IMPLEMENTATION OF INTEGRATIONS OF IOT AND CLOUD SERVICES IN A HOME AUTOMATION SMART SYSTEM

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Abstract:

The knowledge that achieved among all the combined smart devices to a complex ecosystem, cloud services, voice assistants and natural language processing agents was a really great experience and significant according to the participants evaluation answers results. Though the experimental procedure that was applied the parallel communication and interaction through two computers applied and worked fluently. The parallel interaction was applied for examine if the ecosystem or the cognitiv voice assistant would have increased latency to the answers but everything worked normal. The connection between the cloud platforms and the webhook fulfilments probably is the future technology by taking in advance the answers of simple and more dedicated users. The cloud platforms and the cloud services based on our knowledge can support unlimited smart devices for supporting smart System Pandora voice assistant isn't completed yet according to the training phrases, intents and learning process and needs more training for reaching the level of supporting everything with technical approach of things.

Key words: smart devices, Cloud Services, Automation, Smart System, smart devices.

1. Introduction

The control can be achieved through dashboards that software or hardware provides that is manufactured from certified companies. The internet of things (IoT) is the term that characterises the interconnection of smart devices that are separated in groups and are communicating with each other through the network and internet protocol[1]. The user requires to interact more and more with the smart facility with main purpose to succeed the adaptation of the desired needs and habits on the system side for being more attached. The smart facilities are a promising section considering the possible potentials of approaching the user desires adaptation by taking in advance the information usage that is highly involved with the smart system flexibility empower. Critical resources as automation and scripts for facilities and especially for large buildings with complex equipment involved are necessary for the health building system operation. Automations and smart devices are paired together if considering to the market growth because various solutions are based on this qualified combination. The complete solutions that are produced from the manufacturers and stakeholders are supplied with many capabilities, although installers and final users don't have the ability of using the equipment in full of capacity. The smart systems are very promising according to their capabilities of collaboration and interaction with other smart systems and devices independent of the amount or population. According to the best of our knowledge automation and smart devices doesn't have reached yet the maximum level of their potentials and full of capacity. The automation and smart devices that are co- existing in the same system are increase the amount of control complexity in the most of cases[2].

The knowledge that achieved among all the combined smart devices, cloud services,

voice assistants and natural language processing agents was significant, because valuable information was provided about the technical combination for adapting large facilities and applying cognitive services and natural language processing agents and dedicated language models for simplify things, according to the internet of everything systems. The natural language processing agent that applied to the experimental method via the Pandora voice assistant isn't completed according to the training and phrases learning process and needs more training for reaching the level of supporting everything having the ability of classification and approach the most complex demand with the simplest phrases. The stage of Pandora according to language modelling is in preliminary stage in front of the potentials that has the ability to reach, although even in preliminary stage the tasks was completed but more training is a need for succeeding more accurate phrase recognition performance. More complex language and linguistic models' creation is proposed for the future that involved with industrial, home and business usage environments and applications like industry and cities.

The most manufactures are providing their own cloud services for providing in this way more security and stability according to the internet threats. One main disadvantage of the internet of things technology is the attraction of interest of many hackers because they know that this technology involves households.

The data can be forward also to a cloud provider like Microsoft Azure, IBM, AWS Cloud and google cloud services for further processing. The ability forwarding information to the cloud is based on the server infrastructure to be able to have a signal processor, an internet communication gateway or interface and a cloud host in a cloud infrastructure [3].
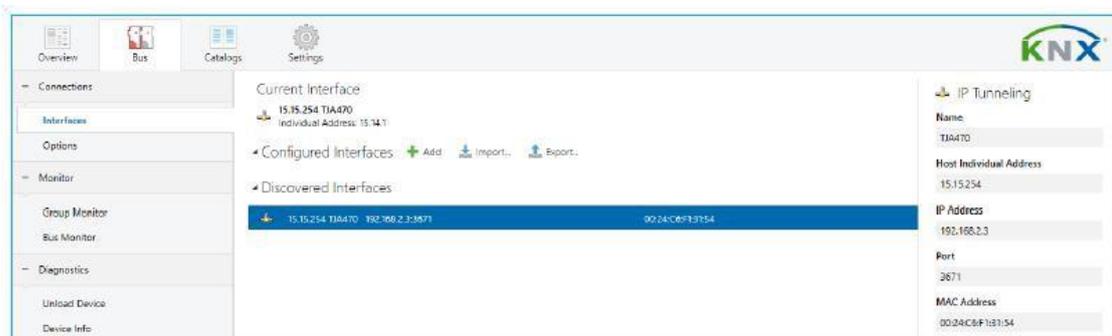

Figure 1: ETS Remote Control via Hager ETS Proxy App for Secure Tunneling

2.   Cloud services :
2.1 IOT Devices based on Manufactures Cloud

Many smart device manufactures are providing their own cloud services to host the installation capacity and important information for ensure the security and concrete stability of the system. The most of cases the cloud services that are providing by manufactures are according to a charge but there are cases that the cloud resources can be provided free [4].

