

Design and Development of Data Integration Techniques Using IOT

Faheemuddin Ahmed¹ and Dr. P. B. Khanale²

¹H.O.D (Computer Science), Poona college of Arts Science and Commerce, Pune

²Assistant Professor, DSM College, Parbhani

ABSTRACT

Nowadays the Internet of Things (IoT) is one of the most trending technology. It is anticipated that via 12 months 2025 there may be 70 billion of Internet-linked devices. Fields like clever towns and clever homes in large part rely upon IoT phenomena with the aid of using a extensive type of sensors for facts series, evaluation and corresponding actions. This trending and comparatively new generation can be applied for layout of new facts integration techniques. These techniques may be correctly utilized in clever houses and clever faculties.

Keywords: IoT, Data integration, Communication Protocols, Sound, Ngrok, Annaconda, Flask, Alexa, DB sqLite Browser.

1. INTRODUCTION

The concept of the Internet of Things (IoT) indicates that in preference to having a small quantity of powerful computing devices e.g. Laptop, tablet you have got a massive number of devices, which are much less effective e.g. bracelet, related light bulb. Name itself means that the IoT includes key parts – community and diverse gadgets related to it. The “Internet” part could take numerous forms and serves as the medium for sending and receiving the facts; at the same time as the gadgets known as “Things” act as facts resources and actuators. Explosive increase of smartphones and pill PCs brought the quantity of Internet-connected gadgets in keeping with character to greater than 1 device in 12 months 2010 for the primary time in history [1]. In 12 months 2015 the full range of linked devices reached 18.2 billion [2]. Cisco predicts that there will be a complete of fifty billion Internet related devices through year 2020. The IoT devices are gift bodily inside the real international, in your house, paintings, and vehicle or worn round your body. This means that they get hold of inputs from the bodily world, remodel them into information and convey outputs that may be accumulated and processed for similarly action, e.g. processing and analysis [3]. The sensor originating statistics are become information, understanding, and, in the end, wisdom. In this context, the IoT becomes immensely crucial in enriching our day by day enjoy. Even now the IoT has already made the Internet sensory with real-time records about measurable homes, such as temperature, strain, vibration, mild and moisture. This serves as a riding pressure for growing cyber-bodily systems which have the capacity of dramatically Enhancing the way human beings stay, examine, work and entertain themselves. In addition, the Internet is expanding into locations that till now have been unreachable. Patients are consuming IoT devices into their personal bodies to help docs diagnose and determine the causes of certain sicknesses. Extremely small Internet-related sensors may be located on plant life, animals, geologic capabilities and in buildings [1]. Those sensors offer information that supply actual-time insights and can also be used for predictive analysis. Lorence Heikell [4] has documented an example from a dairy farm in which IoT primarily based monitoring is used for enhancing milk production, smoothing calving technique and making sure suitable fitness of the cows. The German farmer has recounted that cow farming has come to be plenty easier thanks to the applied IoT solution. The time for evaluating the health of the animals has gone down from 2–3 hours in keeping with day to 3 minutes that can be spent while searching at IoT based totally reviews in a mobile application. Another area of application is the building monitoring structures that present facts to professionals in real-time allowing them to evaluate the modern-day state of a building, predicting viable harm or even collapsing dangers. Experiments documented in [5] show that such IoT based constructing monitoring systems perform well and meet specialists’ requirements IoT solutions may be composed of a massive range of devices that must be supplied with powerful methods of records alternate. Maximizing the

inter-tool communication distance and minimizing the strength intake are an essential task within the location of IoT, and new technology is rising to cope with it [6]. One of such technologies is the Wireless Sensor Network (WSN). It is an architectural version containing a number of sensor nodes and a principal node (hub). In the WSN, the accrued statistics from the sensor nodes are transferred to the critical node for processing and in addition actions. One of the conversation protocols that may be applied for IoT node communication is the Bluetooth low power (BLE) wireless verbal exchange protocol. Another choice imparting low electricity and comparatively extensive verbal exchange range is the Zigbee Wi-Fi communicate fashionable. Zigbee supports introduction of IoT networks with up to sixty four 000 gadgets [7]. Data Integration is the mixture of technical and business approaches used to combine statistics from disparate assets into significant and treasured records. The technique of Data Integration is ready taking information from many disparate resources (including files, various databases, and mainframes) and mixing that statistics to offer a unified view of the data for enterprise intelligence. Data integration is wanted whilst a business makes a decision to enforce a brand new utility and migrate its statistics from the legacy systems into the new utility. It becomes even significantly important in instances of organisation mergers in which companies merge and that they need to consolidate their applications. One of the most typically known use of records integration is building a facts warehouse for an enterprise which allows a enterprise to have a unified view of their facts for analysis and enterprise intelligence (BI) desires.

