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Application of IOT in Library

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A B S T R A C T

Libraries are changing – that's a truth. Today's libraries see more like community centers and places full action, advancement and innovation. The reason for this alters is straightforward. Libraries have had to adjust in arrange to preserve a pertinent nearness in our society and adopt lots technological innovation. One of the foremost later changes in innovation is the move from the 'Internet of Communication' to the 'Internet of Things' or IoT. This exciting and developing innovation makes it conceivable to put through ordinary objects that are not themselves computers, by inserting sensors in them. In this chapter briefly talked about distinctive angles of IoT in library.

Keywords: IoT, Library, IoT application for libraries

1. Introduction

One of the foremost dynamic and exciting developments in data and technology is that the arrival of information superhighway of Things (IoT). though networking technologies became more and more present over the past twenty years, till recently they have mostly been restricted to connecting ancient end-user devices, like mainframes, desktop and portable computer computers, and, additional recently, good phones and tablets.

Recent years have witnessed the attachment of a so much broader vary of devices to the network. These have enclosed vehicles, ménage appliances, medical devices, electrical meters and controls, street lights, traffic controls, sensible TVs and digital assistants like Amazon Alexa and Google Home. Trade analysts estimate that there are a unit presently over eight billion such devices connected to the network and project that this variety can expand to quite 25 billion by 2020. The increasing preparation of these devices has enabled new use cases for network technologies. Some consultants project that the IoT might generate the utmost quantity as US$13 trillion in revenue by 2025. (YOO)

2. Objective of the Study

1. To know the basic concept about IoT and its architecture
2. Advantages and disadvantages of IoT system
3. Different application of IoT in Library

3. Literature Review

The Internet of Things, or IoT, has caused associate explosion among the quantity of everyday devices that square measure ready to collect and transmit information. Librarians acknowledge the leveling act needed to implement IoT technologies in accordance with core principles of post. Wherever IoT will improve access to materials or services, or offer learning opportunities, while not compromising patron privacy, libraries square measure change of integrity hands with their communities and diving in. Librarians are also leading the manner on educating patrons concerning what IoT entails—its inner workings, uses, limits, and implications for our communities and society. (Blog: Amereican Library asoociation, 2017).IoT through the mobile apps will

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allow its users to not only have the virtual tour of the library on their mobile devices, but also keep and track the provision of the book on the respective shelves or check the opposite resource availability despite the placement wherever they're (Bansal, 2018). D.H. Hill Library at North Carolina State University has embraced IoT for library operations and as a teaching tool. IoT devices monitor furniture movement, count visitors, provide keycard access, and control digital signage. Integrated into its other services, including technology lending, the Libraries' Internet of Things program encourages hands-on exploration of embedded technologies, connecting students with relatively low-cost materials to develop practical applications that solve real-word problems. Librarians facilitate learning and students can test and refine their prototypes, learn from others, and showcase their work (Libraries and the IoT Tools, Publications & Resources, American Library Association, 2017)

4. Methodology & Limitation of the Study

Internet of Things (IoT) is bearing new ways to the field of Library & Information Science. This study is done by collecting and collating information from websites, Blogs and some renowned journals. This study is based on the information available on internet no physical observing not done for this study. Therefore, in this study all comprehensive information pertaining to IoT is not provided.

5. What is IoT?

The Internet of Things (IoT) refers to a system of interrelated, internet-connected objects that are able to collect and transfer data over a wireless network without human intervention. IoT devices may be accustomed monitor and control the mechanical, electrical and electronic systems employed in various forms of buildings (e.g., public and personal, industrial, institutions, or residential) in home automation and building automation systems. Simply put, the net of Things could be a network of physical devices that are embedded with software, sensors, and network connectivity to gather and exchange data. IoT makes everyday objects 'smart' by enabling them to transmit data and automate tasks, without requiring any manual intervention.
An IoT device may be something as simple as a health tracking wearable, or as complex as a wise city with sensors across all its regions. One among the foremost prominent samples of IoT is maybe the "Smart Home". It allows you to manage everything in your home - from your thermostat to your lighting to even the surround sound. Essentially, any object which will be connected to the net and controlled that way may be a candidate for an IoT device (Ugrankar, 2019).