*Figure 2: Hager Domovea Third Party Cloud Services Compatibility*
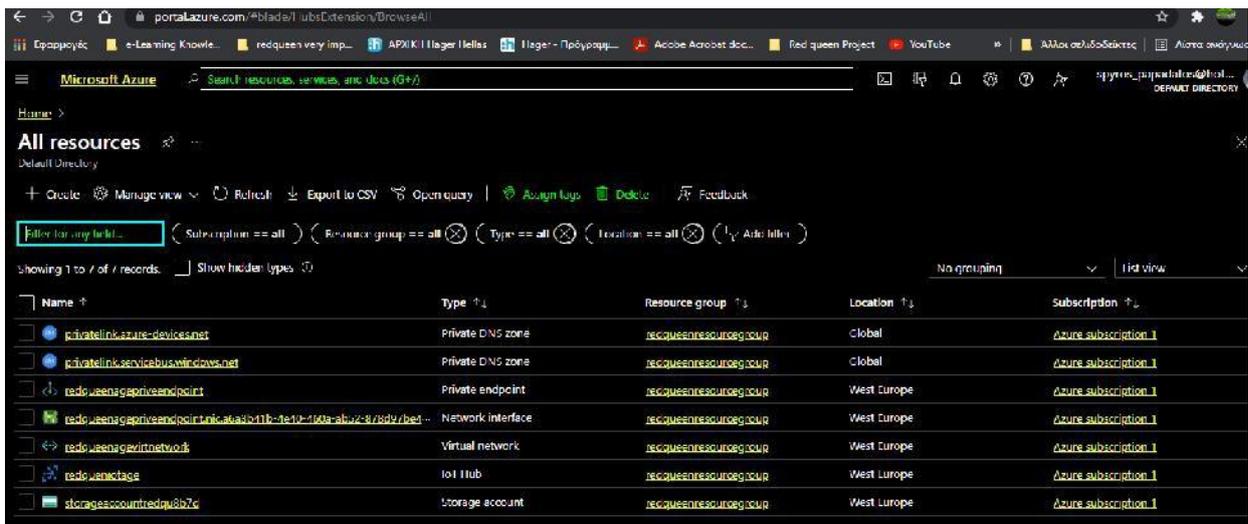
Figure 3: Microsoft Azure Dashboard for Cloud Services Configuratio

There are many cases that the visualisation server is used for uploading data to the cloud the cost is huge if cost reduce techniques not applied. It is important to mention that cloud services are not cheap and cost management is necessary to be already adjusted instantly before uploading anything to a third-party cloud based on a financial plan considering the budget.
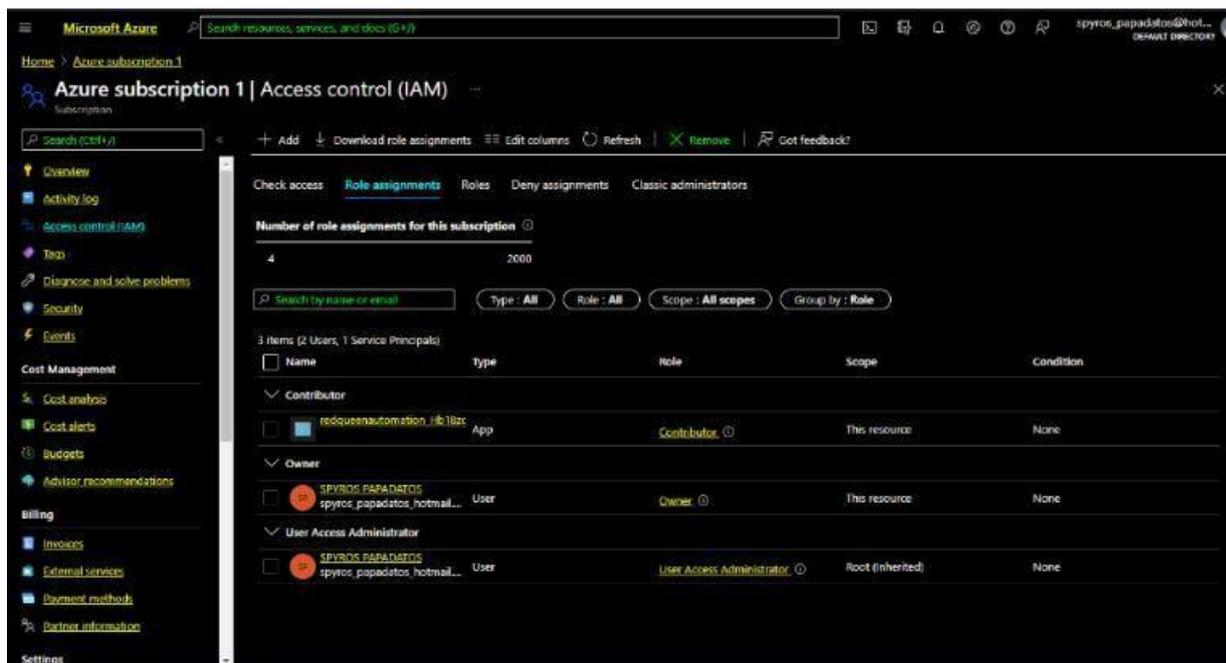
Figure 4: Microsoft Azure IAM Roles Privileges Configuration