DATA INTEGRATION TECHNIQUES:

There are many state-of-the-art methods the unified view of facts can be created today. No more ETL is the best way to attain the goal and that could be a new level of complexity inside the discipline of Data Integration. There are several organizational degrees on which the Data Integration may be done.

1. Manual Data Integration

Technically speakme, this is truly no longer a Data Integration. In this method, an internet based consumer interface or software is created for customers of the machine to reveal them all the relevant data by way of getting access to all the supply structures immediately. There isn't any unification of facts in fact.

2. Middleware Data Integration

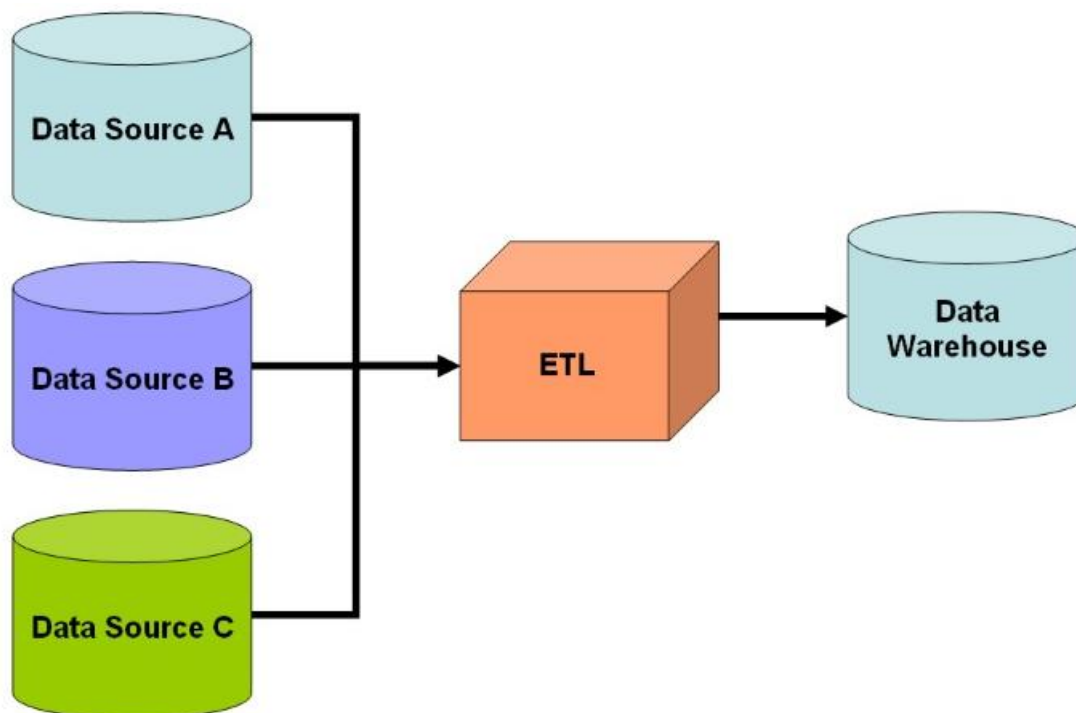
A middleware records integration solution is basically a layer between disparate structures allowing them to talk. Middleware integration can act like glue that holds together multiple legacy applications, making seamless connectivity viable without requiring the 2 packages to speak without delay.

3. Data Virtualization Integration Approach

Data Virtualization allows us to go away facts inside the supply structures while allowing creating a new set of unified perspectives. This offers a way for users to get entry to the unified view of disparate supply system's information across whole agency. A lot of corporations today prefer this approach due to the blessings and technology that exist these days to help this approach. The main advantage of the digital integration method is near actual time view of statistics from the source systems. It gets rid of a need for separate information store for the consolidated unified facts. However, that doesn't mean it's the best way to do Data Integration although it virtually has a short time period advantage. The drawbacks of this approach encompass restrained opportunity of records's availability or information version management and extra load on the supply systems involved which may also have an detrimental effect on the overall performance of the supply structures.

4. Data Warehouse Approach Of Data Integration

This is the most commonly known technique to Data Integration you may already recognize if you have study Ralf Kimball and/or Bill Inmon. This method calls for advent of a new Data Warehouse (of Data Marts) which shops a unified version of information extracted from all the source structures concerned and manipulate it impartial of the original source structures. The blessings of this technique encompass capability to effortlessly manage history of information (or records versioning), ability to combine statistics from very disparate assets (mainframes, databases, flat files) and to store them in a principal repository of records.[8]



