By implementing the KNX technology early on, ever since 1996 to this day, our company has managed to win the **4ᵗʰ KNX award in 2004** and the **1ˢᵗ International Europe award in 2012**. With over 20 years of experience in the KNX technology, we have succeeded in changing completely the electrical installation philosophy, especially when it comes to hotel facilities.

We responded to our customer's call to take on a new installation project related to the establishment of a fish, shellfish and, in general, sea product selling facility.

On our part, we would like to thank KNX ASSOCIATION and the KNX technology, which, based on the experience and learning we gathered throughout these years, have provided us with the necessary know-how and have deepened our knowledge in every direction when it comes to automated buildings; as a result, today, we are able to talk about having created a building with ARTIFICIAL INTELLIGENCE and VOICE RECOGNITION.

In this wonderful facility that was created, we need to point out that a multitude of KNX materials were used, which interact perfectly with each other. Apart from the full automation that can be achieved based on the KNX technology and the interaction of the materials, we would like to outline briefly and comprehensively how this facility operates, trying not to bore you with too much detail. The facility consists of three different buildings. Building A is located elsewhere and is responsible for the B2B wholesale and purchasing activities. Building B is responsible for the retail business and comprises two levels. Level 0 is the point of retail sale and Level 1 hosts the business headquarters together with the master kitchen where the take away food is prepared. Building C is a third building that will be integrated in the future, through an internet network, in the existing new facilities.

Starting from Level 0, Building B, please note that this level hosts 9 freezers and 2 coolers whose operation is controlled by KNX sensors provided by ARCUS-EDS. All data are sent, collected and processed by an Ipas Com Bridge server. This server has been installed in Level 1 and is responsible for the visualization process that is set up for the business, for the processing of different algorithms and logics derived from the data collected and for the different emergency control messages (emails and sms). Specifically, the various data collected from the freezers and coolers are processed, captured and recorded on a 24/7 basis by the server. If any issue arises in any of the freezers or coolers, based on the non-stop monitoring of the temperature, according to the instructions issued by the inspecting officer responsible for food storage, and making use of different algorithms and logics, emails and alarm warnings are sent in compliance with HACCP food regulations. The system identifies when a freezer and/or cooler is in defrost mode and, as a result, it decides on its own what the right moment will be to send an alarm warning. Based on a 24/7 temperature monitoring process and depending on the type of food storage in the respective chamber, when an issue is identified and the temperature variable becomes dangerous for the food stored, without delay, i.e. within one or one and a half hour, the system briefs by means of emails and dedicated messages the technicians responsible so that they can resolve the issue. If the food storage time limit exceeds the variable set by HACCP international regulations, the owner, the

veterinarian and the officer responsible for food storage are informed by means of emails and dedicated messages in order to inspect the food items and/or replace them if they are not fit for sale. In this manner, the company responsible for the compliance with HACCP regulations can check online the server entries concerning food storage based on HACCP specifications and print all data involved. In addition, all the doors of the freezers and coolers where the food items to be sold are held, are controlled by means of visualization and the system identifies their status. Should a customer open the door and hold it open for too long or fail to close it, then a pop alarm message will appear on all computer screens in the business, indicating which door is open.

Note that the lower level also hosts three dedicated sea water fish tanks. One of them hosts live lobsters at two different levels; the one is destined for Atlantic Ocean lobsters and the other one for Mediterranean Sea lobsters. As you can understand, inspections of these levels are completely different, since the living conditions of these two different species vary. Here, too, based on the KNX technology, a complete automation solution for the monitoring of fish tanks has been achieved by emitting warnings in case of any rapid changes in sea water conditions and by sending important alarm signals to the owner so that any damage can be prevented.The second sea water tank hosts live shellfish of all types whereas the third sea water tank hosts live fish of the Mediterranean Sea.

It is pointed out that, throughout the building, there is a focus on ARTIFICIAL INTELLIGENCE and, for this reason, there is no need for switches. As such, we have an ARTIFICIAL INTELLIGENCE building, where the KNX materials work in full interaction with each other (presence detectors etc.) under special algorithms associated with time plans, and dedicated zone levels which identify human presence and create different operation and comfort scenarios with regard to lighting, air conditioning, ventilation, the alarm system, window shutters and blinds and provide, in general, all types of automation and solutions in terms of energy saving and management in the building.

