
Delft University of Technology	NLD	0.33	0.50	1.00	0.33	2%	2.16
Eindhoven University of Technology	NLD	0.20	0.58	0.58	0.37	2%	1.73
Philips Lighting	NLD	1.00	1.80	0.80	0.30	4%	3.90
Philips Electronics Netherlands BV	NLD	0.30	0.60	0.60	0.40	2%	1.90
Prodrive	NLD	0.00	0.00	1.75	0.58	2%	2.33
ViNotion BV	NLD	0.00	0.00	1.33	0.67	2%	2.00
ECRO SRL	ROU	0.00	0.70	1.10	0.40	2%	2.20
Siveco Romania S.A.	ROU	0.56	1.00	1.10	1.04	4%	3.70
FADA-CATEC	ESP	0.00	0.00	0.00	0.20	0%	0.20
SCATI	ESP	0.35	0.50	0.50	0.15	1%	1.50
Telvent	ESP	0.58	0.99	0.99	0.40	3%	2.96
ARGEDOR Information Technologies Ltd.	TUR	0.00	1.10	1.10	0.55	3%	2.75

Argevas	TUR	0.00	0.00	0.50	0.60	1%	1.10
Ericsson Arastrma Gelistirme ve Bilisim Hizmetle	TUR	0.00	0.00	0.00	0.00	0%	0.00
KoçSistem Information Communications Services	TUR	0.00	0.20	0.70	0.30	1%	1.20
Provus Bilisim Hizmetleri A.S	TUR	0.00	0.20	1.00	0.70	2%	1.90
Verisun Informatics Ltd	TUR	0.00	0.00	0.80	1.00	2%	1.80
Totals		3.63	11.89	22.07	14.03		51.62

5.2.47 WP 7 Project management, exploitation & dissemination

Partner	Country	2014	2015	2016	2017	Perc.	Total
C2 SmartLight Oy	FIN	0.00	0.00	0.00	0.00	0%	0.00
Digital Living Finland Oy	FIN	0.00	0.03	0.15	0.25	2%	0.43
Helvar Oy Ab	FIN	0.00	0.00	0.00	0.00	0%	0.00
Innorange Ltd	FIN	0.00	0.00	0.00	0.00	0%	0.00
Kone	FIN	0.00	0.00	0.00	0.00	0%	0.00
Mypose Oy	FIN	0.00	0.00	0.00	0.00	0%	0.00
Offcode Oy	FIN	0.00	0.00	0.00	0.00	0%	0.00
Pro Piknik Festivals	FIN	0.00	0.00	0.00	0.00	0%	0.00
Valopaa Ltd.	FIN	0.00	0.00	0.00	0.00	0%	0.00
VTT Technical Research Centre of Finland	FIN	0.20	0.40	0.40	0.30	5%	1.30
CEA	FRA	0.00	0.00	0.10	0.30	2%	0.40
CITILOG	FRA	0.07	0.10	0.10	0.03	1%	0.30
Lille 1 University	FRA	0.10	0.10	0.20	0.20	2%	0.60
Thales	FRA	0.00	0.00	0.50	0.50	4%	1.00
Thales Services SAS	FRA	0.10	0.10	0.10	0.10	2%	0.40
Urban Community of Strasbourg	FRA	0.00	0.00	0.00	0.00	0%	0.00
Delft University of Technology	NLD	0.13	0.10	0.10	0.07	2%	0.40
Eindhoven University of Technology	NLD	0.17	0.25	0.25	0.17	3%	0.84
Philips Lighting	NLD	0.10	0.15	0.15	0.10	2%	0.50
Philips Electronics	NLD	0.30	0.70	0.60	0.30	7%	1.90

Netherlands BV							
Prodrive	NLD	0.09	0.10	0.10	0.04	1%	0.33
ViNotion BV	NLD	0.05	0.08	0.08	0.05	1%	0.26
ECRO SRL	ROU	0.10	0.10	0.10	0.10	2%	0.40
Siveco Romania S.A.	ROU	0.50	0.50	0.50	0.50	8%	2.00
FADA-CATEC	ESP	0.00	0.00	0.00	0.00	0%	0.00
SCATI	ESP	0.00	0.00	0.00	0.00	0%	0.00
Telvent	ESP	0.12	0.19	0.19	0.10	2%	0.60
ARGEDOR Information Technologies Ltd.	TUR	0.10	0.25	0.25	0.10	3%	0.70
Argevas	TUR	0.20	0.20	0.20	0.20	3%	0.80
Ericsson Arastrma Gelistirme ve Bilisim Hizmetle	TUR	0.00	0.00	0.00	0.00	0%	0.00
KoçSistem Information Communications Services	TUR	0.10	0.20	0.10	0.10	2%	0.50
Provus Bilisim Hizmetleri A.S	TUR	0.10	0.20	0.20	0.10	2%	0.60
Verisun Informatics Ltd	TUR	0.00	0.00	0.00	0.00	0%	0.00
Totals		2.53	3.75	4.37	3.61		14.26

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12. Annex 2 Letter of interest by municipalities

gemeente Eindhoven

VERZONDEN 29 OKT. 2013

Retouradres Postbus 90152, 5600 RB Eindhoven

ViNotion B.V
T.a.v. de heer Egbert Jaspers
Horsten 1
Postbus 2348
|5600 CH Eindhoven

Economie & Cultuur, Staf
Behandeld door Tiens Kanters
Telefoon 040-2382552
Uw brief van
Uw kenmerk
Ons kenmerk 13OFP0036
29 oktober 2013

Betreft: Letter of support

Dear members of the INSIST project,

Hereby we send you our acknowledgement of support for the INSIST project. The City of Eindhoven is leading in technology and one of the European leading technology regions. As the local authority we highly encourage technological initiatives to improve the social and economic situation of the city. In fact, the municipality has explicitly defined an action plan to reach this goal and has established a foundation called 'The Dutch Institute for Technology, Safety and Security (DITSS)' that stimulates collaborations between private and public partners in so-called Living labs.