2. REVIEW OF LITERATURE AND DEVELOPMENT IN THE SUBJECT

The IoT facts integration answer is prepared for deployment and is deliberate to be installed via the quit of yr 2016. Currently our solution can perform measurements only in a unmarried vicinity since it uses a single set of boards and sensors; however, this could be effortlessly prolonged by way of including greater additives. The particular function of our IoT records integration solutions is the integration with Twitter, that's planned to be prolonged with help for other social media networks, such as Instagram. Student feedback can be accumulated serving as enter for specifying additional necessities for future improvements. The cutting-edge information integration answer is simplest at its early degrees and supports information accumulating from a single vicinity; therefore, work on in addition improvement will be related to expansion of machine competencies. Authors are making plans to extend the Twitter integration with extra instructions that can be used in tweets. For example, customers might be able to find out the statistics approximately real time conditions on the university through just tweeting a syntactically valid command e.g. @rtu-iot get temperature to the IoT answer's Twitter account and getting the response in form of a tweet. This could provide clean get entry to to the IoT information from drugs, smart phones and computer PCs. The present range of sensors may be extended with a sound stage detection sensor. Increasing the quantity of devices will permit placing them in several rooms in such manner gathering facts from a larger place. Our IoT solution can also be supplemented with actuators performing diverse moves underneath positive context situations. For example, the conditioner in one of our labs may be powered by means of a signal from an infrared (IR) transmitter in case of temperature going above a predefined margin. Authors also are making plans to feature a Wi-Fi adapter inside the tracking mode that will be able to collect all broadcasted SSIDs (Service Set Identifiers) that cell telephones or laptops are broadcasting even as trying to hook up with Wi-Fi access factors that they have got already been linked to previously. The end result may be displayed on Smart TV elevating the awareness that our gadgets are broadcasting excessive statistics. Bluetooth adapter also can be used to accumulate records about cell phones or laptops that have their Bluetooth enabled. Another capability characteristic of the IoT records integration answer is people counting the usage of cameras and picture processing applications that are deployed to the cloud. However, in this example the privacy elements have to be taken into consideration based on EU Regulation on the protection of natural humans with regard to the processing of private records and on the unfastened motion of such facts. Currently best Wi-Fi is used as a way of verbal exchange; however, Authors are making plans to experiment with different extra

perspective conversation technologies. In next versions of our solution, the connected sensors could be primarily based on AVR MCU and sensors may want to ship facts to the board wirelessly. In this example, we also have to reflect on consideration on protection troubles, as an instance, whether or not the records might be sent in plaintext or encrypted shape. After putting in the variety of sensors and monitored rooms, authors are planning to display a live map of the sensor places on the Smart TV. Authors are also making plans to put in custom designed Bluetooth beacons for demonstrating the in room positioning talents and tracking the movement of users, who have mounted a Bluetooth connection with our beacons.[10]

IoT has been regularly bringing a sea of technological modifications in our each day lives, which in turn enables to making our existence less difficult and extra comfortable, though various technologies and applications. There is innumerable usefulness of IoT programs into all the domain names inclusive of scientific, manufacturing, business, transportation, training, governance, mining and habitat. Though IoT has considerable blessings, there are a few flaws in the IoT governance and implementation level. The key observations within the literature are that [11] There isn't any fashionable definition in worldwide [12]. Universal standardizations are required in architectural stage [13] and technologies are varying from vendor-vendor, so wishes to be interoperable [14]. For higher international governance, we need to construct fashionable protocols.

The Internet of Things concept arises from the want to manage, automate, and discover all gadgets, devices, and sensors within the global. In order to make sensible decisions both for people and for the matters in IoT, statistics mining technology are integrated with IoT technology for choice making support and machine optimization. Data mining includes discovering novel, thrilling, and probably beneficial patterns from information and making use of algorithms to the extraction of hidden facts. In this paper, authors survey the data mining in 3 one-of-a-kind views: understanding view, method view, and application view. In know-how view, authors overview category, clustering, affiliation evaluation, time series evaluation, and outlier evaluation. In application view, authors evaluation the everyday information mining application, together with e-trade, industry, fitness care, and public carrier. The technique view is discussed with expertise view and alertness view. Nowadays, huge statistics is a warm topic for information mining and IoT; we additionally speak the brand new traits of huge information and analyze the demanding situations in facts extracting, information mining algorithms, and facts mining system location. Based on the survey of the cutting-edge studies, a suggested big statistics mining gadget is proposed [15].

David Lago et al., 2008:[16] This paper presents an educational laboratory that has been implemented for the sensible education in sensors, records acquisition, and primary manipulate skills. The use of the laboratory has been optimized by way of the provision of a faraway access infrastructure that allows the definition and booking of time slots related to the laboratory websites. Given the various styles of present sensors, conditioning circuits, and actuators, setting up an educational framework is a complex (and high priced) challenge, although handiest the primary design options are taken into account.