Furthermore, Level 0 hosts the department that sells ready-made cooked dishes, which are prepared and dispatched from the kitchen - located in Level 1 - through a dedicated food elevator used for the transportation of meals. Then, meals are placed in the designated display fridges, heated food display cabinets and bain-maries which are used to conserve and store food in the temperatures required until delivery to end users. All ben-marie, heated food display cabinet and display fridge functions are monitored through KNX sensors and based on special algorithms, even after the end of a business day, in case some appliances are left open or their temperature reaches a non-permitted level, thus exposing the building, in the absence of people, to perilous situations such as a fire. At this point, the KNX technology takes charge and before the temperature reaches non-permitted levels, it issues an all-appliance lockout and sends the respective alarm signals. In addition, at the level where customers choose the food items they want, there are three TVs which are interconnected to the network and can transmit food storage recordings on a 24/7 basis from the different coolers and freezers. This way, customers can see online, from the KNX server, the temperatures in which food items are conserved and stored.

Five Elsner fire detectors have undertaken to check fire safety at the lower level. They are able, with the use of different algorithms and logics, to perceive any incident that may result in the building being in need of immediate help due to a fire alarm, since, in a split second, they can place the building in emergency fire alarm mode. Namely, the building, by itself,

paves the ground for the fire extinguishing services that will be provided without delay. This means that, at this building level, the gas supply as well as the 400 volt power supply are terminated automatically from the panel board that manages the building's power supply. The emergency mode is activated together with an emergency generator in order for different emergency lighting scenarios to be put in motion. The air conditioning unit stops functioning and, as a result, fresh air that would revitalize and feed the fire is no longer channeled into the store. Moreover, the system opens the electrical entrances and exits immediately so that people can depart and sends alarm emails and sms immediately to all responsible agencies and organizations. In addition, these fire detectors, working together with algorithms and logics and based on ARTIFICIAL INTELLIGENCE, develop an interaction with presence detectors and create various scenarios for the operation of air conditioning and ventilation in the area. At this point, the owner, through the GOOGLE VOICE RECOGNITION assistant, can make a voice intervention in order to change the various logics and algorithms taken into account by the building as well as change, based on the data and temperatures, the operation scenarios. It must be pointed out that for the production of enough ice to meet business needs, three ice production units and a cold chamber are placed in operation. Through the air conditioning circuit and the cooling water pump, a collector has been placed, which prepares water by lowering its temperature to 7-12 degrees in the ice machine inlet. As a result, energy is saved and the business saves time and power for ice production. The air conditioning unit and the system are controlled by Siemens Synco RMU720B.

Moreover, music is activated based on automated operation and the operation scenarios that are activated in the building. Please note that with a simple instruction, via the GOOGLE VOICE RECOGNITION assistant, it is possible to change scenarios in the WHD sound system which constitutes the building's sound installation.

Due to the nature of the tasks performed (shellfish and fish cleaning) and in order to eliminate any remaining odors, an automated pre-washing system has been created for all drain gratings which are washed automatically three times a day during working hours.

Level 1, Building B, hosts the main office areas as well as the master kitchen responsible for the preparation of take away cooked meals.

As mentioned, there are no switches on account of the ARTIFICIAL INTELLIGENCE implemented and the various algorithms employed throughout this building level. All offices operate without switches, interacting with presence detectors and taking into account the presence of lighting and the lux levels of each separate space as well as the dedicated fire detectors so that, under the various interaction parametrization algorithms, ARTIFICIAL INTELLIGENCE is created which regulates automatically air conditioning, lighting and, in general, all operations and scenarios running in each separate office and/or on the entire floor.

Each office has been equipped with a GOOGLE assistant, through which all parametrizations can change very easily, just by making use of VOICE RECOGNITION.

In the entrance leading to the office area, an entry installation (DAHUA IP TV) and a NUKI electronic lock have been installed. When someone calls through the office entry installation, a window pops up on business computer screens and any office user can provide the passcode with a voice instruction, through the GOOGLE assistant, so that the door opens and the visitor enters the offices.

A user can, through the GOOGLE assistant, activate any scenario whatsoever in each office separately and activate music by making use of voice instructions through VOICE RECOGNITION.

All offices and common areas on the upper floor have been fitted with air conditioning splitters. These are controlled by means of eight Intesis interfaces and all their operations are triggered automatically through ARTIFICIAL INTELLIGENCE with parametrization algorithms that can be very easily modified by each separate user in each office space, through GOOGLE assistant and VOICE RECOGNITION.

10 Elsner fire detectors have undertaken to check fire safety at the upper level. They are able, with the use of different algorithms and logics, to perceive any incident that may result in the building being in need of immediate help due to a fire alarm, since, in a split second, they can place the building in emergency fire alarm mode. Namely, the building, by itself, paves the ground for the fire extinguishing services that will be provided without delay. This means that, at this building level, the gas supply to the upper floor kitchen and to all building levels as well as the 400 volt power supply are terminated automatically from the panel board that manages the building's power supply. The emergency mode is activated together with an emergency generator in order for different emergency lighting scenarios to be put in motion. The air conditioning unit stops functioning and, as a result, fresh air that would revitalize and feed the fire is no longer channeled into the store. Moreover, the system opens electrical entries and exits immediately so that people can depart and sends alarm emails and sms immediately to all responsible agencies and organizations. In addition, due to the sea food cleaning tasks that need to be performed, the hot water used for this purpose in the building is controlled through solar panels that record, with the use of various algorithms, the hot water temperature on a 24/7 basis. Depending on solar power, priority is given to the one or other source of power used for water heating, meaning that if the sunlight is intense, solar power will be given priority whereas if the sunlight is weak, electrical power will be given priority for water heating purposes. These settings can change with the use of VOICE RECOGNITION and GOOGLE assistant – all it takes is a simple instruction in order to change hot water set-points.

