

LOW FIDELITY PROTOTYPE

Part - 2

IoT-based smart home security based on AWS: A project on low fidelity prototype focusing on AWS-based cloud infrastructure. Introducing project "**LOGIC HOME**" and a review of system architecture, planning, and design.

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Introduction

Home security includes both security equipment placed on a property and personal security activities of individuals. Security equipment includes doors, locks, alarm systems, lighting, motion detectors, and security camera systems. Personal security includes activities such as securing doors, activating alarms, keeping dogs, closing windows, and not hiding additional keys outside. Most target cash first, followed by jewelry, drugs, and electronics. Common security methods include never hiding extra keys outside, never turning off all lights, sticking small CCTV cameras on doors, and keeping a good eye on neighbors.

One of the key components of home security is finding a space where it's easy to program and interact with users. A control panel is made to equip and disable the home security system. The control panel is the main connection to the alarm company monitoring a home. It usually has a touchpad or buttons for easy system operation, and some newer systems also have voice control or wireless remote controls.

Security issues for electrical infrastructure One of the basic foundations of modern society is the power supply system. Intentionally disrupting the power supply will affect national security, the economy, and people's lives. Because power grids and their sources are widely dispersed, it is a challenge to the effectiveness of defense institutions and structures. Vandalism can damage power sources in the power grid, including civil nuclear power plants. Sabotage in the form of a cyber attack can wreak havoc on the computer, communications, and information systems, and can seriously cut off power supplies. This in turn can cause major disruptions in other components of society's infrastructure. Comprehensive defense plans are in place. One method is to isolate the charging system. Sophisticated defenses must have extensive protection in real-time, with control systems alerted and guided by detection technologies. Communication and information must be appropriately streamed.

Overview & Team Procedure

In our project, we talked about IoT, the Internet of Things, and how it could make our life easier and provide us services like home security. We offered our ideas about home security how it can use services like AWS to make it more advanced and why current IoT on home security has issues.

Our team described why current services on home security are backdated and described the overlaying issues on it. The issues that come to consideration while using the current version of home security services include Data security, backup and restore, limited storage, high cost, and mobility. Using AWS we can solve all these shortcomings of the current home security services and create and provide more reliable, secure, faster, and low-cost service. AWS provides cloud service which has high security, provides a massive amount of storage that can be easily accessed from the cloud once it is uploaded, is more cost-effective, and allows users to use multiple devices and the service can also be easily accessed using mobile devices so allows user to control from any location at any time. The benefits of AWS are undeniable and have to be put into consideration as it totally overpowers the current back-dated home security services.

Features of AWS that makes it superior and the key factor in using it for home security and monitoring includes reason like its Board and Deep, have solid Multi-layered security that protects devices, data, and people with an effective preventative security mechanism, it also has a superior AI(artificial intelligence) that utilize machine learning to optimize models in the cloud and finally it has proven experience at scale which easily scales to support up to millions of devices with secure cloud infrastructure.

Our team worked collectively as a result we came out with the solutions for home security. Our team was led by Abdullah Al Khalid who was the leader of the team and did the architecture and planning of the service we are proposing, Yassin Samy did the introductory part of the project, while Abdullah Al Rafi described elaborately on 4th IR technology and Amazon Web Services, while me Sazzadul Arafat Abir gave a general overview of the whole project and talked about the team progress and steps designed by m team members and the conclusion was done by Ahmed Ali Abdelwahed.

Disadvantages & Limitations of physical architecture

The current physical architecture has several limitations and disadvantages of using it.