Emiliano Miluzzo et al., 2010:[16] Mobile telephones or Smartphone's are rapidly turning into the critical laptop and conversation tool in human beings's lives. Authors agree with that sensor-prepared cell telephones will revolutionize many sectors of our financial system, such as business, healthcare, social networks, environmental monitoring, and transportation. In this text they survey current cellular cellphone sensing algorithms, applications, and systems. Authors speak on the emerging sensing paradigms, and define an architectural framework for discussing a number of the open problems and challenges emerging inside the new region of telephone research area.

The Romanian engineering schooling started out to offer to college students the essential abilities to code programmable forums, to create intelligent gadgets, and in some branches, to use 3-D printers. However, earlier than being enrolled in academic studies, the scholars have the possibility to gain such competencies best in remoted instances. Since the IoT effect is predicted to increase, the real project is to educate as many students as possible on what IoT can add to their existence and future career. Here, no longer best the students who desire to turn out to be engineers are considered, considering that lower and specifically higher secondary college need to introduce related IoT content material in formal and non-formal

schooling activities. More, transferring IoT basic competencies to students, starting from early ages, they will have a good sized assist to be competitive within the labour market. It is apparent that the consequences presented in this text show that IoT and 3D printing technologies are nevertheless in the starting, in the Romanian education, but small steps for promoting such technologies are recorded within the ultimate current years. On the opposite hand, it's far absolutely encouraging to peer that maximum of the college students who participated to the described survey confirmed openness and preference to study those topics. By positive, the actual voice of young era is in-line with the surveyed college students' answers, who need to recognise extra about this rising technology which will become an important a part of our regular existence very soon.[17]

Internet of Things depends on Internet, sensors era which makes the conversation feasible among gadgets by using implementing specific protocols. After doing the literature survey some principal issues are located, like the interrupted connectivity among devices effecting the verbal exchange. Also there may be compatibility issue in gadgets. Security of gadgets all through verbal exchange manner and security of communicate channel or link is likewise a prime issue. Lots of work is to be performed for the betterment and development of this area; still there's more paintings to do, extra standardization of generation, protocols and hardware are required to make

Absolutely reliable and at ease area of Internet of Thing. Some worldwide hints ought to be used for this cause. The destiny is completely depends on Internet of Thing, so lot of component to do at implementation level. In order to solve safety problems in IoT domain we recommend to put into effect the idea of Block Chain in IoT. Authors may have deep dialogue on principals and implementation of Block Chain in our in addition works.[18]

Internet of in undergraduate schooling Marlin H.Mickle IoT schooling method repurpose traditional laptop networking path as "Introduction to IoT" equip the pupil with a "Toolbox" of wi-fi networking techniques from the past encourage undergraduates to participate in palms-on projects and research.[19]

3. GOALS AND OBJECTIVES OF RESEARCH

The Goal of this research is the effective use of data integration by using IoT technology in certain real life application.

OBJECTIVES OF THIS RESEARCH PROPOSAL ARE

- a) To study IoT technology and data integration technology in depth.
- b) To design and develop a new steps for data integration using IoT technology.
- c) To implement the developed new steps by using appropriate software platform.
- d) To apply the newly developed application which is integrated IoT technology and produced integrated data from the various data sources by using IoT devices.

4. METHODOLOGY TO BE ADOPTED

Methodology to be used in this research is the design and creation methodology. In this research we will initially perform experiment to understand the limitation of existing technologies and then we will design the new algorithm to remove such limitations.

5. ARCHITECTURE OF DATA INTEGRATION



Figure-1.4 : Architecture of Data Integration

1. NGROK

NGROK is areverse proxy that crates a secure tunnel from a public end point to a locally running web service. NGROK captures and analyses all traffic over the tunnel for later inspection and replay. Expose any

http service behind a fire wall to the internet on a sub domain of NGROK expose any TCP service behind a firewall to the internet on a random port on NGROK.com. Inspect all http request/responses that are transmitted over the tunnel. Whatever request transmitted over a tunnel will replay securely

2. IoT

Internet of things (IoT) is playing a critical role in various technologies that are greater useful in various packages. IoT is a network, in which all bodily items are related to the internet via network gadgets inclusive of router

3. Alexa

Amazon Alexa Echo dot device is a hands-free smart speaker that control using voice it connects to Alexa a cloud based voice service to expense manager which gives income intent, expense intent, expenditure report it has a built in speaker so we can also use Alexa to find the date, month and year .

4. Expense Manager

Expense Manager is a base package of an application which have intents that can be created in a alexa_skill_env

5. Flask Framework

Class application integrated with front end framework which is written in Python language we require two package to set up environment one is a) Virtual env b) Flask.

6. Data Dictionary

All the records are stored at the back end site

6. IMPORTANCE OF STUDY/ SOCIETY APPLICATION

Importance of my study is focusing on data integration technology using IoT. Which will most beneficial for society because now a days human being is depend on Internet connected devices. This trending and relatively new technology can be useful in many application like smart homes smart colleges and wearable computers.