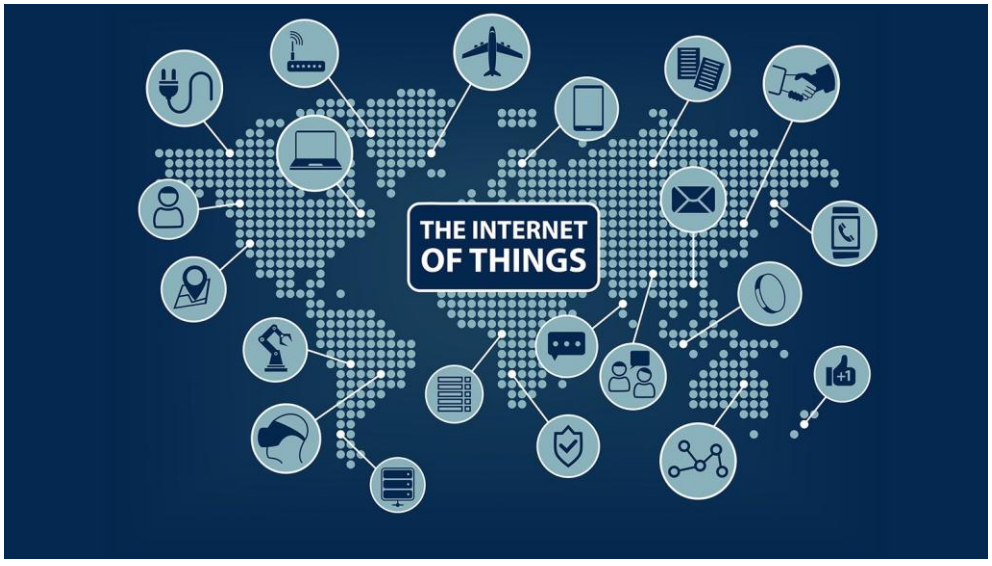

Fig-1,Source:https://www.freecodecamp.org/news/introduction-to-iot-internet-of-things/

6. Architecture of Internet of Things (IoT)

Internet of Things (IoT) technology incorporates a big variety of applications and use of internet of Things is growing thus quicker. Relying upon completely different application areas of net of Things, it works consequently as per it's been designed/developed. however it's not a regular outlined design of operating that is strictly followed universally. The design of IoT depends upon its practicality and implementation in numerous sectors. Still, there's a basic method flow supported that IoT is constructed.