- **Costly-** The servers are costly and there are various options to choose from. A wrong decision may fail the whole infrastructure of the system. Also with the increase of clients servers will be needed to upgrade that need huge investments. the faulty server can cause errors at any time.
- **Limited storage option-** The physical server has data limitations. It has limited storage. Sometimes there could be a hard disk failure and all the data been there could be lost. This adds a huge limitation and downside. Server built with hard drives is slower than others which will put limitations to the traffic management to the server-side and client-side development. And having no backup will make the data being used to total loss.
- **Mobility-** For worldwide support server shipping and managing it is also another hard work. This puts a huge cost and limitation on the whole architecture.
- **Security & Protection-** With building the server there rise one question which is security & protection. Without a strong firewall clients' information and devices are much more vulnerable to the internet. Cyber attacks and also vulnerable tools can cause server failure and the whole server can fall down in no time.
- **Server monitoring-** Data monitoring and control is also part of the whole process but with the traditional server that becomes some kind of burden.
- **Local Internet availability-** The mobility and reliability become less as the local internet system could go down at any time also there could be routing and slow trafficking problems.

There are a lot of problems with the local infrastructure than AWS. AWS provides a strong plan and reliable architecture with a lot less cost on the go. It's more affordable and can be controlled easily and from anywhere. With no downtime and unlimited resources, the AWS cloud platform delivers the most strong design.

Building connected home device is challenging

- Difficult to quickly build differentiated products in a crowded market.
- Challenging to improve the customer experience while keeping costs low.
- Hard to maintain Interoperability between multi-vendor devices.
- Need to ensure devices work regardless of local connectivity.
- lack of reliable & scalable global cloud infrastructure platform.
- Need to ensure secure connections and maintain compliance.

Why AWS based architecture of Logic Home

The system architecture is designed based on AWS (Amazon Web Service) one of the biggest cloud platforms of the present time. AWS is much more reliable and manageable than the physical server platform. With AWS cloud the system scalability and service availability are higher than the physical server option.

- AWS servers are worldwide and have vast regional and zonal support so clients can interact and locate the server to their nearest or in the location they want.
- AWS server security is protected with reliable encryption and security. Also, its capability to keep clients' information and system infrastructure safe and sound is very high.
- AWS has unlimited server capacity which can handle huge storage and database needs and also high traffic data transfers.
- AWS offers variant flexibility and affordability to clients' projects. The services of the AWS Cloud are way cheaper and easy to manage by using AWS.

Internet of Things (IoT) on Logic Home

IoT home automation is the ability to control domestic appliances by electronically controlled, internet-connected systems. It may include setting complex heating and lighting systems in advance and setting alarms and home security controls, all connected by a central hub and remote-controlled by a mobile app or a computer device through which the user can monitor. IoT gives us the freedom to monitor and look at the data of the actions we carry in the home during everyday life. Nowadays, IoT technology is working as one of the main roles in human life. In recent years, smart home system and smart city security are based on Internet of Things (IoT) technology, which support and facilitates monitoring the appliances to increase the availability of various gadgets for the aim of home automation with tough security.

IoT has been exploited as one of the key features for the upcoming wireless sensor network in order to be able to operate without human involvement. If any robber breaks into the house the sensors that make up the home security system will be able to alarm the user about the threat that he's about to face and actions can be taken.

To establish IoT internet connectivity needs to be applied for the user to access the home security services. In order to give such capacities that sensor gadgets are set in the home condition to recover information and send it to such web server so that the data can help the owner to avoid any unexpected bad situation without spending any additional effort after data analyzed and presented from the sensor. We propose our home security services with AWS cloud services which allows us to instantly react to upcoming activities that will take place. AWS allows us to reduce reaction time between identifying the unexpected situation and alerting the user because of its easy-to-use cloud services. It also allows the home security services provided to be extremely affordable as users can monitor by using only an android device.

The component required for IoT on home security will include four main basic objects: sensors/devices, connectivity, data processing, and a user interface.

Data processing and user interface will be provided by AWS. The service provided for the home security needs to be quite protected otherwise hackers can easily break through the system and disable the sensors otherwise all the efforts put in for the services will be wasted. AWS has very strong protection and security of cloud services so hackers won't be able to break through the system and can't disable the sensors that make up the home security.