7. APPLICATION

Below are the key steps in configuration of alexa skill : (For all steps internet connection is a must)

1. Starting up NGROK

Go to Downloads > ngrok > ngrok.exe > A cmd prompt will open, type below command to enable NGROK (port forwarding using wildcard SSL)

Ngrok http 5000

We are instruction ngrok to enable http(protocol) at port 5000(default port of our Flask application)

2. Starting Anaconda environment

Go to windows startup menu > Type in “Anaconda prompt” > Open the prompt and type below command to search and activate the environment.

conda info --envs (lists all available environments created)

conda activate alexa_skill_env(our env name)

Now our environment is activated, An environment contains python version 3.5 and all necessary packages like flask_ask(used to created skills using Flask framework), Flask(python based web framework), Num2words(converts numbers to words for easier understanding of words)

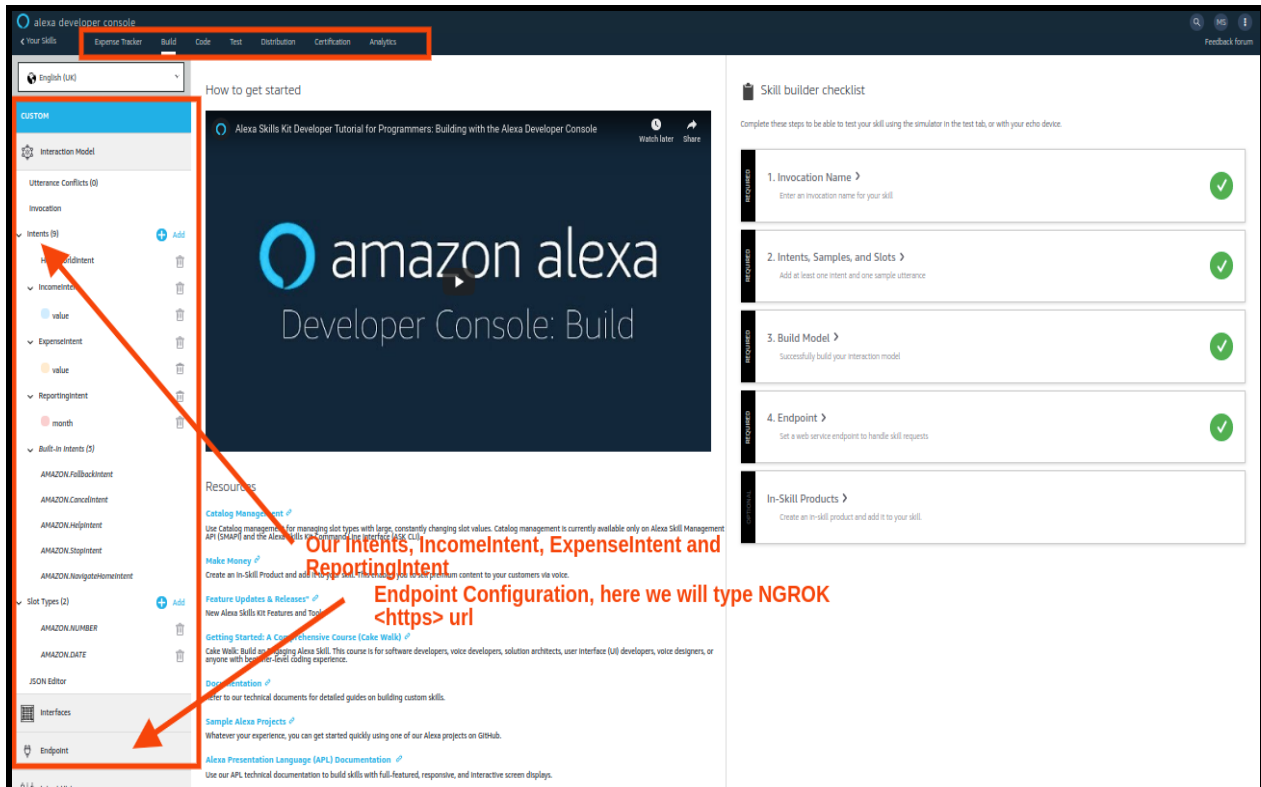
3. Start the alexa skill

Navigate to your desktop > expense_manager > type command > python main.py and HIT enter. This will execute the script which listen on server port 5000 for any requests.

