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CLOUD SERVICES AND PLATFORMS RESEARCH FOR INTERNET OF THINGS APPLICATIONS DEPLOYMENT

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Background. Various cloud services and platforms are available to deploy and host IoT applications. Such services and platforms differ in capabilities, cost, complexity and other factors. What cloud services or platforms to select from for an IoT solution is an actual and challenging question. The paper expands in detail on cloud services and platforms research for IoT applications deployment and hosting, and offers a way to find an answer to selecting appropriate cloud services or platforms.

Objective. The paper aims to provide an overview of cloud services and platforms for IoT applications deployment and hosting, and propose a method for selecting suitable cloud services or platforms for IoT applications deployment and hosting.

Methods. We use theoretical research in the cloud services and platforms area of expertise for building IoT solutions, employing mathematical modelling and decision theory proposed in the functional form with weight coefficients, to select the best option from pre-selected cloud services and platforms based on IoT solution requirements and constraints.

Results. The paper thoroughly explores IoT technology evolution, IoT product lifecycle, IoT solution architecture, and cloud service types for IoT solutions hosting. Research delves into public cloud service providers with detailed elaboration on the AWS public cloud services, and reviews platform service providers for implementing IoT solutions. Then, the work breaks down two practical implementation cases of IoT solutions using the Blynk platform and custom hosting services. Furthermore, the study articulates recommendations for developing sustainable IoT solutions and provides examples of selecting an IoT cloud service or platform for three IoT applications across various business domains. As a result, the work proposes a utility-based scoring function for selecting cloud or platform services for deploying and hosting an IoT solution.

Conclusions. There's no one-size-fits-all IoT cloud or platform. The choice depends on IoT solution specifics, requirements and constraints. A utility-based scoring function is proposed to guide cloud provider or platform selection.

Keywords*: IoT; cloud service; platform; utility score function.*

Introduction

Internet of Things (IoT) is a term that refers to physical devices connected to the network or Internet, collecting and/or exchanging data [1-2].

Problem statement. Various cloud services and platforms are available to host IoT applications. Such services differ in capabilities, cost, complexity and other factors. What cloud services or platforms to select from for an IoT solution is the question nowadays. Proper architecture design for IoT solutions, development and hosting, and cost-effective and sustainable operations are also vital.

Task statement. Thus, the task is to research cloud services and platforms and create recommendations for selecting cloud and platform providers for hosting and operating sustainable IoT solutions. As a result, the culmination of this task is proposing the utility-based scoring function for selecting cloud and platform services for IoT solution implementation and hosting.

IoT technology evolution

The IoT technology has evolved over the last sixty years, with the most significant development in the previous 5-10 years because of technological capabilities development for IoT solutions implementation [3-5]. The evolution of IoT technology can be presented in major phases of infocommunication technology developments (Fig.1).

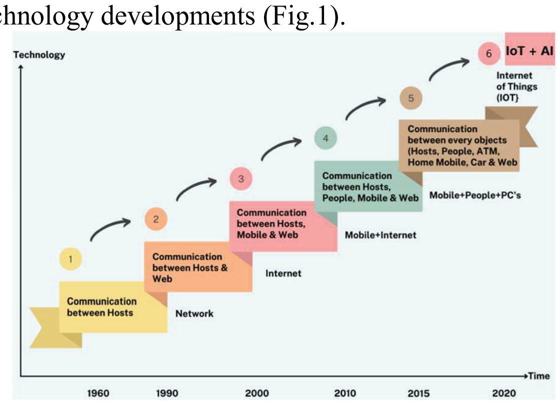

Fig.1. IoT technology evolution and major phases.

IoT domains and business applications. IoT technology has spread in many economic areas. The IoT domains and business applications are shown in Fig.2.

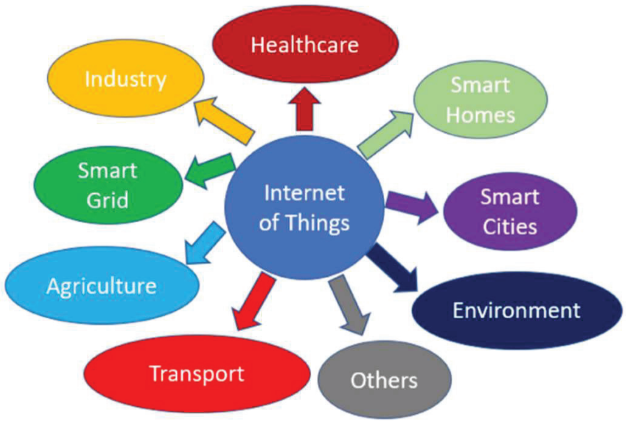

Fig.2. IoT domains and business applications.