There are several advantages of IoT to make a smart and secured home. The first one has to be its cost-effective usage, for a reasonable cost users will get the best service possible to secure their home. The second advantage of IoT has to be it's easy to use services for the user as it isn't much complicated and users can monitor it by using only a mobile device. The third advantage is portability as no matter how far the user is from home he can monitor his smart home from any part of the world as long as he's connected to an internet service. The fourth advantage is customer service as the user can get any help 24/7 from the internet which offline won't be possible.

Today the world is advancing at a very increasing rate and to keep up with it IoT has to be one of the services. Smart homes will allow more security as a result we can proceed to smart cities and hence decrease the frequency of robberies and vandalism of homes by making them more secure.

Introducing Logic Home

- Our AWS IoT solution integrates smoothly with our logic home smart devices. Without having to maintain any infrastructure, the AWS IoT solution allows you to easily operate your scalable IoT applications that gather, process, analyze, and act on data provided by connected home devices. This allows you to concentrate on developing solutions and experiences that provide value to both your companies and your customers, as well as developing a new class of connected home apps that interact with the actual environment.
- The data is then sent to AWS Direct Connect by the AWS IoT solution. It uses a regular Ethernet fiber-optic connection to connect your internal network to an AWS Direct Connect site. The cable is linked to your router on one end and an AWS Direct Connect router on the other. With this connection, you may construct virtual interfaces to public AWS services (for example, Amazon S3) or Amazon VPC without having to go via internet service providers.
- Amazon S3 is an object storage service with industry-leading scalability, data availability, security, and performance. Customers of all sizes and sectors can store and safeguard nearly any amount of data for use cases including data lakes, cloud-native apps, and mobile apps. You can minimize expenses, organize data, and establish fine-tuned access restrictions to suit particular business, organizational, and compliance requirements with cost-effective storage classes and easy-to-use administration tools.

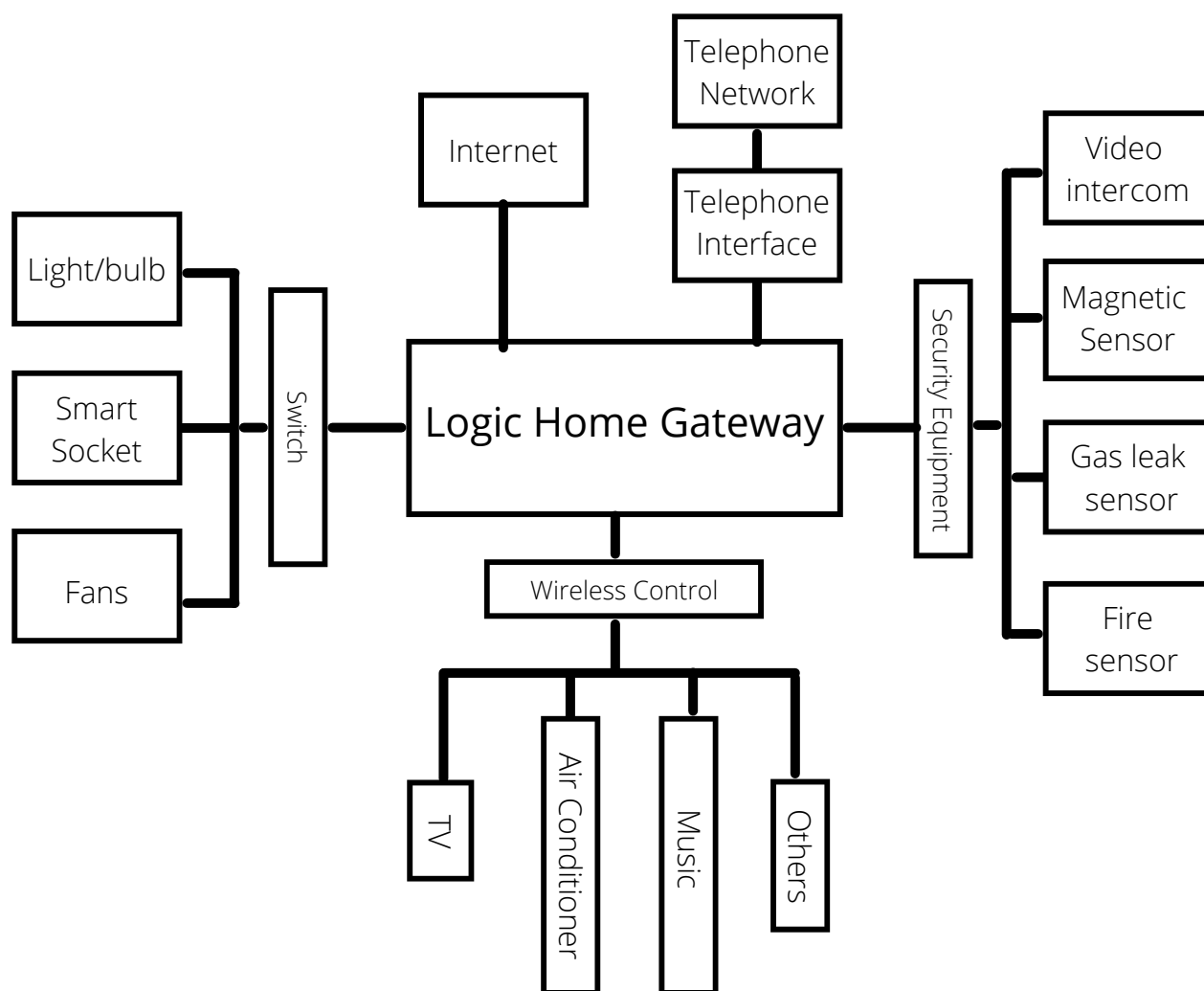
Our system has the Amazon cloud front. It is a content delivery network (CDN) service built for high performance, security, and developer convenience.