4. Alexa Skill Build

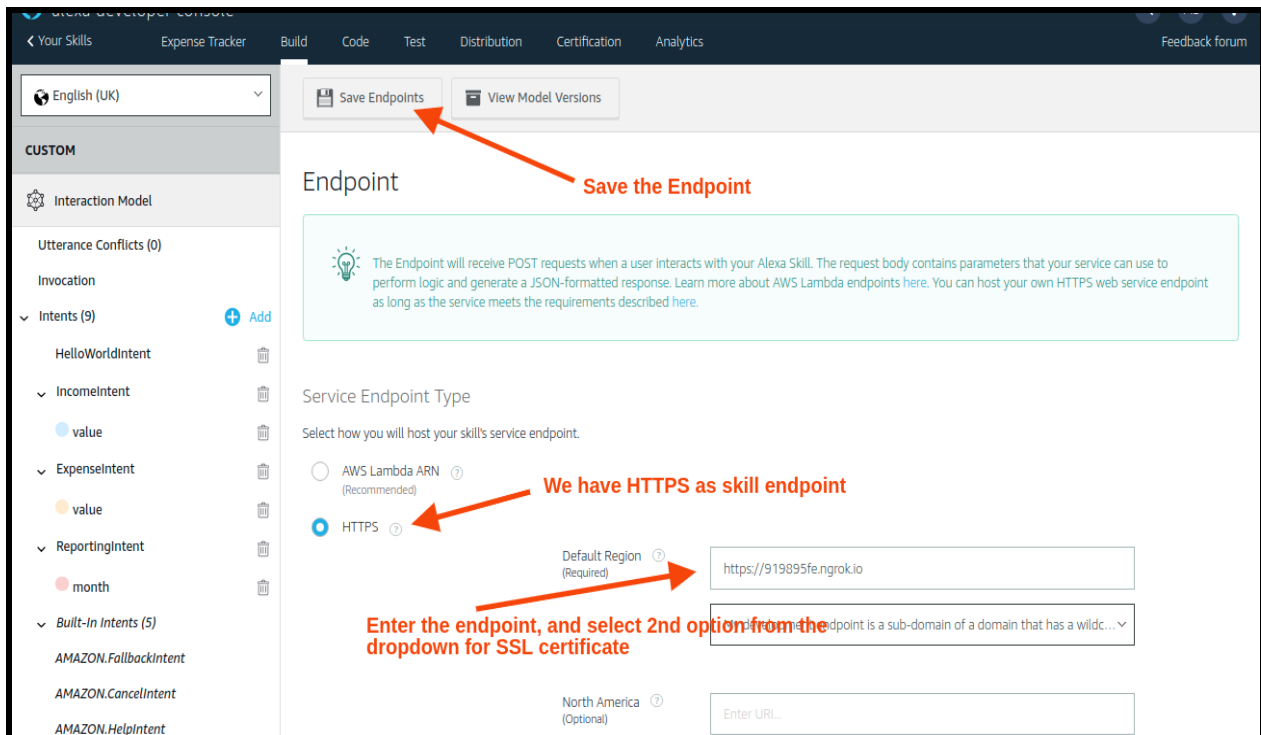
Login to <https://developer.amazon.com/alexa/console/ask>