IoT solution and product lifecycle

To review deployment and hosting technologies for IoT solutions, it is worth having a baseline understanding of the lifecycle of an IoT solution and the process for building an IoT solution. At the beginning of the IoT solution product lifecycle, there is a design phase, which involves gathering requirements for the IoT solution (Fig.3).

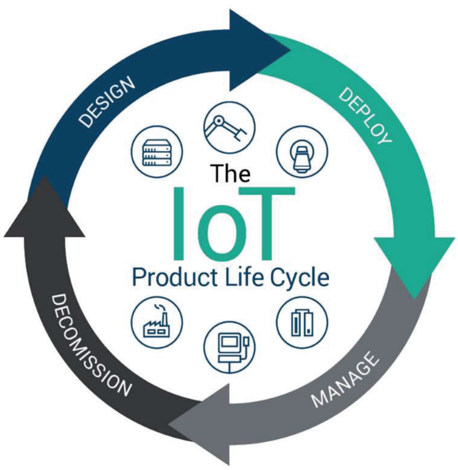

Fig.3. IoT product lifecycle.

As shown in Fig.3, the key phases of the IoT product are as follows: design, deployment, management, and decommission.

IoT solution requirements and constraints. Let's review the definition of requirements and targeted information for collection.

Functional requirements (FRs) – answer the question of what the IoT solution should do, including its features, sensor size, form factor, colour, and software for the end-user functionality.

Non-Functional requirements (NFRs) – answer the question of how an IoT solution should operate, and such requirements are not usually what end users of IoT solutions touch, like performance, security, availability, scalability, usability, and maintainability. Still, users of IoT solutions might face a negative experience of working with the IoT solution when NFRs do not meet designed targets, for example, when the IoT solution is unavailable for the end user because of performance degradation or because of a broken cloud service where the IoT solution is hosted due to a security incident.

Constraints – IoT solution limitations, like budget, technology, time, engineering skills, and hardware. Constraints are strict requirements that usually can't be changed or bypassed when defined.

IoT solution architecture

Essential IoT solution architecture components are shown in Fig.4. Let us describe those layers briefly.

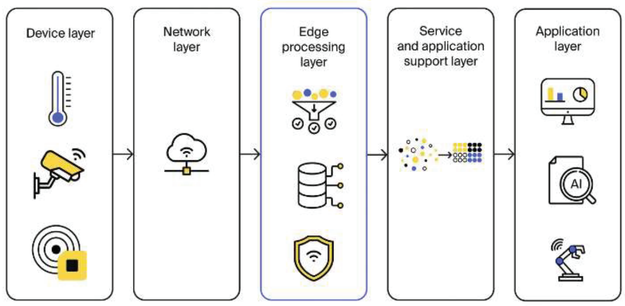

Fig.4. Essential IoT solution architecture components.

The device layer is the IoT solution's endpoint: sensors, a controller for getting a response from the sensor and preparing it for further sending to the network.

The network layer is designed to transfer data from the controller to the network, via wires, wireless or any other acceptable technology and media for effective and timely data transmission.

The edge processing layer is a technical layer designed to store and process data and extract information from the received data.

The service and application layer is designed to present information correctly to the right stakeholders so that decisions can be made based on the response to the received data.

The application layer implements a response to the received information.

This paper focuses on the first three layers (device-network-edge processing), and mainly on the edge processing layer technologies and platforms.

Cloud service types for IoT solutions hosting

Let's focus on reviewing the edge processing layer technologies. *Cloud services* - on-demand computing services (servers, storage, databases, software) delivered over the Internet (public cloud) or locally (on-premises cloud).

The cost versus security and customisation characteristics of different cloud types are shown in Fig.5.

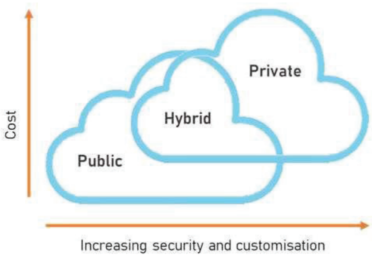

Fig.5. Cloud types.

Advantages and disadvantages of public and private clouds are shown in Fig.6. The hybrid cloud time is a mix of public and private clouds when an organisation needs such architecture due to security requirements or any other objective reason.

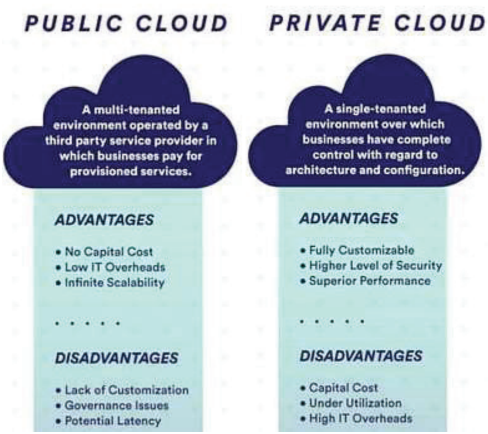

Fig.6. Advantages and disadvantages of public and private clouds.