The INSIST project is totally in line with this plan. Although we cannot commit financial support, we do support the project as end user with requirements and feedback. Moreover, we put the city centre and its infrastructure at you disposal for research and experiments with system prototypes and look forward to the promising results. From this letter of support no rights can be claimed.

Friendly regards

T. Kanters sector Economy and Culture, staff
on behalf of G. Sluijter
Strategic advisor of the Eindhoven municipality

Bezoekadres Kennedyplein 222
5611 ZM Eindhoven
www.eindhoven.nl

Postadres Postbus 90150
5600 RB Eindhoven
gemeente@eindhoven.nl
Telefoon (040) 238 28 94

PRIMARIA MUNICIPIULUI SIBIU
Str. Samuel Brukenthal nr.2, 550178 Sibiu, Romania
tel. 004-0269-208800, fax. 0040-0269-208931
e-mail: piu@sibiu.ro; http://www.sibiu.ro

No. 98167 / 04.10.2013

To: **SIVECO Romania SA**
73-81, Bucuresti-Ploiesti Drive, Building C4,
District 1, 013685 Bucharest, Romania

Letter of Support proposal ***INSIST, ITEA2 - 13021***

Dear Mrs. Monica Florea,

With this letter we would like to express the interest and support on behalf of **SIBIU City Hall** for the proposed *project "**Integrated service delivery for citizens' safety and comfort (INSIST)**"* that will be submitted in response to the ITEA2 call 2013.

We support the planned objectives of ***INSIST*** and regard the foreseen work packages and deliverables as important and helpful for addressing the current and future challenges in exploiting and extending the potential of Smart Cities and Communities.

Additionally we express our intention to contribute to the project by supporting the execution of the use cases, by giving advice and feedback to the foreseen deliverables, by participation in the planned workshops and events, and by using the results in further opportunities.

Yours sincerely,

City of Sibiu
Klaus Werner Iohannis
Mayor

M. Yves Laugel

SIRAC - Chef de service

Communauté Urbaine de Strasbourg

To whom it may concern,

The City Council of Strasbourg, hereafter named CUS (Communauté Urbaine de Strasbourg), hereby expresses its interest in the ITEA2 project INSIST, led by Philips Lighting, as potential End User of the technologies and services that will be developed during the course of this project.

The CUS is in charge of the management of lighting, traffic monitoring and video-protection for the city of Strasbourg. Coupling these three systems for the improvement of data collection, reduction of exploitation costs and enhancement of operational performances is a clear target for the CUS.

The CUS provides its support to this initiative and is willing to be involved in the project either as partner or as potential customer of the outcomes of this three-year program.

Telvent and the City of Seville have an agreement to identify and define “Smart City” pilots with the objective of validating relevant services and technologies. INSIST project fits in the interest of this agreement and results will support the development of the Smart City Director Plan of the City of Seville.

SEVILLA, 10 Feb. (EUROPA PRESS) -

El alcalde de Sevilla, Juan Ignacio Zoido (PP), ha suscrito con la firma tecnológica Telvent, en representación de la Corporación de Empresas Municipales de la ciudad (CEMS), un convenio marco de colaboración para impulsar el desarrollo de iniciativas relacionadas con la investigación, la innovación y el desarrollo tecnológico para convertir a Sevilla en referente de 'ciudad inteligente' o 'Smart City'.

Según han informado este domingo desde Telvent en una nota, en virtud de este acuerdo la firma se compromete a colaborar con el Ayuntamiento para propiciar un cambio de modelo productivo en la capital hispalense que "cree oportunidades de generación de empleo y actividad económica a través de la innovación tecnológica".

De esta forma, en el marco de este convenio se pretenden desarrollar iniciativas orientadas a "lograr la máxima eficiencia económica y operativa en la prestación de los servicios públicos sevillanos sin renunciar a la calidad y alcance de los mismos".

Se trata, explica la compañía, de "promover un modelo de servicios sostenibles para la ciudad, impulsando la eficiencia energética a través de la gestión inteligente de la energía, la movilidad y los servicios públicos", así como de "impulsar la reindustrialización de Sevilla en base a tecnologías relacionadas con la información".

Para el presidente y consejero delegado de Telvent y Executive Vice-President de Smart Infrastructure de Schneider Electric, Ignacio González Domínguez, "Sevilla brinda muchas oportunidades como plataforma I+D" que su empresa aspira a "maximizar".

En la misma línea, el alcalde ha expresado su satisfacción por este acuerdo ya que, en su opinión, "colaborar con una empresa como Telvent supone abrir las puertas a muchas pequeñas y medianas empresas del sector TIC, tan importantes en el tejido empresarial de la ciudad".

Entre las iniciativas que se pondrán en marcha en virtud de este acuerdo figuran un Plan de Director 'Smart City' para mejorar los servicios públicos de Sevilla; así como un Centro de Competencias de Servicios 'Smart City' de Telvent en la ciudad. Además, se identificarán proyectos alineados con los objetivos del acuerdo en los que participar de forma conjunta.