Open your skill <expense_tracker>

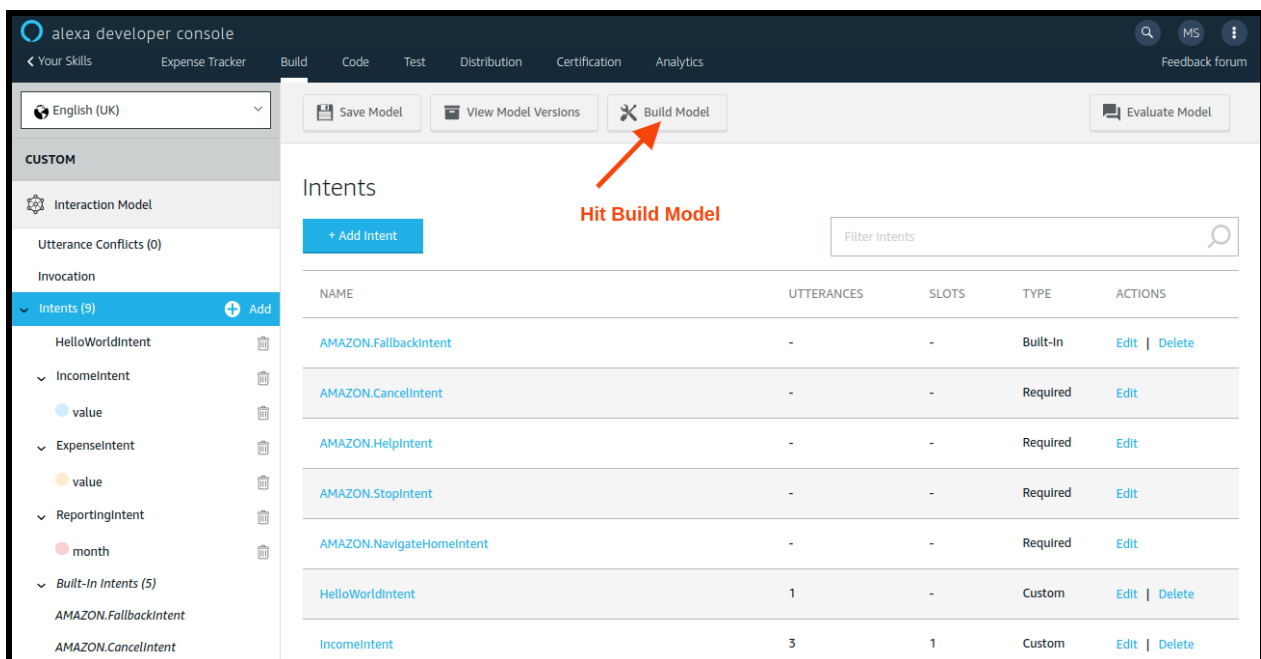


We need to build the skill as we need to allow training for the skill which is in development.

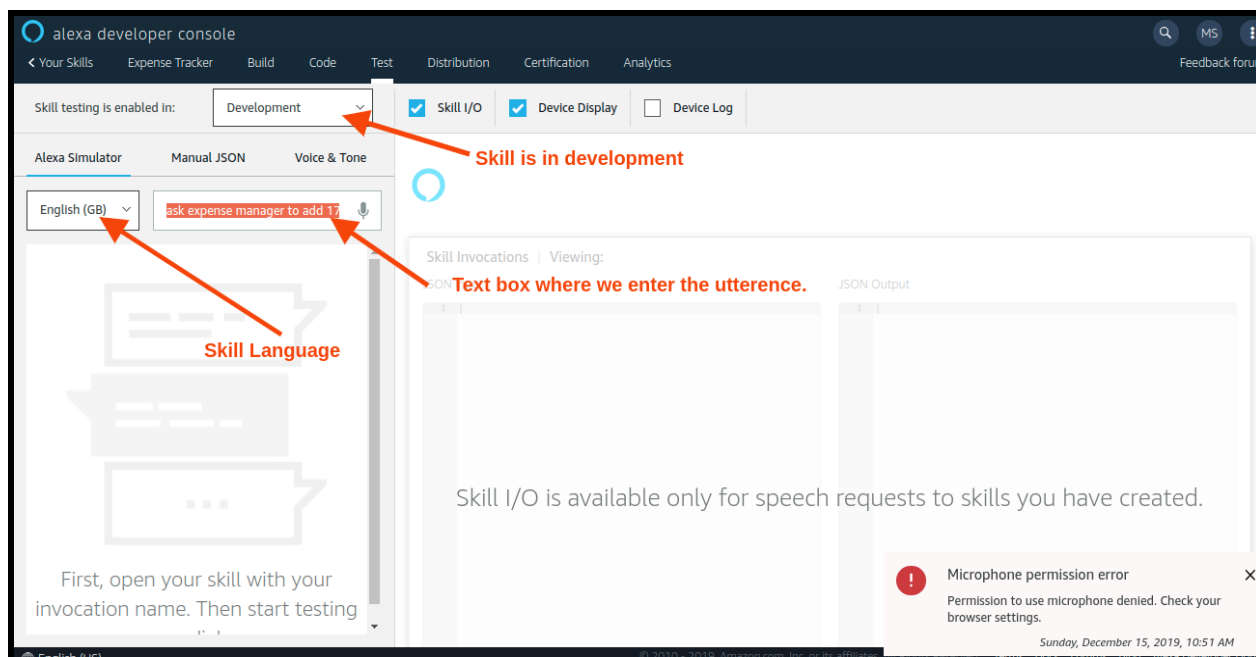
We will now add the NGROK endpoint to point our skill to.



Build the skill, This will train the NLP model of alexa for our skill intents and utterances.



Testing the skill



Utterances which user can enter are

1. IncomeIntent

Ask expense manager to add <amount> as income

2. ExpenseIntent

Ask expense manager to add <amount> as expense

3. ReportingIntent

Ask expense manager to give expenditure report

CONCLUSION

In this Research we have implemented the IoT features through IoT device i.e Alexa echo dot, and we have created an application i.e Expense manger which provide us to four intent like welcomeintent, incomeintent, expenseintent and Expenditure reportintent. We have used a alexa developer console for accepting the commands for the intent. Ngrok used to port forwarding using wildcard SSL.and anaconda prompt is used to activate the environments. Data is stored at the backend for future reference.so we can implemented such kind of features in the different fields which will help to grow a better productivity.