Public cloud service providers

The biggest *public cloud service providers for implementing IoT solutions* with pros and cons are described briefly in Table 1.

Table 1. Public cloud service providers have pros and cons when hosting IoT solutions.

Provider	Pros	Cons
Amazon Web Services (AWS)	Rich IoT services (IoT Core, Greengrass). Strong analytics/AI integration	Complex for beginners. Higher cost if unoptimised
Microsoft Azure	Strong industrial IoT tools. Enterprise integration	Steep learning curve. Some regional limitations
Google Cloud Platform (GCP)	Great AI/ML and data tools. Competitive pricing	Retired native IoT Core. Smaller IoT ecosystem
IBM Cloud	Industrial and hybrid IoT strength. Watson IoT for insights	Smaller developer community. Expensive for small setups
Oracle Cloud	Asset tracking & industry tools. Built-in analytics	Not modern, not developer-friendly. Limited edge/IoT device tools

As shown in Table 1, many different cloud providers invested billions in cloud services development, and this evolution is continuing with only increasing volume, scope, and service types. With increased variety and scope of services, questions arise: Which cloud should you select? How to use those? What are the best practices for creating an IoT solution? Answers to such questions can be found in the recommendations and frameworks.

The AWS provider creates one such framework named "*AWS IoT Lens: Well-Architected Framework*" [6]. It provides best practices and design principles for building AWS Cloud's reliable, scalable, secure, and efficient IoT workloads. This framework includes the following *pillars*:

1. Operational Excellence - enable continuous improvement in operations and monitoring, automate deployments, monitoring, and device management.

2. Security - enforce strong identity and access management (IAM) for devices and users [7], secure data in transit and at rest; use certificates, encryption, and mutual TLS.

3. *Reliability* - design for device connectivity challenges (intermittent or poor networks); implement retry logic, queueing, and buffering.

4. *Performance* - use event-driven architecture and serverless technologies; process data close to the source with edge computing (e.g., AWS IoT Greengrass); optimise communication protocols (MQTT, HTTP, LoRaWAN).

5. *Cost Optimisation* - leverage pay-as-you-go services, reduce data transfer and storage costs by filtering and aggregating data at the edge, use tiered storage and lifecycle policies.

6. *Sustainability* - reduce energy consumption and increase efficiency across all components of a workload by maximising the benefits from the provisioned resources and minimising the total resources required.

AWS public cloud services

AWS has over 240 fully featured services available overall. At the same time, not all of these are applicable or used for IoT solutions; AWS has more than 200 services that can be used to build IoT solutions. These services, specifically designed for IoT solutions, can be categorised across computing, storage, and networking.

Some of the *AWS services designed for building IoT solutions* are the following:

1. AWS IoT Core - securely connects and manages IoT devices at scale.
2. AWS IoT Greengrass - runs local computing, messaging, and ML on edge devices.
3. AWS IoT Analytics - analyses, filters, and enriches IoT data for insights.
4. AWS IoT Device Defender - monitors and secures device fleets with auditing and alerts.
5. AWS IoT Device Management - onboards, organises, monitors, and remotely manages devices.
6. AWS Lambda - runs event-driven code without provisioning servers.
7. Amazon Timestream - a time-series database optimised for IoT telemetry data.
8. Amazon Kinesis Ingest - buffers and processes real-time data streams.
9. Amazon S3 - durable, scalable storage for IoT data.
10. AWS Glue - prepares and transforms IoT data for analytics and reporting.

Let us review an example of an *IoT solution architecture hosted and deployed in AWS* (Fig.7). It implements all the IoT solution layers shown in Fig.4, where essential IoT solution architecture components are shown.

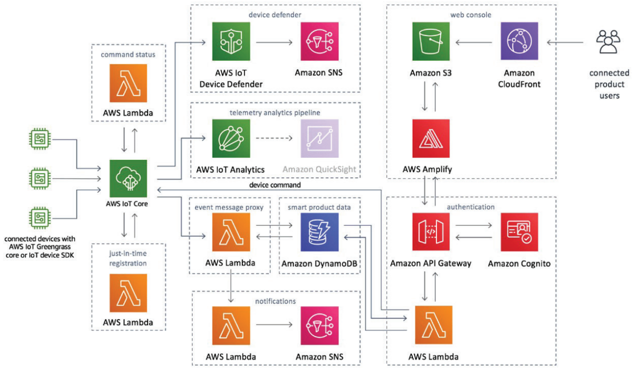

Fig.7. Example of IoT solution architecture hosted and deployed in AWS cloud services.

AWS cloud services cost varies based on the service types and pricing units. For example, it can be per million minutes of connection, million messages, active devices per month, data volume processing and storage, million requests, computing time, audit checks and metrics, data throughput and retention, job duration, direct-connected devices per device per month, and others. AWS Pricing Calculator [8] can be used to *estimate the cost* of AWS services for a specific IoT solution.