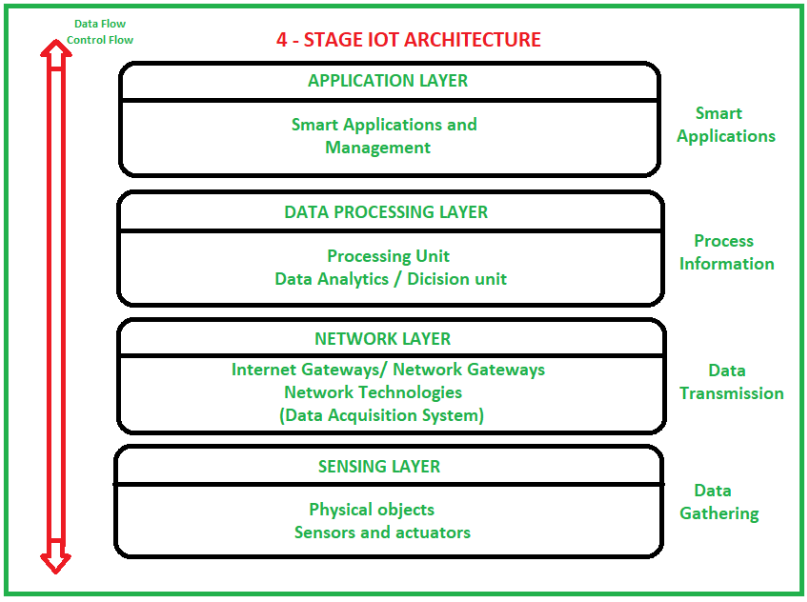

Fig-2. Source: https://www.geeksforgeeks.org/architecture-of-internet-of-things-iot/

These area units explained as following below.

Sensing Layer –

Sensors, actuators, devices are present during this Sensing layer. These Sensors or Actuators accepts data(physical/environmental parameters), processes knowledge and emits information over network.

Network Layer –

Internet/Network gateways, knowledge Acquisition System (DAS) are present during this layer. DAS performs knowledge aggregation and conversion perform (Collecting knowledge and aggregating knowledge then changing analog knowledge of sensors to digital information etc). Advanced entrances that in the main unveil connection between device networks and web conjointly performs several basic gateway functionalities like malware protection, and filtering conjointly sometimes deciding supported inputted knowledge and knowledge management services, etc.

Data processing Layer –

This is process unit of IoT scheme. Here knowledge is analyzed and pre-processed before causing it to knowledge center from wherever knowledge is accessed by software package applications usually termed as business applications wherever knowledge is monitored and managed and any actions also are ready. thus here Edge IT or edge analytics comes into image.

Application Layer –

This is last layer of four stages of IoT design. Knowledge centers or cloud is management stage of knowledge of information. Wherever data is managed and is employed by end-user applications like agriculture, health care, aerospace, farming, defense, etc.

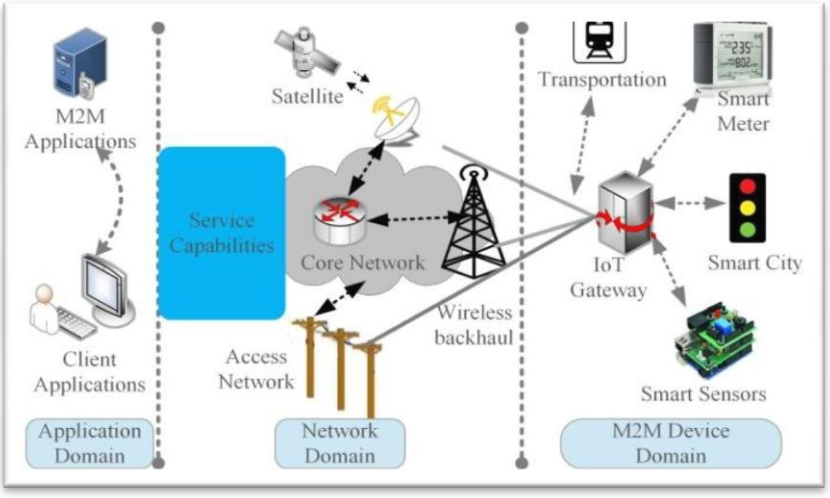

Fig-3 source: https://www.google.com

7. Advantage of IoT

Internet of things facilitates the many blessings in daily life within the sector. a number of its edges square measure given below:

1. Economical resource utilization: If we all know the practicality and also the approach that however every device work we have a tendency to positively increase the economical resource utilization also as monitor natural resources.
2. Minimize human effort: because the devices of IoT act and communicate with one another and do heap of task for U.S.A., then they minimize the human effort.
3. Save time: because it reduces the human effort then it positively saves out time. Time is that the primary issue which may save through IoT platform.
4. Enhance knowledge Collection
5. Improve security: currently, if we've a system that everyone these items square measure interconnected then we are able to build the system safer and economical.
6. Value reduction
7. Business opportunities
8. Client expertise
9. Quality and lightsomeness

8. Libraries and also the IoT

The Internet of Things, or IoT, has caused associate explosion among the quantity of everyday devices that are ready to collect and transmit information. Librarians acknowledge the equalization act needed to implement IoT technologies in accordance with core principles of situation. Wherever IoT will improve access to materials or services, or offer learning opportunities, while not compromising patron privacy, libraries are change of integrity hands with their communities and diving in. Librarians are leading the method on educating patrons concerning what IoT entails—its inner workings, uses, limits, and implications for our communities and society.