Why Amazon cloud front?

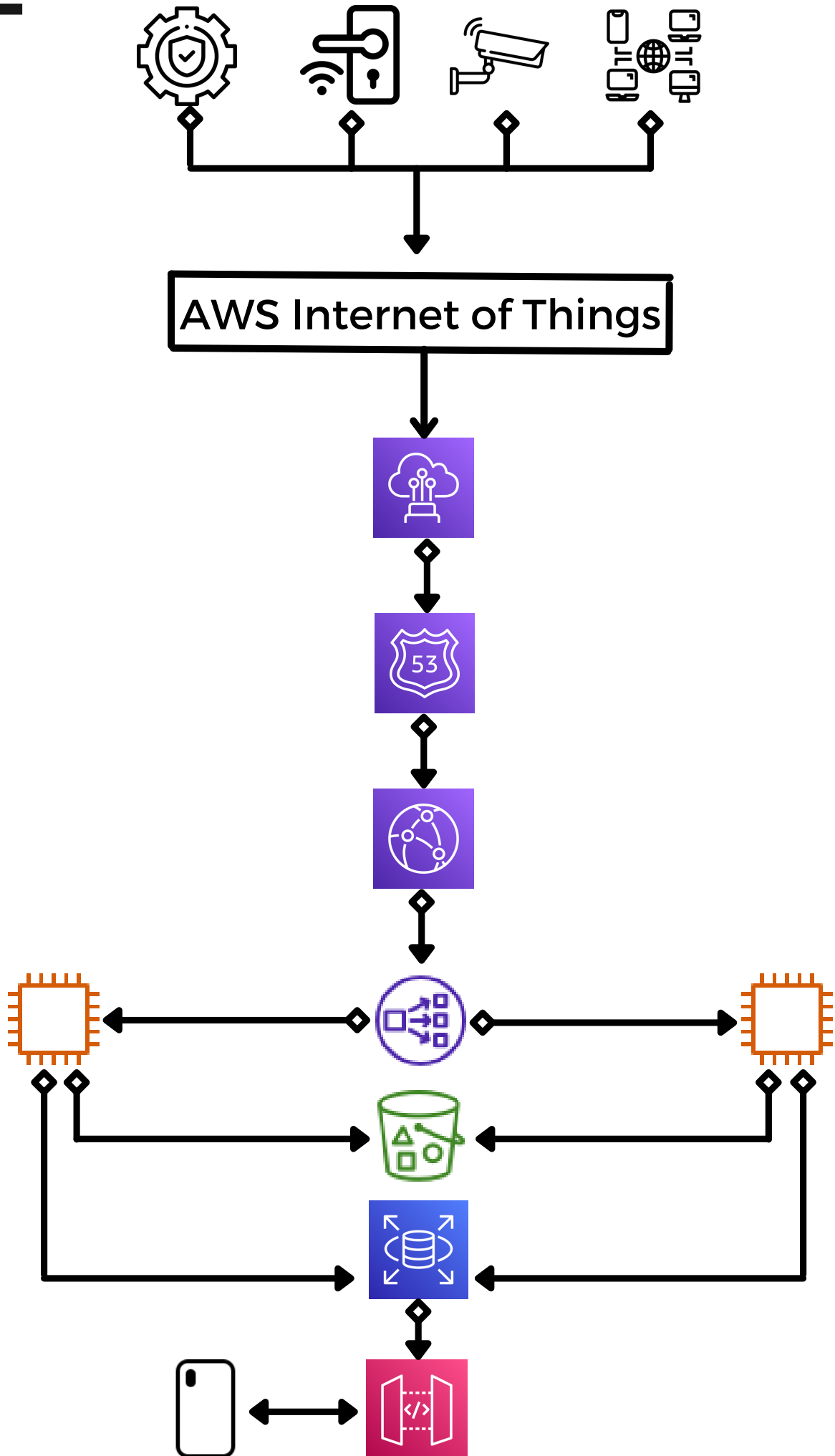
- Delivers fast, secure websites
- Backs up and restores critical data
- Archives data at the lowest cost
- Runs cloud-native applications

- Amazon CloudFront then sends the data to the Amazon Elastic Load balancer. Elastic Load Balancing (ELB) automatically distributes incoming application traffic across multiple targets and virtual appliances in one or more Availability Zones (AZs).
- Our architecture uses Amazon EC2 instances. An EC2 instance is a virtual server in Amazon's Elastic Compute Cloud (EC2) for running applications on the Amazon Web Services (AWS) infrastructure. AWS is a comprehensive, evolving cloud computing platform; EC2 is a service that allows business subscribers to run application programs in the computing environment.
- For keeping all the data manageable and keeping all the events noted, our system has included Amazon Relational Database Service.
- Lastly, the Amazon API gateway maintains two-way communication and controls the fully managed service that makes it easy for a system to create, publish, maintain, monitor, and secure APIs at any scale.

Logic home Security Design



Logic Home AWS Architecture



AWS IoT

- **AWS IoT Core** - AWS IoT Core services connect IoT devices to AWS IoT services and other AWS services. AWS IoT Core includes the device gateway and the message broker, which connect and process messages between your IoT devices and the cloud.
- **AWS IoT Device Management** - AWS IoT Device Management makes it easy to securely register, organize, monitor, and remotely manage IoT devices at scale. You can also organize your devices, monitor and troubleshoot device functionality, query the state of any IoT device in your fleet, and send firmware updates over the air (OTA)—all through a fully managed web application.
- **AWS IoT Device Defender** - AWS IoT Device Defender is a fully managed service that helps you secure your fleet of IoT devices. It continuously audits your IoT configurations to make sure that they aren't deviating from security best practices.
- **AWS IoT Analytics** - AWS IoT Analytics is a fully-managed service that makes it easy to run and operationalize sophisticated analytics on massive volumes of IoT data without having to worry about the cost and complexity typically required to build an IoT analytics platform.
- **AWS IoT Events** - AWS IoT Events is a fully managed service that makes it easy to detect and respond to events from IoT sensors and applications.
 1. Easily ingest operations data.
 2. Trigger a range of actions.
 3. Easily build rules.