AWS cloud services cost optimisation: FinOps. FinOps ("Finances and DevOps") is an operational framework and cultural practice that maximises the business value of cloud and technology used for IoT solutions and creates financial accountability through collaboration between engineering, finance, and business teams. There are three *FinOps phases*:

1. *Phase 1: Inform.* It builds visibility into cloud usage and costs to drive data-based decisions. Accurate forecasting and benchmarking help control budgets and measure performance.
2. *Phase 2: Optimise.* It leverages provider discounts like "reserved instances" and "committed use discounts" to cut costs. Also, it improves efficiency through right-sizing, automation, and eliminating unused resources.
3. *Phase 3: Operate.* It aligns cloud operations with business goals across cost, speed, and quality. It establishes a FinOps culture and tracks trends.

At this point, we finish reviewing public cloud solutions. Fig. 7 illustrates an IoT solution architecture hosted and deployed in AWS and moves to the next topic, *platforms* for implementing IoT solutions.

Platform service providers for implementing IoT solutions

Platforms - foundational technology systems that support developing and deploying applications or services in the cloud or on-premises. A platform is not necessarily a cloud; a platform is usually smaller in scale and simpler in technology than cloud services. Some well-known platforms for hosting IoT solutions are shown in Table 2.

Table 2. Platform services for hosting IoT solutions with comparison

Platform	Pros	Cons
Blynk	User-friendly app builder. Cloud & private deployment. Broad hardware support	Limited analytics. Some features need paid tiers.
ThingSpeak	MATLAB integration. Ideal for education/research. Free tier available	Not suitable for large-scale. Basic UI
Tuya	Smart home ecosystem. Quick OEM app setup. Device management via cloud	Limited to Tuya devices. Less customisation
Akenza	No-code platform. Great visualisation tools	Higher cost for small setups. Smaller community
ThingsBoard	Open-source and scalable. Protocol support (MQTT, CoAP). Highly customizable	Requires technical knowledge. Setup can be complex

Let's review a practical implementation case of an IoT solution using one of the platforms described in Table 2.

Practical implementation of an IoT solution using the Blynk platform

Students of the Electronic Communications and IoT department in Educational and Scientific Institute of Telecommunication Systems, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", designed and implemented an *IoT solution* using the Blynk platform services [9-11] for gathering temperature data (Fig.8).

Key components of the IoT solution are the following:

1. *Sensor* DHT11 for getting the temperature value,
2. *Microcontroller* ESP8266 for getting data from the sensor and sending this data over a wireless IEEE 802.11 interface to the IoT platform,
3. Wireless access point with IEEE 802.11 interface, which acts as a *telecommunication infrastructure* for data transmission [12],
4. A laptop with the Blynk platform that acts as a server for hosting the data received from the sensor.

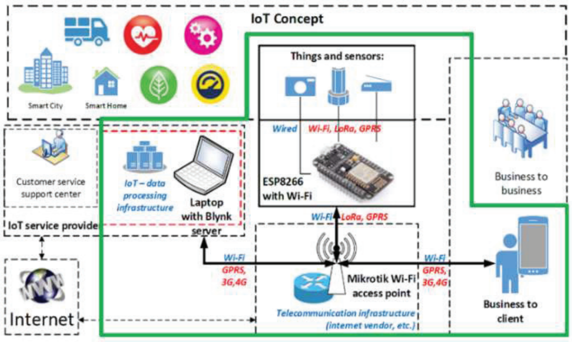

Fig.8. IoT solution for gathering temperature data using the Blynk platform services

The result of this implemented solution can be demonstrated via the screenshot from the Android mobile device application (Fig.9), which shows the value of 18 degrees Celsius of temperature received from the sensor.

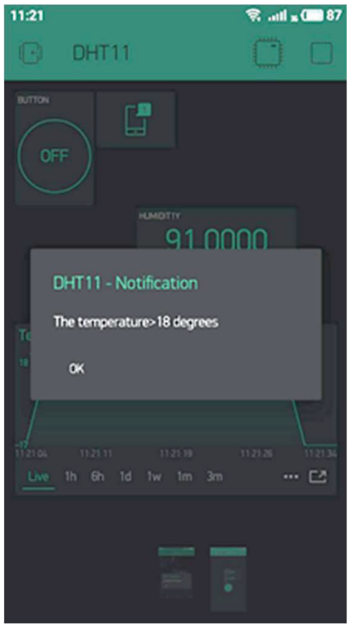

Fig.9. The Android mobile device receives the value of 18 degrees Celsius from the temperature sensor.