One of the advantages of IoT technologies is that they allow for remote watching, information transmission and management. For many folks, this conjures pictures of "nanny cams" or refrigerators that trigger associate alarm once the milk is low; however the opportunities for library applications are large, from chase area usage and program group action to watching humidness levels for special collections. And IoT offers libraries even quite these basic watching functions.

As a partner among the city's method finding Program, Hillsboro library in American state has introduced the Book-O-Mat, a self-service booth settled in Hillsboro's central plaza and well-found new and in style books and flicks. Settled in associate extremely high traffic space, the Book-o-Mat is monitored from the foremost libraries some miles away to trace usage, alert the library once restocking is needed, and establish in style alternatives for au courant assortment development.

D.H. Hill Library at North geographical area State University has embraced IoT for library operations and as a teaching tool. IoT devices monitor article of furniture movement, count guests, offer identity card access, and management digital aggregation. Integrated into its alternative services, together with technology loaning, the Libraries' net of Things program encourages active exploration of embedded technologies, connecting students with comparatively inexpensive materials to develop sensible applications that solve real-word issues. Librarians facilitate learning and students will check and refine their prototypes, learn from others, and showcase their work. (Libraries and conjointly the IoT Tools, Publications & Resources, American Library Association, 2017)

9. Potential areas of IoT implementation for libraries

As library may be a complex organization which has embedded constituents linked together and an oversized no. of interactions happen be it with man to man or man to machine, machine to man, and with IoT object with object interaction contains a great possibility. Libraries can have some futuristic applications. These applications are probable, but with supporting technologies related to IoT these can to place in action. a number of the potential applications for libraries are

Inventory Control: aside from books, journals, magazines, various other library sources like microfiche, video, audio, etc., can even be controlled by applying sensors on them. With IoT, the movements of every item will be tracked. Though RFID already serves little bit of the identical purpose for books, but with IoT since internet is involved, so it provides all the important time data on mobile of the librarian/manager and hence better internal control is feasible and ultimately the library personnel require doing less work for stock verification (Bansal, Arora, & Suri, 2018).

Improved access to collections and resources – IoT could make it possible to put in RFID on all library shelves so patrons could quickly find where a book is found. Patrons could then be directed right to its location employing a special app.

QR codes and RFID tags: Then after all, there are the books themselves. it might be fairly straightforward to show a printed book into a connected object, by instrumenting it with an RFID tag. The tag could wirelessly communicate select information, like whether the book is accessible or tested, as an example. Meanwhile, anyone stuck for a replacement book recommendation could scan the QR code of a favourite novel, to work out suggestions of other titles they could enjoy, supported the book they need scanned (Clark, 2017).

Collection management– Library material is controlled by applying sensors on them. By connecting the sensor to the net, the movements of every item

may be tracked. this will provide real time data, thereby providing better internal control also as help patrons easily find the item they're trying to find. this might be done employing a special app on their smart phones.

Protecting rare collections: Larger or more specialist libraries could use the IoT to assist protect their rare collections by monitoring and controlling the conditions during which they're stored. Humidity, temperature and lightweight sensors could measure the conditions in rare books rooms in real time, remotely adjusting them consistent with preset limits to preserve the dear artefacts within (Clark, 2017).