Why use AWS IoT for Home Security & monitoring?

- **Broad & Deep**

Access the broadest and deepest IoT functionality, spanning the edge to the cloud, for virtually any use case and across a wide range of connected devices.

- **Superior AI integration**

Bring artificial intelligence and IoT together and utilize machine learning to build, train, and optimize models in the cloud, then deploy them to devices so you can take actions as events unfold.

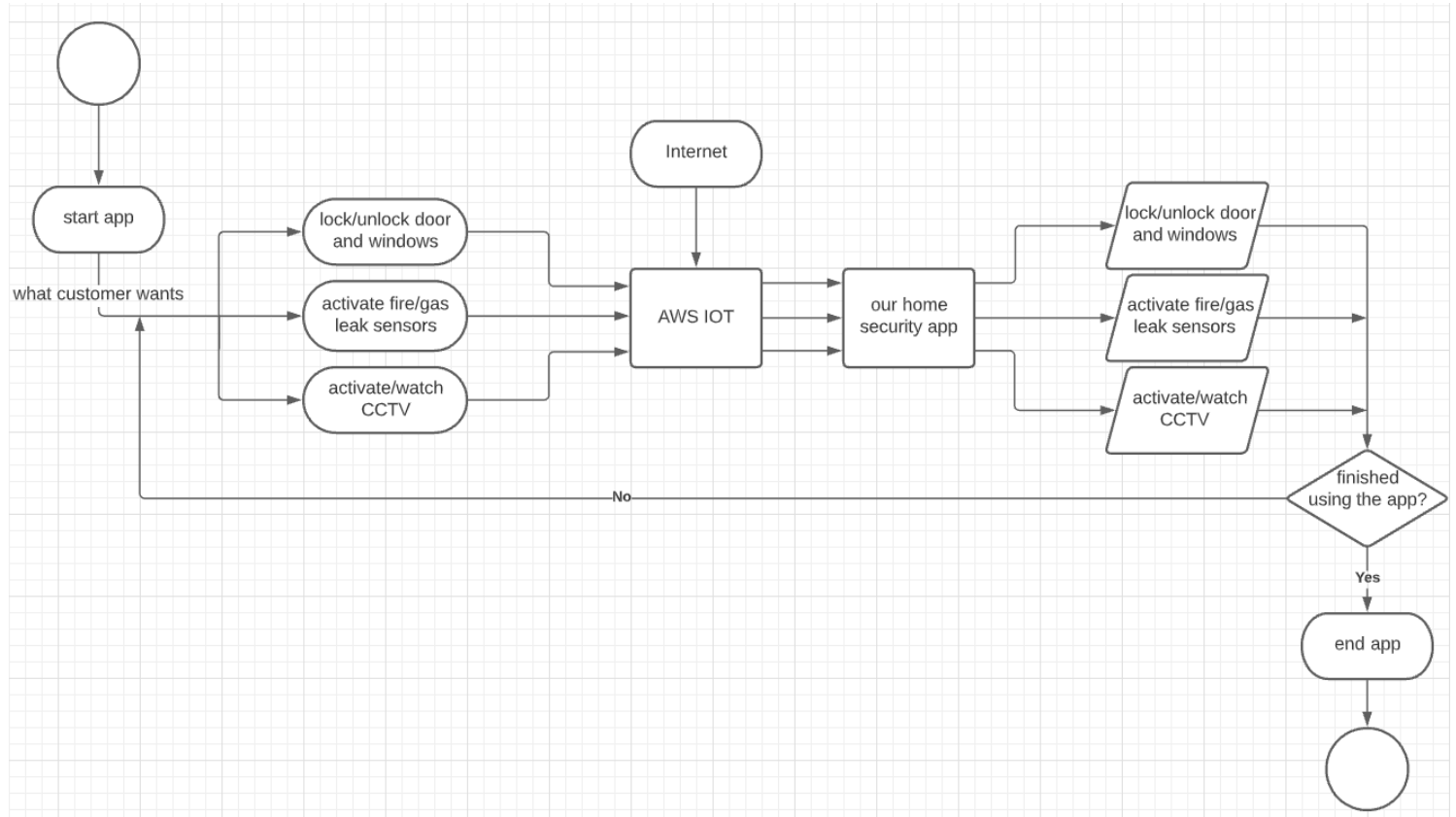
- **Multi-layered security**

Protect your devices, device data, and people with preventative security mechanisms, continuous monitoring, alerts, and remote mitigation actions.

- **Proven experience at scale**

Easily scale to support up to tens of millions of devices and billions of messages—all with a scalable, secure, and proven cloud infrastructure.

Business Process diagram



This is the business process flowchart for our app. It makes it easier to understand our app by describing for customers and you how our app works. We just included Three examples of what our app can do.

- **Limitations:**

Our application has some limitations because it requires internet with high speed and electricity in all of its processes and it could be hacked if we didn't put a high-security algorithm to prevent that. The whole system will cost so much because you should buy the system and specific parts for the system like smart doors and windows. Life will be safer for all those who have our system. Our system will require maintenance as time passes

Contribution

Potential client scenario :

By now We have introduced ourselves to Home security. But what it's the actual purpose and why should you buy it even though we have analog locks in our home.

We are living in a modern world now but if we still use analog technology it will only hold us back.

The modern home security system's main propaganda is Home protection and family safety are the primary purposes of a home security system.

Now it comes down to why should you use it?

- Benefits of a home security system.

Protection:

First and foremost, a home security system aims to protect your property and those inside it from burglary, home intrusion, fire, and other environmental disasters such as burst pipes. Professional monitoring services do this whether you're aware of the problem or not, and they can also help in a medical emergency.