Practical implementation of an IoT solution using custom hosting platform services

While public cloud or platform services can be used for deploying and hosting IoT solutions, various platforms and hosting providers provide web application hosting services on the Internet. Such hosting platform services can also be used for deploying and hosting IoT solution, however, it is worth mentioning that such hosting solution is limited in its capabilities to store, process and present the received IoT data, and thus it might require lots of customisation and additional development, so as a result the cost of such solution can be higher than purchasing existing IoT platform or cloud services, especially in case of strict requirements and scaling IoT solution for many IoT devices and users.

The hosting services provider for the Web-applications console example is shown in Fig.10.

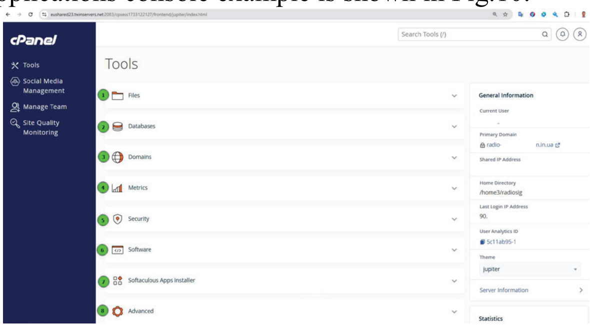

Fig.10. The console of a hosting services provider for deploying web applications and IoT solutions.

As shown in Fig.10, the custom Web-applications hosting services provider offers such services as file storage, databases, domain management, metrics, security, pre-defined software packages and installers, which are not designed for IoT solutions but still can be used for hosting IoT solutions if adopted and appropriately configured.

High-level architecture of the IoT solution based on the customised hosting platform resources is shown in Fig.11 [13, 14].

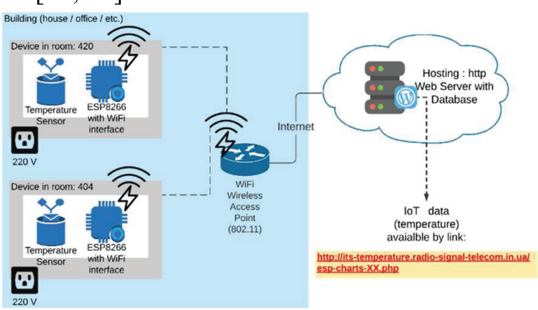

Fig.11. High-level architecture of the IoT solution based on the customised hosting platform resources.

This IoT solution's result is a data graph showing data points over time collected by sensors and stored in the database (Fig.12).

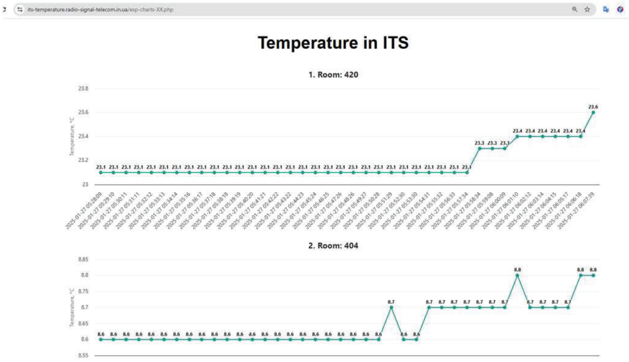

Fig.12. The Data graph shows temperature data points over time collected by sensors and stored in the database of the custom hosting platform.

The IoT devices used for the described solution are shown in Fig.13 and Fig.14.

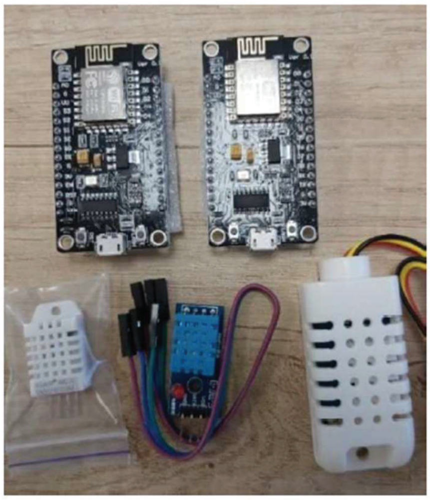

Fig.13. Temperature and humidity sensors DHT11, DHT22, with the ESP8266 microcontrollers.

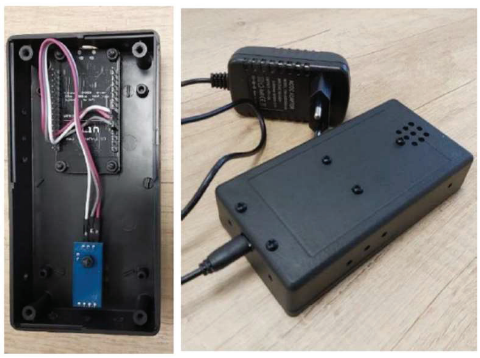

Fig.14. The temperature sensors with ESP8266 microcontroller in the box with the power supply.