The cloud services are having great impact to the market, although the costs are reasonable in the most of cases if considering the resources and the abilities that are providing. Cloud services are providing the ability of creating a virtual organization that has the ability of communicating with other Cloud organizations to the same or other Cloud Platform providers. This information of bridging engineering potentials is proving the ability of interconnecting cities and everything digital according to the IAM roles hierarchy and principals that are exists as parts of an agreement. The Cloud services are providing the abilities of separation parts, a part can be detached from the ecosystem that was assigned and became part to other provider or even an owner with all rights in the same Cloud service. The entities that are part of a Cloud Organisation are behaviour like particles by applying the proper engineering. The cost is one of the most important things that installation author has to handle according to a study and planning procedures that are based to the customer's budget [5].

The cloud services are providing hundreds of different services that are reliable and very accurate according to their quality of services. The information can be stored to paid cloud services and the configuration of these services can be made mostly by the user's administrator. In "ready solutions" cases the cloud services are free of charge and are providing also memory and device coverage followed by amount limitations, although are very convenient and are providing the ability to support easily a medium amount of usage.

2.2 Smart Installations ETS Cloud Secure Tunnelling

The data can be forward also to a cloud provider like Microsoft Azure, IBM, AWS Cloud and google cloud services for further processing. The ability forwarding information to the cloud is based on the server infrastructure to be able to have a signal processor, an internet communication gateway or interface and a cloud host in a cloud infrastructure.
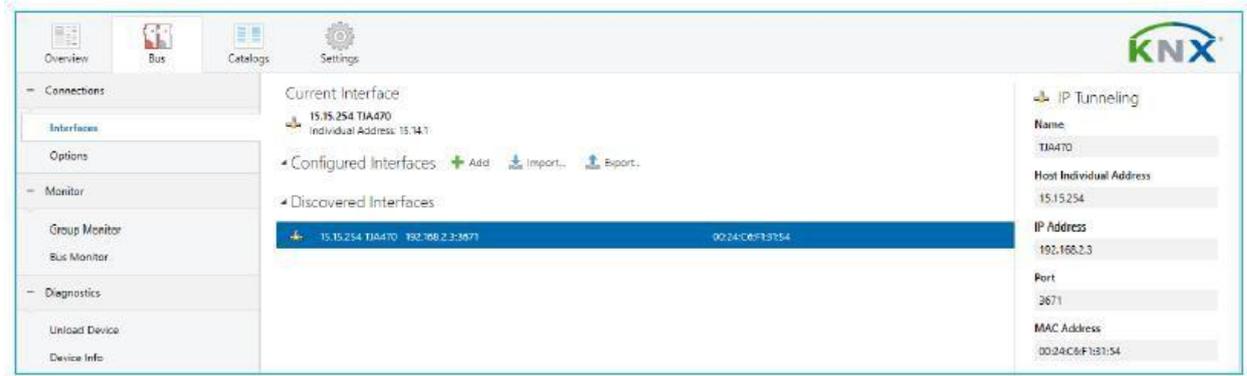
Figure 5 ETS Remote Control via Hager ETS Proxy App for Secure Tunneling

2.3 Smart Devices Common Central Configuration

Combining smart devices together for creating an ecosystem it is providing many advantages although many things have to be arranged one of the most important is the security task that have to be completed for prevent any unexpected results.