Recommendation & Notification service: Smart phones might be detected within the library, via Wi-Fi or Bluetooth, and send targeted communications to patrons. for example, IoT imbedded in patron identity card will trigger a notification to readers who owe a fine to the library once they enter the building. This notification with a link directs patrons to the payment page. Iot could even be accustomed send a notification a couple of new fiction book within the library while the patron is searching for books within the fiction aisle.

Mobile Technology and placement based services – track IoT devices to see traffic patterns of patrons to enhance space design or to higher pinpoint popular library areas. Patrons could connect their phones to sensors and receive notifications to locate items from their favourites list. This data could help in optimizing staff; understand genre patterns and spot opportunities.

Mobile Reference Since IoT allows each and each activity of the library to be connected to the web. So, with just one app on mobile, one can refer the library without even physically being present there (Bansal, Arora, & Suri, 2018).

Tracking movement of Resources and Inventory with IoT, users may be categorized supported the standards for accessing library resources. As some libraries offer different accessing rights to faculties, students, staff, regular and non-regular students, etc. Suppose just in case a book/magazine is wrongly issued to a non-authorised user. With IoT, the tracking is feasible on mobile of the librarian that where the library resource is physically present (inside or outside) the library. over and over the library items are sent outside the library for repair, etc. With IoT, it's possible to trace the situation of the inventory outside the library (Bansal, Arora, & Suri, 2018)

Virtual Library and Book Tracking IoT through the mobile apps will allow its users to not only have the virtual tour of the library on their mobile devices, but also keep and track the provision of the book on the respective shelves or check the opposite resource availability despite the placement wherever they're (Bansal, Arora, & Suri, 2018).

Safety – By installing internet-connected fire sensors, disastrous fires is forbidden more swiftly dealt and safely from outside the library.

Fire Detection and Prevention Suppose there's fire within the library and there's nobody to note it. The fireplace detection devices may alarm and sensors within the library with the associated networks will automatically send the message to the fireplace Department. And not only this but the concerned person of the library (say Fire Officer) who may be available anywhere and is chargeable for taking action also can receive a message. this fashion IoT will help in taking action automatically at early stage and stop further damages (Bansal, Arora, & Suri, 2018).

Theft Management With tags on each item of the library inventory (scanners, printers, hard disk, CDs, etc.), a form of tracking is made all-time. to forestall theft the library gate will be enabled with high-end sensors and transponders, which except for signalling the authorities on their mobiles or by loud alarm, can even block the theft with taking the automated prompt action like shutting the door, etc. Another application is that it lets the library staff remotely sees camera views of their homes, send a warning when something isn't right and that they can approach the emergency service people to require action (Bansal, Arora, & Suri, 2018).

Cost Savings & Appliances Monitoring – by using smart lighting that's controlled by the net to sense when to possess lights on or off or by implementing a wise energy system where energy consumption are often controlled in line with need.

Drones – right away being tested by Amazon, there are implications here for libraries still. it'd become very easy to urge materials to homebound patrons or people living in remote service areas.

Automatically Survey Patrons – IoT sensors can know when patrons are leaving the library and automatically send a survey to the patron. Data may be collected to work out if the patron was satisfied with their experience.

Direct patrons to special displays, programs and events – Most libraries, except storing books, organize events, like storytelling, book discussion etc, and academic programs for kids, teens and adults. With beacons deployed within the library, information about these events and special displays is simply taps away (Lapointe, 2019).

Information literacy Information literacy or orientation is obtainable to new patrons to teach them a few library, its resources and services. IoT may help libraries in providing self guided virtual tour of the library. Libraries having setup beacons like wireless devices at various sections of the library, when users visit the actual section, their movable will play a video or audio explaining more that section and the way one can get maximum benefit out of it. it's going to even able to provide enriched experience of special collections like manuscripts by providing digital format of it on their mobile phones as physical access to such resources is restricted (Potter, 2014).