The research and development process of creating IoT solutions by students of the Electronic Communications and IoT department in the Educational and Scientific Institute of Telecommunication Systems is shown in Fig.15-16.

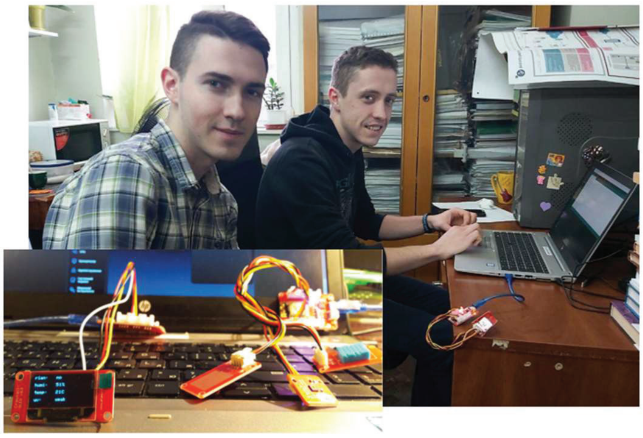

Fig.15. Electronic Communications and IoT department students are programming the ESP8266 microcontroller to work with different input and output interfaces and sensors.

Fig.16. Electronic Communications and IoT department students are putting the temperature sensors with ESP8266 microcontroller in the box with the power supply as a ready-to-go solution that only requires turning on the power. Once the power is turned on, the measured temperature data will be sent to the database.

Recommendations for creating sustainable IoT solutions

Sustainability - practices that meet present needs without compromising the ability of future generations to meet theirs, often involving environmental, social, and economic considerations. Thus, creating sustainable IoT solutions is vital to any IoT solution design and development process.

The following techniques and tips can be kept in mind and considered when creating a sustainable IoT solution:

1. *Use Energy-Efficient Hardware.* Select low-power sensors and microcontrollers (e.g., ESP32, ESP8266, ARM Cortex-M series). Select battery-saving communication protocols like Zigbee, LoRaWAN, or Bluetooth. Use sleep modes and duty cycling to reduce power consumption.
2. *Optimise Data Transmission.* Send data only when needed (event-driven vs. constant streaming). Compress and aggregate data at the edge before uploading to the cloud. Use edge computing (e.g., AWS Greengrass, Azure IoT Edge) to reduce unnecessary cloud traffic.
3. *Use Sustainable Cloud Services*. Select cloud providers with carbon-neutral or renewable energy goals (e.g., Google, Microsoft, AWS). Optimise cloud usage via FinOps practices to reduce idle resources. Use serverless architectures to auto-scale with demand (Lambda, Azure Functions).
4. *Extend Device Lifecycle*. Design for modularity and upgradeability (firmware updates via over-the-air). Use recyclable materials and eco-friendly enclosures. Provide tools or instructions for end-of-life recycling.
5. *Minimise Packaging and Logistics Impact*. Ship devices with minimal and recyclable packaging. Optimise supply chains for local sourcing and low-emission transport. Use digital documentation instead of printed manuals.
6. *Implement Smart Power Management*. Use AI/ML models to predict optimal energy usage (e.g., turning devices off during inactivity). Deploy predictive maintenance to reduce unnecessary servicing trips.

These listed techniques and tips help to build sustainable IoT solutions if considered and followed.

Examples of selecting an IoT cloud service or platform for an IoT application

Three examples of IoT solutions are shown in Table 3, with suggestions as to what cloud services or platforms to use and notes about the features of the implementation of IoT applications.

Table 3. Three examples of IoT solution implementation.

IoT application	IoT cloud or platform	Features of IoT application implementation
Smart farming (precision farming)	Azure IoT Hub	Collects real-time data from soil moisture, temperature, and weather sensors. Integrates with Azure machine learning for predictive analytics [15-16]. Automates weather forecasts and soil conditions.
Smart home automation	Blynk	A platform for controlling home security, lighting, and home appliances. Supports IoT devices such as ESP8266, Raspberry Pi, and Arduino. Provides an intuitive mobile app interface with drag-and-drop capabilities for device monitoring.
Industrial maintenance	AWS IoT Core	Monitors machine performance and predicts failures in factories. Uses AWS Lambda for real-time event processing. Integrates with Amazon SageMaker for AI-based anomaly detection.

Comparison in Table 3 gives a clue about various tools, technologies, capabilities and impact on the cost of IoT solution hosting services for a specific IoT application. However, the question is, how do we know or decide which cloud services or platforms to select from, for example, as shown in Table 3? The answer to this question is proposed below, and a mathematical approach is described for solving such a task.