Deterrent to Burglars - Obvious signs of an alarm system, such as stickers, yard signs, outdoor cameras for video surveillance, have been proven to deter a burglar.

Peace of Mind - With home security installed, you can achieve some peace of mind knowing that your home is protected whether you're away or sleeping with modern wireless security systems connected to the internet, you can also check in on your system anywhere in the world.

Convenience and Energy-saving - Modern home security systems feature home automation capabilities that offer convenience and energy savings, which helps to justify the extra cost of the security system. Internet-connected lights and thermostats paired with a security system can adjust themselves to save energy when the system is armed, while the smart door locks connected garage door openers give you a secure way to let friends and family into your home.

Now the question arrives there are many home security systems in the market why should you use our home security system?

- We use AWS Cloud Computing technology.

AWS provides a highly reliable, scalable, low-cost infrastructure platform in the cloud

How does AWS work?

- Instead of buying and owning and maintaining physical data centers or servers you can access technology services such as computing power, storage, and databases on a needed basis from a cloud provider.

What is exactly cloud computing and what's its benefit?

- In the simplest terms, cloud computing means storing and accessing data and programs over the internet instead of your computer hard drive.

How it's beneficial?

- As we all know that Cloud computing is a trending technology. Almost every company switched their services on the cloud to rise the company's growth.

Here, we are going to discuss some important advantages of Cloud Computing-

- Back-up and restore data -

Once the data is stored in the cloud, it is easier to get back up and restore that data using the cloud.

- Improved collaboration -

Cloud applications improve collaboration by allowing groups of people to quickly and easily share information in the cloud via shared storage.

- Excellent accessibility -

Cloud allows us to quickly and easily access store information anywhere, anytime in the whole world, using an internet connection. An internet cloud infrastructure increases organization productivity and efficiency by ensuring that our data is always accessible.