Assistive Technology Today smart phone are providing the features like text to speech, touch navigation, hands free operations, especially for the person with disabilities. IoT adopts this feature of the mobile phones and provides services to such library users. With IoT such persons can request the specified resource (say book, which can have tag) with speech and once they need the resource physically, they will find directions to it book within the library by spoken language within the mobile (Bansal, Arora, & Suri, 2018).

Community activities supported your interests: Beacon technology could offer library visitors other benefits, too. like making them alert to activities, workshops, classes or offers supported their interests; Not only does this highlight the extensive range of services on offer, but it could help newcomers to the community reach bent on others who share the identical interests. The iBeacon app, as an example, sends location-triggered information to visitors about library offers and events. So someone browsing the horror section might receive an alert a few Halloween-themed book reading within the library the subsequent weekend. Someone spending plenty of your time within the cooking section might receive an alert about an upcoming cookery demonstration (Clark, 2017).

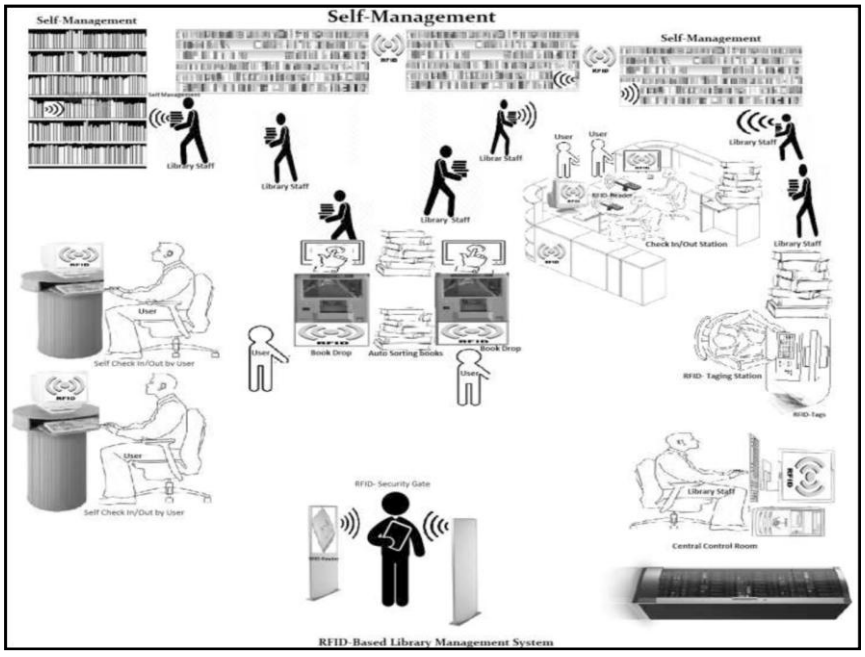

Figure:4 Source: google.com

10. Disadvantages of IoT

As the internet of things facilitates a group of advantages, it conjointly creates a big set of challenges. a number of the IoT challenges square measure given below:

Security: because the IoT systems square measure interconnected and communicate over networks. The system offers very little management despite any security measures and it are often lead the varied varieties of network attacks.

Privacy: Even while not the active participation on the user, the IoT system provides substantial personal knowledge in most detail.

Complexity: The coming up with, developing, and maintaining and sanctionative the massive technology to IoT system is sort of difficult.

11. Conclusion

Advanced technology solutions utilizing IoT tech will facilitate corporations attain and maintain a competitive advantage in their business. Through investing the tools obtainable, you'll be able to increase workers productivity and reduce costs—your business can relish higher in operation capability and deliver a superior client expertise. The library professionals are always at the forefront in adopting the new technologies. They're very smart and active in implementing and getting benefits of the technology for his or her work. Some such technologies are: library automation software, library management tools, digitization technology, tools for search and access, preservation tools, internet, social media, mobile applications, sms, e-mails, etc. The Library professionals don't leave any stone unturned to use the technology and serve their patrons. Now the IoT has emerged and definitely there are applications of it for the libraries some probable are mentioned during this article. IoT will help the libraries and their users in a very big way. While there are certain issues which require to be addressed but surely with time because the technology has emerged, the solutions also will set out. Library professionals need to think sooner than time which they definitely are. (Bansal, Arora, & Suri, 2018).