Utility-based scoring function for selecting cloud or platform services for hosting an IoT solution

Let's define a mathematical description of the task for selecting a service or platform for building an IoT solution. Let C – the set of all candidates of cloud and platform services that are considered for hosting IoT solutions (e.g., AWS, Azure, Blynk, ThingsBoard; *each* of these can be presented as c). Let's assign a *utility score.* $U(c)$ to each candidate of the selected cloud and platform services $c \in C$ as follows (1):

$$U(c) = w_1 \cdot T(c) + w_2 \cdot B(c) + \\ + w_3 \cdot F(c) + w_4 \cdot N(c), \quad (1)$$

where:

- $T(c) \in [0,1]$ – normalised *time score* (1 is the best, the fastest implementation of the IoT solution),
- $B(c) \in [0,1]$ – normalised *budget score* (1 is the best, the cheapest implementation of the IoT solution),
- $F(c) \in [0,1]$ – normalised functional requirements (FR) fit score (1 is the best, cloud or service fully meets IoT solution FRs),
- $N(c) \in [0,1]$ – normalised non-functional requirements (NFR) fit score (1 is the best, cloud or service fully meets IoT solution NFRs),
- $w_1, w_2, w_3, w_4 \in [0,1]$ – weights that represent the importance of each criterion for the IoT solution. The sum of these weights should equal 1.

As a result of estimating the *utility score* for each cloud and platform option from a shortlist, select the cloud or the platform. c^* for an IoT solution that *maximises the utility function* (2):

$$c^* = \arg\max_{c \in C} U(c). \quad (2)$$

Thus, this is a proposed approach to selecting cloud or platform services for hosting an IoT solution.

Please note that the proposed utility function is simplified because it considers FRs and NFRs on a very high level. At the same time, it can be improved and customised for an IoT solution by adding fit scores and weights for specific FRs, NFRs, or constraints.

Conclusion

There's no unique answer about selecting the best IoT cloud services or platform provider since there's no one best platform suitable for any IoT solution.

Big and large IoT solutions will likely use top public cloud providers (Amazon, Microsoft, Google). Their offerings are the best established but also the most expensive. Cloud services calculators can be used to estimate the service's running cost.

Smaller IoT solutions may find small and medium platforms for deploying and hosting in the IoT solution (Blynk, ThingSpeak, ThingsBoard), which are more cost-efficient options.

The choice will always depend on the specific requirements of the business and IoT solution, like functional and non-functional requirements, as well as constraints.

A utility-based scoring function for selecting cloud or platform services is proposed.

References

1. World trends of modern information and telecommunication technologies development / Ilchenko M., Uryvsky L., Osypchuk S. // The Fourth International Conference on Information and Telecommunication Technologies and Radio Electronics, UkrMiCo-2019. Odesa, Ukraine. – Conference proceedings. https://ieeexplore.ieee.org/document/9165461/. Date of Conference: 9-13 Sept. 2019. Date Added to IEEE Xplore: 12 August 2020. ISBN Information: DOI: 10.1109/UkrMiCo47782.2019.9165461. – 7 p.
2. The main directions of improving information and communication technologies in the global trends / Mykhailo Ilchenko, Leonid Uryvsky, Sergey Osypchuk // Lecture Notes in Networks and Systems. Springer. ISSN 2367-3370 ISSN 2367-3389 (electronic). Lecture Notes in Networks and Systems. ISBN 978-3-030-58358-3 ISBN 978-3-030-58359-0 (eBook). September 2020. DOI:10.1007/978-3-030-58359-0_1. In book: Advances in Information and Communication Technology and Systems (pp.3-22)
3. Internet of things solutions usage perspectives in Ukraine and their applications specifics / L. Uryvsky, A. Moshynska, S. Osypchuk // Collective monograph «The Potential of Modern Science». 2019. – 17 p.
4. Yadav Poonam, Qi Li, and Richard Mortier. "IoT Network Behaviours and Dependencies." November 2018. Series No: CDBB_WP_005. DOI: https://doi.org/10.17863/CAM.31463. University of Cambridge. (2018).
5. Kumar Vijay, Poonam Yadav, et al. "Challenges in the design and implementation of IoT testbeds in smart-cities: A systematic review." arXiv preprint arXiv:2302.11009 (2023).
6. Amazon Web Services, Inc., "AWS Well-Architected Framework: IoT Lens," [Online]. Retrieved from: https://docs.aws.amazon.com/wellarchitected/latest/iot-lens/wellarchitected-iot-lens.pdf. [Accessed: May 22, 2025].
7. Kolcun, Roman, Diana Andreea Popescu, Vadim Safronov, Poonam Yadav, Anna Maria Mandalari, Richard Mortier, and Hamed Haddadi. "Revisiting IoT device identification." arXiv preprint arXiv:2107.07818 (2021).
8. Amazon Web Services, Inc., "AWS Pricing Calculator." [Online]. Retrieved from: https://calculator.aws. [Accessed: May 22, 2025].
9. Blynk Inc., "Blynk IoT Platform," [Online]. Retrieved from: https://blynk.io. [Accessed: May 22, 2025].
10. Theoretical research and practical design of IoT testbed solution based on ESP8266 SoC and Blink components / Chekunov M., Osypchuk I., Kyrashchuk V., Osypchuk S. // 12th International Scientific Conference "Modern Challenges in Telecommunications", April 16-20, PT-2018. Kyiv, Ukraine. Conference materials. – pp. 466-468.
11. Applied aspects of implementation of information transmission solutions in the IoT technologies / Serhiy Osypchuk, Alina Moshinska, Vasyl Kirashchuk // Proceedings of the International Scientific and Technical Conference "Perspectives of Telecommunications". Kyiv, Ukraine. PT-2019. pp.17-21.
12. Kumar, Vijay, Poonam Yadav, and Leandro Soares Indrusiak. "Resilient Edge: Building an adaptive and resilient multi-communication network for IoT Edge using LPWAN and WiFi." IEEE Transactions on Network and Service Management 20, no. 3 (2023): 3055-3071.
13. Research and implementation of IoT temperature automated metering project based on telecommunication systems institute / Iatsyshin O., Maltsev A., Dykyy A., Osypchuk S. // Proceedings of the International Scientific and Technical Conference "Perspectives of Telecommunications". Kyiv, Ukraine, PT-2020. – pp. 343-345.
14. Research and implementation of IoT projects for environment parameters and energy resource metering / Leonid O. Uryvsky, Wolfgang H. Gerstacker, Alina V. Moshynska, Serhii O. Osypchuk, Oleksandr V. Yatsyshyn // ISSN 2312-4121, Information and Telecommunication Sciences, 2020, Volume 11, Number 1 © 2020, National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”. – pp. 27-34. https://doi.org/10.20535/2411-2976.12020.27-34
15. Yadav Poonam, Edith CH Ngai, et al. "Machine Learning on Edge in Sensor Systems (SenSys-ML 2024)." In 2024 IEEE 3rd Workshop on Machine Learning on Edge in Sensor Systems (SenSys-ML), pp. 1-2. IEEE, 2024.
16. Kolcun Roman, Poonam Yadav, et al. "The case for retraining of ML models for IoT device identification at the Edge." arXiv preprint arXiv:2011.08605 (2020).