Manufactures in most of the cases are manufactured products that are closed to coding or external resources for getting things more secured and easier to adjust and configure from the administrator side of things. The above statements are important according to all the real procedures for building and install all the equipment to a facility. The facility must follow rules that are based on the building study and national electrical certification, norms and directives that are applied for human life safety.
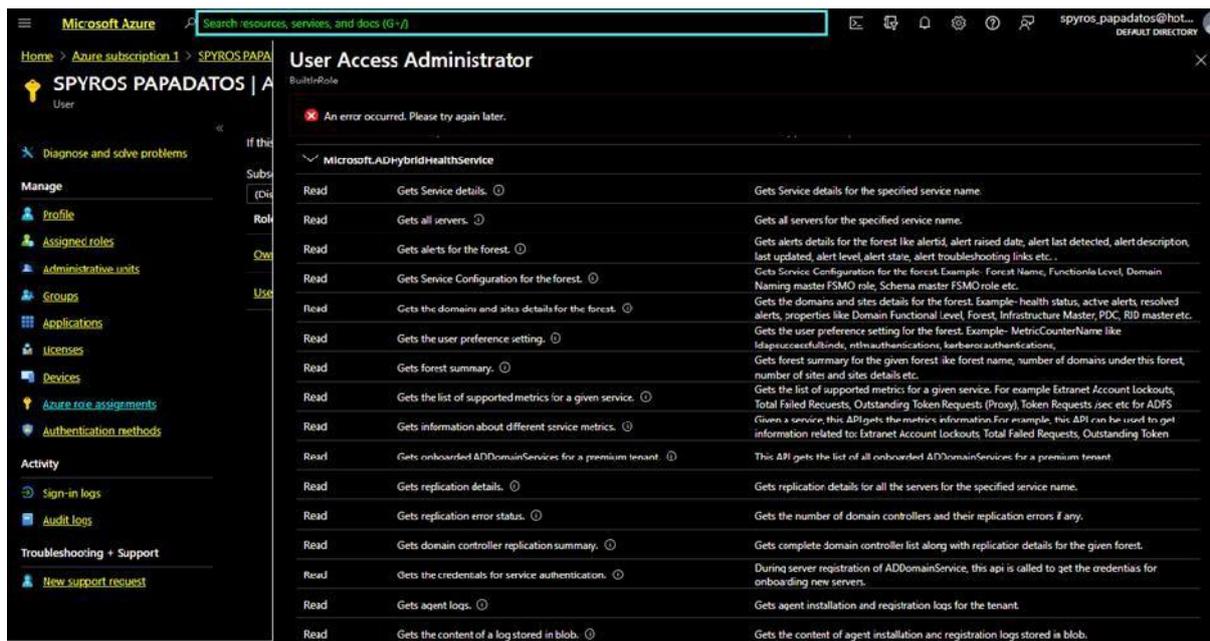

Figure 6 Microsoft Azure Cloud Services IAM role Configuration Dashboard

3. Home Automation Smart System

The automated queries that are starting by one or more triggers and are providing one or more automated actions that are based in specific or floating conditions is automation. The automation is useful for industry, smart homes, health care facilities, smart cities and can be applied everywhere for everything for integrate things and provide comfort, energy consumption decrease, safety and production lines for manufacture products. The automation development was not easy to apply in the past, deep engineering knowledge was need to develop queries that are dedicated to specific smart system areas. These days automation became more user friendly and even users are able to apply simple automation queries through their smart interface via the visualization server. The automation development from users and developers empowers the market of products that can be part of one or more automated procedures[6].

The amount of automation that can co-exist in the same smart system are hundreds. The increment of automation production in a smart system increases rapidly the amount of complexity because the user has to see the automation query that designed again before choose to enable or disable it. The automation when the user or the developer is developing an automation it becomes part of the smart system and a virtual entity is created when the automation query saved.

The entity of the automation has the ability to be enabled or disabled like all the other entities of the system. When the automation is disabled stays in the system and exists under some mode circumstances and when the user or the administrator needs the particular services, they enable the automation service again. Through hundreds of automations, it is difficult to remember what was the type and parameters and the actions that the automation query is designed to do with main result the automation doesn't reach the level of full usage.