Building A is at a 200m distance from Building B and there is direct visual contact between the two buildings.

Please note that Building B is the main business building. For this reason, we installed a link network panel transferring thereto all networks established in Buildings B and A. In this manner, we established a Wi-Fi interconnection between the two buildings. Through the network, with the IP-KNX router interconnection, we managed to have online services in Building A which hosts 8 cold rooms that consist of 4 freezers and 4 coolers. It is important to know that all algorithms, time plans and logics that are applicable to Building B are also deployed in Building A with regard to all sea food storage chambers. As such, through a common server, the business achieved the interconnection of Buildings A and B, interaction and data recordings and, through this, the activation of alarm signals, logics and time plans. As such, we have two buildings with Wi-Fi encoded interaction and, through the various algorithms and artificial intelligence, management becomes a very easy task with the use of GOOGLE assistant and VOICE RECOGNITION.

The business includes 10 refrigerator trucks (freezers and coolers), which are responsible for transporting and delivering food throughout the island, to all customers that mainly consist of

hotel facilities. In this context, we were asked if we could provide online services with these 10 trucks since, based on HACCP regulations and the specifications required by the owner and the officer responsible for food storage and protection, temperature must be recorded during the transportation of products. This ensures that company customers can monitor the products bought from storage to delivery and throughout transportation so as to be aware of the transportation conditions.

In this case, we used the I.o.T. (Internet of Things) technology and created, on a stand-alone basis, a KNX line and area per truck. Each refrigerator truck was fitted with: a 4G Internet of Things IP routing mikrotik, which is responsible for the creation of a data transmission network, whereas, in Building B, we programmed a mikrotik router to monitor each truck separately as a VPN virtual server who sends data from a separate area. Through this, the KNX SERVER com bridge evolution provided by IPAS is able to identify each area separately thanks to the KNX IP router technology and the I.o.T. technology; a converter, which, depending on the truck's battery voltage, converts the said voltage to 230 Volt in order to power each KNX line in each truck;

A KNX IP router, which determines the system topology, a digital input, which is responsible for recording the operation of the refrigerator, when it operates and the truck is on the move, as well as perceiving the alarm signals of the refrigerator without delay and swiftly alert a technician even before the driver realizes what is going on. In addition, based on the interaction with the server, it is able to report when the fridge door is open or closed and, depending on circumstances and algorithms, identify and issue different alarm signals, even anti-theft alarm signals for the products.

For example, if a truck is not on the move and is charging (via an electric socket), an alarm system is activated, which, due to the interaction with the server, can identify whether the door opened and activate, as a result, different alarm signals on computer screens in the buildings as well as send email and sms notifications to the persons responsible. In addition, please note that in order to ensure full interaction and connectivity with the KNX network and the KNX IP SERVER, we created algorithms on the server that controls, reads and asks each truck network if the router is connected. This is achieved with the use of Pink IP technology, with the server performing a check at a time set by us – in this case, every 15 minutes. If the server perceives that in a given 15-minute period, the router has lost connection with the KNX network and the SERVER, then it emits alarm signals immediately for the specific truck and sends email and sms warnings to all persons responsible.

Moreover, each refrigerator truck was fitted with an ARCUS-EDS sensor, which monitors on a permanent basis the refrigerator truck's temperature. In this context, given the interaction with the server, it sends temperature data and based on algorithms, the server is able to record the temperature during transport. The server is even able to know when the refrigerator is in defrost mode and record it.

As such, customers have in their hands a certificate with complete refrigerator temperature recordings during product transportation. In addition, within the context of the interaction with the ten trucks that are on the move throughout the island –based on the Internet of Things technology – it is possible for any information to be provided and any checks to be performed between the trucks and the master building, thus managing, automating and recording everything through the Google assistant, which is available in each food truck, aiming primarily to remote control and remote management even through a smartphone

In the future, if requested by the owner, the system will be able to run other ALARM systems as well, such as fuel recordings or even a driver emergency alarm system, which will send information to business headquarters.

Finally, we would be tired if we analyzed in detail all the operations of the business through visualization, managed from any computer in the buildings. We should also mention that visualization has also been developed in smartvisu as we show in photos, to manage everything via smartphone.