- Low maintenance cost -

Cloud computing reduces both hardware and software maintenance costs for organizations.

- I Services in the pay-per-use model -

Cloud computing offers Application Programming Interfaces (APIs) to the users for access services on the cloud and pays the charges as per the usage of service.

- Unlimited storage capacity -

Cloud offers us a huge amount of storage capacity for storing our important data such as documents, images, audio, video, etc. in one place.

- Data security -

Data security is one of the biggest advantages of cloud computing. Cloud offers many advanced features related to security and ensures that data is securely stored and handled.

- Mobility -

Cloud computing allows us to easily access all cloud data via mobile.

How AWS is special?

- In 2006, Amazon web services(AWS) started to offer IT services to the market in the form of web services, which is now known as cloud computing.
- AWS enables you to select the operating system, programming language, web application platform, database, and other services you need. With AWS you receive A virtual environment that lets you load the software and services your application requires.
- AWS servers are fast and reliable and it's stable it's doesn't drop the connection
- More convenient to use.
- AWS is now being used in almost 190 countries.

With AWS technology and our futuristic infrastructure, our home security system is the best in the market and our system is less costly more efficient.

Conclusion

- **Achievement:**

In conclusion, our application by using Amazon Web Services intends to secure houses and make a safe environment for families and kids. It has a lot of benefits like protection, an alarm system, and energy-saving. You can watch your house by the cameras attached to every corner. We use AWS because AWS provides a highly reliable, scalable, low-cost infrastructure platform in the cloud. We also used the cloud computing technique because of its mobility, low maintenance cost, data security, and unlimited storage capacity.

- **Future plan:**

With the developed technology we are focusing on bringing the technology to all platforms. Our goal is to make our daily life more secure and easy. With the help of AWS and its cloud infrastructure its not soo far when we will be developing more reliable smart home security design.

- **WHAT HAVE YOU LEARNED AND YOUR MOTIVATION TO COMPLETE THIS PROJECT?**

- THIS PROJECT TAUGHT US ABOUT CLOUD COMPUTING, BUSINESS MODEL, INFRASTRUCTURE, AWS TECHNOLOGY, MICROSOFT BI. ALL OF THESE THINGS ARE NEW TO US, ALTHOUGH I HAD A BASIC IDEA OF WHAT IT IS! BUT THIS PROJECT HAS TO ENRICHED OUR KNOWLEDGE BASE LET US INTO A NEW WORLD OF KNOWLEDGE

IT HAS PIQUED MY CURIOSITY THAT'S MY MAIN MOTIVATION TO COMPLETE THE PROJECT

- **WHAT ISSUES AND SOLUTIONS ARE IMPLEMENTED TO MAKE THE PROJECT A SUCCESS?**

- FIRST OF IN PROJECT 2 PART 1 WE INTRODUCED A NEW HOME SECURITY SYSTEM, AND MENTIONED THE PROBLEMS OF USING AN ANALOG SECURITY SYSTEM THEN WE PROPOSE A NEW AND IMPROVED AWS CLOUD TECHNOLOGY SYSTEM AND SHOWED THE IMPLEMENTATION OF AWS IN THIS PROJECT.

- **WHAT IS YOUR DIRECTION AFTER COMPLETING THE PROJECT?**

- AFTER COMPLETING THE PROJECT WE KIND OF HAVE CURIOSITY ABOUT CLOUD COMPUTING NOT SURE I'LL GO DOWN THAT PATH

- **WHAT IS THE IMPROVEMENT NECESSARY FOR YOU TO IMPROVE YOUR POTENTIAL IN THE INDUSTRY?**

- WE THINK WE NEED TO STUDY MORE ABOUT CLOUD TECHNOLOGY AND VIRTUAL CLOUD SPACE AND DATA CENTER, THESE ARE THE THINGS I'M LACKING KNOWLEDGE IN SO THAT'S WHAT I NEED TO IMPROVE

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