The proposal in this dissertation is to simplify control of a smart complex ecosystem with appliance of a cognitive agent that is accepting conversational descriptions from the user and automatically is picking which automation is approaching the momentary needs of the user to enable the entity. The user or the developer doesn't need to be concerned about which automation has to pick for the problem or the functionality that wants to succeed for the moment[7].

The voice assistant with cognitive natural language skills understands the demand and is picking to enable one or more automation that can provide their services for solving the particular problem through a conversational description. No Technical knowledge is needed to describe the automation to the cognitive conversational voice assistant that is built for support the experimental procedure. Although it is convenient for the user to reach the ability of creating automation when it is needed and call the automation to be enabled or disabled through conversational descriptions. The automation procedure can be very quick and easy even quicker if compare with the procedure of picking the best automation for the job that created from the past similar condition. The proposed method considering the dissertation is the technical approach of entities that are enable and triggered through voice or written texts. The direct communication with the smart system provides the user and the administrator according to hierarchy the ability of controlling the smart ecosystem only with phrases. The smart system status feedback ensures the user or the administrator or both that the technical problem that was providing is solved through the entity or entities that are enable or disabled. The solution in the problem can be the disable of an automation entity[8].

Cognitive agent are very convenient tools for providing control simplification through everything in nature. The user or the system administrator has the ability to develop automation by applying many techniques below Domovea expert provides the ability to the administrator to provide automation to the general page of the system.

Figure 7: Domovea Expert IOT Graphical User Interface for Automation and Virtual
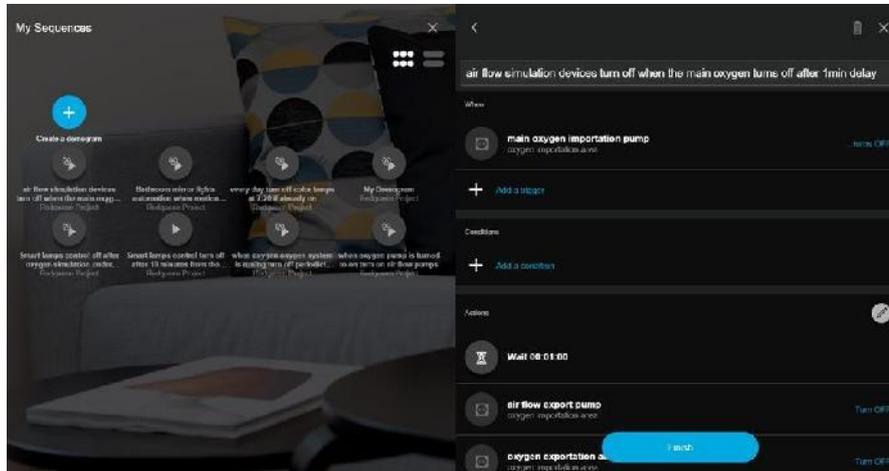
Entities

The automation entities are able to support hierarchy. The developer is providing the actions, conditions and triggers through the block chain automation development menu and by pressing save the automation is part of the system. The automation creation tool are having limitation and are server functionality dependent, the automation that is built to a particular server can't be part of other server. Although the automation that is part of a server particular server can be enabled or disabled from other internet of things servers[9].