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Дослідження хмарних сервісів та платформ для розгортання додатків Інтернету речей

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Проблематика. Для розгортання та розміщення додатків Інтернету речей доступні різні хмарні сервіси та платформи. Такі сервіси та платформи відрізняються можливостями, вартістю, складністю та іншими факторами. Які хмарні сервіси або платформи вибрати для рішення Інтернету речей – це актуальне та складне питання. У статті детально досліджені хмарні сервіси та платформи для розгортання та розміщення додатків Інтернету речей, а також пропонується спосіб знайти відповідь на питання вибору відповідних хмарних сервісів або платформ.

Мета досліджень. Мета статті – надати огляд хмарних сервісів та платформ для розгортання та розміщення додатків Інтернету речей, а також запропонувати метод вибору відповідних хмарних сервісів або платформ для розгортання та розміщення додатків Інтернету речей.

Методика реалізації. У роботі використані теоретичні дослідження в галузі експертизи хмарних сервісів та платформ для побудови рішень Інтернету речей, математичне моделювання та теорія рішень, запропоновано функціональну форму з ваговими коефіцієнтами для вибору набільш підходящого варіанту із попередньо вибраних хмарних сервісів та платформ на основі вимог та обмежень рішення Інтернету речей.

Результати досліджень. У статті детально досліджується еволюція технології Інтернету речей, життєвий цикл продукту Інтернету речей, архітектура рішень Інтернету речей та типи хмарних сервісів для хостингу рішень Інтернету речей. Дослідження заглиблюється в постачальників послуг публічної хмари з детальним розглядом послуг публічної хмари AWS та розглядає постачальників послуг платформи для впровадження рішень Інтернету речей. Далі робота аналізує два практичні випадки впровадження рішень Інтернету речей з використанням платформи Blynk та користувацьких послуг хостингу. Також дослідження формулює рекомендації щодо створення сталих рішень Інтернету речей та надає приклади вибору хмарного сервісу або платформи Інтернету речей для трьох застосунків Інтернету речей з різних бізнес-сфер. Як результат, у роботі пропонується функція оцінювання на основі корисності для вибору хмарних або платформних сервісів для розгортання та хостингу рішення Інтернету речей.

Висновки. Не існує універсального рішення хмари або платформи для розгортання рішень Інтернету речей. Вибір залежить від специфіки рішення Інтернету речей, вимог та обмежень. Запропоновано функцію оцінювання на основі корисності для вибору постачальника хмарних послуг або платформи.

Ключові слова*: Інтернет речей; хмарний сервіс; платформа; функція оцінювання корисності.*

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