REFERENCES

(n.d.). Retrieved from https://www.freecodecamp.org/news/introduction-to-iot-internet-of-things/

(n.d.). Retrieved from https://www.geeksforgeeks.org/architecture-of-internet-of-things-iot/

(n.d.). Retrieved from https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.semanticscholar.org%2Fpaper%2FRadio-frequency-identification-(RFID)-

technology-in-Sunil-Ojha%2F5adfc352c1709cb639930b7cb8fcdb04b28e791f%2Ffigure%2F1&psig=AOvVaw2Hi8RA0nm-8dI9i8AqtxNh&ust=16143200341440

Architecture of Internet of Things - WeIndians.in. (n.d.). Retrieved February 2021, from weindians.in: https://weindians.in/architecture-of-internet-of-things/

Architecture of Internet of Things (IoT) - GeeksforGeeks. (n.d.). Retrieved February 2021, from www.geeksforgeeks.org: https://www.geeksforgeeks.org/architecture-of-internet-of-things-iot/

Architecture of Internet of Things (IoT) - GeeksforGeeks. (n.d.). Retrieved February 2021, from m.lytianjiaji.com: https://m.lytianjiaji.com/architecture-of-internet-of-things-iot/amp/?ref=rp

Bansal, A. A. (2018, December). Internet of Things: Beginning of New Era for Libraries. Library Philosophy and Practice (e-journal) .

Blog: 5 Benefits of the Internet of Things for SMBs. (2021, February 11). Retrieved February 25, 2021, from www.impactmybiz.com: https://www.impactmybiz.com/blog/blog-5-benefits-of-the-internet-of-things-for-smbs/

Blog: Amereican Library asoociation. (2017). Retrieved February 20, 2021, from www.ala.org: http://www.ala.org/tools/librariestransform/future/blog/fri-05122017-0844

Blog: Architecture of Internet of Things (IoT). (2020, June 25). Retrieved 24 fEBRUARY, 2021, from www.geeksforgeeks.org: https://www.geeksforgeeks.org/architecture-of-internet-of-things-iot/

Blog: IoT Advantage and Disadvantage - Javatpoint. (n.d.). Retrieved from www.javatpoint.com: https://www.javatpoint.com/iot-advantage-and-disadvantage

Blog: The Emerging Internet of Things | Internet of things - IoT. (n.d.). Retrieved February 19, 2021, from iot.50cnnet.com: http://iot.50cnnet.com/the-emerging-internet-of-things

Blog: What is IoT and Why is it Important? 9 IoT Statistics to Watch ... (n.d.). Retrieved February 17, 2021, from www.built.io: https://www.built.io/blog/what-is-iot-and-why-is-it-important-9-iot-statistics-to-watch-out-for

I.o.T Technologies in Libraries | Princh Library Blog. (n.d.). Retrieved from princh.com: https://princh.com/iot-technologies-in-libraries/

INTERNET OF THINGS | ALA Libraries Transform. (n.d.). Retrieved from www.ilovelibraries.org: http://www.ilovelibraries.org/librariestransform/internet-of-things

Internet of Things: Beginning of New Era for Libraries. (n.d.). Retrieved February 2021, from digitalcommons.unl.edu: https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=5449

Libraries and the IoT Tools, Publications & Resources, American Library Association. (2017, May 12). Retrieved February 22, 2021, from American Library Association: http://www.ala.org/tools/librariestransform/future/blog/fri-05122017-0844

What is IoT? Defining the Internet of Things (IoT) | Aeris. (2021). Retrieved February 25, 2021, from www.aeris.com: https://www.aeris.com/in/what-is-iot/