These technical answers are significant and demands huge amount of experimentation to succeed for reaching the technical information that needs for creating a complex, secure, quick respond and reliable ecosystem. The Home assistant server also provides a convenient menu for creating automation. The setup is the same in any automation development platform. The abilities are different from server to server but all the entities can be enabled through everywhere. One basic parameter that is significant to mention is that if there is not smart device present with the skills that the automation needs for creating the query the automation can't be setup.
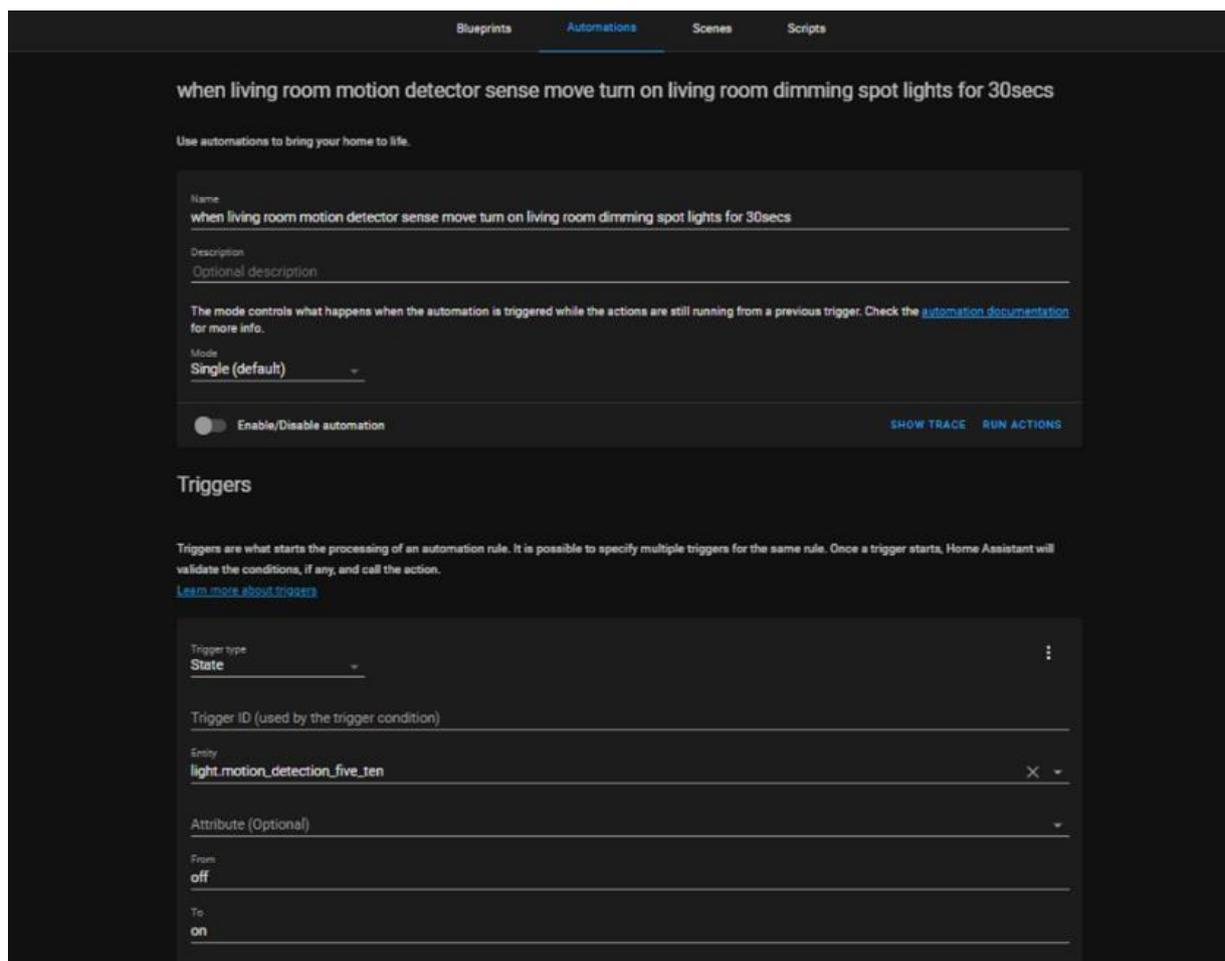
Figure 8: Home Assistant Graphical User Interface for Automation Creation

The automated auto discovery procedure doesn't allow the system to reveal entities that are not existing to the system. That is one of the most important reasons that many smart devices it was very important to be parts of the smart system for the experimental procedure to occur[10]. The smart devices, sensors, virtual entities that are pointing to actuators are parts of the ecosystem and revealed through that automation menu for further configuration. The creation of multiple simple and complex automation proceeds for examine the ecosystem behaviour and receive history data for graphs that can be revealed from everywhere.

The internet of things smart interfaces and devices are having great impact to the industry also with. The communication protocol KNX is a very convenient and reliable protocol that has the ability to support industrial applications, although for industry appliance more industrial products and sensors proposed to be manufactured in the future according to this protocol because the KNX is pointing mostly in residential usage. Although automation can be explored in manual way by writing codes according to the platform that is responsible to run the piece of code. The platform that runs the automation query is collaborating with the core of the internet of things server. Below the home assistant "yaml" file is corresponding to the server core, the core is reading the code and provides actions to the smart system entities that calls though other compiled files that are engaging the services that are responsible to handle the code routines. The service functions are extremely important for the automation procedure and are responsible to provide parameters to the automation

entities for complete the procedure[12]. When an automation is enabled when the one or more trigger entities trigger the automation the routine will start to run the actions if the conditions of other entities are fulfilled.