7. REFERENCES

- 1) D. Evans, The Internet of Things. How the next evolution of the Internet is changing everything. Cisco Internet Business Solutions Group, 2011.
- 2) "Internet of Things (IoT): number of connected devices worldwide from 2012 to 2020 (in billions)," The Statistics Portal, August 2015. [Online]. Available: <https://www.statista.com/statistics/471264/iot-number-ofconnected-devices-worldwide/> [Accessed: Sept. 4, 2016].
- 3) A. McEwen and H. Cassimally, Designing the Internet of things. Chichester, UK: John Wiley and Sons, 2014, pp. 10–11.
- 4) L. Heikell, "Connected cows help farms keep up with the herd)," [Online]. Available: <https://news.microsoft.com/features/connected-cows-helpfarms-keep-up-with-the-herd/#sm.001f8tey8169bdtiwt31clgcb586g/> [Accessed: Sept. 28, 2016].

- 5) W. Sun, X. Chen, F. Liu and L. Zhao, "Collection System for Pressure Information of Buildings Based on the IoT and CAN Bus," in 2012 International Conference on Cyber-Enabled Distributed Computing and Knowledge Discover, CyberC2012, Sanya, China, 2012, pp. 274–277. <https://doi.org/10.1109/cyberc.2012.53>
- 6) K. Nair, J. Kulkarni, M. Warde, Z. Dave, V. Rawalgaonkar, G. Gore and J. Joshi, "Optimizing Power Consumption in IoT based Wireless Sensor Networks using Bluetooth Low Energy," in 2015 International Conference on Green Computing and Internet of Things, ICGCIoT, Greater Noida, Delhi, India, 2015, pp. 589–593. <https://doi.org/10.1109/icgciot.2015.7380533>
- 7) E. D. N. Ndihi and S. Cherkoui. "On Enhancing Technology Coexistence in the IoT Era: ZigBee and 802.11 Case," IEEE Access, vol. 4, pp. 1835–1844, 2016. <https://doi.org/10.1109/ACCESS.2016.2553150>
- 8) <http://www.dataintegration.ninja/data-integration-techniques-and-its-challenges/>
- 9) <http://h30614.www3.hp.com/collateral/Barcelona2013/presentations/IT3112.pdf>
- 10) <http://www.gsma.com/newsroom/wp-content/uploads/15625-Connected-Living-Report.pdf>
- 11) Case Study: IoT Data Integration for Higher Education Institution Krišjānis Pinka¹, Jānis Kampars², Vladislavs Minkevičs³ 1–3 Riga Technical University ISSN 2255-9094 (online) ISSN 2255-9086 (print) December 2016, vol. 19, pp. 71–77 doi: 10.1515/itms-2016-0014 <https://www.degruyter.com/view/j/itms>
- 12) Lianos, M. and Douglas, M. (2000) Dangerization and the End of Deviance: The Institutional Environment. British Journal of Criminology, 40, 261-278. <http://dx.doi.org/10.1093/bjc/40.2.261>
- 13) Ferguson, T. (2002) Have Your Objects Call My Object. Harvard Business Review, June, 1-7.
- 14) Nunberg, G. (2012) The Advent of the Internet: 12th April, Courses.
- 15) Kosmatos, E.A., Tselikas, N.D. and Boucouvalas, A.C. (2011) Integrating RFIDs and Smart Objects into a Unified In-ternet of Things Architecture. Advances in Internet of Things: Scientific Research, 1, 5-12.
- 16) Data Mining for the Internet of Things: Literature Review and Challenges Feng Chen,^{1,2} Pan Deng,¹ Jiafu Wan,³ Daqiang Zhang,⁴ Athanasios V. Vasilakos,⁵ and Xiaohui Rong Hindawi Publishing Corporation International Journal of Distributed Sensor Networks Volume 2015, Article ID 431047, 14 pages <http://dx.doi.org/10.1155/2015/431047>
- 17) http://shodh.inflibnet.ac.in:8080/jspui/bitstream/123456789/3987/3/03_liteature%20review.pdf
- 18) A Survey on IoT in Education Ana-Maria SUDUC¹, Mihai BÎZOI², Gabriel GORGHIU³ ISSN: 2066-7329 | e-ISSN: 2067-9270 Covered in: Web of Sciences (WOS); EBSCO; ERIH+; Google Scholar; Index Copernicus; Ideas RePeC; Econpapers; Socionet; CEEOL; Ulrich ProQuest; Cabell, Journalseek; Scipio; Philpapers; SHERPA/RoMEO repositories; KVK; WorldCat; CrossRef; CrossCheck 2018, Volume 10, Issue 3, pages: 103-111 | doi: <https://doi.org/10.18662/rrem/66>
- 19) A Literature Survey on Internet of Things (IoT) : Krishna Kumar Goyal Int. J. Advanced Networking and Applications Volume: 09 Issue: 06 Pages: 3663-3668 (2018) ISSN: 0975-0290
- 20) https://www.engineering.pitt.edu/uploadedFiles/_Content/Sub_Sites/Labs/RFID/_Documents/IoT_Education_SJD.pdf