The conditions can exist or not although is good to exist for ensuring the desired value of the smart devices for creating more sophisticated automating procedures. In this dissertation thousands of automations were created in the same system for ensure that the ecosystem doesn't crash in according to high effort of actions.

The stability of the ecosystem is in great condition through the appliance of many engineering techniques for getting over the issues that are happened through the installation procedure. The updates for internet of things system can provide collision to the ecosystem because many things can be changes according to the iOS of the server. This is possible an avoidable disadvantage because an issue or a bug in the coding from the manufacture side can cause disturbance to the user and the administrator.

The advantage in the system updates is that the smart system is automatically updating as smart edges through the manufacture cloud by providing this way the synchronization of the system with the new technologies. It is important to mention that automation and scripts with the applied method is more convenient to occur if compare to change setting to a smart thermostat or control an HVAC system.

The conversational description of the user or administrator demands is providing to the system all the possible information that needs to complete the adjustments automatically. One possible disadvantage is that the automation has to be created at least once for being part of the ecosystem server and the Dialogflow. After the first configuration the automation can be enabled automatically through the cognitive agent. The cognitive agent can be a general resource for one ecosystem. The cognitive agent can rule a smart ecosystem but different ecosystems that are belonging to other smart facility owner needs a dedicated agent for supporting the facility environment and training phrases that corresponds to the particular ecosystem. The system administrator can collaborate with the Dialogflow developer for creating novel solutions for the smart ecosystem supporting independent of the type of ecosystem. Although the Dialogflow developer can have the all the agent in their own resources for working and collaborating easily from everywhere anytime and this is very important for empower the business specialties in the cognitive sections also. The cognitive agents are the future of the technology because they are providing many cognition abilities that can reduce complexity and increase security.

4. Solicitation
4.1 Scripts

Scripts are typically routines of functions and services that are running once when a trigger is enable them. The script is running and after the completion of the procedure the scripts is disable again but is steel part of the ecosystem. Automation queries are providing the ability to enable scripts, scenes, events and scenes. Although the user or the administrator are having the ability to trigger scripts by enable the script entities that are revealed to the internet of things dashboard.
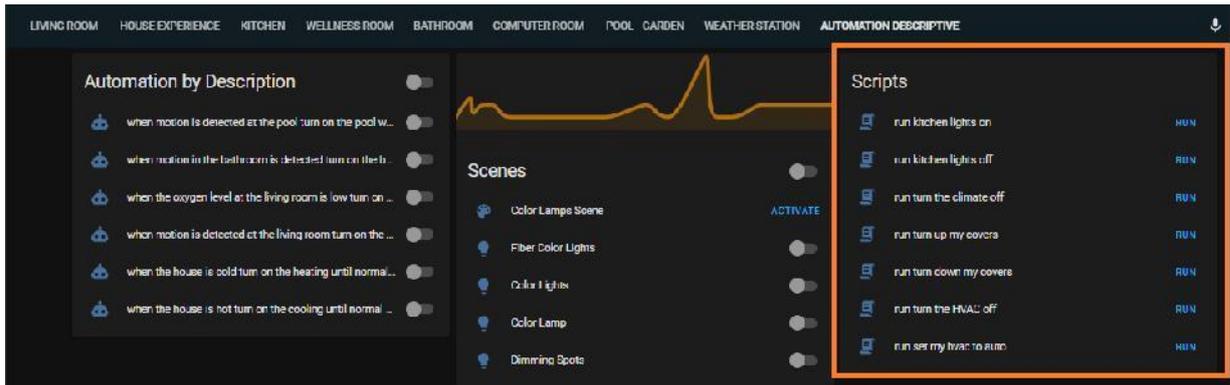
Figure 9: Home Assistant Shorted Automation Dashboard for Cognitive Approaching via Pandora assistant

4.2 Dashboards

The communication between the user and the administrator with the smart system succeeds with appliance of the graphical user interface that any internet of things server has its own disposal. The dashboard of the server reveals the pre-configured from the administrator entities that are reflecting to the real smart devices address of the smart system.
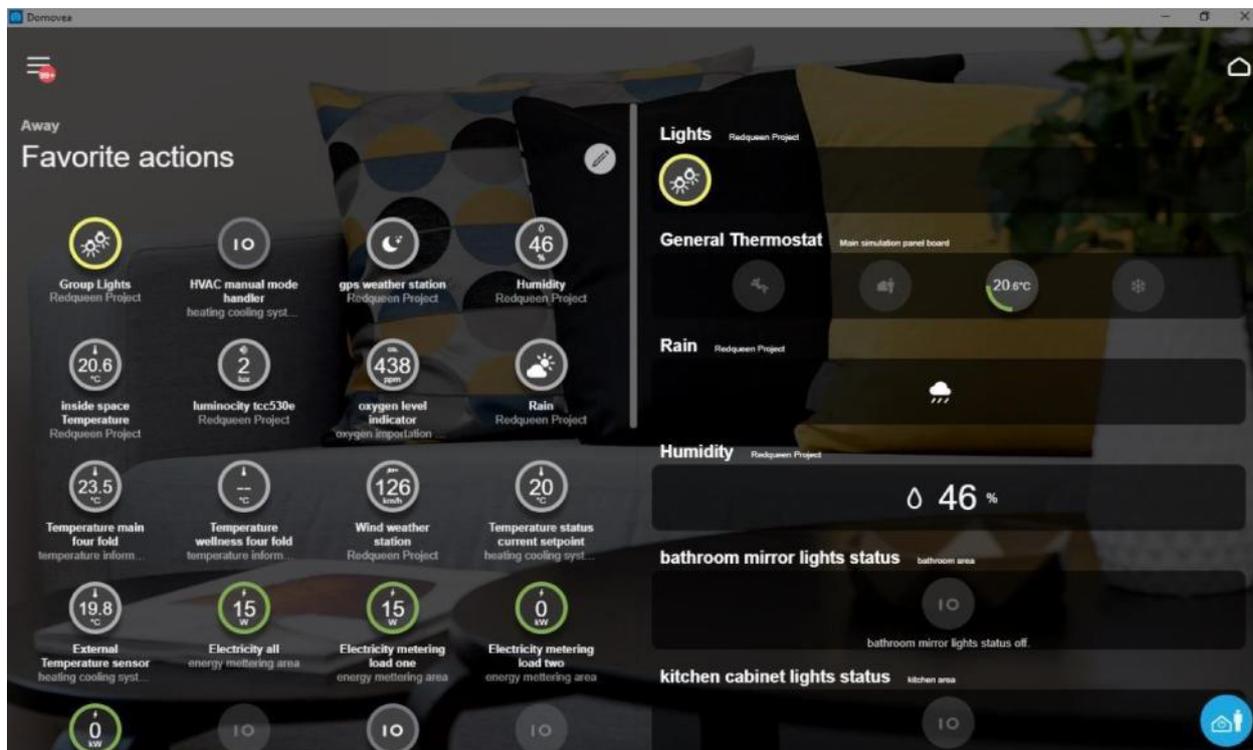
Figure 10: Domovea Expert IOT server Smart Thermostat and Peripheral Data Points Dashboard

5.   Conclusion :

The cloud services that were bridged with the ecosystem are providing possibly limitless capabilities and especially if product manufactures will provide the ability of their products to

connect to third party cloud services. The connection between the cloud platforms and the webhook fulfilments probably is the future technology by taking in advance the answers of simple and more dedicated users. The cloud platforms and the cloud services based on our knowledge can support unlimited smart devices for supporting smart cities, urbans or even smart countries in the future. The open-source software home assistant and Domovea expert IOT was installed for controlling the smart system devices, they were tested in all of their abilities and I have to say that are extremely significant tools because with one or another way as products are providing the opportunity of discovering new features to developers for finding novel and more sophisticated solutions about the smart facilities. The updates are also an advantage of the cloud services because it is providing synchronisation to the system security and new features compatibility automatically.

The creation of the ecosystem, the cognitive agent and the connected Pandora, cameras, smart devices, security firewalls, cloud certifications, cloud services testing, machine learning, language training, electrical and KNX installation, KNX programming, MQTT programming and many other things until finally find a applicable solution it is significant to mention that so many specialties are opened with the appliance of the above technologies for people that is dedicated to any area of the above areas of interest and more. To ensure that the communication is not having any possible issues if more than two servers are applied to the ecosystem, four more virtual servers was applied to the same ecosystem but this will provide in future work. Although one of these virtual servers is providing machine learning services in local condition and it already connected with the others and the cloud. The ecosystems need group working together for creating these type and level of intelligent solutions, people with deep knowledge to their scientific, technical or engineering area will provide advanced novel solution by empowering the work of many scientists that are trying to apply things for making the world a better place to live for this and if not this, the next generations.

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